ENCYCLOPEDIA BRITANNICA.

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Encyclopaedia Britannica;

OR, A

DICTIONARY

OF

ARTS, SCIENCES, AND MISCELLANEOUS LITERATURE;

ENLARGED AND IMPROVED.

THE FOURTH EDITION.

Illustrated with nearly six hundred Engravings.

VOL. I.

INDOCTI DISCANT; AMENT MEMINISSE PERITI.

EDINBURGH:
Printed by Andrew Bell, the Proprietor,
FOR ARCHIBALD CONSTABLE AND COMPANY, EDINBURGH;
AND FOR VERNOR, HOOD, AND SHARPE,
LONDON.

1810.

TO

THE KING.

In requesting permission to inscribe to your Majesty the present Edition of the Encyclopædia Britannica, the Proprietor hopes, that this humble testimony of his loyalty and duty will be graciously received. In this expectation he is the more encouraged, when he considers the zeal which your Majesty has uniformly shown for the improvement of Arts and Sciences, and the known benevolence of your Majesty's disposition, which has long made you revered as the Father of your People, and which has always secured a favourable reception to the requests of your subjects.

That, by the wisdom of your Councils, and the vigour of your Fleets and Armies, your Majesty may be enabled soon to restore peace to Europe; that you may again have leisure to

direct your undivided attention to the improvement of Arts, and the advancement of Knowledge; that you may long reign over a free, a happy, and a loyal people; and that the Sceptre of the British Empire may be swayed by your Majesty's descendants to the latest posterity, is the earnest prayer of

Your MAJESTY's

Most dutiful Subject,

And devoted Servant,

ANDREW BELL.

Lauristoun, Edinburgh,
1809.

PREFACE.

In the present improved state of science, of literature, and of all those arts which are connected with the progress and improvement of society, it is surely unnecessary to dwell on the importance of a work, the chief object of which is to exhibit a view of those great and interesting subjects. If science, while its beneficial influence is felt in all the common pursuits of life, affords scope at the same time to the greatest exertions of human genius; if literature is both the delight and ornament of those by whom it is cultivated; and if history, by bringing under our review the great course of human affairs, enables us to draw lessons for our future conduct from the unerring experience of the past, there can be no question as to the importance of a work comprising so many objects of deep and general interest to mankind. It deserves also to be remarked, that many of those great discoveries which have effected a revolution in science, and which have gradually introduced the most striking changes into the affairs of the world, have been the fruit not of accident, but of the most painful and abstruse inquiries; and that the great powers of invention and genius necessary to explore those intricate paths, do not by any means imply the same capacity of plain and familiar illustration;—those who possess those rare endowments being, on the contrary, rather averse to waste their precious talents on what appears to them to be the natural employment of more ordinary minds. It is hardly necessary, however, to point out to the reader how greatly the cause of philosophy must be promoted, when its important truths, in place of being confined to the speculative few, are expounded in popular works, and in this manner diffused among all classes of the community, so as to be the common topics of men's discourse,—thus adding to their innocent and laudable recreations, and setting to work at the same time, in the cause of literature and science, an additional stock of talent and exertion. Such being the obvious advantages arising from a well-digested account of Science, of Literature, and of General History, we shall not enlarge farther on the utility of the present work. As in such an undertaking, however, the execution is of as much importance as the plan, we shall endeavour, as shortly as possible, to satisfy the reader that, in that particular, no pains nor ex-

pence

pence have been spared to render the present edition as perfect as possible, and to give it a fair claim to that share of popularity and reputation, so amply enjoyed by the ENCYCLOPÆDIA BRITANNICA from the first moment of its publication.

In so complicated a work, it is obviously of infinite importance to preserve a clear and accurate arrangement, so as to give unity and consistency to its various parts; for it is evident that, without constant attention to method and order, such a work may be rendered in a great measure useless: and though it may still be an immense and valuable register of knowledge, the reader may search through its pages without any clue to guide him to the object of his inquiries. It is in this particular that the first rude essays towards a compilation of this kind are so extremely defective. The alphabet, in place of being employed in the humble function of an index to the matter contained in the work, was made supreme arbiter of the whole arrangement; and the different sciences, instead of following their natural order, were cut down into detached parts, out of which no great whole could possibly be formed. In this view the alphabet, far from conducing to clearness, became an instrument of disorder; and its only use appeared to be, to save the writers to whom we allude from the trouble of a more accurate or philosophical arrangement. Those obvious defects in all the most popular dictionaries of arts and sciences were observed by Mr Chambers, the compiler of a very valuable work of this kind himself; and, in speaking of the labours of his predecessors, he particularly censures the inattention to method, so visible in every part of their performances. "Former lexicographers (he observes) scarce attempted any thing like structure in their works; they seem not to have been aware that a dictionary is in some measure capable of the advantages of a continued discourse; and hence it is, that we see nothing like a whole in what they have done." For the purpose of remedying this defect in his own work, he informs his readers, that "his view was to consider the several matters, not only in themselves, but relatively, or as they respect each other; both to treat them as so many wholes, and as so many parts of some greater whole; and to point out their connection with each other, and with that whole, by reference: so that by a course of references from generals to particulars, from premises to conclusions, from cause to effect, and *vice versa*, a communication might be opened between the several parts of the work, and the detached articles be in some measure replaced in the natural order of science, out of which the alphabetical order had removed them." With a view of exhibiting a

connected

connected view of the various articles scattered through his dictionary, Mr Chambers has accordingly prefixed to it an analysis, from which may be seen, at one view, the mutual connection and dependence of its various parts.

But although the arrangement of the Cyclopædia of Mr Chambers is much preferable to that of any former work of the kind, it is still liable to many of those objections for which he censures his predecessors. Even if his original plan had been carried into effect with complete success, and all the articles in different parts of his work had been so managed, as, when reunited, to have made so many complete systems, the number of references was still so great that no reader could possibly have submitted to the trouble of combining them (A).

Of

(A) To be convinced of the truth of this assertion, one needs but to cast his eye over the author's table of arrangement. It is as follows.

KNOWLEDGE is either

- *Natural* and *Scientifical*; which is either —
  - *Sensible*; consisting in the perception of phenomena or external objects—called PHYSIOLOGY or NATURAL HISTORY; and which, according to the different kinds of such objects, divides into —
    - METEOROLOGY.
    - HYDROLOGY.
    - MINERALOGY.
    - PHYTOLOGY.
    - ZOOLOGY.
  - OR,
  - *Rational*; consisting in the perception of the intrinsic characters or habitudes of sensible objects — either their — — —
    - *Powers*, and *Properties*—called PHYSICS, and NATURAL PHILOSOPHY.
    - *Abstracts*—called METAPHYSICS, which subdivides into
      - ONTOLOGY.
      - PNEUMATOLOGY.
    - *Quantities*—called PURE MATHEMATICS—which divides, according to the subject of the quantity, into —
      - ARITHMETIC—whence
        - ANALYTICS.
        - ALGEBRA.
      - GEOMETRY—whence
        - TRIGONOMETRY.
        - CONICS.
        - SPHERICS.
      - STATICS —
    - *Relations* to our happiness—called
      - ETHICS, or NATURAL RELIGION, or the doctrine of OFFICES, which subdivides into
        - POLITICS.
        - LAW.
      - RELIGION—whence
        - THEOLOGY, or REVELATION.
- OR,
- *Internal*; employed in discovering their agreement and disagreement; or their relations in respect of truth—called LOGIC.
- *Artificial* and *Technical*, (consisting in the application of natural notices to farther purposes), which is either —
  - *Real*, employed in discovering and applying the
    - *Latent powers* and *properties* of bodies—called CHEMISTRY—whence
      - ALCHEMY.
      - NATURAL MAGIC, &c.
    - *Quantities* of bodies — called MIXED MATHEMATICS; which according to the different subjects, resolves into —
      - OPTICS, CATOPTRICS, DIOPTRICS, —whence
        - PERSPECTIVE.
        - PAINTING.
      - PHONICS—whence MUSIC.
      - HYDROSTATICS, HYDRAULICS.
      - PNEUMATICS.
      - MECHANICS—whence
        - ARCHITECTURE.
        - SCULPTURE.
        - TRADES and MANUFACTURES.
      - PYROTECHNIA—whence
        - The MILITARY *Art*.
        - FORTIFICATION.
      - ASTRONOMY—whence
        - CHRONOLOGY.
        - DIALLING.
      - GEOGRAPHY, HYDROGRAPHY—whence
        - NAVIGATION.
        - COMMERCE.
    - *Structure* and *economy* of organical bodies, called ANATOMY.
    - *Relations* thereof to the preservation and improvement—either of —
      - Animals—called
        - MEDICINE.
        - PHARMACY.
      - Vegetables—called
        - AGRICULTURE.
        - GARDENING.
      - BRUTES—called
        - FARRYING.
        - MANEGE—whence
          - HUNTING.
          - FALCONRY.
          - FISHING, &c.
  - OR,
  - *External*; which is either
  - *Symbolical*, employed in framing and applying
    - *Words*, or articulate signs of ideas—called GRAMMAR.
    - *Armories*—called HERALDRY.
    - *Tropes* and *Figures*—called RHETORIC.
    - *Fables*—called POETRY.

Such

Of this inconveniency, inseparable from a mere *dictionary* of arts and sciences, the original compilers of the Encyclopædia Britannica were fully aware; and they resolved, in the conduct of their work, to adopt such a plan as should completely free it from this objection. They were as fully convinced as their predecessors of the utility of a separate explanation of every technical term, and of the necessity also of noticing, in detail, many topics which it would be proper more fully to illustrate in the general account of the respective sciences to which they belonged. They were sensible, however, at the same time, how greatly the progress of useful knowledge is facilitated by systematical arrangement, and how necessary it is for those to think methodically who expect to benefit mankind by their labours. They have accordingly endeavoured, in place of the awkward expedient of a prefatory analysis, adopted by Mr Chambers, to exhibit a clear and satisfactory account of the several arts and sciences under their proper denominations, and to explain at the same time the subordinate articles under their technical terms. These articles may be divided into three kinds. The first consists of such as, not depending very closely on particular systems, admit of a complete explanation under their proper names; the second of such as require to be considered in the general account of the sciences with which they are connected, and also under their own denominations; and the third, of such as belong to a great whole, from which they cannot be separated, so as to be explained in detail. Articles of the first kind admit, of course, of no references; those of the second sort, being only partially explained under their own denominations, the reader is referred for more complete information to the article where the subject is more fully illustrated; and in articles of the third description, no attempt is made to explain them, except in connection with the subjects to which they severally belong, and to which the reader is therefore always referred.

Such

Such is that great and general analysis of knowledge, which has by some of our correspondents been recommended to us in terms of the highest praise, and to which elegance and accuracy cannot perhaps be refused. Its utility, however, as prefixed to a dictionary of arts and sciences, is not very apparent. From each word, which in this table is printed in capitals, many branches are made to spring, which in the dictionary are all treated as separate articles. Thus, from METEOROLOGY we are referred, in a subordinate analysis, to AIR and the ATMOSPHERE; including, 1st, The history of its contents, ÆTHER, FIRE, VAPOUR, EXHALATION, &c. 2d, METEORS formed therein; as CLOUD, RAIN, SHOWER, DROP, SNOW, HAIL, DEW, DAMP, &c. RAINBOW, PARHELION, HALO, THUNDER, WATERSPOUT, &c. WINDS, MONSOON, HURRICANE, and the like. As every word printed in capitals, as well in this subordinate division as in the general table, is the title of an article treated separately in the Cyclopædia, we must turn backwards and forwards through more than 24 references before we come at the detached topics, which we are directed to unite into a system of METEOROLOGY. The number of articles which must be united in the same manner to constitute the Compiler's system of METAPHYSICS is upwards of 48; and those which are referred to THEOLOGY above 300!

Such is the arrangement adopted in every edition of the ENCYCLOPÆDIA BRITANNICA; and there appears to be no other, by which the great object of such a work would be so easily and so completely attained. The necessary effect of such a plan must be, to give to readers of every description the most easy access to the objects of their various pursuits; for, whilst the philosopher or artist may procure whatever information he is in search of, by turning to the general name of the science to which his attention is directed, those who are desirous of information on particular topics will find them explained with sufficient accuracy under their respective denominations. Considered in this point of view, the ENCYCLOPÆDIA BRITANNICA may vie in the accuracy of its arrangement with the *Encyclopédie Methodique*; for though that voluminous work undoubtedly has an imposing appearance, yet we, who, in the course of our labours, have had to consult it frequently, have never found our object the more readily, for having been obliged to travel in quest of it through different alphabets.

A dictionary, in which the several arts and sciences are digested into distinct treatises or systems, whilst the various detached parts of knowledge are explained in the order of the alphabet, seems indeed to have received the best form of which such a work is susceptible; and may certainly be made to answer one end, which more philosophical arrangements never can accomplish. Under the various letters of the alphabet, it is obvious that the whole circle of the sciences may be completely exhausted; and that every discovery, ancient or recent, may be referred to the particular system which it tends to confute or to confirm, without having recourse to the awkward expedient of employing several alphabets, or the still more inconvenient arrangement by which the systems themselves are broken into fragments.

The truth of these observations is confirmed beyond the possibility of doubt, by the favourable reception which every edition of the ENCYCLOPÆDIA BRITANNICA has hitherto met with; by the still greater encouragement which has been given to the present; and by the circumstance of its plan having been invariably adopted by the editors of all similar works. On this subject, the proprietors of the present edition express themselves with the greater ease and confidence, as they cannot be accused of flattering their own vanity, or of being the publishers of their own praise. The merit of the arrangement, as well as of various other improvements suggested in the course of the work, belongs not so much to them, as to the compilers of the first edition.

To

To a work which proposes as its main object to exhibit a view of the Arts and Sciences, the private history of those eminent persons by whose ingenuity the progress of science has been promoted, seems to be a proper accompaniment. Those who formed the plan of the ENCYCLOPÆDIA BRITANNICA resolved accordingly to improve it, by the addition of one department, not to be found in any former compilation of the kind, with the exception of the French *Encyclopédie*.

Of all the various sorts of narrative-writing, it is acknowledged that none is more worthy of cultivation than Biography, since none can be more delightful or more useful; none can more certainly enchain the heart by irresistible interest, or more widely diffuse instruction to every diversity of condition. Its tendency to illustrate particular passages in general history, and to diffuse new light through such arts and sciences as were cultivated by the persons whose lives are related, are facts too obvious to require proof. It exhibits likewise the human character in every possible form and situation. It not only attends the hero through all the bustle of public life, but pursues him to his most sequestered retirements. It shows how distinguished characters have been involved in misfortunes and difficulties; by what means they were extricated; or with what degree of fortitude and dignity they discharged the various functions, or sustained the vicissitudes, sometimes prosperous and sometimes adverse, of a chequered and a fluctuating life. In such narratives, men of all ranks must feel themselves interested; for the high and the low, as they have the same faculties and the same senses, have no less similitude in their pains and pleasures; and, therefore, in the page of honest biography, those whom fortune or nature has placed at the greatest distance, may mutually afford instruction to each other. For these reasons it is, that every man of learning and taste has esteemed the biographical labours of Plutarch among the most valuable and interesting remains of antiquity.

The lives and characters, therefore, of such persons as have excelled in the arts either of war or of peace, of such as have distinguished themselves either on the theatre of action, or in the recess of contemplation, will be found in the ENCYCLOPÆDIA BRITANNICA alphabetically disposed under their proper names. In former editions of this work, many names are omitted for which the reader will naturally look; some because the work had advanced beyond the initial letters of their names before the editor received intelligence of their deaths; others through inadvertency, and from various mistakes, against which it is difficult to provide in so extensive an undertaking,

taking; and several from the confusion occasioned by the death of the first editor in the midst of his labours. In the present edition, all these defects have been carefully rectified; and the proprietor may safely venture to assert, that it contains a more perfect biographical register than any which has hitherto been offered to the public. Some, indeed, may be disposed to remark, that this department of their work is executed with too great minuteness, and that the names of many persons are dragged from obscurity, who are not proper objects of public regard. To this we shall only reply, with the greatest biographer of modern times, that, in our apprehension, there has rarely passed a life of which a faithful narrative would not be useful; and that, in the lives of the most obscure persons of whom we have given any account, something will be found either connected with recent discoveries and public affairs, or capable of affording a useful lesson to those who may be placed in similar circumstances.

Between eminent achievements and the scenes where they were performed, there is a natural and necessary connexion. The character of the warrior is connected with the fields of his battles; that of the legislator, with the countries which he civilized; and that of the traveller and navigator, with the regions which they explored. Even when we read of the persons by whom, and the occasions on which, any particular branch of knowledge has been improved, we naturally wish to know something of the places where such improvements were made. This curiosity, so natural and so laudable, has been frequently felt by ourselves during the compilation of this work; and to gratify it in others, we have subjoined to the name of every considerable place an account of its situation, its climate, its soil, its peculiarities, its inhabitants, with the manners, customs, and arts; its revolutions, laws, and government, with whatever else appeared necessary for the reader's information, and at the same time admissible into a work of such variety and extent. It is indeed probable, that by many of our readers we shall be thought to have done too much rather than too little in this department; and to have filled our pages with accounts of towns and villages not of sufficient importance to demand general attention. But were it known how many of such places we have excluded from our work, though recommended to us by some of our most obliging correspondents, those who reflect upon the different tastes of mankind, and consider that we wrote for the public at large, would forgive us for having occasionally employed a few sentences in the description of others, which, whatever be their real importance, could not have been omitted without disappointing a very numerous class of readers.

The knowledge of history is so important, not only to the statesman and the legislator, to whom indeed it is absolutely necessary, but likewise to every man who moves in a sphere above that of the lowest vulgar, that a work professing to be a general repository of arts, sciences, and literature, would be exceedingly defective, if it did not contain some information of the transactions of those who have been in possession of the world before us; of the various revolutions of states and empires; and of all the other means which have contributed to bring every thing into the state in which we behold it. Fully aware of this, the compilers of the ENCYCLOPÆDIA BRITANNICA, besides giving a general view of universal history and chronology, have enriched this edition with a short, though they hope luminous, detail of the progress of each particular nation, which from the remotest period to the present time, has acted a conspicuous part on the theatre of the world. The reader therefore will here find a very comprehensive view of Civil History, ancient and modern, in all its branches. Nor have the histories of Nature and Religion been neglected. Of the former, it is not perhaps too much to say, that in all the subdivisions of its three great kingdoms, it will be found more fully, more accurately, and more scientifically, detailed in this work, than in any other dictionary which has yet been published. Of the latter, a brief view is given under the general article History; the unavoidable defects of which are in a great measure supplied by the accounts that will be found, under their proper denominations, of all the considerable sects and opinions which have prevailed in the religious world, from the earliest periods to the present day.

From the original plan of the ENCYCLOPÆDIA BRITANNICA, which hardly seems capable of any improvement, the compilers of the present edition have, except in a very few instances, never deviated; and they can honestly assure their readers, that notwithstanding their adherence to this resolution, they have found ample scope for the exercise both of learning, and diligence in every sort of laborious research. This must necessarily be the case, indeed, in every succeeding edition of such a work as the present, which professes to follow the sciences and the arts through all their changes and refinements, and to present the most accurate view of the state of the world and of all its concerns at the period of each successive publication. This part of their duty, those concerned with the present edition have neither spared labour nor expence faithfully to discharge. Literary journals; the memoirs and transactions of philosophic societies; and all the most valuable dictionaries of arts and sciences, both in our own and in other languages,

guages, have been constantly consulted. The works of the most eminent authors, as well ancient as modern, who have written on any particular art or science, have been collected and compared. Such of them as treat of topics, about which there is no room for controversy, and are at the same time susceptible of abridgement, have been abridged with the greatest care; whilst others, more concise and tenacious of their subjects, have been more closely pursued and more faithfully retained. Upon those branches of science on which the works of other authors furnished nothing fit for the purpose of the Editors, original essays and treatises are inserted, which were composed either by themselves, or by such of their friends as they knew to be intimately acquainted with the subject. On disputed points, whether in the physical or moral sciences, arguments and objections have been displayed in their full force; and of each of the various sects into which the Christian church is divided, the account is generally given by the most eminent clergymen of that sect to whom the Editors could find access.

In executing this part of their task, there were various circumstances connected with the history of the third edition, which greatly added to its difficulties. In so extensive and multifarious a collection, a few mistakes, repetitions, and omissions might naturally be looked for, although the publication were, from the beginning to the end, in the hands of a single individual. When it is known, however, that after the third and last edition of this work was considerably advanced, it was committed to the care of a new editor, ignorant of the contents of what had been already finished and printed, and without any directions from his predecessor to guide him accurately through the remaining part of his task; it will not, perhaps, appear very surprising that inaccuracies, omissions, and repetitions should have occurred. For these defects, the want of an intelligible index to the materials left by the first editor is the best apology, and it was owing to the want of such a necessary guide that Dr Gleig, the second editor, was perpetually liable, notwithstanding the utmost circumspection, to give, under one title, an explanation of subjects which had before been explained under another; and to omit articles altogether, from a persuasion, sufficiently natural in the circumstance in which he was placed, that they had been discussed in some preceding volume under the general system to which they belong.

We are far from wondering at, or from censuring these imperfections in the last edition. At the same time we may be permitted to observe, that they

they contributed greatly to add to the difficulties of the present editor; since it was absolutely necessary, in order to preserve the unity and consistency of the work, diligently to examine and to compare all those parts of the former edition in which there was any thing unsuitable to the general plan, or in which any interesting information was omitted.

In executing this part of his task, the Editor has encountered many difficulties; but he can truly say he has spared no pains, whether by addition or arrangement, to overcome them, and to present to the public a finished work. For this purpose, he has also availed himself of the valuable information contained in the two supplementary volumes to the third edition, conducted under the inspection of Dr Gleig, which, joined to the more recent improvements of science, he has new-modelled and arranged for the present work.

As it may be satisfactory to the reader to learn by whose assistance the ENCYCLOPÆDIA BRITANNICA has been brought to its present state of perfection, the following list is subjoined, which the Editor flatters himself will be found to contain the names of various writers eminent for their proficiency in different departments of literature and science.

For whatever instruction may be contained under the articles Anatomy, the public is indebted to the late Andrew Bell, F. S. S. A., the proprietor, who had devoted a great portion of his time and attention to the study of anatomy, and to the ingenious Mr Fife, who has practised for many years under Dr Monro, as dissecter in the anatomical school of the University; and the whole article Surgery has been written anew by Mr James Wardrope, surgeon in London.

The articles Aerology, Aerostation, Chemistry, Electricity, Gunnery, Hydrostatics, Mechanics, Meteorology, Mineralogy, with most of the separate articles in the various branches of Natural History, we have reason to believe were originally compiled by the late Mr James Tytler, chemist, but many of them have been entirely re-written, and the others accommodated to the present improved state of these sciences, by Dr James Millar, who superintended the editing of the present work, Dr Kirby, and Dr Brewster of Edinburgh, and Professor Muirhead of Glasgow.

The article Blind was furnished by the late Dr Blacklock and Dr Moyes, both men of superior attainments, the former in elegant literature, and the latter in the physical sciences.

Astronomy and Navigation were compiled, the one by Dr Thomas Thomson, and the other by Dr Andrew Mackay; and the articles Algebra, Conic

Sections, Trigonometry, and several others in the mathematical and physical sciences were furnished by Mr William Wallace of the Royal Military College, Great Marlow.

The lives of Johnson and Mary Queen of Scots, with the articles Instinct, Love, Metaphysics, Miracle, the history of Ethics under Moral Philosophy, Oath, Passion, Plastic Nature, Polytheism, Prayer, Slavery, and Supper of the Lord, were contributed by the Right Reverend Bishop Gleig of Stirling, editor of the last six volumes of the former edition; Grammar and Theology by Dr Gleig and the Reverend James Bruce, A. B. late of Emanuel College, Cambridge; and Motion by Dr Gleig. The system of Medicine, which was published in the former edition, was revised and improved for the present by Andrew Duncan, M. D. Fellow of the Royal Society of Edinburgh, and Professor of the Institutes of Physic in the University.

The article Music was furnished by Dr Blacklock for the third edition, and has been considerably improved for the present by Mr George Sandy, writer to the signet, and William Maxwell Morison, Esq. advocate, to the latter of whom the Editor is also indebted for what we have published on the science of Physiognomy. The articles Mysteries, Mythology, and Philology, we owe to the erudition of the late Dr David Doig, master of the grammar school of Stirling, and author of two very ingenious Letters on the Savage State, addressed to the late Lord Kames.

Navigation, Paralax, Pendulum, Projection of the Sphere, and Ship-Building, were furnished by the late Andrew Mackay, L. L. D. long known to the public as an able mathematician; and the article War, including Naval Tactics, by Dr Kirby.

In the former edition, the valuable articles Physics, Pneumatics, Precession of the Equinoxes, Projectiles, Pumps, Resistance of Fluids, River, Rotation, Seamanship, Signals, Sound, Specific Gravity, Statics, Steam and Steam Engine, Strength of Materials, Telescope, Tide, Articulating Trumpet, Variation of the Compass, and Water-Works, were originally written by Professor John Robison. These articles have not been materially altered in the present edition; and to those who are at all acquainted with the various and original acquirements of that author, it is altogether unnecessary to enter particularly into their merits.

Philosophy is the joint production of Professor Robison and Dr Gleig. Physiology was furnished by John Barclay, M. D. of Edinburgh, and Midwifery by Dr James Hamilton, junior. For a continuation of the History

of India, the editor is indebted to Dr William Tennant, who resided long in that country. The articles Political Economy and Taxation are written by Mr Hugh Murray; Gardening by Mr James Williamson; and an account of Boscovich's system of Natural Philosophy by Dr Poole. We know that much useful information had been communicated by Dr Latham of Dartford in Kent, the celebrated ornithologist; by Dr William Wright, physician-general to the forces in the West Indies under the command of Sir Ralph Abercromby; by the Reverend J. Hawkins, vicar of Halsted in Essex; by the late Mr Adams, mathematical instrument maker to his Majesty; and by Mr William Jones, optician in Holborn, London.

With every disposition to acknowledge the very able assistance with which we have been favoured in the prosecution of this important undertaking, we are still sensible, that it is wholly out of our power to particularize every one to whom we are indebted. To enter into any detail of the reasons which prevent us from making this particular acknowledgment is wholly unnecessary. We may mention, however, one circumstance, which would of itself have prevented us from being so minute in this particular as we might have wished, namely, the death of Mr Bell, the late proprietor, before the work was finished; to whose great exertions in forwarding this publication, as well as to his zeal in the general cause of science, all those who had the pleasure of his acquaintance can bear witness. While delicacy, however, prevents us from enlarging on this topic, we hope the reader will excuse this tribute of respect to the memory of an estimable character; and that the apology we have made will, at the same time, be deemed satisfactory by those, whose assistance, in the course of the publication, we are in this manner prevented from properly acknowledging.

Edinburgh, July 1810.

ENCYCLOPÆDIA BRITANNICA.

A.

A, Abbreviat.

A, THE first letter of the alphabet, in all the known languages of the world, that of Ethiopia excepted, in which it is the 13th. It has deservedly the first place in the alphabet, on account of its simplicity, very little more being necessary to its pronunciation than opening the mouth.

In the English language, A is the mark of three different sounds, termed, by our grammarians, the *broad*, the *open*, and the *slender* A. The first resembles that of the German A, is found in several monosyllables, as *wall*, *salt*, &c. and is pronounced as *au* in *cause*. It is probable that the Saxons expressed only this broad sound of the letter, as it is still commonly retained in the northern districts of England, and universally throughout Scotland; as, *tauk* for *talk*, *wauk* for *walk* or *wake*.—The open A resembles that of the Italians in *adagio*, and is the same with that of *a* in *father*, *rather*, &c. The slender sound is peculiar to the English language, and resembles the sound of the French diphthong *ai* in *pais*, or their *a* masculine, or perhaps it is a middle sound between them. This is exemplified in *place*, *waste*, &c. also in *toleration*, *justification*, and all other words ending with *ation*.

A is sometimes added after words in burlesque poetry; in which case it only makes an additional syllable without any alteration of the sense, as the interjection O very often does in our ballads. It is also sometimes redundant, as in the words *arise*, *awake*, &c. which are not different in signification from *rise*, *wake*, &c.

It is sometimes a word, either noun or interjection; in which last case, it is commonly an expression of grief, and joined with the aspirate, as *ah!* When a noun, it is only with respect to itself; as *great* A, *little* a, &c.

A is very frequently used as an article; in which case it has no plural signification, and is used to denote the number *one*, as *a* house, *a* field, &c. When placed as an article before any of the vowels, *y* and *w* only excepted, it is joined with the letter *n*; as *an* island, *an* orator, &c.—In the three following cases it is a preposition: 1. When it goes before a participle, or noun derived from a participle; as, I am *a* doing this or that. 2. When used before local surnames; as Cornelius *a* Lapide, Thomas *a* Kempis, &c. 3. When it is used in composition; as, *a* foot, *a* sleep, &c. In some instances it denotes the proportion of one thing to another; as, so much *a* week, *a* man, *a* head, &c.

A, among the ancients, was a numeral letter, and signified 500; and when a dash was added on the top $\overline{A}$, 5000.

A, Abbreviat.

A, in the Julian calendar, is the first of the seven DOMINICAL letters. It had been in use among the Romans long before the establishment of Christianity, as the first of the eight *nundinales literæ*; in imitation whereof it was that the dominical letters were first introduced.

A is also an abbreviation used with different intentions. Hence,

A, among logicians, is used to denote an universal affirmative proposition; according to the verse,

Affirat A, negat E, verum generaliter ambæ.

Thus, in the first figure, a syllogism consisting of three universal affirmative propositions, is said to be in Bārbā-rā; the *A* thrice repeated, denoting so many of the propositions to be universal, &c. See BARBARA.

A, among the Romans, was used in giving votes or suffrages.—When a new law was proposed, each voter had two wooden ballots put into his hand; the one marked with a capital *A*, signifying *antiquo*, q. d. *antiquam volo*; and the other with *U. R.* for *uti rogas*. Such as were against the law, cast the first into the urn; signifying, I refuse it, I antiquate it; or, I like the ancient law, and desire no innovation.

A, in the trials of criminal causes, also denoted absolution: Whence Cicero, *pro Milone*, calls *A*, *litera salutaris*, a saving letter.—Three ballots were distributed to each judge, marked with the letters, *A* for *absolvo*, I acquit; *C* for *condemno*, I condemn; and *N. L.* for *non liquet*, It is not clear. From the number of each cast into the urn, the prætor pronounced the prisoner's fate. If they were equal in number, he was absolved.

A, in the ancient inscriptions of marbles, &c. occasionally stands for *Augustus*, *ager*, *aiunt*, &c. When double it denotes *Augusti*; when triple *aurum*, *argentum*, *æs*; and sometimes its meaning can only be known by the rest of the inscription. Isidore adds, that when it occurs after the word *miles*, (soldier), it denotes him young. On the reverse of ancients medals, it denotes that they were struck by the city of Argos, sometimes by that of Athens; but on coins of modern date, it is the mark of Paris.

A, as an abbreviation, is also often found in modern writers; as A. D. for *anno Domini*; A. M. *artium magister*, master of arts; *anno mundi*, &c.

A, Abbreviat.

A || Aaron.

A, the letter a, with a line above it, thus ā, is uſed in medical preſcriptions for *ana*, of each; ſometimes it is written thus, āā: e. g. ℞ Mel. Sacchar. et Mann. ā, vel āā, ℥j. i. e. Take of honey, ſugar, and manna, of each, one ounce.

A, put to bills of exchange, is in England an abbreviation of *accepted*, and in France for *accepté*. It is likewiſe uſual among merchants to mark their ſets of books with the letters A, B, C, &c. inſtead of the numbers 1, 2, 3, &c.

A.A.A. The chemical abbreviation for Amalgama, or Amalgamation.

AA, the name of ſeveral rivers in Germany and Swiſſerland.

AACH, a little town of Germany, in the circle of Suabia, near the ſource of the river Aach, and almoſt equally diſtant from the Danube and the lake Conſtance. It belongs to the houſe of Auſtria. E. Long. 9. 0. N. Lat. 47. 55.

AAHUS, a little town of Germany, in the circle of Weſtphalia and biſhopric of Munſter. It is the capital of Aahus, a ſmall diſtrict; has a good caſtle; and lies north-eaſt of Coesfeldt. E. Long. 7. 1. N. Lat. 52. 10.

AAM, or HAAM, a liquid meaſure in common uſe among the Dutch, containing 128 meaſures called *mingles*, each weighing nearly 36 ounces avoirdupois; whence the *Aam* contains 288 Engliſh, and 148⅔ pints Paris meaſure.

AAR, the name of two rivers, one in Swiſſerland, and another in Weſtphalia in Germany. It is alſo the name of a ſmall iſland in the Baltic.

AARASSUS, *in Ancient Geography*, a town of Piſidia, in the Hither Aſia, thought to be the Anaſſus of Ptolemy.

AARON, high-prieſt of the Jews, and brother to Moſes, was by the father's ſide great grandſon, and by the mother's, grandſon of Levi. By God's command he met Moſes at the foot of Mount Horeb, and they went together into Egypt to deliver the children of Iſrael: he had a great ſhare in all that Moſes did for their deliverance. The Scriptures call him the prophet of Moſes, and he acted in that capacity after the Iſraelites had paſſed over the Red ſea. He aſcended Mount Sinai with two of his ſons, Nadab and Abihu, and ſeventy elders of the people; but neither he nor they went higher than half way, from whence they ſaw the glory of God; only Moſes and Joſhua went to the top, where they ſtaid forty days. During their abſence, Aaron, overcome by the people's eager entreaties, ſet up the golden calf, which the Iſraelites worſhipped by his conſent. This calf has given riſe to various conjectures. Some rabbies maintain that he did not make the golden calf, but only threw the gold into the fire, to get rid of the importunities of the people; and that certain magicians who mingled with the Iſraelites at their departure from Egypt, caſt this gold into the figure of a calf. According to ſome authors, the fear of falling a ſacrifice to the reſentment of the people, by giving a refuſal, made Aaron comply with their deſire: and they allege alſo, that he hoped to elude their requeſt, by demanding of the women to contribute their ear rings, imagining they would rather chooſe to remain without a viſible deity, than be deprived of their perſonal ornaments. This affair of the golden calf happened in the third month after the Iſraelites came out of Egypt. In the firſt month of the following year, Aaron was appointed by God high-prieſt; which office he executed during the time that the children of Iſrael continued in the wilderneſs. He died in the fortieth year after their departure from Egypt, upon Mount Hor, being then 123 years old; A. M. 2522, of the Julian period 3262, before the Chriſtian era 1452. Aaron || Aarſens.

AARON, the Caraite, a learned Jew who flouriſhed about the year 1299. He left many works on the Old Teſtament, among which there is one entitled, "A Commentary on the Pentateuch," which has been much valued. It was written in Hebrew, and printed in folio with a Latin tranſlation, at Jena, in 1710.

AARON, another Caraite Jew, who lived in the 15th century, wrote a conciſe Hebrew grammar, entitled *Chelil Jophi*, "the Perfection of Beauty," which was printed at Conſtantinople in 1581.

AARON and JULIUS, Saints, were brothers who ſuffered martyrdom together, during the perſecution under the emperor Dioclefian, in the year 303, about the ſame time with St Alban the firſt martyr of Britain. We are not told what their Britiſh names were, it being uſual with the Chriſtian Britons, at the time of baptiſm, to take new names from the Greek, Latin, or Hebrew. Nor have we any certainty as to the particulars of their death; only that they ſuffered the moſt cruel torments. Two churches were dedicated to the brothers, in which their bodies were interred, at Caer-Leon, the ancient metropolis of Wales.

AARON, or *Harun*, *Al Raſchid*, a celebrated caliph, or Mahometan ſovereign of the Saracen empire; whoſe hiſtory is given under the article BAGDAD.

AARSENS, FRANCIS, Lord of Someldyck and Spyck, was one of the greateſt miniſters for negotiation the United Provinces could ever boaſt of. His father, Cornelius Aarſens, was regiſter to the States; and being acquainted with Mr Pleſſis Mornay, at the court of William prince of Orange, he prevailed upon him to take his ſon under him, with whom he continued ſome years. John Olden Barneveldt, who preſided over the affairs of Holland and all the United Provinces, ſent him afterwards agent into France, where he learned to negotiate under thoſe profound politicians Henry IV. Villeroy, Silleri, Roſſie, Jaonnin, &c. and he acquitted himſelf in ſuch a manner as to obtain their approbation. Soon after, he was inveſted with the character of ambaſſador, and was the firſt who was recognized as ſuch by the French court; at which time Henry IV. declared, that he ſhould take precedence next to the Venetian miniſter. He reſided in France 15 years; during which time he received great marks of eſteem from the king, who created him a knight and baron; and for this reaſon he was received among the nobles of the province of Holland. However, he became at length ſo odious to the French court, that they deſired to have him recalled. He was afterwards deputed to Venice, and to ſeveral German and Italian princes, upon occaſion of the troubles in Bohemia. He was the firſt of three extraordinary ambaſſadors ſent to England in 1620, and the ſecond in 1641; in which latter embaſſy he was accompanied by the lord of Brederode as firſt ambaſſador, and Heemſvliet as third, to negotiate the marriage of Prince William, ſon of the prince of Orange, with a daughter

Aafar || Aba.

daughter of Charles I. He was likewiſe ambaſſador extraordinary at the French court in 1624, at the beginning of Cardinal Richlieu's adminiſtration, who had a high opinion of him. The memoirs which he has left, of the negotiations in which he was engaged, ſhow him to have been one of the ableſt men of his time, and worthy of the confidence and truſt repoſed in him by his country. But his character is not altogether without ſtain. His enmity to the remonſtrants was bitter and unrelenting; and he is ſuppoſed to have greatly encouraged the violent meaſures purſued by Prince Maurice againſt the venerable Barneveldt, and to have been the principal adviſer for aſſembling the famous and perſecuting ſynod of Dordrecht. He died at a very advanced age; and his ſon, who ſurvived him, was reputed the wealthieſt man in Holland.

AASAR, in *Ancient Geography*, a town of Paleſtine, in the tribe of Judah, ſituated between Azotus and Aſcalon. In Jerome's time it was a hamlet.

AB, the eleventh month of the civil year of the Hebrews, and the fifth of their eccleſiaſtical year, which begins with the month Niſan. It anſwers to the moon of July; that is, to part of our month of the ſame name, and to the beginning of Auguſt: it conſiſts of thirty days. The Jews faſt on the firſt of this month, in memory of Aaron's death; and on the ninth, becauſe on that day both the temple of Solomon, and that erected after the captivity, were burnt; the former by the Chaldeans, and the latter by the Romans. The ſame day is alſo remarkable among that people for the publication of Adrian's edict, wherein they were forbidden to continue in Judea, or even to look back when at a diſtance from Jeruſalem, in order to lament the deſolation of that city. The 18th of the ſame month is alſo a faſt among the Jews; becauſe the lamp in the ſanctuary was that night extinguiſhed, in the time of Ahaz.

AB, in the Syriac calendar, is the name of the laſt ſummer month. The firſt day of this month they called *Suum-Miriam*, the faſt of the virgin, becauſe the eaſtern Chriſtians faſted from that day to the fifteenth, which was therefore called *Fathr-Miriam*, the ceſſation of the faſt of the virigin.

ABA (or rather ABAU) HANIFAH or HANFA, ſurnamed Al-Nooma, was the ſon of Thabet, and born at Coufah in the 80th year of the Hegira. This is the moſt celebrated doctor of the orthodox Muſſulmans, and his ſect is held in greateſt eſteem among the four which they indifferently follow. Notwithſtanding this, he was not very well eſteemed during his life; inſomuch that the caliph Almanſor cauſed him to be impriſoned at Bagdad, for having refuſed to ſubſcribe to the opinion of abſolute predeſtination, which the Muſſulmans call Cadha. But afterwards Abou Joſeph, who was the ſovereign judge or chancellor of the empire under the caliph Hadi, brought his doctrine into ſuch credit, that it became a prevailing opinion, That to be a good Muſſulman was to be a Hanifite. He died in the 150th year of the Hegira, in the priſon of Bagdad: and it was not till 335 years after his death, that Melick Schah, a ſultan of the Selgiucidan race, erected to his memory a magnificent monument in the ſame city, and a college for his followers, in the 485th year of the Hegira, and Anno Chriſti 1092. The moſt eminent ſucceſſors of this doctor were Ahmed Benali, Al Giaffas, and Al Razi who was the maſter of Naſſari; and there is a moſque particularly appropriated to them in the temple of Mecca.

Aba | Aback.

ABA, *Abas*, *Abos*, or *Abus*, in *Ancient Geography*, the name of a mountain of Greater Armenia, ſituated between the mountains Niphatos and Nibonis. According to Strabo, the Euphrates and Araxes roſe from this mountain; the former running eaſtward, and the latter weſtward.

ABA. See ABÆ.

ABA, ALBON, or OVON, a king of Hungary. He married the ſiſter of Stephen I. and was elected king on the depoſition of Peter in 1041. The emperor Henry III. preparing to reinſtate Peter on the throne, Aba made an incurſion into his dominions, and returned loaded with booty; but was next year obliged to make reſtitution, by paying a large ſum, in order to prevent a threatened invaſion from the emperor. He indulged in great familiarity with the lower claſs of the people, on account of which, and his ſeverity to their order, he became univerſally odious to the nobility. The fugitive nobles, aided by the emperor, excited a revolt againſt him. After a bloody battle, Aba was put to flight; and was murdered by his own ſoldiers in 1044, having reigned three years.

ABAA, a river in Theſſaly, ſuppoſed by ſome to be the Peneus of the ancients.

ABACÆNA, in *Ancient Geography*, a town of Media, and another of Caria in the Hither Aſia.

ABACÆNUM, in *Ancient Geography*, a town of Sicily, whoſe ruins are ſuppoſed to be thoſe lying near Trippi, a citadel on a high and ſteep mountain not far from Meſſina. The inhabitants were called *Abacænini*.

ABACH, a market town of Germany, in Lower Bavaria, ſeated on the Danube, 12 miles S. W. of Ratiſbon. It is remarkable for Roman antiquities, and for ſprings of mineral waters which are ſaid to be good for various diſtempers. E. Long. 11. 56. N. Lat. 48. 53.

ABACINARE, or ABBACINARE, in writers of the middle age, a cruel ſpecies of puniſhment, conſiſting in the blinding of the criminal, by holding a red-hot baſen or bowl of metal before his eyes.

ABACK (a ſea term), the ſituation of the ſails when the ſurfaces are flatted againſt the maſts by the force of the wind. The ſails are ſaid to be *taken aback* when they are brought into this ſituation, either by a ſudden change of the wind, or by an alteration in the ſhip's courſe. They are *laid aback*, to effect an immediate retreat, without turning to the right or left; or, in the ſea phraſe, to give the ſhip *ſtern-way*, in order to avoid ſome danger diſcovered before her in a narrow channel, or when ſhe has advanced beyond her ſtation in the line of battle, or otherwiſe. The ſails are placed in this poſition by ſlackening their lee braces, and hauling in the weather ones; ſo that the whole effort of the wind is exerted on the fore part of their ſurface, which readily puſhes the ſhip aſtern, unleſs ſhe is reſtrained by ſome counteracting force. It is alſo uſual to ſpread ſome ſail aback near the ſtern, as the mizen-top-ſail, when a ſhip rides with a ſingle anchor in a road, in order to prevent her from approaching it ſo as to entangle the flukes of it with her ſlackened cable, and thereby looſen it from the ground.

Abacot || Abacus.

ABACOT, the name of an ancient cap of ſtate worn by the kings of England, the upper part whereof was in the form of a double crown.

ABACTORS, or ABACTORES, a name given to thoſe who drive away, or rather ſteal, cattle by herds, or great numbers at once; and are therefore very properly diſtinguiſhed from *fures* or thieves.

ABACUS, among the ancients, was a kind of cupboard or buffet. Livy, deſcribing the luxury into which the Romans degenerated after the conqueſt of Aſia, ſays they had their *abaci*, beds, &c. plated over with gold.

ABACUS, among the ancient mathematicians, ſignified a table covered with duſt, on which they drew their diagrams; the word in this ſenſe being derived from the Phœnician *abak*, duſt.

ABACUS, or ABACISCUS, in *Architecture*, ſignifies the ſuperior part or member of the capital of a column, and ſerves as a kind of crowning to both. Vitruvius tells us the abacus was originally intended to repreſent a ſquare tile laid over an urn, or rather over a baſket. See ARCHITECTURE, N° 15.—The form of the abacus is not the ſame in all orders: In the Tuſcan, Doric, and Ionic, it is generally ſquare; but in the Corinthian and Compoſite, its four ſides are arched inwards, and embelliſhed in the middle with ſome ornament, as a roſe or other flower. Scammozzi uſes *abacus* for a concave moulding on the capital of the Tuſcan pedeſtal; and Palladio calls the plinth above the echinus, or boultin, in the Tuſcan and Doric orders, by the ſame name.

ABACUS is alſo the name of an ancient inſtrument for facilitating operations in arithmetic. It is variouſly contrived. That chiefly uſed in Europe is made by drawing any number of parallel lines at the diſtance of two diameters of one of the counters uſed in the calculation. A counter placed on the loweſt line, ſignifies 1: on the 2d, 10; on the 3d, 100; on the 4th, 1000. &c. In the intermediate ſpaces, the ſame counters are eſtimated at one half of the value of the line immediately ſuperior, viz. between the 1ſt and 2d, 5; between the 2d and 3d, 50, &c. See Plate I. fig. 1. where the ſame number, 1802 for example, is repreſented under both diviſions by different diſpoſitions of the counters. A farther illuſtration of this mode of notation is given in fig. 2.

National debt, according to Mr Addington, 1ſt Feb. 1802,		L.400,709,832
According to Mr Tierney,	-	457,154,081
According to Mr Morgan,	-	558.418,628
New ſinking fund,	- -	3,275,143
Old ſinking fund,	- -	2,534,187

ABACUS is alſo uſed by modern writers for a table of numbers ready caſt up, to expedite the operations of arithmetic. In this ſenſe we have *Abaci* of addition, of multiplication, of diviſion. This inſtrument for computation is, under ſome variations, in uſe with moſt nations, as the Greeks, Romans, Germans, French, Chineſe, &c.

Grecian ABACUS, was an oblong frame, over which were ſtretched ſeveral braſs wires, ſtrung with little ivory balls, like the beads of a necklace; by the various arrangements of which all kinds of computations were eaſily made.

Roman ABACUS was a little varied from the Grecian, having pins ſliding in grooves, inſtead of ſtrings or wires and beads.

Abacus || Abaiſſed.

Chineſe ABACUS, or SHWANPAN, like the Grecian, conſiſts of ſeveral ſeries of beads ſtrung on braſs wires, ſtretched from the top to the bottom of the inſtrument, and divided in the middle by a croſs piece from ſide to ſide. In the upper ſpace every ſtring has two beads, which are each counted for 5; and in the lower ſpace every ſtring has five beads, of different values, the firſt being counted as 1, the ſecond as 10, the third as 100, and ſo on, as with us.

Abacus Pythagoricus, the common multiplication table, ſo called from its being invented by Pythagoras.

Abacus Logiſticus, is a rectangled triangle, whoſe ſides, forming the right angle, contain the numbers from 1 to 60; and its area, the facta of each two of the numbers perpendicularly oppoſite. This is alſo called a *canon of ſexageſimals*.

Abacus et Palmulæ, in the *Ancient Muſic*, denote the machinery, whereby the ſtrings of polyplectra, or inſtruments of many ſtrings, were ſtruck with a plectrum made of quills.

Abacus Harmonicus, is uſed by Kircher for the ſtructure and diſpoſition of the keys of a muſical inſtrument, whether to be touched with the hands or the feet.

Abacus Major, in metallurgic operations, the name of a trough uſed in the mines, wherein the ore is waſhed.

ABADDON, is the name which St John in the Revelation gives to the king of the locuſts, the angel of the bottomleſs pit. The inſpired writer ſays, this word is Hebrew, and in Greek ſignifies Απολλυων, i. e. a *deſtroyer*. That angel-king is thought to be Satan or the devil: but Mr le Clerc thinks with Dr Hammond, that by the locuſts which came out of the abyſs, may be underſtood the zealots and robbers, who miſerably afflicted the land of Judea, and laid it in a manner waſte, before Jeruſalem was taken by the Romans; and that Abaddon, the king of the locuſts, may be John of Giſchala, who having treacherouſly left that town a little before it was ſurrendered to Titus, came to Jeruſalem, where he ſoon headed part of the zealots, who acknowledged him as their king, whilſt the reſt would not ſubmit to him. This ſubdiviſion of the zealot party brought a thouſand calamities on the Jews.

ABADIR, a title which the Carthaginians gave to gods of the firſt order. In the Roman mythology, it is the name of a ſtone which Saturn ſwallowed, by the contrivance of his wife Ops, believing it to be his newborn ſon Jupiter: hence it became the object of religious worſhip.

ABÆ, or ABA, in *Ancient Geography*, a town of Phocis in Greece, near Helicon; famous for an oracle of Apollo older than that at Delphi, and for a rich temple which was plundered and burnt by the Perſians.

ABAFT, a ſea term, ſignifying the hinder part of a ſhip, or all thoſe parts both within and without which lie towards the ſtern, in oppoſition to AFORE; which ſee.—*Abaft*, is alſo uſed as a prepoſition, and ſignifies *further aft*, or *nearer the ſtern*: as, the barricade ſtands *abaft* the main-maſt, i. e. behind it, or nearer the ſtern.

ABAISSED, *abaiſſé*, in *Heraldry*, an epithet applied to the wings of eagles, &c. when the tip looks downwards

Abaka || Abantias

downwards to the point of the ſhield, or when the wings are ſhut; the natural way of bearing them being extended.

ABAKA KHAN, the eighth emperor of the Moguls, a wiſe and good prince, aſcended the throne in 1264. He reigned 17 years, and is by ſome authors ſaid to have been a Chriſtian. It may be admitted, indeed, that he joined with the Chriſtians in keeping the feaſt of Eaſter, in the city Hamadan, a ſhort time before his death. But this is no proof of his Chriſtianity; it being common, in times of brotherly love, for Chriſtians and Mahometans to join in keeping the ſame feaſts, when each would compliment the other with doing honour to his ſolemnity.

ABAKANSKOI, a town of Siberia, which was founded by Peter the Great in 1707. It is provided with a garriſon, to protect the hunters who are employed in catching martens and foxes on account of their furs, which are here an important article of commerce. It is ſituated in E. Long. 94. 5. N. Lat. 53. 30.

ABALAK, a ſmall town of Siberia, two miles from Toboliſk, in E. Long. 64. 10. N. Lat. 57. 1. Abalak is famous as the reſort of many pilgrims who viſit an image of the virgin Mary, which is annually carried in proceſſion to Toboliſk.

ABALIENATION, in *Law*, the act of transferring one man's property to another.

ABALLABA, the ancient name of APPLEBY, a town in Weſtmorland, remarkable only for its antiquity, having been a Roman ſtation. W. Long. 1. 4. N. Lat. 55. 38.

ABALUS, in *Ancient Geography*, ſuppoſed by the ancients to be an iſland in the German ocean, called by Timæus *Baſilia*, and by Xenophon Lampſacenus *Baltia*; now the peninſula of Scandinavia. Here, according to Pliny, ſome imagined that amber dropped from the trees.

ABANA, or AMANA, in *Ancient Geography*, a river of Phœnicia, which, riſing from Mount Hermon, waſhed the ſouth and weſt ſides of Damaſcus, and falls into the Phœnician ſea to the north of Tripolis, called *Chryſorrhoas*, by the Greeks.

ABANGA. See ADY.

ABANO, a town of the Paduano, in the republic of Venice, famous among the ancients for its hot baths.

ABANTES, a people who came originally from Thrace, and ſettled in Phocœa, a country of Greece, where they built a town which they called *Aba*, after the name of Abas their leader; and if we may credit ſome ancient authors, the Abantes went afterwards into the iſland Eubœa, now called *Negropont*: others ſay the Abantes of Euhœa came from Athens. The Abantes were a very warlike people, cloſing with their enemies, and fighting hand to hand.

ABANTIAS, or ABANTIS, in *Ancient Geography*, a name of the iſland Eubœa in the Egean ſea, extending along the coaſt of Greece, from the promontory Sunium in Attica to Theſſaly, and ſeparated from Bœotia by a narrow ſtrait called *Euripus*. From its length the iſland was formerly called *Macris*; afterwards *Abantias* or *Abantis*, from the Abantes, a people originally of Thrace, called by Homer οπιστεν Κομοωντες, from wearing their hair long behind, having in a battle experienced the inconvenience of wearing long hair before. From cutting their hair before, they were called *Cureter*.

Abaptiſton || Abaris.

ABAPTISTON, in *Surgery*, the perforating part of the inſtrument called a TREPAN. This inſtrument, which is mentioned by Galen, Fabricius ab Aquapendente, and others, was a conical ſaw with a circular edge. Modern practitioners, however, prefer the cylindrical form; and various contrivances have been recommended to obviate the danger that may ariſe from want of dexterity, or from raſhneſs, in performing the operation of trepanning. A new inſtrument has been lately invented and delineated for this purpoſe, by Mr Rodman, ſurgeon in Paiſley. This inſtrument is ſo contrived, that it can be fitted to cut any thickneſs of bone without danger of injuring the brain; and as no pivot or centre-pin is neceſſary, the dreadful accidents which have ſometimes happened by not removing it, when the inſtrument in common uſe is employed, are completely avoided. (*Philoſoph. Mag. April* 1802.)

ABARA, a town in the Greater Armenia, under the dominion of the Turks; it is often the reſidence of the archbiſhop of Nakſivan. E. Long. 46. 25. N. Lat. 39. 45.

ABARANER, a town of Aſia, in the Greater Armenia, belonging to the Turks: it is ſeated on the river Alingena. E. Long. 46. 30. N. Lat. 39. 50.

ABARCA, an ancient kind of ſhoe uſed in Spain for paſſing the mountains with. It was made of raw hides, and bound with cords, which ſecured the feet of travellers againſt the ſnow.

ABARIM, high mountains of ſteep aſcent, ſeparating the country of the Ammonites and Moabites from the land of Canaan, where Moſes died. According to Joſephus, they ſtood oppoſite to the territory of Jericho, and were the laſt ſtation but one of the Iſraelites coming from Egypt. Nebo and Piſgah were parts of theſe mountains.

ABARIS, the Hyperborean; a celebrated ſage of antiquity, whoſe hiſtory and travels have been the ſubject of much learned diſcuſſion. Such a number of fabulous ſtories * were told of him, that Herodotus himſelf ſeems to ſcruple to relate them. He tells us only †, that this barbarian was ſaid to have travelled with an arrow, and to have taken no ſuſtenance: but this does not acquaint us with the marvellous properties which were attributed to that arrow; nor that it had been given him by the Hyperborean Apollo. With regard to the occaſion of his leaving his native country, Harpocration ‡ tell us, that the whole earth being infeſted with a deadly plague, Apollo, upon being conſulted, gave no other anſwer, than that the Athenians ſhould offer up prayers in behalf of all other nations; upon which, ſeveral countries deputed ambaſſadors to Athens, among whom was Abaris the Hyperborean. In this journey, he renewed the alliance between his countrymen and the inhabitants of the iſland of Delos. It appears that he alſo went to Lacedæmon; ſince, according to ſome writers ||, he there built a temple conſecrated to Proſerpine the Salutary. It is aſſerted, that he was capable of foretelling earthquakes, driving away plagues, laying ſtorms §, &c. He wrote ſeveral books, as Suidas * informs us, viz. Apollo's arrival in the country of the Hyperboreans; The nuptials of the river Hebrus; Θεογονια, or the Generation of the Gods; A collection of oracles, &c.

* Jamblich. *Vita Pythag.*

† Lib. iv. cap. 36.

‡ Under the word Αβαρις.

|| Pauſanias, lib. iii. p. 94.

§ Porphyry in *Vita Pythagor.*

* Under the word Αβαρις.

Himerius

Abarticulation.

Himerius the ſophiſt applauds him for ſpeaking pure Greek; which attainment will be no matter of wonder to ſuch as conſider the ancient intercourſe there was between the Greeks and Hyperboreans.——If the Hebrides, or Weſtern iſlands of Scotland, (ſays Mr Toland †), were the Hyperboreans of Diodorus ‡, then the celebrated Abaris was of that country; and likewiſe a druid, having been the prieſt of Apollo. Suidas, who knew not the diſtinction of the inſular Hyperboreans, makes him a Scythian; as do ſome others, miſled by the ſame vulgar error; though Diodorus has truly fixed his country in an iſland, and not on the continent. Indeed the fictions and miſtakes concerning our Abaris are infinite: however, it is agreed by all that he travelled quite over Greece, and from thence into Italy, where he converſed familiarly with Pythagoras, who favoured him beyond all his diſciples, by inſtructing him in his doctrines (eſpecially his thoughts of nature) in a plainer and more compendious method than he did any other. This diſtinction could not but be very advantageous to Abaris. The Hyperborean, in return, preſented the Samian, as though he equalled Apollo himſelf in wiſdom, with the ſacred arrow, on which the Greeks have fabulouſly related * that he ſat aſtride, and flew upon it, through the air, over rivers and lakes, foreſts and mountains; in like manner as our vulgar ſtill believe, particularly thoſe of the Hebrides, that wizards and witches fly whitherſoever they pleaſe on their broomſticks. The orator Himerius above mentioned, though one of thoſe who, from the equivocal ſenſe of the word *Hyperborean*, ſeem to have miſtaken Abaris for a Scythian, yet deſcribes his perſon accurately, and gives him a very noble character. "They relate (ſays he) "that Abaris the ſage was by nation a Hyperborean, "appeared a Grecian in ſpeech, and reſembled a Scy- "thian in his habit and appearance. He came to A- "thens, holding a bow in his hand, having a quiver "hanging on his ſhoulders, his body wrapt up in a "plaid, girt about the loins with a gilded belt, and "wearing trowſers reaching from his waiſt down- "ward." By this it is evident (continues Mr Toland) that he was not habited like the Scythians, who were always covered with ſkins; but appeared in the native garb of an aboriginal Scot. As to what relates to his abilities, Himerius informs us, that "he "was affable and pleaſant in converſation, in diſpatch- "ing great affairs ſecret and induſtrious, quick-ſight- "ed in preſent exigencies, in preventing future dan- "gers circumſpect, a ſearcher after wiſdom, deſirous "of friendſhip, truſting little to fortune, and having "every thing truſted to him for his prudence." Neither the Academy nor the Lycæum could have furniſhed a man with fitter qualities to travel ſo far abroad, and to ſuch wiſe nations, about affairs no leſs arduous than important. And if we further attentively conſider his moderation in eating, drinking, and the uſe of all thoſe things which our natural appetites inceſſantly crave; joining the candour and ſimplicity of his manners with the ſolidity and wiſdom of his anſwers; all which we find ſufficiently atteſted; it muſt be owned that the world at that time had few to compare with Abaris.

† Account of the Druids, in his *Poſthumous Works*, vol i. p. 161.

‡ Diod. Sic. lib. ii. iii.

* Jamblichi *Vita Pythag.* p. 128.

ABARTICULATION, in *Anatomy*, a ſpecies of articulation, admitting of a manifeſt motion; called alſo *Diarthroſis*, and *Dearticulatio*, to diſtinguiſh it from that ſort of articulation which admits of a very obſcure motion, and is called *Synarthroſis*.

Abas || Abaſſa.

ABAS, a weight uſed in Perſia for weighing pearls. It is one-eighth leſs than the European carat.

ABAS, in heathen mythology, was the ſon of Hypothoon and Meganira, who entertained Ceres, and offered a ſacrifice to that goddeſs; but Abas ridiculing the ceremony, and giving her opprobrious language, ſhe ſprinkled him with a certain mixture ſhe held in her cup, on which he became a newt or water lizard.

ABAS, *Schah*, the Great, was third ſon of Codabendi, 7th king of Perſia of the race of the Sophis. Succeeding to his father in 1585, at the age of 18, he found the affairs of Perſia at a low ebb, occaſioned by the conqueſts of the Turks and Tartars. He regained ſeveral of the provinces they had ſeized: but death put a ſtop to his victories in 1629, after a reign of 44 years. He was the greateſt prince who had reigned in Perſia for many ages; and it was he who made Iſpahan the metropolis of Perſia. His memory is held in the higheſt veneration among the Perſians.

ABAS, *Schah*, his grandſon, 9th king of Perſia of the race of the Sophis, ſucceeded his father Seſi at 13 years of age. He was but 18 when he made himſelf maſter of the city of Candahar, which had ſurrendered in his father's reign to the great Mogul, and all the province about it; and he preſerved it afterwards againſt this Indian emperor, though he beſieged it more than once with an army of 300,000 men. He was a very merciful prince, and openly protected the Chriſtians. He had formed a deſign of extending the limits of his kingdom toward the north, and had for that effect levied a powerful army; but death put a ſtop to all his great deſigns, at 37 years of age, A. D. 1666.

ABASCIA, or ABCASSIA, the northern diſtrict of the weſtern diviſion of Georgia in Aſia, ſituated on the coaſt of the Black ſea, and tributary to the Turks. The inhabitants are poor, thievith, and treacherous, ſo that there is no trading with them without the utmoſt caution. They trade in furs, buck and tyger ſkins, linen yarn, boxwood, and bees wax: but their principal traffic conſiſts in the ſale of their own children to the Turks, and to one another. They are deſtitute of many neceſſaries of life, and have nothing among them that can be called a town; though we find Anacopia, Dandar, and Czekorni, mentioned in the maps. They have the name of Chriſtians; but have nothing left but the name, any more than the Mingrelians their northern neighbours. The men are robuſt and active, and the women are fair and beautiful; on which account the Turks have a great value for the female ſlaves which they purchaſe from among them. Their cuſtoms are much the ſame as thoſe of the MINGRELIANS; which ſee. E. Long. from 39° to 43°. N. Lat. from 43° to 45°.

ABASCUS, a river of Aſiatic Sarmatia, which, riſing from Mount Caucaſus, falls into the Euxine, between Pityus to the eaſt, and Noſis to the weſt.

ABASITIS, in *Ancient Geography*, a tract of Aſiatic Myſia, in which was ſituated the city of Ancyra.

ABASSA, THE GREATER and THE SMALLER, two diſtricts in the vicinity of the Caucaſian mountains. The latter, according to Pallas, is inhabited by ſix tribes who were formerly Chriſtians, but the nobles now profeſs

Abaſſi Abatis.

ſeſs the Mahometan religion. In manners, dreſs, mode of life, and, in ſome degree, in language, they reſemble the Circaſſians. They practiſe agriculture, but chiefly depend on paſturage for their ſubſiſtence. They are celebrated for a fine breed of large horſes. They are frequently haraſſed and plundered by the Circaſſian princes.

ABASSI, or ABASSIS, a ſilver coin current in Perſia, equivalent in value to a French livre, or tenpence halfpenny ſterling. It took its name from Schah Abbas II. king of Perſia, under whom it was ſtruck.

ABASSUS, in *Ancient Geography*, a town of the Greater Phrygia, on the confines of the Toliſtobagii, a people of Galatia in Aſia.

ABATAMENTUM, in *Law*, is an entry to lands by interpoſition, i. e. when a perſon dies ſeized, and another who has no right enters before the heir.

To ABATE, (from the French *abattre*, to pull down, overthrow, demoliſh, batter down, or deſtroy), a term uſed by the writers of the Engliſh common law both in an active and neutral ſenſe; as, To *abate* a caſtle, is to beat it down. To *abate* a writ, is, by ſome exception, to defeat or overthrow it. A ſtranger *abateth*; that is, entereth upon a houſe or land void by the death of him that laſt poſſeſſed it, before the heir takes poſſeſſion, and ſo keepeth him out: wherefore, as he that putteth out him in poſſeſſion is ſaid to diſſeize, ſo he that ſteppeth in between the former poſſeſſor and his heir is ſaid to *abate*. In the neuter ſignification thus: The writ of the demandant ſhall *abate*; that is, ſhall be diſabled, fruſtrated, or overthrown. The appeal *abateth* by covin; that is, the accuſation is defeated by deceit.

ABATE, in the manege, implies the performing any downward motion properly. Thus a horſe is ſaid to *abate* or take down his curvets, when he puts both his hind legs to the ground at once, and obſerves the ſame exactneſs in all the times.

ABATELMENT, in commerce, a term uſed for a prohibition of trade to all French merchants in the ports of the Levant who will not ſtand to their bargains, or refuſe to pay their debts. It is a ſentence of the French conſul, which muſt be taken off before they can ſue any perſon for the payment of their debts.

ABATEMENT, in *Heraldry*, an accidental figure ſuppoſed to have been added to coats of arms, in order to denote ſome diſhonourable demeanour or ſtain, whereby the dignity of coat armour was rendered of leſs eſteem. See HERALDRY.

ABATEMENT, in *Law*. See To ABATE.

ABATEMENT, in the cuſtoms, an allowance made upon the duty of goods, when the quantum damaged is determined by the judgement of two merchants upon oath, and aſcertained by a certificate from the ſurveyor and land waiter.

ABATIS, an ancient term for an officer of the ſtables.

ABATIS, or ABATTIS, in military affairs, a kind of retrenchment made of felled trees. In ſudden emergencies, the trees are merely laid lengthwiſe beſide each other, with the branches pointed outwards to prevent the approach of the enemy, while the trunks ſerve as a breaſtwork to the defendants. When the abatis is employed for the defence of a paſs or entrance, the boughs of the trees are ſtripped of their leaves and pointed, the trunks are planted in the ground, and the branches interwoven with each other.

Abaton Abauzit.

ABATON, a building at Rhodes, erected as a fence to the trophy of Artemiſia, queen of Halicarnaſſus, Coos, &c. raiſed in memory of her victory over the Rhodians; or rather to conceal the diſgrace of the Rhodians from the eyes of the world: for to efface or deſtroy the trophy was with them a point of religion.

ABATOR, in *Law*, a term applied to a perſon who enters to a houſe or lands void by the death of the laſt poſſeſſor, before the true heir.

ABATOS, in *Ancient Geography*, an iſland in the lake Moeris, formerly famous for its papyrus. It was the burial place of Oſiris.

ABAUZIT, FIRMIN, a learned Frenchman, was born at Uſez, in Languedoc, in November 1679. His father died when he was but two years of age. In conſequence of the revocation of the edict of Nantz, in the time of Louis XIV. to avoid the rigours of perſecution to which the Proteſtants of France were expoſed, young Abauzit's mother, who was a Proteſtant, not without difficulty, eſcaped with her ſon to Geneva, where he remained ſecure from danger, and enjoyed the benefit of education. From his 10th to his 19th year, his time was wholly devoted to literature; and having made great progreſs in languages, he ſtudied mathematics, phyſics, and theology. In the year 1698, he travelled into Holland, where he became acquainted with the learned Bayle, with Baſnage and Jurieu. Thence he paſſed over to England, and was introduced to Sir Iſaac Newton, who entertained a very high opinion of his merit. For this philoſopher afterwards ſent him his *Commercium Epiſtolicum*, accompanied with a very honourable teſtimony. "You are well worthy, ſays Newton, to judge between Leibnitz and me." The reputation of Abauzit reached the years of King William, who encouraged him by a very handſome offer to ſettle in England; which he declined, and returned to Geneva. In 1715 he entered into the ſociety formed for the purpoſe of tranſlating the New Teſtament into the French language, and contributed valuable aſſiſtance to this work. The chair of philoſophy in the univerſity was offered to him by that body in 1723, which he refuſed on account of his health and diffidence of his talents. But in 1727 he accepted of the office of librarian to the city, the duties of which were neither burdenſome, nor ſubjected him to any particular reſtraint.

Abauzit, who was deeply converſant in phyſical and mathematical knowledge, was one of the firſt who embraced the grand truths which the ſublime diſcoveries of Newton exhibited to the world. He defended the doctrines of that philoſopher againſt Father Caſtel; and diſcovered an error in the *Principia*, which was corrected by Newton in the ſecond edition of his work. He was a perfect maſter of many languages; he underſtood hiſtory ſo exactly, that he remembered the names of the principal characters and the dates of the events; his knowledge of phyſics was deep and extenſive, and he was well acquainted with medals and ancient manuſcripts. The different ſciences which he had ſtudied, were ſo well digeſted and arranged in his retentive mind, that he could at once bring together all that he ever knew on any ſubject. A remarkable inſtance of this occurred in a converſation with

Rouſſeau

Abavo || Abba.

Rouſſeau on the muſic of the ancients, while the latter was employed in compiling his Dictionary of Muſic. He had been at great pains in giving an accurate account of ancient muſic. But how much was he ſurpriſed to find that Abauzit could give him a full and clear hiſtory of all that he had with much labour collected; and the more ſo, when he was informed that 30 years had elapſed ſince his inquiries led him to conſider that ſubject. It was probably in conſequence of this incident that Rouſſeau addreſſed to Abauzit one of the fineſt panegyrics which he ever wrote.

A very fine compliment is ſaid to have been paid to Abauzit by Voltaire. A ſtranger having addreſſed the poet in a flattering manner, by ſaying he had come to Geneva to ſee a great man, Voltaire aſked him, whether he had ſeen Abauzit?

This excellent man having enjoyed that *otium cum dignitate*, ſo much talked of, and ſo eagerly ſought after, but rarely obtained, having thus lived univerſally reſpected to the great age of 87 years, died in the year 1767. lamented by the republic, and regretted by the learned.

Abauzit was a ſincere Chriſtian; his piety was pure and unaffected; his benevolence was extenſive. Liberal in his opinions, he was indulgent and forbearing to thoſe whoſe ſentiments and opinions were different from his own. Simple and eaſy in his manners, every thing about him, his houſe, his perſon, and his way of life, diſcovered a ſtrong averſion to ſhow and luxury. He carefully avoided the officious obſervances of ceremony, and anxiouſly withdrew from the fulſome praiſe of flattery. His converſation, free from pedantry and oſtentation, inſtructive and entertaining, was always heard with eagerneſs, and liſtened to with attention.

The writings which Abauzit left behind him are chiefly on religious ſubjects. He wrote an "Eſſay on the Apocalypſe," in which be endeavoured to ſhow, that the predictions in that book were to be applied to the deſtruction of Jeruſalem. This work was tranſlated into Engliſh; to which a refutation was added, which ſatisfied Abauzit ſo much that he was miſtaken in his views, that he ordered an edition then ready for publication in Holland to be ſtopped. His other works are, "Reflections on the Euchariſt; On Idolatry; On the Myſteries of Religion; Paraphraſes and Explanations of ſundry parts of Scripture; Several Critical and Antiquarian Pieces; and various Letters."

ABAVO, in *Botany*, a ſynonyme of the ADANSONIA.

ABB, a term among clothiers applied to the yarn of a weaver's warp. They ſay alſo *Abb-wool* in the ſame ſenſe.

ABBA, in *Ancient Geography*, a town of Africa Propria, near Carthage.

ABBA, in the Syriac and Chaldee languages, literally ſignifies *a father*; and figuratively, a ſuperior, reputed as a father in reſpect of age, dignity, or affection. It is more particularly uſed in the Syriac, Coptic, and Ethiopic churches, as a title given to the biſhops. The biſhops themſelves beſtow the title of *Abba* more eminently on the biſhop of Alexandria; which occaſioned the people to give him the title of *Baba*, or *Papa*, that is *Grandfather*; a title which he bore before the biſhop of Rome. It is a Jewiſh title of honour given to certain rabbins called *Tanaites*: and it is alſo particularly uſed, by ſome writers of the middle age, for the ſuperior of a monaſtery, uſually called ABBOT.

Abbadie || Abbaſſides.

ABBADIE, JAMES, an eminent Proteſtant divine, born at Nay in Bern in 1654; firſt educated there under the famous John la Placette, and afterwards at the univerſity of Sedan. From whence he went into Holland and Germany, and was miniſter in the French church of Berlin. He left that place in 1690; came into England; was ſome time miniſter in the French church in the Savoy, London; and was made dean of Killalo in Ireland. He was ſtrongly attached to the cauſe of King William, as appears in his elaborate defence of the Revolution, and his hiſtory of the aſſaſſination-plot. He had great natural abilities, which he improved by true and uſeful learning. He was a moſt zealous defender of the primitive doctrine of the Proteſtants, as appears by his writings; and that ſtrong nervous eloquence for which he was ſo remarkable, enabled him to enforce the doctrines of his profeſſion from the pulpit with great ſpirit and energy. He poſſeſſed uncommon powers of memory. It is ſaid that he compoſed his works without committing any part to writing, till they were wanted for the preſs. He died in London in 1727, after his return from a tour in Holland. He publiſhed ſeveral works in French that were much eſteemed; the principal of which are, A Treatiſe on the Truth of the Chriſtian religion; The Art of Knowing one's Self; A Defence of the Britiſh Nation; the Deity of Jeſus Chriſt eſſential to the Chriſtian Religion; The Hiſtory of the laſt Conſpiracy in England, written by order of King William III.; and The Triumph of Providence and Religion, or the opening the Seven Seals by the Son of God.

ABBAS, ſon of Abdalmotalieb, and Mahomet's uncle, oppoſed his nephew with all his power, regarding him as an impoſtor and traitor to his country; but in the ſecond year of the Hegira, being overcome and made a priſoner at the battle of Beder in 623, a great ranſom being demanded for him, he repreſented to Mahomet, that his paying it would reduce him to beggary, which would bring diſhonour on the family. Mahomet, who knew that he had concealed large ſums of money, ſaid to him, "Where are the purſes of gold that you gave your mother to keep when you left Mecca? Abbas, who thought this tranſaction ſecret, was much ſurpriſed, and conceiving that his nephew was really a prophet, embraced his religion. He became one of his principal captains; and ſaved his life when in imminent danger at the battle of Honain, againſt the Thakefites, ſoon after the reduction of Mecca. But beſides being a great commander, Abbas was one of the firſt doctors of Iſlamiſm, the whole of whoſe ſcience conſiſted in being able to repeat and explain the Koran, and to preſerve in their memory certain apocryphal hiſtories. He is ſaid to have read lectures on every chapter of the Koran, as his nephew pretended to receive them from heaven. He died in 652, and his memory is held in the higheſt veneration among the Muſſulmans to this day.

Abul-Abbas, ſurnamed *Saffah*, one of his grandſons, was proclaimed caliph a century after his death; and in him began the dynaſty of the

ABBASSIDES, who poſſeſſed the caliphate for 524 years. There were 37 caliphs of this race who ſucceeded one another without interruption.

ABBE',

Abbe || Abbey.

ABBE', in a monaſtic ſenſe, the ſame with ABBOT.

ABBE', in a modern ſenſe, the denomination of a claſs of perſons which has been popular in France. They were not in orders; but having received the ceremony of tonſure, were entitled to enjoy certain privileges in the church. The dreſs of abbés was that of academics or profeſſed ſcholars. In colleges they were the inſtructors of youth, and were employed as tutors in private families. Many of them have riſen to a diſtinguiſhed rank in the ſtate, while others have been no leſs eminent in ſcience and literature.

ABBESS, the ſuperior of an abbey or convent of nuns. The abbeſs has the ſame rights and authority over her nuns that the abbots regular have over their monks. The ſex indeed does not allow her to perform the ſpiritual functions annexed to the prieſthood, with which the abbot is uſually inveſted; but there are inſtances of ſome abbeſſes who have a right, or rather a privilege, to commiſſion a prieſt to act for them. They have even a kind of epiſcopal juriſdiction, as well as ſome abbots who are exempted from the viſitation of their dioceſans.

Martene, in his treatiſe on the rights of the church, obſerves, that ſome abbeſſes have formerly confeſſed their nuns. But he adds, that their exceſſive curioſity carried them ſuch lengths, that there aroſe a neceſſity of checking it. However, St Baſil, in his Rule, allows the abbeſs to be preſent with the prieſt at the confeſſion of her nuns.

ABBEVILLE, a conſiderable city of France in Picardy, and the capital of Ponthieu. The river Somme divides it into two parts. It has a collegiate church and twelve pariſh churches, the moſt conſiderable of which are St George's and St Giles's; beſides a great number of monaſteries and nunneries, a bailiwick, and a preſidial court. It is a fortified town; the walls are flanked with baſtions, and ſurrounded by large ditches. It was never taken: from which circumſtance it is ſometimes called the *Maiden Town;* and hence too its motto, *Semper fidelis*. The number of the inhabitants amounts to 36,000. The ſituation in the midſt of a fertile valley is pleaſant and healthy. It is famous for its woollen manufactory eſtabliſhed in 1665 under the auſpices of Colbert. The ſtuffs manufactured here are ſaid to equal in fabric and quality the fineſt in Europe. There is alſo a manufactory of fire arms, and a conſiderable trade in grain, lint, and hemp. It is about fifteen miles eaſt of the Britiſh channel, and ſhips may come from thence by the river Somme to the middle of the town. E. Long. 2. 6. N. Lat. 50. 7.

ABBEY, a monaſtery, or religious houſe, governed by a ſuperior under the title of *abbot* or *abbeſs*.

Abbeys differ only from *priories*, that the former are under the direction of an abbot, and the others of a prior; for abbot and prior (we mean a prior conventual) are much the ſame thing, differing in little but the name.

Fauchet obſerves, that, in the early days of the French monarchy, dukes and counts were called *abbots*, and duchies and counties *abbeys*. Even ſome of their kings are mentioned in hiſtory under the title of *abbots*. Philip I. Louis VI. and afterwards the duke of Orleans, are called *abbots of the monaſtery of St Aignan*. The dukes of Aquitain were called *abbots of the monaſtery of St Hilary at Poictiers;* and the earls of Anjou, *of St Aubin*, &c.

Abbey.

Monaſteries were at firſt eſtabliſhed as religious houſes, to which perſons retired from the buſtle of the world to ſpend their time in ſolitude and devotion. But they ſoon degenerated from their original inſtitution, and obtained large privileges, exemptions, and riches. They prevailed greatly in Britain before the Reformation, particularly in England; and as they increaſed in riches, ſo the ſtate became poor: for the lands which theſe regulars poſſeſſed were *in mortua manu*, i. e. could never revert to the lords who gave them. This inconvenience gave riſe to the ſtatutes againſt gifts in *mortmaine*, which prohibited donations to theſe religious houſes; and Lord Coke tells us, that ſeveral lords, at their creation, had a clauſe in their grant, that the donor might give or ſell his land to whom he would, (*exceptis viris religioſis et Judæis*) excepting monks and Jews.

Theſe places were wholly aboliſhed in England at the time of the Reformation; Henry VIII. having firſt appointed viſitors to inquire into the lives of the monks and nuns, which were found in ſome places to be extremely irregular, the abbots, perceiving their diſſolution unavoidable, were induced to reſign their houſes to the king, who by that means became inveſted with the abbey lands: theſe were afterwards granted to different perſons, whoſe deſcendants enjoy them at this day: they were then valued at 2,853,000l. per annum, an immenſe ſum in thoſe days.

Though the ſuppreſſion of religious houſes, even conſidered in a political light only, was a great national benefit, it muſt be owned, that, at the time they flouriſhed, they were not entirely uſeleſs. Abbeys or monaſteries were then the repoſitories, as well as the ſeminaries, of learning; many valuable books and national records, as well as private hiſtory, having been preſerved in their libraries, the only places in which they could have been ſafely lodged in thoſe turbulent times. Many of thoſe, which had eſcaped the ravages of the Danes, were deſtroyed with more than Gothic barbarity at the diſſolution of the abbeys. Theſe ravages are pathetically lamented by John Bale, in his declaration upon Leland's Journal 1549. "Coveteouſneſs," ſays he, "was at that time ſo buſy about private commodity, that public wealth, in that moſt neceſſary and of reſpect, was not anywhere regarded. A number of them which purchaſed theſe ſuperſtitious manſions, reſerved of the library books, ſome to ſerve their jakes, ſome to ſcour the candleſticks, and ſome to rub their boots; ſome they ſold to the grocer and ſoapſeller; and ſome they ſent over ſea to the bookbinders, not in ſmall numbers, but in whole ſhips full; yea, the univerſities of this realm are not clear of ſo deteſtable a fact. I know a merchant that bought the contents of two noble libraries for 40s. price; a ſhame it is to be ſpoken! This ſtuff hath he occupied inſtead of gray paper, by the ſpace of more than theſe ten years, and yet he hath ſtore enough for as many years to come. I ſhall judge this to be true, and utter it with heavineſs, that neither the Britons under the Romans and Saxons, nor yet the Engliſh people under the Danes and Normans, had ever ſuch damage of their learned monuments as we have ſeen in our time."

In theſe days every abbey had at leaſt one perſon whoſe office it was to inſtruct youth; and the hiſtorians of this country are chiefly beholden to the monks

Abbeyboyle || Abbot.

for the knowledge they have of former national events. In theſe houſes alſo the arts of painting, architecture, and printing, were cultivated. They were hoſpitals for the ſick and poor, and afforded entertainment to travellers at a time when there were no inns. In them the nobility and gentry who were heirs to their founders could provide for a certain number of ancient and faithful ſervants, by procuring them corodies, or ſtated allowances of meal, drink, and clothes. They were likewiſe an aſylum for aged and indigent perſons of good family. The neighbouring places were alſo greatly benefited by the fairs procured for them, and by their exemption from foreſt laws; add to which, that the monaſtic eſtates were generally let at very eaſy rents, the fines given at renewals included.

ABBEYBOYLE, a town of Ireland, in the county of Roſcommon, and province of Connaught. W. Long. 8. 32. N. Lat. 56. 54. It is remarkable for an old abbey.

ABBEYHOLM, a town in Cumberland, ſo called from an abbey built there by David king of Scots. It ſtands on an arm of the ſea. W. Long. 2. 38. N. Lat. 54. 45.

ABBOT, or ABBAT, the ſuperior of a monaſtery of monks erected into an abbey or priory.

The name *Abbot* is originally Hebrew, where it ſignifies father. The Jews call *father*, in their language, *Ab*; whence the Chaldeans and Syrians formed *Abba*; thence the Greeks Ἀββᾶς, which the Latins retained; and hence our *Abbot*, the French *Abbé*, &c. St Mark and St Paul uſe the Syriac *Abba* in their Greek, by reaſon it was then commonly known in the ſynagogues and the primitive aſſemblies of the Chriſtians; adding to it, by way of interpretation, the word *father*, Ἀββᾶ ὁ πατὴρ. "Abba, father;" q. d. Abba, that is to ſay, Father. But the name Ab, or Abba, which at firſt was a term of tenderneſs and affection in the Hebrew and Chaldee, became at length a title of dignity and honour: The Jewiſh doctors affected it; and one of their moſt ancient books, containing the ſayings or apophthegms of divers of them, is entitled Pirke *Abboth* or Avoth; i. e. Chapters of the Fathers. It was in alluſion to this affectation, that Jeſus Chriſt forbade his diſciples to call any man their father on earth; which word St Jerome turns againſt the ſuperiors of the monaſteries of his time, for aſſuming the title of *Abbots*, or Fathers.

The name *Abbot*, then, appears as old as the inſtitution of monks itſelf. The governors of the primitive monaſteries aſſumed indifferently the titles *Abbots*, and *Archimandrites* *. They were really diſtinguiſhed from the clergy; though frequently confounded with them, becauſe a degree above laymen.

* See *Monk* and *Archimandrite*.

In thoſe early days, the abbots were ſubject to the biſhops and the ordinary paſtors. Their monaſteries being remote from cities, built in the fartheſt ſolitudes, they had no ſhare in eccleſiaſtical affairs. They went on Sundays to the pariſh church with the reſt of the people; or, if they were too remote, a prieſt was ſent them to adminiſter the ſacraments; till at length they were allowed to have prieſts of their own body. The abbot or archimandrite himſelf was uſually the prieſt: but his function extended no farther than to the ſpiritual aſſiſtance of his monaſtery; and he remained ſtill in obedience to the biſhop. There being among the abbots ſeveral perſons of learning, they made a vigorous oppoſition to the riſing hereſies of thoſe times; which firſt occaſioned the biſhops to call them out of their deſerts, and fix them about the ſuburbs of cities, and at length in the cities themſelves; from which era their degeneracy is to be dated. Then the abbots threw off their former plainneſs and ſimplicity, aſſumed the rank of prelates, aſpired at being independent of the biſhops, and graſped at ſo much power, that ſevere laws were made againſt them at the council of Chalcedon. Many of them, however, carried the point of independency, obtained the appellation of *lord*, and were diſtinguiſhed by other badges of the epiſcopate, particularly the mitre. Abbot.

Hence aroſe new diſtinctions between the abbots. Thoſe were termed *mitred* abbots, who were privileged to wear the mitre, and exerciſe epiſcopal authority within their reſpective precincts, being exempted from the juriſdiction of the biſhop. Others were called *croſiered* abbots, from their bearing the croſier or paſtoral ſtaff. Others were ſtyled *ecumenical* or univerſal abbots, in imitation of the patriarch of Conſtantinople: while others were termed *cardinal* abbots, from their ſuperiority over all other abbots. In Britain, the mitred abbots were lords of parliament; and called abbots-ſovereign, and abbots general, to diſtinguiſh them from the other abbots. And as there were lords-abbots, ſo there were alſo lords priors, who had exempt juriſdiction, and were likewiſe lords of parliament. Some reckon 26 of theſe lords abbots and priors who ſat in parliament. Sir Edward Coke ſays, that there were 27 parliamentary abbots and two priors. In the parliament 20 Rich. II. there were but 25 abbots and two priors: but in the ſummons to parliament anno 4 Ed. III. more are named.

In Roman Catholic countries, the principal diſtinctions obſerved between abbots are thoſe of *regular* and *commendatory*. The former take the vow and wear the habit of their order; whereas the latter are ſeculars who have received tonſure, but are obliged by their bulls to take orders when of proper age.

Anciently the ceremony of creating an abbot conſiſted in clothing him with the habit called *cucullus*, or cowl; putting the paſtoral ſtaff into his hand, and the ſhoes called *pedales* on his feet: but at preſent, it is only a ſimple benediction, improperly called, by ſome, conſecration.

ABBOT is alſo a title given to others beſide the ſuperiors of monaſteries: thus biſhops whoſe ſees were formerly abbeys, are called abbots. Among the Genoeſe, the chief magiſtrate of the republic formerly bore the title of *abbot* of the people. It was likewiſe uſual, about the time of Charlemagne, for ſeveral lords to aſſume the title of *count-abbots*, *abba-comites*; becauſe the ſuperintendancy of certain abbeys was committed to them.

ABBOT, *George*, archbiſhop of Canterbury, was born October 29. 1562, at Guildford in Surrey. He was the ſon of Maurice Abbot a cloth-worker. He ſtudied at Oxford, and in 1597 was choſen principal of Univerſity college. In 1599, he was inſtalled dean of Wincheſter: the year following, he was choſen vice-chancellor of the univerſity of Oxford, and a ſecond time in 1603. In 1604, the tranſlation of the Bible now in uſe was begun by the direction of King James; and

Abbot. and Dr Abbot was the second of eight divines of Oxford, to whom the care of translating the whole New Testament (excepting the Epistles) was committed. The year following, he was a third time vice-chancellor. In 1608, he went to Scotland with George Hume earl of Dunbar, to assist in establishing an union between the churches of Scotland and England; and in this business he conducted himself with so much address and prudence, that it laid the foundation of all his future preferment. King James ever after paid great deference to his advice and counsel; and upon the death of Dr Overton bishop of Litchfield and Coventry, he named Dr Abbot for his successor, who was accordingly constituted bishop of those two united sees in December 1609. About a month afterwards he was translated to the see of London, and on the second of November following was raised to the archiepiscopal see.

It is not however improbable, that his extravagant adulation of his royal master, in which he went as far as any other court-chaplain could do, contributed not a little to his rapid preferment. In the preface to a pamphlet which he published, the following specimen of ridiculous flattery occurs: Speaking of the king, he says, "whose life hath been so immaculate and unspotted, &c. that even malice itself, which leaves nothing unsearched, could never find true blemish in it, nor cast probable aspersion on it.—Zealous as a David; learned and wise, the *Solomon* of our age; religious as Josias; careful of spreading Christ's faith as Constantine the Great; just as Moses; undefiled in all his ways as a Jehoshaphat and Hezekiah; full of clemency as another Theodosius."—If Mr Walpole had seen this passage, he certainly would not have said, that "honest Abbot could not flatter."

His great zeal for the Protestant religion made him a strenuous promoter of the match between the Elector Palatine and the Princess Elizabeth; which was accordingly concluded and solemnized the 14th of February 1612, the archbishop performing the ceremony on a stage erected in the royal chapel. In the following year happened the famous case of divorce between the lady Frances Howard, daughter of the earl of Suffolk, and Robert earl of Essex; which has been considered as one of the greatest blemishes of King James's reign. The part which the archbishop took in the business, added much to the reputation he had already acquired for incorruptible integrity. It was referred by the king to a court of delegates, whose opinion the king and court wished and expected to be favourable to the divorce. But the archbishop, unawed by royal authority, with inflexible firmness resisted it, and published his reasons for persisting in his opinion, to which the king, disappointed in his views, though fit to reply: Sentence was given in the lady's favour. In 1618, the king published a declaration, which he ordered to be read in all churches, permitting sports and pastimes on the Lord's day: this gave great uneasiness to the archbishop; who, happening to be at Croydon on the day it was ordered to be read, had the courage to forbid it.

Being now in a declining state of health, the archbishop used in the summer to go to Hampshire for the sake of recreation; and being invited by Lord Zouch to hunt in his park at Bramzill, he met there with the greatest misfortune that ever befel him; for he accidentally killed the game-keeper by an arrow from a cross bow which he shot at one of the deer. This fatal accident threw him into a deep melancholy; and he ever afterwards kept a monthly fast on Tuesday, the day on which it happened; and he settled an annuity of 20l. on the widow *. Advantage was taken of this misfortune, to lessen him in the king's favour; but his majesty said, "An angel might have miscarried in this sort." His enemies alleging that he had incurred an irregularity, and was thereby incapacitated for performing the offices of a primate; the king directed a commission to ten persons to inquire into this matter.

Abbot.

* Fuller's *Church Hist.* cent. xxvii. p. 87.

The result, however, was not satisfactory to his Grace's enemies; it being declared, that, as the murder was involuntary, he had not forfeited his archiepiscopal character. The archbishop after this seldom assisted at the council, being chiefly hindered by his infirmities; but in the king's last illness he was sent for, and constantly attended till his Majesty expired on the 27th of March 1662. He performed the ceremony of the coronation of King Charles I. though very infirm and distressed with the gout. He was never greatly in this king's favour; and the duke of Buckingham being his declared enemy, watched an opportunity of making him feel the weight of his displeasure. This he at last accomplished, upon the archbishop's refusing to license a sermon, preached by Dr Sibthorpe to justify a loan which the king had demanded, and pregnant with principles which tended to overthrow the constitution. The archbishop was immediately after suspended from all his functions as primate; and they were exercised by certain bishops commissioned by the king, of whom Laud, the archbishop's enemy, and afterwards his successor, was one: while the only cause assigned for this procedure was, That the archbishop could not at that time personally attend those services which were otherwise proper for his cognizance and direction. He did not, however, remain long in this situation; for a parliament being absolutely necessary, his Grace was sent for, and restored to his authority and jurisdiction. But not proving friendly to certain rigorous measures adopted by the prevailing church party, headed by Laud, whose power and interest at court were now very considerable, his presence became unwelcome there; so that, upon the birth of the prince of Wales, afterwards Charles II. Laud had the honour to baptize him, as dean of the chapel. The archbishop being worn out with cares and infirmities, died at Croydon, the 5th of August 1633, aged 71 years; and was buried at Guildford, the place of his nativity, where he had endowed an hospital with lands to the amount of 300l. per annum. A stately monument was erected over the grave, with his effigy in his robes.

He proved himself, in most circumstances of his life, to be a man of great moderation to all parties; and was desirous that the clergy should gain the respect of the laity by the sanctity and purity of their manners, rather than claim it as due to their function. His opinions and principles, however, have drawn upon him many severe reflections; particularly, from the earl of Clarendon. But Dr Welwood has done more justice to his merit and abilities †. He wrote several tracts upon

† *Memoirs*, 8vo, 1700, p. 38.

Abbot || Abbotſbury.

upon various ſubjects; and, as already mentioned, tranſlated part of the New Teſtament, with the reſt of the Oxford divines, in 1611.

There was another writer of the ſame name, who flouriſhed ſomewhat later. This George Abbot wrote *A Paraphraſe on Job*, *A Vindication of the Sabbath*, and *A Paraphraſe on the Pſalms*.

ABBOT, *Robert*, elder brother to the former, was born at Guildford in 1560, and completed his ſtudies at Baliol college, Oxford. In 1582, he took his degree of maſter of arts, and ſoon became a celebrated preacher; and to this talent he chiefly owed his preferment. Upon the firſt ſermon at Worceſter, he was choſen lecturer in that city, and ſoon after rector of All-ſaints in the ſame place. John Stanhope, Eſq. happened to hear him preach at Paul's-croſs, was ſo pleaſed with him, that he immediately preſented him to the rich living of Bingham in Nottinghamſhire. In 1597, he took his degree of doctor in divinity: and, in the beginning of King James's reign, was appointed chaplain in ordinary to his Majeſty; who had ſuch an opinion of him as a writer, that he ordered the doctor's book *De Antichriſto* to be printed, with his own commentary upon part of the Apocalypſe. In 1609, he was elected maſter of Baliol college; which truſt he diſcharged with the utmoſt care and aſſiduity, by his frequent lectures to the ſcholars, by his continual preſence at public exerciſes, and by promoting temperance in the ſociety. In November 1610, he was made prebendary of Normanton in the church of Southwell; and, in 1612, his majeſty appointed him regius profeſſor of divinity at Oxford. The fame of his lectures became very great; and thoſe which he gave upon the ſupreme power of kings, againſt Bellarmine and Suarez, ſo much pleaſed his majeſty, that when the ſee of Saliſbury became vacant, he named him to that biſhopric, and he was conſecrated by his own brother at Lambeth, December 3. 1615. When he came to Saliſbury, he found the cathedral falling to decay, through the avarice and negligence of the clergy belonging to it; however, he found means to draw five hundred pounds from the prebendaries, which he applying towards repairing it. Here he devoted himſelf to the duties of his function with great diligence and aſſiduity, viſiting his whole dioceſe in perſon, and preaching every Sunday. But his ſedentary life, and cloſe application to ſtudy, brought upon him the gravel and ſtone; of which he died on the 2d of March 1618, in the 58th year of his age; having filled the ſee only two years and three months. Dr Fuller *, ſpeaking of the two brothers, ſays, "that George was the "more plauſible preacher, Robert the greateſt ſcholar; "George the abler ſtateſman, Robert the deeper di- "vine: gravity did frown in George, and ſmile in Ro- "bert." He publiſhed ſeveral pieces; and left behind him ſundry manuſcripts, which Dr Corbet preſented to the Bodleian library.

* Heylin's *Hiſtory of Preſbyterians*, p. 83.

ABBOTSBROMLEY, a town in Staffordſhire. After the diſſolution of the monaſteries, it was given to the Lord Paget; and has ſince been called *Paget's Bromley*. But it retains its old name in the king's books, and with regard to the fairs. W. Long. 1. 2. N. Lat. 52. 45.

ABBOTSBURY, a ſmall town in Dorſetſhire, in W. Long. 1. 17. N. Lat. 50. 40. The abbey near this town was founded by a Norman lady, about the year 1026. Edward the Confeſſor and William the Conqueror were conſiderable benefactors to it.

Abbots-Langley || Abbreviation.

ABBOTS-LANGLEY, a village in Herts, four miles from St Alban's, famous as the birthplace of Pope Adrian IV.

ABBREVIATE *of* ADJUDICATIONS, in *Scots Law*, an abſtract or abridgment of a decreet of adjudication, which is recorded in a regiſter kept for that purpoſe.

ABBREVIATION, or ABBREVIATURE, a contraction of a word or paſſage, made by dropping ſome of the letters, or by ſubſtituting certain marks or characters in their place. A late philoſophical writer on grammar, divides the parts of ſpeech into words which are neceſſary for the communication of thought, as the noun and verb, and *abbreviations* which are employed for the ſake of diſpatch. The latter, ſtrictly ſpeaking, are alſo parts of ſpeech, becauſe they are all uſeful in language, and each has a different manner of ſignification. Mr Tooke, however, ſeems to allow that rank only to the neceſſary words, and to conſider all others as merely ſubſtitutes of the firſt ſort, under the title of abbreviations. They are employed in language in three ways; in terms, in ſorts of words, and in conſtruction. Mr Locke in his Eſſay treats of the firſt claſs; numerous authors have written on the laſt; and for the ſecond claſs of abbreviations, ſee *Diverſions of Purley*. Lawyers, phyſicians, &c. uſe many abbreviations, for the ſake of expedition. But the Rabbins are the moſt remarkable for this practice, ſo that their writings are unintelligible without the Hebrew abbreviatures. The Jewiſh authors and copyiſts do not content themſelves with abbreviating words like the Greeks and Latins, by retrenching ſome of the letters or ſyllables; they frequently take away all but the initial letters. They even take the initials of ſeveral ſucceeding words, join them together, and, adding vowels to them, make a ſort of barbarous words, repreſentative of all thoſe which they have thus abridged. Thus, *Rabbi Moſes ben Maimon*, in their abbreviature is *Rambam*, &c.

The following ABBREVIATIONS *are of moſt frequent occurrence in the Writings and Inſcriptions of the Romans.*

A

AB. Abdicavit.
AB. AUG. M. P. XXXXI. Ab Auguſtâ millia paſſuum quadraginta unum.
AB. AUGUSTOB. M. P. X. Ab Auguſtobrigâ millia paſſuum decem.
ABN. Abnepos.
AB. U. C. Ab urbe conditâ.
A. CAMP. M. P. XI. A Camboduno millia paſſuum undecim.
A. COMP. XIIII. A Compluto quatuor decem.
A. C. P. VI. A capite, *vel* ad caput pedes ſex.
A. D. Ante diem.
ADJECT. H-S. IX ∞. Adjectis ſeſtertiis novem mille.
ADN. Adnepos.
ADQ. Adquieſcit *vel* adquiſita *pro* acquiſita.
ÆD. II. II. VIR. II. Ædilis iterum, duum-vir iterum.
ÆD. II. VIR. QUINQ. Ædilis duum-vir quinquennalis.

ÆD.

Abbreviation.

ÆD Q. II. VIR. Ædilis quinquennalis duum-vir.
ÆL. Ælius, Ælia.
ÆM. *vel* AIM. Æmilius, Æmilia.
A. K. Ante kalendas.
A. G. Animo grato : Aulus Gellius.
AG. Ager, *vel* Agrippa.
ALA. I. Ala prima.
A. MILL. XXXV. A milliari triginta quinque, *vel* ad milliaria triginta quinque.
A. M. $\overline{XX}$. Ad milliare vigesimum.
AN. A. V. C. Anno ab urbe conditâ.
AN. C. H. S. Anno cent. hic situs est.
AN. DCLX. Anno sexcentesimo sexagesimo.
AN. H. S. Annos duos semis.
AN. IVL. Annos quadraginta sex.
AN. N. Annos natus.
ANN. LIII. H. S. E. Annorum quinquagesim. trium hic situs est.
ANN. NAT. LXVI. Annos natus sexaginta sex.
ANN. PL. M. X. Annos *vel* annis plus minus decem.
AN. ⊖. XVI. Anno defunctus decimo sexto.
AN. V. XX. Annos vixit viginti.
AN. P. M. Annorum plus minus.
A. XII. Annis duodecim.
AN. P. M. L. Annorum plus minus quinquaginta.
A. XX. H. EST. Annorum viginti hic est.
AN. P. R. C. Anno post Romam conditam.
AN. V. P. M. II. Annis vixit plus minus duobus.
AN. XXV. STIP. VIII. Annorum viginti quinque stipendii, *vel* stipendiorum octo.
A. P. M. Amico posuit monumentum.
AP. Appia, Appius.
A. P. V. C. Annorum post urbem conditam.
APVD. L. V. CONV. Apud lapidem quintum convenerunt.
A. RET. P. $\overline{III}$. S. Ante retropedes tres semis.
AR. P. Aram posuit.
ARG. P. X. Argenti pondo decem.
ARR. Arrius.
A. V. B. A viro bono.
A. V. C. Ab urbe conditâ.

B.

B. Balbus, Balbius, Brutus, Belenus, Burrus.
B. Beneficiario, beneficium, bonus.
B. Balnea, beatus, bustum.
B. *pro* V, berna *pro* verna, bixit *pro* vixit, bibo *pro* vivo, bictor *pro* victor, bidua *pro* vidua.
B. A. Bixit annis, bonus ager, bonus amabilis, bona aurea, bonum aureum, bonis auguriis, bonis auspiciis.
B. B. Bona bona, bene bene.
B. DD. Bonis deabus.
B. F. Bona fide, bona femina, bona fortuna, bene factum.
B. F. *reverſed thus*, ꝑ. ꝑ. Bona femina, bona filia.
B. H. Bona hereditaria, bonorum hæreditas.
B. I. I. Boni judicis judicium.
B. L. Bona lex.
B. M. P. Bene merito posuit.
B. M. P. C. Bene merito ponendum curavit.
B. M. S. C. Bene merito sepulcrum condidit.
BN. EM. Bonorum emptores.
BN. H. I. Bona hic invenies.
B. RP. N. Bono reipublicæ natus.
B. A. Bixit, *id est*, vixit annis.

Abbreviation.

BIGINTI. Viginti.
BIXIT. BIXSIT. BISSIT. Vixit.
BIX. ANN. XXCI. M. IV. D. VII. Vixit annis octoginta unum, mensibus quatuor, diebus septem.
BX. ANVS. VII. ME. VI. DI. XVII. Vixit annos septem, menses sex, dies septem decim.

C.

C. Cæsar, Caio, Caius, censor, civitas, consul, condemno.
C. C. Carissimæ conjugi, calumnia causa, consilium cepit.
C. C. F. Caius Caii filius.
C. B. Commune bonum.
C. D. Comitialibus diebus.
C. H. Custos hortorum *vel* hæredum.
C. I. C. Caius Julius Cæsar.
CC. VV. Clarissimi viri.
CEN. Censor, centuria, centurio.
CERTA. QUINQ. ROM. CO. Certamen quinquennale Romæ conditum.
CL. Claudius.
CL. V. Clarissimus vir.
CH. COH. Cohors.
C. M. *vel* CA. M. Causa mortis.
CN. Cneus.
C. O. Civitas omnis.
COH. I. *vel* II. Cohors prima *vel* secunda.
COS. ITER. ET. TERT. DESIG. Consul iterùm et tertiùm designatus.
COS. TER. *vel* QUAR. Consul tertium, *vel* quartum.
COSS. Consules.
COST. CUM. LOC. H-S.∞ D. Custodiam cum loco sestertiis mille quingentis.
C. R. Civis Romanus.
CS. IP. Cæsar imperator.
C. V. Centum viri.

D.

D. Decius, decimus, decuria, decurio, dedicavit, dedit, devotus, dies, divus, Deus, dii, Dominus, domus, donum, datum; decretum, &c.
D. A. Divus Augustus.
D. B. I. Diis benè juvantibus.
D. B. S. De bonis suis.
DCT. Detractum.
DDVIT. Dedicavit.
D. D. Donum dedit, datis, datio, Deus dedit.
D. D. D. Dono dederunt, *vel* datum decreto decurionem.
D. D. D. D. Dignum Deo donum dedicavit.
DDPP. Depositi.
D. N. Dominus noster. D. D. N. N. Domini nostri.
D. D. Q. O. H. L. S. E. V. Diis deabusque omnibus hunc locum sacrum esse voluit.
DIG. M. Dignus memoriâ.
D. M. S. Diis manibus sacrum.
D. O. M. Deo optimo maximo.
D. O. Æ. Deo optimo æterno.
D. PP. Deo perpetuo.
DR. Drusus.
DR. P. Dare promittit.
D. RM. De Romanis.
D. RP. De republica.
D. S. P. F. C. De sua pecunia faciundum curavit.
DT. Duntaxat.
DVL. *vel* DOL. Dulcissimus.

Abbreviation.

DEC.*XIII.AVG.XII.POP.XI. Decurionibus denariis tredecim, auguſtalibus duodecim, populo undecim.
D. IIII. ID. Die quartâ idus.
D. VIIII. Diebus novem.
D. V. ID. Die quintâ idus.

E

E. Ejus, ergo, eſſe, eſt, erexit, exactum, &c.
E. C. F. Ejus cauſa fecit.
E. D. Ejus domus.
ED. Edictum.
E. E. Ex edicto.
EE. N. P. Eſſe non poteſt.
EG. Egit, egregius.
E. H. Ejus hæres.
EID. Idus.
EIM. Ejuſmodi.
E. L. Ex lege.
E. M. Elexit *vel* erexit monumentum.
EQ. M. Equitum magiſter.
EQ. O. Equeſter ordo.
EX. A. D. K. Ex antè diem kalendas.
EX. A. D. V. K. DEC. AD. PRID. K. IAN. Ex antè diem quinto kalendas Decembris ad pridie kalendas Januarias.
EX. H-S. X. P. F. I. Ex ſeſtertiis decem parvis fieri juſſit.
EX. H-S. CIↃN. Ex ſeſtertiis mille nummûm.
EX. H-S. ∞∞∞∞ Ex ſeſtertiis quatuor millia.
EX. H-S. N. CC. L. ∞ D. XL. Ex ſeſtertiis nummorum ducentis quinquaginta millibus, quingentis quadraginta.
EX. H-S. DC. ∞ D. XX. Ex ſeſtertiis ſexcentis millibus quingentis viginti.
EX. KAL. IAN. AD. KAL. IAN. Ex kalendis Januarii ad kalendas Januarii.

F

F. Fabius, fecit, factum, faciendum, familia, famula, faſtus, Februarius, feliciter, felix, fides, fieri, fit, femina, filia, filius, frater, finis, flamen, forum, fluvius, fauſtum, fuit.
F. A. Filio amantiſſimo *vel* filiæ amantiſſimæ.
F. AN. X. F. C. Filio *vel* filiæ annorum decem faciundum curavit.
F. C. Fieri *vel* faciendum curavit, fidei commiſſum.
F. D. Flamen Dialis, filius dedit, factum dedicavit.
F. D. Fide juſſor, fundum.
FEA. Femina.
FE. C. Fermè centum.
FF. Fabrè factum, filius familias, fratris filius.
F. F. F. Ferro, flamma, fame, fortior, fortuna, fato.
FF. Fecerunt.
FL. F. Flavii filius.
F. FQ. Filiis filiabuſque.
FIX. ANN. XXXIX. M. I. D. VI. HOR. SCIT. NEM. Vixit annos triginta novem, menſem unum, dies ſex, horas ſcit nemo.
FO. FR. Forum.
F. R. Forum Romanum.

G

G. Gellius, Gaius *pro* Caius, genius, gens, gaudium, geſta, gratia, gratis, &c.
GAB. Gabinius.
GAL. Gallus, Gallerius.
G. C. Genio civitatis.
GEN. P. R. Genio populi Romani.
GL. Gloria.
GL. S. Gallus Sempronius.
GN. Gneus *pro* Cneus, genius, gens.
GNT. Gentes.
GRA. Gracchus.
GRC. Græcus.

H

H. Hic, habet, haſtatus, hæres, homo, hora, hoſtis, herus.
H. A. Hoc anno.
HA. Hadrianus.
HC. Hunc, huic, hic.
HER. Hæres, hereditatis, Herennius.
HER. *vel* HERC. S. Herculi ſacrum.
H. M. E. H-S. CCIↃↃ. CCIↃↃ. IↃↃ. M. N. Hoc monumentum erexit ſeſtertiis viginti quinque mille nummûm.
H. M. AD. H. N. T. Hoc monumentum ad hæredes non tranſit.
H. O. Hoſtis occiſus.
HOSS. Hoſtes.
H. S. Hic ſitus *vel* ſita, ſepultus *vel* ſepulta.
H-S. N. IIII. Seſtertiis nummûm quatuor.
H-S. CCCC. Seſtertiis quatuor centum.
H-S. ∞. N. Seſtertiis mille mummûm.
H-S. ∞. CCIↃↃ. N. Seſtertiis novem mille nummûm.
H-S. CCIↃↃ. CIↃↃ. Seſtertiis viginti mille.
H-S. XXM. N. Seſtertiis viginti mille nummûm.
H. SS. Hic ſupra ſcriptis.

I

I. Junius, Julius, Jupiter, ibi, ideſt, immortalis, imperator, inferi, inter, invenit, invictus, ipſe, iterùm, judex, juſſit, jus, &c.
IA. Intra.
I. AG. In agro,
I. AGL. In angulo.
IAD. Jamdudùm.
IAN. Janus.
IA. RI. Jam reſpondi.
I. C. Juris conſultus, Julius Cæſar, judex cognitionum,
IC. Hîc.
I. D. Inferiis diis, Jovi dedicatum, Iſidi deæ, juſſu deæ.
ID. Idus.
I. D. M. Jovi Deo magno.
I. F. vel I. FO. In foro.
IF. Interfuit. IFT. Interfuerunt.
I. FNT. In fronte.
IG. Igitur.
I. H. Jacet hîc.
I. I. In jure.
IM. Imago, immortalis, imperator.
I. M. CT. In medio civitatis.
IMM. Immolavit, immortalis, immunis.
IM. S. Impenſis ſuis.
IN. Inimicus, inſcripſit, interea.
IN. A. P. XX. In agro pedes viginti.
IN. *vel* INL. V. I. S. Inluſtris vir infrà ſcriptus.
I. R. Jovi regi, Junoni reginæ, jure rogavit.
I. S. *vel* I. SN. In ſenatum.
I. V. Juſtus vir.
IVD. Judicium.
IVV. Juventus, Juvenalis.
II. V. Duum-vir, *vel* duum-viri.
III. V. *vel* III. VIR. Trium-vir, *vel* trium-viri.
IIII. VIR. Quatuor-vir, *vel* quatuor-viri, *vel* quatuor viratus.

Abbreviation.

HIIII. V. *vel* VIR. Sextum-vir, *vel* ſe-vir, *vel* ſex-vir.
IDNE. *vel* IND. *aut* INDICT. Indictio. *vel* indictione.

K

K. Cæſo, Caius, Caio, Cælius, Carolus, calumnia, candidatus, caput, cariſſimus, clariſſimus, caſtra, cohors, Carthago, &c.
K. KAL. KL. KLD. KLEND. Kalendæ, *aut* kalendis; *et ſic de cæteris ubi menſium apponuntur nomina.*
KARC. Carcer.
KK. Cariſſimi.
KM. Cariſſimus.
K. S. Carus ſuis.
KR. Chorus.
KR. AM. N. Carus amicus noſter.

I

L. Lucius, Lucia, Lælius, Lollius, lares, Latinus, latum, legavit, lex, legio, libens *vel* lubens, liber, libera, libertus, liberta, libra, locavit, &c.
L. A. Lex alia.
LA. C. Latini coloni.
L. A. D. Locus alteri datus.
L. AG. Lex agraria.
L. AN. Lucius Annius, *vel* quinquaginta annis.
L. AP. Ludi Apollinares.
LAT. P. VIII. E. S. Latum pedes octo et ſemis.
LONG. P. VII. L. P. III. Longum pedes ſeptem, latum pedes tres.
L. ADQ. Locus adquiſitus.
LB. Libertus, liberi.
L. D. D. D. Locus datus decreto decurionum.
LECTIST. Lectiſternium.
LEG. I. Legio prima.
L. E. D. Lege ejus damnatus.
LEG. PROV. Legatus provinciæ.
LIC. Licinius.
LICT. Lictor.
LL. Libentiſſimè, liberi, libertas.
L. L. Seſtertius magnus.
LVD. SÆC. Ludi ſæculares.
LVPERC. Lupercalia.
LV. P. F. Ludos publicos fecit.

M

M. Marcus, Marca, Martius, Mutius, maceria, magiſter, magiſtratus, magnus, manes, mancipium, marmoreus, marti, mater, maximus, memor, memoria, menſis, meus, miles, militavit, militiâ, millie, miſſus, monumentum, mortuus, &c.
MAG. EQ. Magiſter equitum.
MAR. VLT. Mars ultor.
MAX. POT. Maximus pontifex.
MD. Mandatum.
MED. Medicus, medius.
MER. Mercurius, mercator.
MERK. Mercurialia, mercatus.
MES. VII. DIEB. XI. Menſibus ſeptem, diebus undecim.
M. I. Maximo Jovi, matri Ideæ *vel* Iſidi, militiæ jus, monumentum juſſit.
MIL. COH. Miles cohortis.
MIN. *vel* MINER. Minerva.
M. MON. MNT. MONET. Moneta.
M. *vel* MS. Menſis *vel* menſes.
MNF. Manifeſtus.
MNM. Manumiſſus.
M. P. II. Millia paſſuum duo.
MV. MN. MVN. MVNIC. Municipium *vel* municeps.

N

N. Neptunus, Numerius, Numeria, Nonius, Nero, nam, non, natus, natio, nefaſtus, nepos, neptis, niger, nomen, nonæ, noſter, numerarius, numerator, numerus, nummus *vel* numiſma, numen.
NAV. Navis.
N. B. Numeravit bivus *pro* vivus.
NB. *vel* NBL. Nobilis.
N. C. Nero Cæſar, *vel* Nero Claudius.
NEG. *vel* NEGOT. Negotiator.
NEP. S. Neptuno ſacrum.
N. F. N. Nobili familia natus.
N. L. Non liquet, non licet, non longè, nominis Latini.
N. M. Nonius Macrinus, non malum, non minus,
NN. Noſtri. NNR. *vel* NR. Noſtrorum.
NO. Nobis.
NOBR. November.
NON. AP. Nonis Aprilis.
NQ. Namque, nuſquam, nunquam.
N. V. N. D. N. P. O. Neque vendetur, neque donabitur, neque pignori obligabitur.
NVP. Nuptiæ.

O

O. Officium, optimus, olla, omnis, optio, ordo, oſſa, oſtendit, &c.
OB. Obiit.
OB. C. S. Ob cives ſervatos.
OCT. Octavianus, October.
O. E. B. Q. C. Oſſa ejus benè quieſcant condita,
O. H. F. Omnibus honoribus functus.
ONA. Omnia.
OO. Omnes, omnino. O. O. Optimus ordo.
OP. Oppidum, opiter, oportet, optimus, opus.
OR. Ornamentum.
OTIM. Optimæ.

P

P. Publius, paſſus, patria, pecunia, pedes, perpetuus, pius, plebs, populus, pontifex, poſuit, poteſtas, præfes, prætor, pridie, pro, poſt, provincia, puer, publicus, publicè, primus, &c.
PA. Pater, Patricius.
PAE. ET. ARR. COS. Pæto et Arrio conſulibus.
P. A. F. A. Poſtulo an fias auctor.
PAR. Parens, parilia, Parthicus.
PAT. PAT. Pater patriæ.
PBLC. Publicus.
PC. Procurator.
P. C. Poſt conſulatum, patres conſcripti, patronus coloniæ, ponendum curavit, præfectus corporis, pactum conventum.
PED. CXVS. Pedes centum quindecim ſemis.
PEG. Peregrinus.
P. II. ℔. L. Pondo duarum ſemis librarum.
P. II. :: Pondo duo ſemis et triente.
P. KAL. Pridiè kalendas.
POM. Pompeius.
P. P. P. C. Propria pecunia ponendum curavit.
P. R. C. A. DCCCXLIIII. Poſt Romam conditam annis octingentis quadraginta quatuor.
PRO. Proconſul. P. PR. Pro-prætor. P. PRR. Proprætores.

PR...

Abbreviation

PR. N. Pro nepos.
P. R. V. X. Populi Romani vota decennalia.
PS. Paſſus, plebiſcitum.
PUD. Pudicus, pudica, pudor.
PUR. Purpureus.

Q

Q. Quinquennalis, quartus, quintus, quando, quantum, qui, quæ, quod, Quintus, Quintius, Quintilianus, quæſtor, quadratum, quæſitus.
Q. B. AN. XXX. Qui bixit, *id eſt* vixit, annos triginta.
QM. Quomodo, quem, quoniam.
QQ. Quinquennalis. QQ. V. Quoquo verſum.
Q. R. Quæſtor reipublicæ.
Q. V. A. III. M. II. Qui *vel* quæ vixit annos tres, menſes duo.

R

R. Roma, Romanus, rex, reges, Regulus, rationalis, Ravennæ, recta, recto, requietorium, retro, roſtra, rudera, &c.
RC. Reſcriptum.
R. C. Romana civitas.
REF. C. Reficiendum curavit.
REG. Regio.
R. P. RESP. Reſpublica.
RET. P. XX. Retro pedes viginti.
REC. Requieſcit.
RMS. Romanus.
ROB. Robigalia, Robigo.
RS. Reſponſum.
RVF. Rufus.

S

S. Sacrum, ſacellum, ſcriptus, ſemis, ſenatus, ſepultus, ſepulcrum, ſanctus, ſervus, ſerva, Servius, ſequitur, ſibi, ſitus, ſolvit, ſub, ſtipendium, &c.
SAC. Sacerdos, ſacrificium.
SÆ. *vel* SÆC. Sæculum, ſæculares.
SAL. Salus.
S. C. Senatus-conſultum.
SCI. Scipio.
S. D. Sacrum diis.
S. EQ. Q. O. ET. P. R. Senatus, equeſterque ordo et populus Romanus.
SEMP. Sempronius.
SL. SVL. SYL. Sylla.
S. L. Sacer ludus, ſine linguâ.
S. M. Sacrum manibus, ſine manibus, ſine malo.
SN. Senatus, ſententia, ſine.
S. P. Sine pecunia.
S. P. Q. R. Senatus populuſque Romanus.
S. P. D. Salutem plurimam dicit.
S. T. A. Sine *vel* ſub tutoris auctoritate.
SLT. Scilicet.
S. E. T. L. Sit ei terra levis.
SIC. V. SIC. X. Sicut quinquennalia, ſic decennalia.
SSTVP. XVIIII. Stipendiis novem decim.
ST. XXXV. Stipendiis triginta quinque.

T

T. Titus, Tullius, tantum, terra, tibi, ter, teſtamentum, titulus, terminus, triarius, tribunus, turma, tutor, tutela, &c.
TAB. Tabula. TABVL. Tabularius.
TAR. Tarquinius.
TB. D. F. Tibi dulciſſimo filio.
TB. PL. Tribunus plebis.
TB. TI. TIB. Tiberius.
T. F. Titus Flavius, Titi filius.
THR. Thrax.
T. L. Titus Livius, Titi libertus.
TIT. Titulus.
T. M. Terminus, thermæ.
TR. PO. Tribunitia poteſtas.
TRAJ. Trajanus.
TUL. Tullus *vel* Tullius.
TR. V. Trium-vir.
TT. QTS. Titus Quintus.
Θ *vel* TH. AN. Mortuus anno.
ΘXIII. Defunctus viginti tribus.

V

V. Quinque, quintò, quintùm.
V. Vitellius, Volera, Volero, Voluſus, Vopiſcus, vale, valeo; Veſta, veſtalis, veſtis, veſter, veteranus, vir, virgo, vivus, vixit, votum, vovit, urbs, uſus, uxor, victus, victor, &c.
V. A. Veterano aſſignatum.
V. A. I. D. XI. Vixit annum unum, dies undecim.
V. A. L. Vixit annos quinquaginta.
V. B. A. Viri boni arbitratu.
V. C. Vale conjux, vivens curavit, vir conſularis, vir clariſſimus, quintum conſul.
VDL. Videlicet.
V. E. Vir egregius, viſum eſt, verum etiam.
VESP. Veſpaſianus.
VI. V. Sextum vir. VII. V. Septem-vir. VIII. VIR. octum-vir.
VIX. A. FF. C. Vixit annos fermè centum.
VIX. AN. XXX. Vixit annos triginta.
ULPS. Ulpianus, Ulpius.
V. M. Vir magnificus, vivens mandavit, volens merito.
V. N. Quinto nonas.
V. MUN. Vias munivit.
VOL. Volcania, Voltinia, Voluſus.
VONE. Bonæ.
VOT. V. Votis quinquennalibus.
VOT. V. MULT. X. Votis quinquennalibus, multis decennalibus.
VOT. X. Vota decennalia.
VOT. XX. *vel* XXX. *vel* XXXX. Vota vicennalia, aut tricennalia, aut quadragenalia.
V. R. Urbs Roma, votum reddidit.
VV. CC. Viri clariſſimi.
UX Uxor.

X

X. AN. Annalibus decennalibus.
X. K. OCT. Decimo kalendas Octobris.
X. M. Decem millia. X. P. Decem pondo.
X. V. Decem-vir. XV. VIR. Quindecim-vir.

Abbreviation || Abb's.

ABBREVIATION of fractions, in *Arithmetic* and *Algebra*, is the reducing them to lower terms.

ABBREVIATOR, in a general ſenſe, a perſon who abridges any large book into a narrower compaſs.

ABBREVIATORS, a college of 72 perſons in the chancery of Rome, who draw up the pope's brieves, and reduce petitions, when granted by him, into proper form for being converted into bulls.

ABB'S (St) HEAD, a promontory of land in the ſouthern extremity of the frith of Forth, in Scotland, 10 miles north of Berwick, and nearly the ſame diſtance

Abbutals

Abdalonymus.

ſtance ſouth of Dunbar. W. Long. 1. 56. N. Lat. 55. 55.

ABBUTALS, ſignify the buttings or boundings of land towards any point. Limits were anciently diſtinguiſhed by artificial hillocks, which were called *botemines*; and hence *butting*. In a deſcription of the ſite of land, the ſides on the breadth are more properly *adjacentes*, and thoſe terminating the length are *abbutantes*; which, in old ſurveys, were ſometimes expreſſed by *capitare*, to head, whence abbutals are now called *head lands*.

ABCEDARY, or ABCEDARIAN, an epithet given to compoſitions, the parts of which are diſpoſed in the order of the letters of the alphabet: thus we ſay, Abcedarian pſalms, lamentations, hymns, &c.; ſuch are Pſal. xxv. xxxiv. cxix. &c.

ABCOURT, a town near St Germains, four leagues from Paris. Here is a briſk chalybeate water, which is alſo impregnated with carbonic acid and ſoda; and reſembling the waters of Spa and Ilmington.

ABDALLA, the ſon of Abalmotalleb, was the father of the prophet Mahomet. He was the moſt beautiful and modeſt of the Arabian youth, and when he married Amina, of the noble race of the Zahrites, 200 virgins are ſaid to have died of jealouſy and deſpair. Several other Arabians of eminence bore the ſame name.

ABDALMALEK, the ſon of Mirvan, and the 5th caliph of the race of the Ommiades. He ſurpaſſed all his predeceſſors in power and dominion; for in his reign the Indies were conquered in the eaſt, and his armies penetrated Spain in the weſt: he likewiſe extended his empire toward the ſouth, by making himſelf maſter of Medina and Mecca. Under his reign the Greek language and character were excluded from the accounts of the public revenue. If this change, ſays Gibbon, was productive of the invention or familiar uſe of the Arabic or Indian cyphers, which are our preſent numerals, a regulation of office has promoted the moſt important diſcoveries of arithmetic, algebra, and the mathematical ſciences. His extreme avarice expoſed him to the contempt and deriſion of his ſubjects, who gave him the appellation of *the ſweat of a ſtone*; and his fetid breath, it is ſaid, poiſoned the flies which accidentally lighted on his lips, whence he was called the *father of flies*. He began his reign in the 65th of the Hegira, A. D. 684; reigned 15 years; and four of his ſons ſucceſſively enjoyed the caliphate.

ABDALMALEK, *Ben Zohar*, an eminent phyſician, commonly called by the Europeans *Avenzoar*. See AVENZOAR.

ABDALMOTALLEB, or ABDOL MOTALLEB, the ſon of Haſhem, the father of Abdalla, and grandfather of Mahomet the prophet of the Muſſulmans, was, it is ſaid, of ſuch wonderful comelineſs and beauty, that all women who ſaw him became enamoured: which may have given occaſion to that prophetic light, which, according to the Arabians, ſhone on the foreheads of him, his anceſtors, and deſcendants; it being certain that they were very handſome and graceful men. He died when Mahomet, of whom he had taken peculiar care, was only eight or nine years old; aged, according to fame, 110, and according to other writers 120.

ABDALONYMUS, or ABDOLONYMUS, in claſſic hiſtory, of the royal family of Sidon, and deſcended from King Cinyras, lived in obſcurity, and ſubſiſted by cultivating a garden, while Strato was in poſſeſſion of the crown of Sidon. Alexander the Great having depoſed Strato, inquired whether any of the race of Cinyras was living, that he might ſet him on the throne. It was generally thought that the whole race was extinct: but at laſt Abdalonymus was thought of, and mentioned to Alexander; who immediately ordered ſome of his ſoldiers to fetch him. They found the good man at work, happy in his poverty, and entirely a ſtranger to the noiſe of arms, with which all Aſia was at that time diſturbed; and they could ſcarcely perſuade him they were in earneſt. Alexander was convinced of his high deſcent by the dignity of his perſon; but was deſirous of learning from him in what manner he bore his poverty. "I wiſh" ſaid Abdalonymus, "I may bear my new condition as well: Theſe hands have ſupplied my neceſſities: I have had nothing, and I have wanted nothing." This anſwer pleaſed Alexander ſo much, that he not only beſtowed on him all that belonged to Strato, but augmented his dominions, and gave him a large preſent out of the Perſian ſpoils.

Abdals

Abdera.

ABDALS, in the eaſtern countries, a kind of ſaints ſuppoſed to be inſpired to a degree of madneſs. The word is perhaps derived from the Arabic, *Abdallah*, the ſervant of God. The Perſians call them *devaneh khoda*, ſimilar to the Latin way of ſpeaking of prophets and ſibyls, q. d. *furentes deo*, raging with the god. Hurried on by exceſs of zeal, eſpecially in the Indies, they often run about the ſtreets, and kill all they meet who are of a different religion. The Engliſh ſailors call this *running a muck*, from the name of the inſtrument, a ſort of poniard, which they employ on thoſe deſperate occaſions. If they are killed, as it commonly happens before they have done much miſchief, they reckon it highly meritorious; and are eſteemed, by the vulgar, martyrs for their faith.

ABDARA, or ABDERA, in *Ancient Geography*, a town of Bætica in Spain, a Phœnician colony; now *Adra*, to the weſt of Almeira in the kingdom of Granada.

ABDERA, in *Ancient Geography*, a maritime town of Thrace, not far from the mouth of the river Neſſus, on the eaſt ſide. The foundation, according to Herodotus, was attempted to be laid by Timeſius the Clazomenian; but he was forced by the Thracians to quit the deſign. The Teians undertook it and ſucceeded, and ſettled in this place, in order to avoid the inſults and oppreſſion of the Perſians.—Several ſingularities are told of Abdera *. The graſs of the country round it was of ſuch a quality, that the horſes which fed on it were ſeized with madneſs. In the reign of Caſſander king of Macedon, this city was ſo infeſted with frogs and rats, that the inhabitants were forced for a time to quit it.—The Abderites, or Abderitani, were very much derided for their want of wit and judgement: yet their city has given birth to ſeveral eminent perſons; as Protagoras, Democritus, Anaxarchus, Hecatæus the hiſtorian, Nicenætus the poet, and many others, who were mentioned among the illuſtrious men.—In the reign of Lyſimachus, Abdera was afflicted for ſome months with a moſt extraordinary diſeaſe†: this was a burning fever, whoſe criſis was always on the ſeventh day, and then it left them; but it ſo diſtracted their imaginations, that they fancied themſelves players. After this, they were ever repeating verſes from ſome tragedy, and particularly

* Plin. lib. xxv. c. 8. Juſt. lib. xxv. c. 2.

† Lucianus, *quomodo Hiſt. ſit conſcribendus initio.*

Abderahma || Abdication.

from the Andromeda of Euripides, as if they had been upon the ſtage; ſo that many of theſe pale meagre actors were pouring forth their tragic exclamations in every ſtreet. This delirium continued till the winter following; which was a very cold one, and therefore fitter to remove it. Lucian, who has deſcribed this diſeaſe, endeavours to account for it in this manner: Archelaus, an excellent player, acted the Andromeda of Euripides before the Abderites, in the height of a very hot ſummer. Several had a fever at their coming out of the theatre; and as their imaginations were full of the tragedy, the delirium which the fever raiſed perpetually repreſented Andromeda, Perſeus, Meduſa, &c. and the ſeveral dramatic incidents, and called up the ideas of thoſe objects, and the pleaſure of the repreſentation, ſo ſtrongly, that they could not forbear imitating Archelaus's action and declamation: And from theſe the fever ſpread to others by infection.

ABDERAHMA, a Saracen viceroy in Spain, who revolted and formed an independent principality at Cordova. He had ſeveral ſucceſſors of the ſame name.

A viceroy and captain-general of this name led the Saracens and their followers into France, ravaging the country wherever they came. At length he was met at Tours by Charles Martel, who had received reinforcements of Germans and Gepidæ; and after many ſkirmiſhes, the Saracen army, in a general action, was totally routed, and Abderahma was killed with 370,000 Moors. This great event, which firſt broke the power of the Saracens, and taught the Europeans that they were not invincible, happened about the year 732 of the Chriſtian era, and of the Hegira 114.

ABDEST, a Perſian word, properly ſignifying the water placed in a baſon for waſhing the hands; but is uſed to imply the legal purifications practiſed by the Mahometans before prayer, entering the moſque, or reading the Alcoran.

ABDIAS OF BABYLON, one of the boldeſt legend writers, who boaſted that he had ſeen Chriſt, that he was one of the 70 diſciples, had been eye-witneſs of the actions and prayers of ſeveral of the apoſtles at their deaths, and had followed into Perſia St Simon and St Jude, who, he ſaid, made him the firſt biſhop of Bābylon. His book, entitled *Hiſtoria Certaminis Apoſtolici*, was publiſhed by Wolfgang Lazius, at Baſil, 1551; and has paſſed through ſeveral editions in other places.

ABDICATION, the action whereby a magiſtrate, or perſon in office, renounces and gives up the ſame before the term of ſervice is expired.

This word is frequently confounded with *reſignation*; but differs from it; for abdication is done purely and ſimply, whereas reſignation is in favour of ſome third perſon. In this ſenſe, Dioclefian is ſaid to have abdicated the crown; Philip IV. of Spain reſigned it. It is ſaid to be a renunciation, quitting, and relinquiſhing, ſo as to have nothing further to do with a thing; or the doing of ſuch actions as are inconſiſtent with the holding of it. On King James's leaving the kingdom, and abdicating the government, the lords propoſed that the word *deſertion* ſhould be employed; but the commons thought that it was not ſufficiently comprehenſive. Among the Roman writers it is more particularly uſed for the act whereby a father diſcarded or diſclaimed his ſon, and expelled him the family. It is diſtinguiſhed from *exhæredatio* or *diſinheriting*, in that the former was done in the father's lifetime; the latter, by will at his death: ſo that whoever was abdicated, was alſo diſinherited; but not *vice verſa*.

Abdollatiph.

ABDOLLATIPH, a phyſician, was born at Bagdad in the 557th year of the Hegira, A. D. 1161. Having been educated with the greateſt care by his father, who was himſelf a man of learning, and reſided in a capital which abounded with the beſt opportunities of inſtruction, he early diſtinguiſhed himſelf not only by proficiency in rhetoric, hiſtory, and poetry, but alſo in the more ſevere ſtudies of Mohammedan theology. To the acquirement of medical knowledge he applied with eſpecial diligence; and it was chiefly with this view that, in his 28th year, he left Bagdad, in order to viſit other countries. At Moſul, in Meſopotamia, whither he firſt directed his courſe, he found the attention of the ſtudents entirely confined to the chemiſtry of that day, with which he was already ſufficiently acquainted. Having ſpent a year at Moſul, he removed to Damaſcus in Syria, where the grammarian Al Kindi then enjoyed the higheſt reputation; and with whom he is ſaid to have engaged in a controverſy on ſome ſubjects of grammar and philology, which terminated in favour of Abdollatiph.

At this time, Egypt had yielded to the arms of Saladin, who was marching againſt Paleſtine for the purpoſe of wreſting that country from the hands of the Chriſtians: yet towards Egypt Abdollatiph was irreſiſtibly impelled by that literary curioſity which ſo ſtrongly marked his character. To the ſucceſsful proſecution of this journey, the conſent and patronage of the ſultan were indiſpenſably neceſſary: but when the Arabian phyſician arrived at the camp near Acca, (the ancient Ptolemais, now Acre) to ſolicit his powerful protection, he found the Saracens bewailing a defeat which they had recently experienced; a defeat ſo honourable to the ſkill and valour of our Engliſh Richard, that nothing leſs than the late matchleſs defence of this fortreſs, by a handful of Britiſh ſeamen and marines, could have detracted from its importance, or eclipſed its glory. Hence the lofty ſpirit of the ſultan was plunged into a morbid melancholy, which excluded the traveller from his preſence; but the favours which he received evinced the munificence of Saladin, and he perſiſted in his deſign of exploring the wonders of Egypt. One ſtrong inducement which influenced him on this occaſion, was the inſtruction which he hoped to derive from the ſociety of the celebrated Maimonides; and by Al Kadi Al Fadel, who had earneſtly but unavailingly ſolicited him to return to Damaſcus, he was furniſhed with ſuch recommendations as procured for him the moſt flattering reception at Cairo. His talents and his virtues confirmed and increaſed the kindneſs with which he was welcomed on his firſt arrival; and the Egyptians of the higheſt rank continued to vie with each other in cultivating his friendſhip.

From this intercourſe, however, with the great and the learned, Abdollatiph withdrew, in order to preſent himſelf before the ſultan; who, having concluded a truce with the Franks, then reſided in the Holy City. Here he was received by Saladin with every expreſſion of eſteem for his character and attainments.

To

Abdomen, Abdominales. To a dignified politeneſs, and condeſcending freedom, this prince is ſaid to have added a munificent liberality in the patronage of ſcience and of art; and of this fact, indeed, we have a laudable inſtance in the penſion which he granted to Abdollatiph, and which amounted to 30 dinars per month. After the death of the ſultan, this ſum was raiſed by his ſons to 100 dinars, till the ambition of their uncle forced them from the throne of Egypt and of Syria; and thus was our traveller compelled to reſort again to Damaſcus, after a ſhort abode at Jeruſalem: where his lectures, and his treatiſes, were equally the objects of general admiration.

In the capital of Syria, his purſuits were of the ſame nature, and attended with ſimilar ſucceſs. His practice as a phyſician was extenſive. To the ſtudents in the college of Al Aziz, he freely communicated the ample ſtores of his cultivated mind; and in the works which he compoſed on the principles of medicine, he diſplayed that depth of reſearch and that felicity of illuſtration, which are the rare effects of genius combined with diligence, judgement, and erudition.

Such is the teſtimony given to the exertions of our author; and it is added that they were rewarded at Damaſcus not with fame alone, but alſo with riches. Yet neither the applauſe of the wiſe nor the patronage of the wealthy had power to detain him, when other ſcenes or other ſociety promiſed to gratify his curioſity, or to increaſe his knowledge. On this account, probably, he left Damaſcus, and, after having viſited Aleppo, reſided ſeveral years in Greece. With the ſame view he travelled through Syria, Armenia, and Aſia Minor, ſtill adding to the number of his works; many of which he dedicated to the princes whoſe courts he viſited, or whoſe ſubjects he laboured to inſtruct.

After having thus enriched his own mind, and contributed ſo ſucceſsfully to the improvement of others, ſentiments of devotion induced him to undertake a pilgrimage to Mecca. In the mean time, however, he ſeems to have experienced the full force of that deſire, which in the native of Switzerland has often been known to ſuperſede every other,—the deſire of once more beholding the place which gave him birth. He wiſhed alſo to preſent the fruits of his travels, and of his ſtudies, to the caliph Al Moſtanſer Billah. He therefore eagerly journeyed towards Bagdad, which, after ſo long an abſence, he no doubt beheld with emotions of tender exultation:—but all his hopes were diſappointed: Scarcely had he reached his native city, when he was ſuddenly taken ill, and died in his 63d year, A. D. 1223. Of 150 treatiſes which he compoſed on various ſubjects of medicine, natural philoſophy and polite literature, only one, entitled *Hiſtoriæ Ægypti Compendium*, has ſurvived the ravages of time. This manuſcript, the only one which has been diſcovered, was brought to Europe by the celebrated orientaliſt Pococke, and is now preſerved in the Bodleian library. Dr White of Oxford publiſhed an edition of the original Arabic, with an elegant Latin verſion in 4to, in 1800. (*Month. Rev.*)

ABDOMEN, in *Anatomy*, is that part of the trunk of the body which lies between the thorax and the bottom of the pelvis. See ANATOMY.

ABDOMINALES, or ABDOMINAL FISHES, conſtitute the Fourth Order of the *Fourth Claſs* of Animals, in the Linnæan ſyſtem. See ICHTHYOLOGY. Abduction || Abelard.

ABDUCTION, in *Logic*, a kind of argumentation, by the Greeks called *apagoge*, wherein the greater extreme is evidently contained in the medium, but the medium not ſo evidently in the leſſer extreme as not to require ſome farther medium or proof to make it appear. It is called *abduction*, becauſe, from the concluſion, it draws us on to prove the propoſition aſſumed. Thus, in the ſyllogiſm, "All whom God abſolves are free from ſin; but God abſolves all who are in Chriſt; therefore all who are in Chriſt are free from ſin,"—the major is evident; but the minor, or aſſumption, is not ſo evident without ſome other propoſition to prove it, as, "God received full ſatisfaction for ſin by the ſufferings of Jeſus Chriſt."

ABDUCTOR, or ABDUCENT, in *Anatomy*, a name given to ſeveral of the muſcles, on account of their ſerving to withdraw, open, or pull back the parts to which they belong.

ABEL, ſecond ſon of Adam and Eve, was a ſhepherd. He offered to God ſome of the firſtlings of his flock, at the ſame time that his brother Cain offered the fruits of the earth. God was pleaſed with Abel's oblation, but diſpleaſed with Cain's; which ſo exaſperated the latter, that he roſe up againſt his brother and killed him. Theſe are the only circumſtances Moſes relates of him; though, were we to take notice of the ſeveral particulars to which curioſity has given birth on this occaſion, they would run to a very great length. But this will not be expected. It is remarkable, that the Greek churches, who celebrate the feaſts of every other patriarch and prophet, have not done the ſame honour to Abel. His name is not to be found in any catalogue of ſaints or martyrs till the 10th century; nor even in the new Roman martyrology. However he is prayed to, with ſome other ſaints, in ſeveral Roman litanies ſaid for perſons who lie at the point of death.

ABEL-Keramim, or *Vinearum*, beyond Jordan, in the country of the Ammonites, where Jephthah defeated them, ſeven miles diſtant from Philadelphia; abounding in vines, and hence the name. It was alſo called *Abela*.

ABEL-Meholah, the country of the prophet Eliſha, ſituated on this ſide Jordan, between the valley of Jezreel and the village Bethmael, in the plains of Jordan, where the Midianites were defeated by Gideon. Judges vii. 22.

ABEL Mizraim, (called alſo the Threſhing-floor of Atad), ſignifying the lamentation of the Egyptians; in alluſion to the mourning for Jacob, Gen. l. 3, 10, 11. Suppoſed to be near Hebron.

ABEL-Moſch, or *Abelmuſch*, in *Botany*, the trivial name of a ſpecies of the HIBISCUS.

ABEL-Sattim, or *Sittim*, a town in the plains of Moab, to the north eaſt of the Dead ſea, not far from Jordan, where the Iſraelites committed fornication with the daughters of Moab: So called, probably, from the great number of ſittim trees there.

ABELARD, PETER, an eminent ſcholaſtic philoſopher of France, the ſon of Berenger, of noble deſcent, was born at Palais near Nantes in Bretagne, in the year 1079. Abelard had received from nature a vigorous and active mind; but it was his lot to live at a period, when logic, metaphyſics, and polemic theo-

Abelard. logy, conſtituted a learned education, when abſtruſe ſpeculations and verbal ſubtleties occupied the ingenuity of literary men, and diſtinguiſhed talents for diſputation led to honour and preferment. Devoted to letters by his father's appointment, and by his own inclination, his literary attainments could at this time only be exhibited in the field of ſcholaſtic philoſophy; and, that he might be fitted for his deſtined career of life, he was placed, after a previous courſe of grammatical ſtudies, under the tuition of Roſceline, a celebrated metaphyſician, and founder of the ſect of the Nominaliſts. Under the inſtructions of this able maſter, at the early age of ſixteen, he furniſhed himſelf with a large ſtore of ſcholaſtic knowledge, and acquired a ſubtlety and quickneſs of thought, a fluency of ſpeech, and facility of expreſſion, which were neceſſary qualifications in ſcholaſtic diſputation.

Having ſpent ſome time in viſiting the ſchools of ſeveral provinces, after the example of the ancient philoſophers who travelled in ſearch of wiſdom, in the twentieth year of his age, he fixed his reſidence in the univerſity of Paris, then the firſt ſeat of learning in Europe. The maſter, William de Champeaux, was at that time in high repute for his knowledge of philoſophy, and his ſkill in the dialectic art; to him he committed the direction of his ſtudies, and was at firſt contented with receiving inſtruction from ſo eminent a preceptor. De Champeaux was proud of the talents of his pupil, and admitted him to his friendſhip. But the aſpiring youth ventured to contradict the opinions of his maſter, and in the public ſchool held diſputations with him, in which he was frequently victorious. The jealouſy of the maſter and the vanity of the pupil naturally occaſioned a ſpeedy ſeparation.

Elated by ſucceſs, and confident of his own powers, Abelard, without heſitation, at the age of twenty-two, opened a public ſchool of his own. "I was young indeed," ſays he; "but confident of myſelf, my ambition had no bounds: I aſpired to the dignity of a profeſſor, and only waited till I could fix on a proper place to open my lectures." Melun, a town ten leagues from Paris, where the court frequently reſided, was the place which he choſe for this bold diſplay of his talents. But it was not without conſiderable difficulty that Abelard executed his plan; for De Champeaux, who regarded him as a rival, openly employed all his intereſt againſt him. Abelard at length prevailed, his ſchool was opened, and his lectures were attended by crowded and admiring auditories. Emboldened by this ſucceſs, and perhaps ſtimulated by unworthy reſentment, Abelard reſolved to maintain an open conteſt with his maſter, and for this purpoſe removed his ſchool to Corbeil near Paris. The diſputants frequently met in each other's ſchools; and the conteſt was ſupported on each ſide with great ſpirit, amidſt crowds of their reſpective ſcholars. The young champion was in the end victorious, and his antagoniſt was obliged to retire.

Conſtant application and violent exertions had now ſo far impaired Abelard's health, that it was become neceſſary for him to interrupt his labours; and, with the advice of his phyſician, he withdrew to his native country. Two years afterwards, he returned to Corbeil, and found that De Champeaux had taken the monaſtic habit among the regular canons in the convent of St Victor; but that he ſtill continued to teach rhetoric and logic, and to hold public diſputations in theology. Returning to the charge, he renewed the conteſt, and his opponent was obliged to acknowledge himſelf defeated; and the ſcholars of De Champeaux deſerted him, and went over in crowds to Abelard. Even the new profeſſor, who had taken the former ſchool of De Champeaux, voluntarily ſurrendered the chair to the young philoſopher, and requeſted to be enrolled among his diſciples. A triumph ſo complete, while it gratified the vanity of Abelard, could not fail to provoke the reſentment of his old maſter, who had influence to obtain the appointment of a new profeſſor, and drive Abelard back to Melun. De Champeaux's motive for this violent proceeding was ſoon perceived; even his friends were aſhamed of his conduct; and he retired from the convent into the country. When Abelard was informed of the flight of his adverſary, he returned towards Paris, and took a new ſtation at the abbey on Mount St Genevieve. His rival, the new profeſſor, was unequal to the conteſt, and was ſoon deſerted by his pupils, who flocked to the lectures of Abelard. De Champeaux too returning to his monaſtery, renewed the ſtruggle; but ſo unſucceſsfully, that Abelard was again victorious. Abelard.

During a ſhort abſence, in which Abelard viſited his native place, De Champeaux was preferred to the ſee of Chalons. The long and ſingular conteſt between theſe philoſophers terminated; and Abelard, perhaps for want of a rival to ſtimulate his exertions, or poſſibly through envy of the good fortune of his rival, determined to exchange the ſtudy and profeſſion of philoſophy for that of theology. He therefore quitted his ſchool at St Genevieve, and removed to Laon, to become a ſcholar of Anſelm. From this celebrated maſter he entertained high expectations; but they were ſoon diſappointed. On attending his lectures, he found that, though he poſſeſſed uncommon fluency of language, he left his auditors without inſtruction. "You would have thought," ſays Abelard, "he was kindling a fire, when inſtantly the whole houſe was filled with ſmoke, in which not a ſingle ſpark was viſible: he was a tree covered with a thick foliage, which pleaſed the diſtant eye; but, on a nearer inſpection, there was no fruit to be found: I went up to this tree in full expectation, but I ſaw that it was the fig tree which the Lord had curſed." (*Hiſt. Calamit.*) Abelard gradually retired from theſe unprofitable lectures, but without offering offence either to the veteran profeſſor, or his ſcholars. In converſation one of them aſked him, what he thought of the ſtudy of the Scriptures? Abelard replied, that he thought the explanation of them a taſk of no great difficulty; and, to prove his aſſertion, he undertook to give a comment, the next day, upon any part of the Scriptures they ſhould mention. They fixed upon the beginning of the prophecy of Ezekiel; and the next morning he explained the paſſage in a theological lecture, which was heard with admiration. For ſeveral ſucceſſive days, the lectures were at the requeſt of the audience continued; the whole town preſſed to hear them; and the name of Abelard was echoed through the ſtreets of Laon. Anſelm, jealous of the riſing fame of this young theologian, prohibited his lectures, under the pretence that ſo young a lecturer might fall into miſtakes, which would

Abelard. would bring discredit upon his master. Abelard, whose ambition required a wider field than that of Laon, obeyed the prohibition, and withdrew. He returned to Paris, whither the fame of his theological talents had arrived before him, and opened his school with his lectures on the prophecy of Ezekiel. His auditors were delighted; his school was crowded with scholars; and he united in his lectures the sciences of theology and philosophy with so much success, that multitudes repaired to his school from various parts of France, from Spain, Italy, Germany, Flanders, and Great Britain.

Hitherto Abelard has appeared with high distinction, as an able disputant, and a popular preceptor: we must now view him under a different character, and, when nearly arrived at the sober age of forty, see him, on a sudden, exchanging the school of philosophy for the bower of pleasure, and even disgracing himself, as will too plainly appear in the sequel, by forming and executing a deliberate plan for the seduction of female innocence. It happened that there was at this time, resident in Paris, Heloise, the niece of Fulbert, one of the canons of the cathedral church, a lady about eighteen years of age, of great personal beauty, and highly celebrated for her literary attainments. Abelard, whose vanity had been satiated with fame, and the vigour of whose mind was now enervated by repose, found himself inclined to listen to the voice of passion. He beheld with ardent admiration the lovely Heloise, and confident that his personal attractions were still irresistible, he determined to captivate her affections. Fulbert, who doubtless thought himself honoured by the visits of so eminent a scholar and philosopher, received him into his house as a learned friend. He was soon afterwards prevailed upon, by a handsome payment which Abelard offered for his board, to admit him into his family; and, apprehending no hazard from a man of Abelard's age and profession, confidentially requested him to undertake the instruction of Heloise. Abelard accepted the trust, but, as it seems, without any other intention than to betray it. The hours of instruction were employed in other lessons than those of learning and philosophy; and to such a master as Abelard, it was not surprising that Heloise was an apt scholar. Fulbert's respectful opinion of the philosopher, and his partiality for his niece, long concealed from him an amour, which was become the subject of general conversation. At length the discovery burst upon him like a clap of thunder. Upon discovering her pregnancy, it was thought necessary for her to quit her uncle's house, and Abelard conveyed her to Bretagne, where his sister was prepared to receive them. Here Heloise was delivered of a son, to whom they gave the whimsical name of Astrolabus. Abelard, upon the birth of the child, proposed to Fulbert to marry his niece, provided the marriage might be kept secret: Fulbert consented, and Abelard returned to Bretagne to fulfill his engagement. Heloise, partly out of regard to the honour of Abelard, whose profession bound him to celibacy, and partly from a romantic notion that love like hers ought not to submit to ordinary restraints, at first gave Abelard a peremptory refusal. He, however, at last prevailed, and they were privately married at Paris. Heloise from this time met with severe treatment from her uncle, which furnished Abelard with a plea for Abelard. removing her from his house, and placing her in the abbey of Benedictine nuns, in which she had been educated. Fulbert concluded, perhaps not without reason, that Abelard had taken this step, in order to rid himself of an incumbrance which obstructed his future prospects. Deep resentment took possession of his soul, and he meditated revenge. He employed several ruffians to enter his chamber by night, and inflict upon his person a disgraceful and cruel mutilation. The deed was perpetrated; the ruffians were taken, and suffered, according to the *Lex Talionis*, the punishment they had inflicted; and Fulbert, for his savage revenge, was deprived of his benefice, and his goods were confiscated. Unable to support his mortifying reflections, Abelard resolved to retire to a convent. At the same time he formed the selfish resolution, that, since Heloise could no longer be his, she should never be another's, and ungenerously demanded from her a promise to devote herself to religion; and even insisted upon her taking the holy vow before him, suspecting, as it seems, that if he first engaged himself, she might violate her promise, and return to the world; a circumstance, with which she afterwards thus tenderly reproached him: "In that one instance, I confess, your mistrust of me tore my heart; Abelard, I blushed for you." Heloise submitted to the harsh injunction, professed herself in the abbey of Argenteuil, and receiving the religious habit, exclaimed in the words of Cornelia:

——————— O maxime conjux!
O thalamis indigne meis! hoc juris habebat
In tantum fortuna caput? cur impia nupsi,
Si miserum factura fui? nunc accipe pœnas,
Sed quas sponte luam. LUCAN.

"Ah! my once greatest lord! Ah! cruel hour!
Is thy victorious head in Fortune's power!
Since miseries my baneful love pursue,
Why did I wed thee, only to undo!
But see, to death my willing neck I bow;
Atone the angry gods by one kind blow." ROWE.

A few days after Heloise had taken her vows, Abelard assumed the monastic habit in the abbey of St Denys, determined as it seems to forget, in hope of being forgotten by, the world. However, his admirers and scholars in Paris were unwilling that the world should lose the benefit of his labours, and sent deputies to entreat him to return to his school. After some deliberation, he again yielded to the call of ambition; and at a small village in the country, he resumed his lectures, and soon found himself surrounded with a numerous train of scholars. The revival of his popularity renewed the jealousy of other professors, who took the first opportunity of bringing him under ecclesiastical censure. A treatise which he published at this time, entitled, "The Theology of Abelard," was supposed to contain some heretical tenets. A synod was called at Soissons in the year 1121; the work was condemned to be burnt, and Abelard was commanded to throw it into the flames. After being involved in other controversies, new charges were brought against him, and he fled to the convent of St Ayoul at Provins in Champagne, the prior of which was his intimate friend. The place of his retreat was soon discovered, and threats

Abelard. threats and perſuaſions were in vain employed to recal him: at laſt he obtained permiſſion to retire to ſome ſolitary retreat, on condition that he ſhould never again become a member of a convent.

The ſpot which he choſe was a vale in the foreſt of Champagne, near Nogent upon the Seine. Here Abelard, in 1122, erected a ſmall oratory, which he dedicated to the Trinity, and which he afterwards enlarged and conſecrated to the Third Perſon, the Comforter, or Paraclete. Here he was ſoon diſcovered, and followed by a train of ſcholars. A ruſtic college aroſe in the foreſt, and the number of his pupils ſoon increaſed to ſix hundred. Jealouſy again provoked the exertions of his enemies, and he was meditating his eſcape, when, through the intereſt of the duke of Bretagne, and with the conſent of the abbot of St Denys, he was elected ſuperior of the monaſtery of St Gildas, in the dioceſe of Vannes, where, though not without frequent and grievous vexations, he remained ſeveral years.

About this time, Suger the abbot of St Denys, on the plea of an ancient right, obtained a grant for annexing the convent of Argenteuil, of which Heloiſe was now prioreſs, to St Denys, and the nuns, who were accuſed of irregular practices, were diſperſed. Abelard, informed of the diſtreſſed ſituation of Heloiſe, invited her, with her companions, eight in number, to take poſſeſſion of the Paraclete.

It was during Abelard's reſidence at St Gildas, that the intereſting correſpondence paſſed between him and Heloiſe, which is ſtill extant. The letters of Heloiſe, in this correſpondence, abound with proofs of genius, learning, and taſte, which might have graced a better age. It is upon theſe letters that Mr Pope has formed his "Epiſtle from Eloiſa to Abelard;" a piece which is entitled to the higheſt praiſe for its poetical merit, but which deviates in many particulars from the genuine character and ſtory of Heloiſe, and culpably violates moral propriety. Here, too, Abelard probably wrote his "Theology," which again ſubjected him to perſecution. His opinions were pronounced heretical by a council; and although he appealed to Rome, the judgement of the council was confirmed by the pope; and he was ſentenced, unheard, to perpetual ſilence and impriſonment. By the interpoſition of ſome friends, however, and by a ſubmiſſive apology, he obtained his pardon, with permiſſion to end his days in the monaſtery of Cluni.

At Cluni he was retired, ſtudious, and devout. The monks of the convent importuned him to reſume the buſineſs of inſtruction. In a few occaſional efforts he complied with their ſolicitation; and his lectures were heard with undiminiſhed applauſe. But his health and ſpirits were much enfeebled, and gradually declined till he died in the 63d year of his age, A. D. 1142. His body was ſent to Heloiſe to be interred in the convent of the Paraclete. Heloiſe ſurvived her huſband 21 years, a pattern of conjugal affection and monaſtic virtue; and was buried in the ſame grave, as appears by the following epitaph:

Hic
Sub eodem marmore, jacent
Hujus Monaſterii
Conditor, Petrus Abelardus,

Et abbatiſſa prima, Heloiſa,
Olim ſtudiis, ingenio, infauſtis nuptiis
Et pœnitentia,
Nunc æterna, ut ſperamus, felicitate,
Conjuncti.

Abelard & Abelians.

Petrus obiit 21 *Aprilis* 1142.
Heloïſa 17 *Maii* 1163.

The amour, which has given Abelard ſo much celebrity, will remain an eternal blot upon his memory. It was not a juvenile indiſcretion of which Abelard was guilty, but, according to his own confeſſion, the ſeduction of innocence, deliberately planned, and reſolutely executed. It was accompanied with breach of confidence, violation of duty, and degradation of character. Except in the grant of the Paraclete as an aſylum to Heloiſe and her ſiſterhood, an uniform ſelfiſhneſs appears in Abelard's conduct. In Heloiſe, the criminality, though not obliterated, was palliated by youthful ardour and inexperience; and extreme ſenſibility, romantic attachment, noble generoſity, and diſintereſted invincible conſtancy, united to throw a veil over human frailty. Conſidered apart from this diſgraceful affair, Abelard appears with more advantage. His writings, indeed, will not give the reader a high idea of his genius or taſte: but it cannot be queſtioned, that the man who could foil the firſt maſters of the age at the weapons of logic, could draw round him crowded and admiring auditories, and could collect ſcholars from different provinces and countries whereever he choſe to form a ſchool, muſt have poſſeſſed extraordinary talents. Had his love of truth been equal to his thirſt of fame, and had his courage in adhering to his principles been equal to his ingenuity in defending them, his ſufferings and perſecutions might have excited more regret, and his title to honourable remembrance would have been better eſtabliſhed. Upon the whole, of Abelard it may perhaps with truth be ſaid, that he was too vain to be truly great, and too ſelfiſh to be eminently good, and that his character is rather adapted to excite admiration than to command reſpect.

His principal works, written in Latin, are, "An Addreſs to the Paraclete on the Study of the Scriptures; Problems and Solutions; Sermons on the Feſtivals; A Treatiſe againſt Hereſies; An Expoſition of the Lord's Prayer; A Commentary on the Romans; A Syſtem of Theology; and his Letters to Heloiſe and to others." (*Gen. Biog.*)

ABEL TREE, or ABELE TREE, an obſolete name for a ſpecies of the poplar. See POPULUS, BOTANY *Index*.

ABELIANS, ABEOLITES, or ABELONIANS, in church hiſtory, a ſect of heretics mentioned by St Auſtin, which aroſe in the dioceſe of Hippo in Africa, and is ſuppoſed to have begun in the reign of Arcadius, and ended in that of Theodoſius. Indeed it was not calculated for being of any long continuance. Thoſe of this ſect regulated marriage after the example of Abel; who, they pretended, was married, but died without ever having known his wife. They therefore allowed each man to marry one woman, but enjoined them to live in continence; and, to keep up the ſect, when a man and woman entered into this ſociety, they adopted a boy and a girl, who were to inherit their goods, and to marry upon the ſame terms of not begetting

Abella || Aberbrothick.

getting children, but of adopting two of different ſexes.

ABELLA, anciently a town of Campania, near the river Clanius. The inhabitants were called Abellani, and ſaid to have been a colony of Chalcidians. The nux Avellana, called alſo *Præneſtina*, or the *hazel nut*, takes its name from this town, according to Macrobius. Now *Avella*.

ABELLINUM, anciently a town of the Hirpini, a people of Apulia; diſtant about a mile from the rivulet Sabatto, between Beneventum and Salernum. Pliny calls the inhabitants *Abellinates*, with the epithet *Protopi*, to diſtinguiſh them from the Abellinates Marſi. Now *Avellino*. E. Long. 15. 20. N. Lat. 21. 0.

ABEN EZRA, ABRAHAM, a celebrated rabbi, born at Toledo in Spain, called by the Jews, The wiſe, great, and admirable Doctor, was a very able interpreter of the Holy Scriptures; and was well ſkilled in grammar, poetry, philoſophy, aſtronomy and medicine. He was alſo a perfect maſter of the Arabic. His principal work is, "Commentaries on the Old Teſtament," which is much eſteemed: theſe are printed in Bomberg's and Buxtorf's Hebrew Bibles. His ſtyle is clear, elegant, conciſe, and much like that of the Holy Scriptures: he almoſt always adheres to the literal ſenſe, and everywhere gives proofs of his genius and good ſenſe: he, however, advances ſome erroneous ſentiments. The ſcarceſt of all his books is entitled "Jeſud Mora;" which is a theological work, intended as an exhortation to the ſtudy of the Talmud. He alſo wrote *Elegantiæ Grammaticæ*, printed in octavo at Venice in 1548. He died in 1174, aged 75.

ABEN MELLER, a learned rabbin, who wrote a commentary on the Old Teſtament in Hebrew, entitled, "The Perfection of Beauty." This rabbin generally follows the grammatical ſenſe and the opinions of Kimchi. The beſt edition is that of Holland.

ABENAS, a town of France, in Languedoc and in the Lower Vivarais, ſeated on the river Ardeſch, at the foot of the Cevennes. E. Long. 4. 43. N. Lat. 44. 40.

ABENEL GAUBY, a fixed ſtar of the ſecond or third magnitude, in the ſouth ſcale of the conſtellation LIBRA.

ABENSPERG, a ſmall town of Germany, in the circle and duchy of Bavaria, and in the government of Munich. It is ſeated on the river Abentz, near the Danube. E. Long. 11. 38. N. Lat. 48. 45.

ABERAVON, a borough town of Glamorganſhire in Wales, governed by a portreeve. It had a market, which is now diſcontinued. The vicarge is diſcharged, and is worth 45l. clear yearly value. It is ſeated at the mouth of the river Avon, 194 miles weſt of London. W. Long. 3. 21. N. Lat. 51. 40.

ABERBROTHICK, or ARBROATH, one of the royal boroughs of Scotland, ſituated in the county of Angus, about 40 miles N. N. E. of Edinburgh, in W. Long. 2. 29. and N. Lat. 56. 36. It is ſeated on the diſcharge of the little river Brothic into the ſea, as the name imports, *Aber* in the Britiſh implying ſuch a ſituation. It is a ſmall but flouriſhing place, well built, and ſtill increaſing. The town has been in an improving ſtate for the laſt forty years, and the number of inhabitants greatly augmented; which is owing to the introduction of manufactures. The population in 1801 was above 7000. The inhabitants conſiſt chiefly of weavers of coarſe brown linens, and ſome ſail cloth; others are employed in making white and coloured threads: the remainder are either engaged in the ſhipping of the place, or in the neceſſary and common mechanic trades. The brown linens, or oſnaburgs, were manufactured here before any encouragement was given by government, or the linen company erected at Edinburgh. It appears from the books of the ſtamp-office in this town, that ſeven or eight hundred thouſand yards are annually made in the place, and a ſmall diſtrict round. Beſides this export and that of thread, much barley and ſome wheat is ſent abroad. The foreign imports are flax, flax-ſeed, and timber, from the Baltic. The coaſting trade conſiſts of coals from Borrowſtounneſs, and lime from Lord Elgin's kilns in Fife. At this place, in default of a natural harbour, a tolerable artificial one of piers has been formed, where, at ſpring tides, which riſe here fifteen feet, ſhips of two hundred tons can come, and of eighty at neap tides; but they muſt lie dry at low water. This port is of great antiquity: there is an agreement yet extant between the abbot and the burghers of Aberbrothick, in 1194, concerning the making of the harbour. Both parties were bound to contribute their proportions; but the largeſt fell to the ſhare of the former, for which he was to receive an annual tax payable out of every rood of land lying within the borough. The glory of this place was the abbey, whoſe very ruins give ſome idea of its former magnificence. It was founded by William the Lion in 1178, and dedicated to our celebrated primate Thomas à Becket. The founder was buried there; but there are no remains of his tomb, or any other, excepting that of a monk of the name of Alexander Nicol. The monks were of the Tyronenſian order; and were firſt brought from Kelſo, whoſe abbot declared thoſe of this place, on the firſt inſtitution, to be free from his juriſdiction. The laſt abbot was the famous Cardinal Beaton, at the ſame time archbiſhop of St Andrew's, and, before his death, as great and abſolute here as Wolſey was in England. King John, the Engliſh monarch, granted this monaſtery moſt uncommon privileges; for, by charter under the great ſeal, he exempted it *à teloniis et conſuetudine* in every part of England, except London. At Aberbrothick is a chalybeate water, ſimilar to thoſe of Peterhead and Glendye.

Aberconway, Abercromby.

ABERCONWAY, or CONWAY, in Caernarvonſhire, North Wales; ſo called from its ſituation at the mouth of the river Conway. It is a handſome town, pleaſantly ſituated on the ſide of a hill, and has many conveniences for trade; notwithſtanding which it is the pooreſt town in the county. It was built by Edward I. and had not only walls, but a ſtrong caſtle which is now in ruins. Here is an inſcription on the tomb of one Nicholas Hooks, importing that he was the one-and-fortieth child of his father, and had twenty-ſeven children himſelf. It is 229 miles from London. W. Long. 3. 47. N. Lat. 53. 20.

ABERCROMBY, THE HONOURABLE ALEXANDER (Lord Abercromby), a judge in the courts of ſeſſion and juſticiary in Scotland, was the youngeſt ſon of George Abercromby, of Tullibody, Eſq. of a reſpectable family in Clackmannanſhire, and was born on the 15th October 1745. Mr Abercromby was early deſtined for the profeſſion of the law, and with this view

Abercromby. view he was educated at the university of Edinburgh, where he passed through the requisite course of languages, philosophy, and law, and was admitted advocate in the year 1766: but neither during the time of his education, or for some years after he entered his professional career, did he give much promise of those eminent abilities and that assiduous application which afterwards distinguished him as a pleader and a judge. The vivacity of his disposition, and the sprightliness of his manners, led him to prefer the gayer amusements of life, and the society of men of fashion and pleasure, to the arduous prosecution of philosophical studies, and to the less inviting and more barren paths of legal disquisitions. When, however, either during his academical course, or the first years of his practice at the bar, occasions required the exertion of his talents, the quickness of his perception, and the acuteness and strength of his understanding, enabled him to display such powers of attention and application to business as are seldom acquired but by regular and uniform habits of industry, and by the force of constant application. But, to attain that distinction and eminence to which he aspired, and to secure that independence which the patrimony of a younger son of a family, more respectable than opulent, could not afford him, he found it necessary to withdraw from those scenes of amusement and pleasure, and to seclude himself from that society which his gaiety and agreeable manners had enlivened and entertained, and to think seriously of applying to the labours of his profession. With much credit to himself, and with undiminished vigour of mind, he threw off the character of the man of fashion, and devoting his time and talents to the toilsome detail of business as a lawyer, by his successful efforts he soon gave solid proofs of the distinguished abilities which he possessed. About this time, he was engaged as counsel in a cause in which public curiosity and opinion were much interested and divided. This cause, which was of a very intricate nature, afforded an opportunity of making a more eminent display of his professional talents. By a speech which he delivered on this occasion, conspicuous for accurate discrimination, strength of argument, and impressive eloquence, he gave a favourable presage of his future celebrity. The marks of approbation which he now received probably taught him to appreciate those talents which had hitherto remained concealed or unemployed, and encouraged him to call them forth into exertion.

In 1780, Mr Abercromby resigned the office of sheriff-depute of Stirlingshire, which he had held for several years, and accepted of that of depute-advocate, with the hope of extending his employment in the line of his profession. In this step he was not disappointed; for his reputation and business rapidly increased, and soon raised him to the first rank of lawyers at the Scotch bar. In the midst of the laborious duties of his profession, Mr Abercromby did not entirely preclude himself from indulging in the elegant amusements of polite literature. He was one of that society who set on foot two periodical papers, the *Mirror* and *Lounger*, published at Edinburgh; the former in 1779, and the latter in 1785. To the *Mirror* he contributed ten papers, and to the *Lounger* nine. The names of the authors have been published in the late editions of these works, which renders it unnecessary to point out those papers of which Mr Abercromby was the author. Abercromby.

In May 1792, he was appointed one of the judges of the court of session, and in December following he was called to a seat in the court of justiciary. Lord Abercromby continued to discharge the arduous duties of these important offices till summer 1795, when he was seized with a pectoral complaint, of which he died on the 17th November the same year, at Exmouth in Devonshire, where he had gone for the recovery of his health.

As a lawyer, Lord Abercromby had acquired great reputation. His papers on law-cases were distinguished for precision and perspicuity. His speeches were elegant, animated, and eloquent. With the most pathetic feeling he pled the cause of the unfortunate; while he could assume the severe tone of virtuous indignation in rebuking injustice and oppression. With such qualifications, added to the strictest attention and punctuality, he could not fail to become an able and respectable judge. In this high station, his deportment was grave, dignified, and decided. His elocution was solemn and deliberate; and his opinions, delivered in this manner, had an impressive effect. Avoiding a detail of circumstances, and never arguing the cause as a lawyer, he pronounced with brevity and precision the opinion of a judge drawn from its striking and prominent features. His only writings are the papers in the periodical publications already alluded to. They are marked by an easy turn of expression, manly and virtuous sentiments, and, when the subject required it, by delicate irony or unaffected tenderness. (*Phil. Trans. Edin.*)

Abercromby, *Sir Ralph*, knight of the Bath, and a lieutenant-general in the British army, an elder brother of the preceding, was born in the year 1738. Being destined for the army, he obtained, in May 1756, a cornet's commission in the 2d dragoon guards; and rose, April 24. 1762, to the rank of a captain in the 3d regiment of horse. Ascending through the intermediate gradations of rank, he was appointed, November 3. 1781, to the colonelcy of the 103d infantry. September 28. 1787, he was promoted to the rank of major-general. November 5. 1795, he obtained the command of the 7th regiment of dragoons. Having been nearly 40 years in the army, having served with honour in two wars, and being esteemed one of the ablest, coolest, and most intrepid officers in the whole British forces, he was employed on the continent under his royal highness the duke of York, in the commencement of the present war. In the action on the heights of Cateau, he commanded the advanced guard; and was wounded at Nimeguen. He conducted the march of the guards from Deventer to Oldensaal, in the retreat of the British out of Holland, in the winter of 1794-5. In August 1795, he was appointed to succeed Sir Charles Grey, as commander in chief of the British forces in the West Indies. March 24. 1796, Grenada was suddenly attacked and taken by a detachment of the army under his orders. He afterwards obtained possession of the settlements of Demarara and Issequibo, in South America. St Lucia was next taken by more difficult exertions, in which the ability of this eminent commander was signally displayed.

Abercromby. played. St Vincent's was, by the middle of June, added to the Britiſh conqueſts. Trinidad, in February 1797, ſhared the ſame fate. He returned the ſame year to Europe, and, in reward for ſuch important ſervices, was inveſted with the red ribbon, appointed to the command of the regiment of Scots Greys, entruſted with the governments of the Iſle of Wight, Fort George, and Fort Auguſtus, and raiſed to the high military rank of lieutenant-general. He held, for a time, the chief command of the forces in Ireland. In that command, he laboured to maintain the diſcipline of the army, to ſuppreſs the riſing rebellion, and to protect the people from military oppreſſion, with a care worthy alike of the great general and the enlightened and beneficent ſtateſman. From that ſtation he was called to the chief command of the forces in Scotland. His conduct in this diſtinguiſhed appointment gave univerſal ſatisfaction. When the great enterpriſe againſt Holland was reſolved upon, Sir Ralph Abercromby was called again to command, under his royal highneſs the duke of York. The difficulties of the ground, the inclemency of the ſeaſon, delays, though inconvenient, yet unavoidable, the diſorderly movements of the Ruſſians, and the timid duplicity of the Dutch, diſappointed our hopes of that expedition. But, by the Dutch, the French, the Britiſh, it was confeſſed, that even victory, the moſt deciſive, could not have more conſpicuouſly proved the talents of this illuſtrious officer. His country applauded the choice, when he was ſent with an army to diſpoſſeſs the French of Egypt. His experience in Holland and Flanders, and in the climate of the Weſt Indies particularly, fitted him for this new command. He accompliſhed ſome of the firſt duties of a general, in carrying his army in health, in ſpirits, and with the requiſite intelligence and ſupplies, to the deſtined ſcene of action. The landing, the firſt diſpoſitions, the attacks, and the courage oppoſed to attack, the ſpirit with which his army appears to have been by confidence in their leader inſpired, the extraordinary ſuperiority which the Britiſh infantry under his command evinced to that which was thought the braveſt and beſt diſciplined infantry in the world, demonſtrate that all the beſt qualities of the greateſt commanders were in Sir Ralph Abercromby united—that they were all ſummoned forth into activity, in the glorious achievements amid which he fell.—In his private character he was modeſt, diſintereſted, benevolent, and honourable. General Lord Hutchinſon, who ſucceeded him in the command, in the diſpatches with the account of his death, has given a fine eulogium on his character as a ſoldier, and ſtrongly expreſſive of the high eſtimation in which he was held by the army.—"We have ſuſtained an irreparable loſs in the perſon of our never ſufficiently to be lamented commander in chief, Sir Ralph Abercromby, who was mortally wounded in the action, and died on the 28th of March. I believe he was wounded early, but he concealed his ſituation from thoſe about him, and continued in the field, giving his orders with that coolneſs and perſpicuity which had ever marked his character, till long after the action was over, when he fainted through weakneſs and loſs of blood. Were it permitted for a ſoldier to regret any one who has fallen in the ſervice of his country, I might be excuſed for lamenting him more than any other perſon; but it is ſome conſolation to thoſe who tenderly loved him, that, as his life was honourable, ſo was his death glorious. His memory will be recorded in the annals of his country—will be ſacred to every Britiſh ſoldier—and embalmed in the recollection of a grateful poſterity." His remains were conveyed on board Admiral Lord Keith's flag ſhip to Malta, attended by Colonel Sir John Dyer, and were interred in the commandery of the grand maſter, with the higheſt military honours. Aberdeen.

A monument to his memory, to be erected in St Paul's church, London, at the public expence, was voted by the houſe of commons. His widow has been created a peereſs, and a penſion of 2000l a-year for her and three lives ſettled on the family. (*Gent. Mag.*)

ABERDEEN, the name of two cities in Scotland, called the *Old* and *New Town*, ſituated on the German ocean, in W. Long. 2. 8. and N. Lat. 57. 8.

ABERDEEN, *Old*, is a place of great antiquity. According to tradition, it was of note in the reign of Gregory, who conferred on it ſome privileges about the year 893. In 1004, Malcolm II. founded a biſhopric at a place called Mortlich in Banffſhire, in memory of a ſignal victory which he there gained over the Danes: which biſhopric was tranſlated to Old Aberdeen by David I.; and in 1163, the then biſhop of Aberdeen obtained a new charter from Malcolm IV. There is extant a charter of Alexander II. by which, in 1217, the king grants to Aberdeen the ſame privileges he had granted to his town of Perth.

The Old Town lies about a mile to the north of the New, at the mouth of the river Don, over which is a fine Gothic bridge, of a ſingle arch, greatly admired, which reſts on a rock on each ſide. This arch, ſaid to have been built by a biſhop of Aberdeen about the year 1290, is 67 feet wide at the bottom, and 34½ feet high above the ſurface of the river, which at ebb tide is here 19 feet deep. The Old Town was formerly the ſeat of the biſhop, and had a large cathedral commonly called *St Machar's*. Two very antique ſpires, and one aiſle, which is uſed as a church, are now the only remains of it. The biſhopric was founded in the time of David I. as above mentioned. The cathedral had anciently two rows of ſtone pillars acroſs the church, and three turrets; the ſteeple, which was the largeſt of theſe turrets, reſted upon an arch, ſupported by four pillars. In this cathedral there was a fine library; but about the year 1560, it was almoſt totally deſtroyed. But the capital building is the King's College on the ſouth ſide of the town, which is a large and ſtately fabric. It is built in form of a ſquare, with cloiſters on the ſouth ſide. The chapel is very ruinous within; but there ſtill remains ſome wood work of exquiſite workmanſhip. This was preſerved by the ſpirit of the principal at the time of the Reformation, who armed his people and checked the blind zeal of the barons of the Mearns; who, after ſtripping the cathedral of its roof, and robbing it of the bells, were going to violate this ſeat of learning. They ſhipped their ſacrilegious booty, with an intention of expoſing it to ſale in Holland: but the veſſel had ſcarcely gone out of port, when it periſhed in a ſtorm with all its ill-gained lading. The ſteeple is vaulted with a double croſs arch; above which is an imperial crown, ſupported by eight ſtone pillars, and cloſed with a globe and two gilded

Aberdeen. croſſes. In the year 1631 this ſteeple was thrown down by a ſtorm, but was ſoon after rebuilt in a more ſtately form. This college was founded in 1494, by William Elphinſton biſhop of this place, lord chancellor of Scotland in the reign of James III. and lord privy ſeal in that of James IV. But James IV. claimed the patronage of it, and it has ſince been called the *King's College*. This college, and the Mariſchal College in the New Town, form one univerſity, called the *Univerſity of King Charles*. The library is large, but not remarkable for many curioſities. Hector Boethius was the firſt principal of the college; and ſent for from Paris for that purpoſe, on an annual ſalary of forty merks Scots, at thirteen pence each. The ſquare tower on the ſide of the college was built by contributions from General Monk and the officers under him then quartered at Aberdeen, for the reception of ſtudents; of which about a hundred attend the college, many of whom lodge in it.

ABERDEEN, *New*, is the capital of the ſhire of Aberdeen. For extent, trade, and beauty, it greatly exceeds any town in the north of Scotland. It is built on a hill or riſing ground, and lies on a ſmall bay formed by the Dee, deep enough for a ſhip of 200 tons, and above two miles in circumference.—The buildings (which are of granite from the neighbouring quarries) are generally four ſtories high; and have for the moſt part, gardens behind them, which give it a beautiful appearance. On the high ſtreet is a large church which formerly belonged to the Franciſcans. This church was begun by Biſhop William Elphinſton; and finiſhed by Gavin Dunbar, biſhop of Aberdeen, about the 1500. Biſhop Dunbar is ſaid likewiſe to have built the bridge over the Dee, which conſiſts of ſeven arches. In the middle of Caſtle-ſtreet is an octagon building, with neat bas-relievos of the kings of Scotland from James I. to James VII. The town-houſe makes a good figure, and has a handſome ſpire in the centre. The grammar ſchool is a low but neat building. Gordon's hoſpital is handſome; in front is a good ſtatue of the founder: it maintains forty boys, who are apprenticed at proper ages. The infirmary is a large plain building, and ſends out between eight and nine hundred cured patients annually. But the chief public building in the New Town is the Mariſchal College, founded by George Keith earl Mariſchal, in the year 1593; but ſince greatly augmented with additional buildings. There are about 140 ſtudents belonging to it. In both the Mariſchal and King's college the languages, mathematics, natural philoſophy, divinity, &c. are taught by very able profeſſors. The convents in Aberdeen were: one of Mathurines or of the order of the Trinity, founded by William the Lion, who died in 1214; another of Dominicans, by Alexander II.; a third of Obſervantines, a building of great length in the middle of the city, founded by the citizens and Mr Richard Vans, &c.; and a fourth of Carmelites, or White Friars, founded by Philip de Arbuthnot in 1540.

Aberdeen, including the Old Town, is ſuppoſed to contain 25,000 inhabitants. Its trade is conſiderable, but might be greatly extended by an attention to the white fiſheries.

The harbour was long a great detriment to its trade, and occaſioned the loſs of many lives and much property. A ſtranger could never depend upon finding it as he left it; while veſſels lay at anchor in the road till the tide ſhould make, they have often been wrecked by ſtorms which ſuddenly aroſe. It was very narrow at the mouth, having the caſterly rocky point of the Grampian mountains on the ſouth, and a flat blowing ſand on the north, extending along the coaſt for many miles. By the eaſterly and north-eaſt ſtorms the ſand was driven in a long ridge acroſs the harbour's mouth, and formed what was called the *bar*. Upon this bar the depth of water at low tide was ſometimes not above three feet. Clearing away the ſand, though but a partial and temporary remedy, was a matter of great expence to the community. If it was cleared one week ſo as to have five or ſix feet of water at ebb, a freſh ſtorm the next week undid all that had been done. The town at laſt came to the reſolution of erecting a ſtrong pier on the north ſide of the harbour. This pier is 1200 feet in length, and gradually increaſes in thickneſs and height as it approaches to the ſea, where the head or rounding is 60 feet diameter at the baſe, and the perpendicular elevation is 38 feet. The whole is built of granite, which is a very durable ſtone: many of the outſide ſtones are above three tons weight, with hewn beds. It was built under the direction of Mr Smeaton; and the expence, amounting to above 17,000l. is defrayed by doubling the harbour dues, which are chiefly paid by the inhabitants. Aberdeen

A little to the ſouth of the bar, they have now a depth of 17 fathoms at low water; and at the harbour's mouth, from eight to nine fathoms, where they had formerly but a few feet.

Aberdeen once enjoyed a good ſhare of the tobacco trade. At preſent, its imports are from the Baltic; and a few merchants trade to the Weſt Indies and North America. Its exports are ſtockings, thread, ſalmon, and oatmeal. The firſt is a moſt important article, as appears by the following ſtate of it: For this manufacture, 20,800l. worth of wool is annually imported, and 1600l. worth of oil. Of this wool are annually made 69,333 dozen pairs of ſtockings; worth, at an average, 1l. 10s. per dozen. Theſe are the work of the country people in almoſt all parts of this great county, who get 4s. per dozen for ſpinning, and 14s. per dozen for knitting; ſo that there is annually paid them 62,329l. 14s. There is, beſides, about 2000l. value of ſtockings manufactured from the wool of the county. The thread manufacture is another conſiderable article, though trifling in compariſon of the woollen. The ſalmon fiſheries on the Dee and the Don are a good branch of trade. About 46 boats and 130 men are employed on the firſt; and in ſome years 167,000lb. of fiſh have been ſent pickled to London, and about 930 barrels of ſalted fiſh exported to France, Italy, &c.—The fiſhery on the Don is far leſs conſiderable. The fiſh of this river are taken in cruives above the bridge; a practice contrary to the ancient laws of the kingdom, unleſs where the nature of the water rendered the net fiſhery impracticable. The inhabitants likewiſe export conſiderable quantities of pickled pork, which they ſell to the Dutch for victualling their Eaſt India ſhips and men of war; the Aberdeen pork having the reputation of being the beſt cured of any in Europe for keeping on long voyages.

"It is however remarkable, Mr Knox obſerves, that there is not a ſingle decked veſſel fitted out from Aberdeen

Aberdeenshire.

Aberdeen for the herring or white fiſheries; where is now an excellent harbour, an active people, converſant in trade, and poſſeſſed of capital; ſeated within ſix hours ſailing of Long Fortys, and two days ſailing of the Shetland iſles. This inattention is the more extraordinary, as the exports of Aberdeen, though very conſiderable, do not balance the imports in value. The herring and white fiſheries, therefore, if proſecuted with vigour, and cured and dried with judgement, would not only extend the ſcale of exports, but alſo furniſh the outward bound veſſels with freights, and better aſſortments for the foreign markets. The ſalmon of the Dee and Don are taken in great abundance, cured in the higheſt perfection, and greatly valued at the European markets. If the merchants, in addition to theſe, ſhould alſo export the cargoes of 50 or 60 veſſels conſtantly employed in the herring and white fiſheries, the port of Aberdeen would in a few years become the moſt celebrated mart of fiſh now exiſting."

From a round hill at the weſt end of the city, flow two ſprings, one of pure water, and the other of a quality reſembling the German Spa. Aberdeen, with Aberbrothick, Brechin, Montroſe, and Inverbervy, returns one member to parliament.

ABERDEENSHIRE, an extenſive county in Scotland, is bounded on the north and eaſt by the German ocean; on the ſouth by the counties of Kincardine, Angus, and Perth; and on the weſt by Banff, Murray, and Inverneſs ſhires. It extends in length about 90 miles, from ſouth-weſt to north-eaſt, and about 46 in breadth, from the mouth of the river Dee to where it is bounded by the ſhire of Banff. Its extent in ſquare miles may be eſtimated at 1170. It comprehends the diſtricts of Marr, Garioch, Aberdeen Proper, and great part of Buchan. The diſtrict of Marr, which may be conſidered as the centre of Scotland, is wild, rugged, and mountainous; ſome of the hills riſing with precipitous ſides, to the height of 2000 feet above the level of the ſea. The ſides of the hills are covered with extenſive natural foreſts; in many places impenetrable to human footſteps. Buchan is leſs hilly; but very barren, bleak, and inhoſpitable to the view. The reſt of the country is more fertile, having a gradual deſcent from the central diſtrict eaſtward, to the ſea. The coaſt is in general very bold and rocky. The Boilers or Bullers of Buchan, arreſt the attention of all ſtrangers, by their ſtupendous craggy precipices. The ſoil, in ſo extenſive a diſtrict, is as various as can be well ſuppoſed. The ſtate of agriculture in the interior pariſhes of the county is very rude; but the example of many patriotic proprietors is producing wonders even in the moſt barren ſoils. Prejudices in huſbandry, when deeply rooted, are with difficulty overcome; but even theſe are yielding to a more regular and modern ſyſtem. The average produce of the farms in the whole county, is eſtimated in proportion to the rent, as five to one. This produce, conſiderable as it is, compared with the produce formerly, is ſcarcely one-half of what may be expected from the improvements which are daily made. The principal rivers of Aberdeenſhire are, the Dee and Don, the Ythan, the Ugie, and the Cruden. The Deveron alſo forms its boundary with Banffſhire for many miles. All the rivers have been long celebrated for the excellence of the ſalmon with which they abound. The rents of the fiſhings are eſtimated at 2480l. per annum, and the produce at upwards of 10,000l. Beſides the fiſhings of the rivers, the ſea coaſt of Aberdeenſhire abounds with all kinds of excellent fiſh; and a number of fiſhing veſſels are fitted out from the ſea ports of the county, particularly Peterhead and Fraſerburgh. Under the article of fiſheries, we may mention the celebrated pearl fiſhing in the river Ythan. In this river ſome pearls have been found, which ſold ſingly ſo high as 2l. and 3l. With regard to mineralogy, little wealth of that deſcription has hitherto been found in this county. The granite quarries are the moſt valuable articles. From thoſe in the neighbourhood of Aberdeen, 12,000 tons and upwards are annually exported to London, the value of which may be eſtimated at about 8400l. There are ſeveral quarries in the pariſh of Aberdour, which yield excellent millſtones. There is a quarry of blue ſlate wrought in the pariſh of Culſalmond, and a vein of manganeſe in the neighbourhood of Old Aberdeen. The county abounds with limeſtone; but, from the want of coal, it cannot be wrought to much advantage, except near a ſea port. In Old Machar and Old Deer pariſhes, about 55,000 bolls of lime are annually burnt, valued at 2750l. Some kelp is made on the coaſt, the value of which muſt be conſiderable. Mr Pennant mentions an exceeding large piece of amber, thrown aſhore on the coaſt of Buchan; and ſmaller pieces are frequently found on the ſame coaſt. In the pariſh of Leſlie, a beautiful green amianthus, with white and gray ſpots, is found in conſiderable quantities. It is eaſily wrought, and formed into ſnuff boxes and other ornaments by the country people. Plumbago is found on the banks of the Deveron. Amethyſts, emeralds, and topazes, are found in the pariſh of Crathie, and on the ſhore at Peterhead. Onyx and agates are frequently to be met with. On the eſtate of Invercauld, there are found large ſpecimens of rock cryſtals. Beſides theſe, aſbeſtos, talc, mica, ſchiſtus, and other curious minerals, are found in many parts of the county. The principal manufacture carried on in the county, is the knitting of ſtockings and hoſe, in which all the women, and moſt of the old men and boys, are employed the greater part of the year. The other manufactures are too trifling to deſerve particular notice. Aberdeenſhire contains three royal boroughs; ABERDEEN, KINTORE, and INVERURY: and ſeveral large and handſome towns; as Peterhead, Fraſerburgh, Huntly, and Old Meldrum. It is divided into 85 pariſhes. Notwithſtanding the remote ſituation of Aberdeenſhire, it is ornamented with many fine ſeats of the nobility and gentry. Slains caſtle, the ſeat of the earl of Errol; Aboyne caſtle, of the earl of Aboyne; Ellon, of the earl of Aberdeen; Inverury, of the earl of Kintore; are the chief reſidences in the county.

The following account of the population of Aberdeenſhire, at two different periods, is taken from the *Statiſt. Hiſt. of Scotland.*

	Pariſhes.	*Population in 1755.*	*Population in 1790-98.*
1	Aberdeen, Old, or Old Machar	4945	8107
	Aberdeen, New, including Footdee, or Fittie	10785	16120
	Aberdour	1397	1306

Aberdeenshire.

	Parishes.	Population in 1755.	Population in 1790-98.
	Aboyne	1695	1050
5	Alford	990	663
	Auchindore	839	590
	Auchterless	1264	1264
	Belhelvie	1471	1318
	Birse	1126	1300
10	Bourty	525	456
	Cabrach	960	700
	Cairny	2690	2600
	Chapel of Garioch	1351	1035
	Clatt	559	425
15	Clunie	994	885
	Coldstone, Logie	1243	1132
	Coul	751	766
	Crathie and Braemarr	2671	2251
	Crimond	765	917
20	Cruden	2549	2028
	Culsalmond	810	745
	Cushnie, now annexed to Leochel	——	——
	Daviot	975	950
	Deer, New	2313	2800
25	Deer, Old	2813	3267
	Drumblade	1125	886
	Drumoak	760	692
	Dyce	383	352
	Echt	1277	963
30	Ellon	2523	1830
	Fintray	905	851
	Forbes	456	370
	Forgue	1802	1778
	Foveran	1981	1230
35	Fraserburgh	1682	2060
	Fyvie	2528	2194
	Gartley	1328	1800
	Glass	1093	776
	Glenbucket	430	449
40	Glenmuick, &c.	2270	2117
	Huntly	1900	3600
	Insch	995	900
	Inverury	730	732
	Keig	499	475
45	Keith-hall	1111	838
	Kemnay	643	611
	Kildrummie	562	426
	Kincardine O'Niel	1706	2075
	King Edward	1352	1577
50	Kinnellar	398	342
	Kinnethmont	791	830
	Kintore	973	812
	Leochel, including Cushnie	1286	642
	Leslie	319	418
55	Logie Buchan	575	509
	Longside	1979	1792
	Lonmay	1674	1650
	Lumphanan	682	621
	Machar, New	1191	1030
60	Meldrum, Old	1603	1490
	Methlick	1385	1035
	Midmarr	979	945
	Montquhitter	997	1500
	Monymusk	1005	1130
65	Newhills	959	1181
	Oyne	643	630
	Peterculter	755	1002
	Peterhead	2487	4100
	Pitsligo	1224	1300
70	Premnay	448	450
	Rathen	1527	1730
	Rayne	1131	1173
	Rhynie and Effey	856	681
	Skene	1251	1233
75	Slains	1286	1117
	Strathdon	1750	1524
	Strichen	1158	1400
	Tarland	1300	1050
	Tarvas	2346	1690
80	Tillynesle	335	412
	Tough	570	560
	Towie	656	550
	Turreff	1897	2029
	Tyrie	596	949
85	Udny	1322	1137
	Total,	116,836	122,921
			116,836
			Increase, 6085

Aberdour & Abernethy

ABERDOUR, a small town in Fifeshire, Scotland, on the frith of Forth, about ten miles north-west of Edinburgh. In old times it belonged to the Viponts; in 1126 it was transferred to the Mortimers by marriage, and afterwards to the Douglases. William, lord of Liddesdale, surnamed the *Flower of Chivalry*, in the reign of David II. by charter conveyed it to James Douglas, ancestor of the present noble owner the earl of Morton. The monks of Inchcolm had a grant for a burial place here from Allan de Mortimer, in the reign of Alexander III. The nuns, usually styled the *Poor Clares*, had a convent at this place.

ABERFORD, a market town in the west riding of Yorkshire, stands in a bottom; and is about a mile in length, and pretty well built. It is near a Roman road, which is raised very high, and not far from the river Cock; between which and the town there is the foundation of an old castle still visible. It is 181 miles north-by-west from London. W. Long. 2. 45. N. Lat. 55. 52.

ABERGAVENNY, a large, populous, and flourishing town in Monmouthshire, seated at the confluence of the rivers Usk and Gavenny. It has a fine bridge over the Usk, consisting of fifteen arches; and being a great thoroughfare from the west part of Wales to Bath, Bristol, Gloucester, and other places, is well furnished with accommodation for travellers. It is surrounded with a wall, and had once a castle. It carries on a considerable trade in flannels, which are brought hither for sale from the other parts of the county. It is 142 miles distant from London. W. Long. 2. 45. N. Lat. 51 50. Abergavenny appears to have been the *Gibbanium* of Antoninus, and the town of Usk his *Burrium*.

ABERNETHY, JOHN, an eminent dissenting minister, was the son of Mr John Abernethy, a dissenting minister in Coleraine, and was born there on the 19th of October 1680. When about nine years of age, he was separated from his parents, his father being obliged

Abernethy liged to attend ſome public affairs in London; and his mother, to ſhelter herſelf from the mad fury of the Iriſh rebels, retiring to Derry, a relation who had him under his care, having no opportunity of conveying him to her, carried him to Scotland; and thus he eſcaped the hardſhips and dangers of the ſiege of Derry, in which Mrs Abernethy loſt all her other children. He afterwards ſtudied at the univerſity of Glaſgow, where he remained till he took the degree of maſter of arts; and, in 1708, he was choſen miniſter of a diſſenting congregation at Antrim, in which ſituation he continued above 20 years. About the time of the Bangorian controverſy (for which ſee HOADLEY), a diſſenſion aroſe among his brethren in the miniſtry at Belfaſt, on the ſubject of ſubſcription to the Weſtminſter confeſſion of faith. In this controverſy he became a leader on the negative ſide, and incurred the cenſure of a general ſynod. The agitation of parties began to be alſo felt among the members of his congregation. Many of them deſerted him; which induced him to accept of an invitation to ſettle in Dublin, where his preaching was much admired. Here he continued for ten years, reſpected and eſteemed. But his labours were terminated by a ſudden attack of the gout in the head, to which he had been ſubject; and he died in December 1740, in the 60th year of his age. His writings, as was his character, are diſtinguiſhed for candour, liberality, and manly ſentiment. He publiſhed a volume of ſermons on the Divine Attributes; after his death a ſecond volume was publiſhed by his friends; and theſe were ſucceeded by four other volumes on different ſubjects: all of which have been greatly admired.

Aberration.

ABERNETHY, a ſmall town in Strathern, a diſtrict of Perthſhire in Scotland, ſituated on the river Tay, a little above the mouth of the Erne. It is ſaid to have been the ſeat of the Pictiſh kings; and was afterwards the ſee of an archbiſhop, which was afterwards transferred to St Andrew's. In the churchyard of Abernethy, there is a tower of ſingular conſtruction. It is of a circular form, is 74 feet in height, and 48 feet in circumference. The tower at Brechin is the only one of a ſimilar ſtructure in Scotland. The reſearches of the antiquarian have hitherto failed in diſcovering the uſes of theſe inſulated buildings. Conjecture, therefore, has ſupplied the place of certainty, by ſuppoſing that they are of Pictiſh origin, and that they were intended as places of confinement for religious devotees in performing penance, and hence they have been denominated towers of repentance.

ABERRATION, in *Aſtronomy*, an apparent motion of the celeſtial bodies, produced by the progreſſive motion of light, and the earth's annual motion in her orbit.

This effect may be explained and familiarized by the motion of a line parallel to itſelf, much after the manner that the compoſition and reſolution of forces are explained.

M. de Maupertuis, in his "Elements of Geography," gives a familiar and ingenious idea of the aberration, in this manner: "It is thus," ſays he, "concerning the direction in which a gun muſt be pointed to ſtrike a bird in its flight; inſtead of pointing it ſtraight to the bird, the fowler will point a little before it, in the path of its flight, and that ſo much the more as the flight of the bird is more rapid, with reſpect to the flight of the ſhot." In this way of conſidering the matter, the flight of the bird repreſents the motion of the earth, and the flight of the ſhot repreſents the motion of the ray of light.

Aberration.

Mr Clairaut too, in the Mem. de l' Acad. des Sciences for the year 1746, illuſtrates this effect in a familiar way, by ſuppoſing drops of rain to fall rapidly and quickly after each other from a cloud, under which a perſon moves with a very narrow tube; in which caſe it is evident that the tube muſt have a certain inclination, in order that a drop which enters at the top, may fall freely through the axis of the tube, without touching the ſides of it; which inclination muſt be more or leſs according to the velocity of the drops in reſpect to that of the tube; then the angle made by the direction of the tube and of the falling drops, is the aberration ariſing from the combination of thoſe two motions.

This diſcovery, which is one of the brighteſt that have been made in the preſent age, we owe to the accuracy and ingenuity of the late Dr Bradley, aſtronomer royal; to which he was occaſionally led by the reſult of ſome obſervations which he had made with a view to determine the annual parallax of the fixed ſtars, or that which ariſes from the motion of the earth in its annual orbit about the ſun.

The annual motion of the earth about the ſun had been much doubted, and warmly conteſted. The defenders of that motion, among other proofs of the reality of it, conceived the idea of adducing an inconteſtable one from the annual parallax of the fixed ſtars, if the ſtars ſhould be within ſuch a diſtance, or it inſtruments and obſervations could be made with ſuch accuracy, as to render that parallax ſenſible. And with this view various attempts have been made. Before the obſervations of M. Picard, made in 1672, it was the general opinion, that the ſtars did not change their poſition during the courſe of a year. Tycho Brahe and Ricciolus fancied that they had aſſured themſelves of it from their obſervations: and from hence they concluded that the earth did not move round the ſun, and that there was no annual parallax in the fixed ſtars. M. Picard, in the account of his *Voyage d' Uranibourg*, made in 1672, ſays that the pole ſtar, at different times of the year, has certain variations, which he had obſerved for about 10 years, and which amounted to about 40″ a year: from whence ſome, who favoured the annual motion of the earth, were led to conclude that theſe variations were the effect of the parallax of the earth's orbit. But it was impoſſible to explain it by that parallax; becauſe this motion was in a manner contrary to what ought to follow only from the motion of the earth in her orbit.

In 1674 Dr Hook publiſhed an account of obſervations which he ſaid he had made in 1669, and by which he had found that the ſtar γ Draconis was 23″ more northerly in July than in October: obſervations which, for the preſent, ſeemed to favour the opinion of the earth's motion, although it be now known that there could not be any truth or accuracy in them.

Flamſteed having obſerved the pole ſtar with this mural quadrant, in 1680 and the following years, found that its declination was 40″ leſs in July than in December; which obſervations, although very juſt, were yet,

Aberration. yet, however, improper for proving the annual parallax; and he recommended the making of an inſtrument of 15 or 20 feet radius, to be firmly fixed on a ſtrong foundation, for deciding a doubt which was otherwiſe not ſoon likely to be brought to a concluſion.

In this ſtate of uncertainty and doubt, then, Dr Bradley, in conjunction with Mr Samuel Molineux, in the year 1725, formed the project of verifying, by a ſeries of new obſervations, thoſe which Dr Hook had communicated to the public almoſt 50 years before. And as it was his attempt that chiefly gave riſe to this, ſo it was his method in making the obſervations, in ſome meaſure, that they followed; for they made choice of the ſame ſtar, and their inſtrument was conſtructed upon nearly the ſame principles: but had it not greatly exceeded the former in exactneſs, they might ſtill have continued in great uncertainty as to the parallax of the fixed ſtars. For this, and many other convenient and uſeful aſtronomical inſtruments, philoſophers are indebted to the ingenuity and accuracy of Mr Graham.

The ſucceſs of the experiment evidently depending ſo much on the accuracy of the inſtrument, this became a leading object of conſideration. Mr Molineux's apparatus then having been completed, and fitted for obſerving, about the end of November 1725, on the third day of December following, the bright ſtar in the head of Draco, marked γ by Bayer, was for the firſt time obſerved, as it paſſed near the zenith, and its ſituation carefully taken with the inſtrument. The like obſervations were make on the fifth, eleventh, and twelfth days of the ſame month; and there appearing no material difference in the place of the ſtar, a farther repetition of them, at that ſeaſon, ſeemed needleſs, it being a time of the year in which no ſenſible alteration of parallax, in this ſtar, could ſoon be expected. It was therefore curioſity that chiefly urged Dr Bradley, who was then at Kew, where the inſtrument was fixed, to prepare for obſerving the ſtar again on the 17th of the ſame month; when, having adjuſted the inſtrument as uſual, he perceived that it paſſed a little more ſoutherly this day than it had done before. Not ſuſpecting any other cauſe of this appearance, it was aſcribed to the uncertainty of the obſervations, and that either this, or the foregoing, was not ſo exact as had been ſuppoſed. For which reaſon they propoſed to repeat the obſervation again, to determine from what cauſe this difference might proceed: and upon doing it, on the 20th of December, the doctor found that the ſtar paſſed ſtill more ſoutherly than at the preceding obſervation. This ſenſible alteration ſurpriſed them the more, as it was the contrary way from what it would have been, had it proceeded from an annual parallax of the ſtar. But being now pretty well ſatisfied, that it could not be entirely owing to the want of accuracy in the obſervations, and having no notion of any thing elſe that could cauſe ſuch an apparent motion as this in the ſtar; they began to ſuſpect that ſome change in the materials or fabric of the inſtrument itſelf might have occaſioned it. Under theſe uncertainties they remained for ſome time; but being at length fully convinced, by ſeveral trials, of the great exactneſs of the inſtrument; and finding, by the gradual increaſe of the ſtar's diſtance from the pole, that there muſt be ſome regular cauſe that produced it; they took care to examine very nicely, at the time of each obſervation, how much the variation was; till Aberration. about the beginning of March 1726, the ſtar was found to be 20″ more ſoutherly than at the time of the firſt obſervation: it now indeed ſeemed to have arrived at its utmoſt limit ſouthward, as in ſeveral trials, made about this time, no ſenſible difference was obſerved in its ſituation. By the middle of April it appeared to be returning back again towards the north; and about the beginning of June, it paſſed at the ſame diſtance from the zenith, as it had done in December, when it was firſt obſerved.

From the quick alteration in the declination of the ſtar at this time, increaſing about one ſecond in three days, it was conjectured that it would now proceed northward, as it had before gone ſouthward, of its preſent ſituation; and it happened accordingly; for the ſtar continued to move northward till September following, when it again became ſtationary; being then near 20″ more northerly than in June, and upwards of 39″ more northerly than it had been in March. From September the ſtar again returned towards the ſouth, till, in December, it arrived at the ſame ſituation in which it had been obſerved twelve months before, allowing for the difference of declination on account of the preceſſion of the equinox.

This was a ſufficient proof that the inſtrument had not been the cauſe of this apparent motion of the ſtar; and yet it ſeemed difficult to deviſe one that ſhould be adequate to ſuch an unuſual effect. A nutation of the earth's axis was one of the firſt things that offered itſelf on this occaſion; but it was ſoon found to be inſufficient; for though it might have accounted for the change of declination in γ Draconis, yet it would not at the ſame time accord with the phenomena obſerved in the other ſtars, particularly in a ſmall one almoſt oppoſite in right aſcenſion to γ Draconis, and at about the ſame diſtance from the north pole of the equator: for though this ſtar ſeemed to move the ſame way, as a nutation of the earth's axis would have made it; yet changing its declination but about half as much as γ Draconis in the ſame time, as appeared on comparing the obſervations of both made on the ſame days, at different ſeaſons of the year, this plainly proved that the apparent motion of the ſtar was not occaſioned by a real nutation; for had this been the caſe, the alteration in both ſtars would have been nearly equal.

The great regularity of the obſervations left no room to doubt, but that there was ſome uniform cauſe by which this unexpected motion was produced, and which did not depend on the uncertainty or variety of the ſeaſons of the year. Upon comparing the obſervations with each other, it was diſcovered that, in both the ſtars above mentioned, the apparent difference of declination from the *maxima*, was always nearly proportional to the verſed ſine of the ſun's diſtance from the equinoctial points. This was an inducement to think that the cauſe, whatever it was, had ſome relation to the ſun's ſituation with reſpect to thoſe points. But not being able to frame any hypotheſis, ſufficient to account for all the phenomena, and being very deſirous to ſearch a little farther into this matter, Dr Bradley began to think of erecting an inſtrument for himſelf at Wanſtead; that, having it always at hand, he might with the more eaſe and certainty inquire into the laws of this new motion. The conſideration likewiſe of being

Aberration. being able, by another inſtrument, to confirm the truth of the obſervations hitherto made with that of Mr Molineux, was no ſmall inducement to the undertaking; but the chief of all was, the opportunity he ſhould thereby have of trying in what manner other ſtars ſhould be affected by the ſame cauſe, whatever it might be. For Mr Molineux's inſtrument being originally deſigned for obſerving γ Draconis, to try whether it had any ſenſible parallax, it was ſo contrived, as to be capable of but little alteration in its direction; not above ſeven or eight minutes of a degree: and there being but few ſtars, within half that diſtance from the zenith of Kew, bright enough to be well obſerved, he could not, with his inſtrument, thoroughly examine how this cauſe affected ſtars that were differently ſituated, with reſpect to the equinoctial and ſolſtitial points of the ecliptic.

Theſe conſiderations determined him; and by the contrivance and direction of the ſame ingenious perſon, Mr Graham, his inſtrument was fixed up the 19th of Auguſt 1727. As he had no convenient place where he could make uſe of ſo long a teleſcope as Mr Molineux's, he contented himſelf with one of but little more than half the length, namely of 12 feet and a half, the other being 24 feet and a half long, judging from the experience he had already had, that this radius would be long enough to adjuſt the inſtrument to a ſufficient degree of exactneſs: and he had no reaſon afterwards to change his opinion; for by all his trials he was very well ſatisfied, that when it was carefully rectified, its ſituation might be ſecurely depended on to half a ſecond. As the place where his inſtrument was hung, in ſome meaſure determined its radius; ſo did it alſo the length of the arc or limb, on which the diviſions were made, to adjuſt it: for the arc could not conveniently be extended farther, than to reach to about 6¼ degrees on each ſide of the zenith. This however was ſufficient, as it gave him an opportunity of making choice of ſeveral ſtars, very different both in magnitude and ſituation; there being more than two hundred, inſerted in the Britiſh Catalogue, that might be obſerved with it. He needed not indeed to have extended the limb ſo far, but that he was willing to take in *Capella*, the only ſtar of the firſt magnitude that came ſo near his zenith.

His inſtrument being fixed, he immediately began to obſerve ſuch ſtars as he judged moſt proper to give him any light into the cauſe of the motion already mentioned. There was a ſufficient variety of ſmall ones, and not leſs than twelve that he could obſerve through all ſeaſons of the year, as they were bright enough to be ſeen in the day time, when neareſt the ſun. He had not been long obſerving, before he perceived that the notion they had before entertained, that the ſtars were fartheſt north and ſouth when the ſun was near the equinoxes, was only true of thoſe ſtars which are near the ſolſtitial colure. And after continuing his obſervations a few months, he diſcovered what he then apprehended to be a general law obſerved by all the ſtars, namely, that each of them became ſtationary, or was fartheſt north or ſouth, when it paſſed over his zenith at ſix of the clock, either in the evening or morning. He perceived alſo that whatever ſituation the ſtars were in, with reſpect to the cardinal points of the ecliptic, the apparent motion of every one of them tended the ſame way, when they paſſed his inſtrument about the ſame hour of the day or night; for they all moved ſouthward when they paſſed in the day, and northward when in the night; ſo that each of them was fartheſt north when it came in the evening about ſix of the clock, and fartheſt ſouth when it came about ſix in the morning. Aberration.

Though he afterwards diſcovered that the maxima, in moſt of theſe ſtars, do not happen exactly when they paſs at thoſe hours; yet, not being able at that time to prove the contrary, and ſuppoſing that they did, he endeavoured to find out what proportion the greateſt alterations of declination, in different ſtars, bore to each other; it being very evident that they did not all change their inclination equally. It has been before noticed, that it appeared from Mr Molineux's obſervations, that γ *Draconis* changed its declination above twice as much as the before-mentioned ſmall ſtar that was nearly oppoſite to it; but examining the matter more nicely, he found that the greateſt change in the declination of theſe ſtars, was as the ſine of the latitude of each ſtar reſpectively. This led him to ſuſpect that there might be the like proportion between the *maxima* of other ſtars; but finding that the obſervations of ſome of them would not perfectly correſpond with ſuch an hypotheſis, and not knowing whether the ſmall difference he met with might not be owing to the uncertainty and error of the obſervations, he deferred the farther examination into the truth of this hypotheſis, till he ſhould be furniſhed with a ſeries of obſervations made in all parts of the year; which would enable him not only to determine what errors the obſervations might be liable to, or how far they might ſafely be depended on; but alſo to judge, whether there had been any ſenſible change in the parts of the inſtrument itſelf.

When the year was completed, he began to examine and compare his obſervations; and having ſatisfied himſelf as to the general laws of the phenomena, he then endeavoured to find out the cauſe of them. He was already convinced that the apparent motion of the ſtars was not owing to a nutation of the earth's axis. The next that occurred to him, was an alteration in the direction of the plumb-line, by which the inſtrument was conſtantly adjuſted; but this, upon trial, proved inſufficient. Then he conſidered what refraction might do; but here alſo he met with no ſatisfaction. At laſt, through an amazing ſagacity, he conjectured that all the phenomena hitherto mentioned, proceeded from the progreſſive motion of light, and the earth's annual motion in her orbit: for he perceived, that if light were propagated in time, the apparent place of a fixed object would not be the ſame when the eye is at reſt, as when it is moving in any other direction but that of the line paſſing through the object and the eye; and that when the eye is moving in different directions, the apparent place of the object would be different. (*Hutton's Math. Dict.*)

ABERRATION, in *Optics*, the deviation or diſperſion of the rays of light, when reflected by a ſpeculum, or refracted by a lens, which prevents them from meeting or uniting in the ſame point, called the geometrical focus, but are ſpread over a ſmall ſpace, and produce a confuſion of images. There are two ſpecies of aberration diſtinguiſhed by their different cauſes; the

Aberration || Abgar.

the one arifes from the figure of the lens or fpeculum, the other from the unequal refrangibility of the rays of light. This laft fpecies is fometimes called the Newtonian, from the name of its difcoverer. See OPTICS.

Aberration of the Planets, is equal to the geocentric motion of the planet, the fpace it appears to move as feen from the earth, during the time that light employs in paffing from the planet to the earth. Thus, in the fun, the aberration in longitude is conftantly 20″, that being the fpace moved by the fun, or, which is the fame thing, by the earth, in the time of 8′ 7″, which is the time in which light paffes from the fun to the earth. In like manner, knowing the diftance of any planet from the earth, by proportion it will be, as the diftance of the fun is to the diftance of the planet, fo is 8′ 7″ to the time of light paffing from the planet to the earth: then computing the planet's geocentric motion in this time, that will be the aberration of the planet, whether it be in longitude, latitude, right afcenfion, or declination. (*Hutton's Math. Dict.*)

ABERYSTWITH, a market town of Cardiganfhire, in Wales, feated on the Ridal, near its confluence with the Iftwith, where it falls into the fea. It is a populous, rich town, and has a great trade in lead, and a confiderable fifhery of whiting, cod, and herrings. It was formerly furrounded with walls, and fortified with a caftle; but both are now in ruins. Its diftance from London is 203 miles W. N. W. W. Long. 4. 15 N. Lat. 52. 30.

ABESTA, or AVESTA, the name of one of the facred books of the Perfian magi, which they afcribe to their great founder Zoroafter. The Abefta is a commentary on two others of their religious books called *Zend* and *Pazend;* the three together including the whole fyftem of the Ignicolæ or worfhippers of fire.

ABETTOR, a law term, implying one who encourages another to the performance of fome criminal action, or who is art and part in the performance itfelf. Treafon is the only crime in which abettors are excluded by law, every individual concerned being confidered as a principal. It is the fame with *art-and-part* in the Scots law.

ABEX, a country of Higher Ethiopia, in Africa, bordering on the Red fea, by which it is bounded on the eaft. It has Nubia or Sennar on the north; Sennar and Abyffinia on the weft; and Abyffinia on the fouth. Its principal towns are Suaquem and Arkeko. It is fubject to the Turks, and has the name of the beglerbeglik of Habeleth. It is about five hundred miles in length and one hundred in breadth; is a mountainous country, fandy, barren, and unhealthy, much infefted with wild beafts; and the forefts abound with ebony trees.

ABEYANCE, in *Law*, the expectancy of an eftate. Thus if lands be leafed to one perfon for life, with reverfion to another for years, the remainder for years is in abeyance till the death of the leffee.

ABGAR, or ABGARUS, a name given to feveral of the kings of Edeffa in Syria. The moft celebrated of them was one who, it is faid, was cotemporary with Jefus Chrift; and who having a diftemper in his feet, and hearing of Jefus's miraculous cures, requefted him by letter to come and cure him. Euſebius *, who believed that this letter was genuine, and alfo an anfwer our Saviour is faid to have returned to it, has tranſlated them both from the Syriac, and aſſerts that they were taken out of the archives of the city of Edeffa. The firft is as follows: "Abgarus, prince of Edeffa, "to Jefus the holy Saviour, who hath appeared in the "flefh in the confines of Jerufalem, greeting. I have "heard of thee, and of the cures thou haft wrought "without medicines or herbs. For it is reported thou "makeft the blind to fee, the lame to walk, lepers to "be clean, devils and unclean fpirits to be expelled, "fuch as have been long diſeaſed to be healed, and "the dead to be raifed; all which when I heard con"cerning thee, I concluded with myſelf, That either "thou waft a God come down from heaven, or the "Son of God fent to do thefe things. I have there"fore written to thee, befeeching thee to vouchſafe to "come unto me, and cure my diſeaſe. For I have "alfo heard that the Jews uſe thee ill, and lay fnares "to deſtroy thee. I have here a little city, pleaſantly "ſituated, and ſufficient for us both. ABGARUS." To this letter, Jefus, it is faid, returned an anfwer by Annanias, Abgarus's courier; which was as follows: "Bleſſed art thou, O Abgarus! who haft believed in "me whom thou haft not feen; for the Scriptures fay "of me, They who have feen me have not believed in "me, that they who have not feen, may, by believing, "have life. But whereas thou writeſt to have me "come to thee, it is of neceſſity that I fulfil all things "here for which I am ſent; and having finiſhed them, "to return to him that ſent me: but when I am re"turned to him, I will then ſend one of my diſciples "to thee, who ſhall cure thy malady, and give life to "thee and thine. JESUS." After Jeſus's aſcenſion, Judas, who is alſo named Thomas, ſent Thaddeus, one of the ſeventy, to Abgarus; who preached the goſpel to him and his people, cured him of his diſorder, and wrought many other miracles: which was done, ſays Euſebius, A. D. 43.—Though the above letters are acknowledged to be ſpurious by the candid writers of the church of Rome; ſeveral Proteſtant authors, as Dr Parker, Dr Cave, and Dr Grabe, have maintained that they are genuine, and ought not to be rejected.

Abgar || Abians.

ABGILLUS, JOHN, ſurnamed Preſter John, was ſon to a king of the Friſcii; and, from the auſterity of his life, obtained the name of *Preſter*, or Prieſt. He attended Charlemagne in his expedition to the Holy Land; but inſtead of returning with that monarch to Europe, it is pretended that he gained mighty conqueſts, and founded the empire of the Abyſſines, called, from his name, the empire of Preſter John. He is ſaid to have written the hiſtory of Charlemagne's journey into the Holy Land, and his own into the Indies; but they are more probably trifling romances, written in the ages of ignorance.

ABIANS, anciently a people of Thrace, or (according to ſome authors) of Scythia. They had no fixed habitations; they led a wandering life. Their houſes were waggons, which carried all their poſſeſſions. They lived on the fleſh of their herds and flocks, on milk and cheeſe, chiefly on that of mare's milk. They were unacquainted with commerce. They only exchanged commodities with their neighbours. They poſſeſſed lands, but they did not cultivate them. They aſſigned their agriculture to any who would undertake it, reſerving only to themſelves

* *Eccl. Hiſt.* lib. i. cap. 13.

Abiathar || Abimelech.

a tribute; which they exacted, not with a view to live in affluence, but merely to enjoy the neceſſaries of life. They never took arms but to oblige thoſe to make good a promiſe to them by whom it had been broken. They paid tribute to none of the neighbouring ſtates. They deemed themſelves exempt from ſuch an impoſition; for they relied on their ſtrength and courage, and conſequently thought themſelves able to repel any invaſion. The Abians, we are told, were a people of great integrity. This honourable eulogium is given them by Homer. (Strabo).

ABIATHAR, high prieſt of the Jews, ſon to Ahimelech, who had borne the ſame office, and received David into his houſe. This ſo enraged Saul, who hated David, that he put Ahimelech to death, and 81 prieſts; Abiathar alone eſcaped the maſſacre. He afterwards was high prieſt; and often gave King David teſtimonies of his fidelity, particularly during Abſalom's conſpiracy, at which time Abiathar followed David, and bore away the ark. But after this, conſpiring with Adonijah, in order to raiſe him to the throne of King David his father; this ſo exaſperated Solomon againſt him, that he diveſted him of the prieſthood, and baniſhed him, A. M. 3021, before Chriſt 1014.

ABIB, ſignifying an ear of corn, a name given by the Jews to the firſt month of their eccleſiaſtical year, afterwards called *Niſan*. It commenced at the vernal equinox; and according to the courſe of the moon, by which their months were regulated, anſwered to the latter part of our March and beginning of April.

ABIDING *by* WRITINGS, in *Scots Law:* When a perſon founds upon a writing alleged to be falſe, he may be obliged to declare judicially, whether he will ſtand or abide by it as a true deed.

ABIES, the FIR-TREE. See PINUS, BOTANY *Index*.

ABIGEAT, an old law term, denoting the crime of ſtealing cattle by droves or herds. This crime was ſeverely puniſhed; the delinquent being often condemned to the mines, baniſhment, and ſometimes capitally.

ABIHU, brother to Nadab, and ſon to Aaron. The two former had the happineſs to aſcend Mount Sinai with their father, and there to behold the glory of God: but afterward putting ſtrange fire into their cenſers, inſtead of the ſacred fire commanded by God, fire ruſhing upon them killed them. Though all the people bewailed this terrible cataſtrophe, Moſes forbade Aaron and his two ſons Eleazar and Ithamar to join in the lamentation.

ABII SCYTHÆ, taken by Strabo to denote the European Sarmatæ, bordering on the Thracians and Baſtanæ: They were commended by Curtius for their love of juſtice, and by Ammieſius for their contempt of earthly things.

ABIMELECH, king of Gerar, a country of the Philiſtines, was cotemporary with Abraham. This patriarch and his family being there, his wife Sarah, though 90 years of age, was not ſafe in it; for Abimelech carried her off, and was ſo enamoured of her, that he reſolved to marry her. Abraham did not declare himſelf Sarah's huſband; but gave out ſhe was his ſiſter. But the king being warned in a dream, that ſhe was married to a prophet, and that he ſhould die if he did not reſtore her to Abraham, the king obeyed; at the ſame time reproving Abraham for his diſingenuity; who thereupon, among other excuſes, ſaid ſhe was really his ſiſter, being born of the ſame father, though of a different mother. Abimelech afterwards gave conſiderable preſents to Abraham; and a covenant, that of Beerſheba, was entered into between them, A. M. 2107. After the death of Abraham, there being a famine in the neighbouring countries, Iſaac his ſon alſo withdrew into Gerar, which was then likewiſe governed by a king called

Abimelech || Abiponians.

ABIMELECH, probably the ſucceſſor of the former. Here Rebekah's beauty forced her huſband to employ Abraham's artifice. Abimelech diſcovering that they were nearly related, chid Iſaac for calling his wife his ſiſter; and at the ſame time forbade all his ſubjects, upon pain of death, to do the leaſt injury to Iſaac or Rebekah. Iſaac's proſperity loſt him the king's friendſhip, and he was deſired to go from among them. He obeyed; but Abimelech afterwards entered into a covenant with him, A. M. 2200.

ABIMELECH, the natural ſon of Gideon, by his concubine. His violent acts and death are recorded in Judges, chap. ix. A. M. 2769.

ABINGDON, a market-town in Berkſhire, ſituated on a branch of the Thames, derives its name from an ancient abbey. The ſtreets, which are well paved, terminate in a ſpacious area, in which the market is held; and in the centre of this area is the market-houſe, which is ſupported on lofty pillars, with a large hall of freeſtone above, in which the ſummer aſſizes for the county are held, and other public buſineſs done, the Lent aſſizes being held at Reading. It has two churches; one dedicated to St Nicholas, and the other to St Helena: the latter is adorned with a ſpire, and both are ſaid to have been erected by the abbots of Abingdon. Here are alſo two hoſpitals, one for ſix, and the other for thirteen poor men, and as many poor women; a free ſchool; and a charity ſchool. The town was incorporated by Queen Mary. It ſends two members to parliament, who are choſen by the inhabitants at large not receiving alms. Its great manufacture is malt, large quantities of which are ſent by water to London. It is ſeven miles ſouth of Oxford, 47 eaſt of Glouceſter, and 55 weſt of London. This town is ſuppoſed by Biſhop Gibſon to be the place called, in the Saxon annals, *Cloveſhoo*, where two ſynods are ſaid to have been held, one in 742, and the other in 822. W. Long. 1. 12. N. Lat. 51. 42.

ABINTESTATE, in *Civil Law*, is applied to a perſon who inherits the right of one who died inteſtate or without making a will. See INTESTATE.

ABIPONIANS, a tribe of American Indians, who formerly inhabited the diſtrict of *Chaks* in Paraguay; but the hoſtilities of the Spaniards have now obliged them to remove ſouthward into the territory lying between Santa Fe and St Jago. The only account we have of them is that publiſhed by M. Dobrizhoffer in 1785. This gentleman, who lived ſeven years in their country, informs us that they are not numerous, the whole nation not much exceeding 5000; for which he aſſigns as a reaſon an unnatural cuſtom among their women of ſometimes deſtroying their own children, from motives of jealouſy leſt their huſbands ſhould take other mates during the long time they give ſuck,

Abiram || Ablactation.

which is not less than two years. They are naturally white, but, by exposure to the air and smoke, become of a brown colour. They are a strong and hardy race of people; which our author attributes to their marrying so late, an Abiponian seldom or never thinking of marriage till 30 years of age. They are greatly celebrated on account of their chastity and other virtues; though, according to our author, they have no knowledge of a Deity. They make frequent incursions into the territories of the Spaniards, mounted on the horses which run wild in those parts. They have a kind of order of chivalry for their warriors; and are so formidable, that 100 of their enemies will fly before ten of these horsemen. The hatred which these savages, whose manners, though rude and uncultivated, are in many respects pure and virtuous, bear to the Spaniards, is invincible. "These pretended Christians," says our author, "who are the scum of the Spanish nation, practise every kind of fraud and villany among these poor barbarians; and their corrupt and vicious morals are so adapted to prejudice the Abiponians against the Christian religion, that the Jesuit missionaries have, by a severe law, prohibited any Spaniard from coming, without a formal permission, into any of their colonies."—From his account of the success of the Jesuits in converting them to Christianity, however, it does not appear that they have been able to do more than bribe them to a compliance with the ceremonies of the Popish superstition; so that in general they are quite ignorant and uncivilized; a most striking instance of which is, that in counting they can go no further than three; and all the art of the Jesuits to teach them the simplest use and expression of numbers has proved unsuccessful.

ABIRAM, a seditious Levite, who, in concert with Korah and Dathan, rebelled against Moses and Aaron, in order to share with them in the government of the people; when Moses ordering them to come with their censers before the altar of the Lord, the earth suddenly opened under their feet, and swallowed up them and their tents; and at the same instant fire came from heaven, and consumed 250 of their followers. Numb. chap. xvi.

ABISHAI, son of Zeruiah, and brother to Joab, was one of the celebrated warriors who flourished in the reign of David: he killed with his own hand 300 men, with no other weapon but his lance; and slew a Philistine giant, the iron of whose spear weighed 300 shekels. 1 Sam. chap. xxvi. 2 Sam. chap. xxiii.

ABJURATION, in our ancient customs, implied an oath, taken by a person guilty of felony, and who had fled to a place of sanctuary, whereby he solemnly engaged to leave the kingdom for ever.

ABJURATION is now used to signify the renouncing, disclaiming, and denying upon oath, the Pretender to have any kind of right to the crown of these kingdoms.

Abjuration of Heresy, the solemn recantation of any doctrine as false and wicked.

ABLACTATION, or weaning a child from the breast. See WEANING.

ABLACTATION, among the ancient gardeners, the same with what is now called *Grafting by approach*, is a method of engrafting, by which the cyon of one tree being for some time united to the stock of another, is afterwards cut off, and, as it were, weaned from the parent tree.

ABLAI, a country of Great Tartary, the inhabitants of which are called *Buchars* or *Buchares*. See ABLAY.

Ablai || Able.

ABLACQUEATION, an old term in *Gardening*, signifies the operation of removing the earth, and baring the roots of trees in winter, to expose them more freely to the air, rain, snows, &c.

ABLANCOURT. See PERROT.

ABLATIVE, in *Grammar*, the sixth case of Latin nouns. The word is formed from *auferre*, "to take away." Priscian also calls it the *comparative case*; as serving among the Latins, for comparing, as well as taking away.

The ABLATIVE is opposite to the DATIVE; the first expressing the action of taking away, and the latter that of giving.

In English, French, &c. there is no precise mark whereby to distinguish the ablative from other cases; and we only use the term in analogy to the Latin. Thus, in the two phrases, *the magnitude of the city*, and *he spoke much of the city*; we say, that *of the city* in the first is *genitive*, and in the latter *ablative*; because it would be so, if the two phrases were expressed in Latin.

The question concerning the Greek ablative has been the subject of a famous literary war between two great grammarians, Frischlin and Crusius; the former maintaining, and the latter opposing, the reality of it. The dispute still subsists among their respective followers. The chief reason alleged by the former is, that the Roman writers often joined Greek words with the Latin prepositions which govern ablative cases, as well as with nouns of the same case. To which their opponents answer, that the Latins anciently had no ablative themselves; but instead thereof, made use, like the Greeks, of the dative case; till at length they formed an ablative, governed by prepositions, which were not put before the dative: that, at first, the two cases had always the same termination, as they still have in many instances: but that this was afterwards changed in certain words. It is no wonder then, that the Latins sometimes join prepositions which govern an ablative case, or nouns in the ablative case, with Greek datives, since they were originally the same; and that the Greek dative has the same effect as the Latin ablative.

ABLATIVE ABSOLUTE, in *Grammar*, is a phrase detached or independent of the other parts of a sentence or discourse. In the Latin language it is frequent, and it has been adopted by the moderns.

ABLAY, in *Geography*, a country of Great Tartary, governed by a Calmuck chief, but subject to Russia, to obtain its protection. It lies east of the river Irtisch, and extends 500 leagues along the southern frontiers of Siberia, from E. Long. 72° to 83°. N. Lat. from 51° to 54°.

ABLE, or ABEL, THOMAS, chaplain to Queen Catharine, consort to Henry VIII. distinguished himself by his zeal in opposing the proceedings against that unfortunate princess for a divorce. For this purpose he wrote a piece, entitled "*Tractatus de non dissolvendo Henrici et Catharinæ matrimonio*, i. e. "A Treatise proving that the marriage of King Henry and Queen Catharine ought not to be dissolved." But the title of the book, according to Bishop Tanner, was

Invicta

Ablecti || Abner.

Invicta Veritas. He took the degree of bachelor of arts at Oxford on the 4th of July 1513, and that of maſter of arts on the 27th of July 1516. In 1534 he fell under a proſecution for being concerned in the affair of Elizabeth Barton, called the *Holy Maid of Kent*. This was an infamous impoſtor, ſuborned by the monks to uſe ſtrange geſticulations, exhibit fictitious miracles, and to feign the gift of prophecy; and ſo well did ſhe act her part, that ſhe drew ſome perſons of reſpectability to her intereſt: but being detected, ſhe was condemned and executed, after diſcovering the names of her principal accomplices and inſtigators. On her account Able was charged with miſpriſion of treaſon, by ſtat. 25. Hen. VIII; and being alſo one of thoſe who denied the king's ſupremacy over the church, he was apprehended and impriſoned; during which time his confinement was ſo rigorous, that the keeper of Newgate was committed to Marſhalſea priſon for ſuffering him to go out upon bail. He was afterwards hanged, drawn, and quartered, at Smithfield in 1540. Bouchier gives him the character of a very learned man; and tells us, that he uſed to teach the queen muſic and the learned languages.

ABLECTI, in Roman antiquity, a ſelect body of ſoldiers choſen from among thoſe called EXTRAORDINARII.

ABLEGMINA, in Roman antiquity, thoſe choice parts of the entrails of victims which were offered in ſacrifice to the gods. They were ſprinkled with flour, and burnt upon the altar; the prieſts pouring ſome wine on them.

ABLOE, in *Geography*, a town of Little Tartary, which lies between the river Dnieper and the Black ſea. E. Long. 33. 15. N. Lat. 46. 20.

ABLUENTS, in *Medicine*, the ſame with diluters or DILUENTS.

ABLUTION, in a general ſenſe, ſignifies the waſhing, or purifying ſomething with water.

ABLUTION, in a religious ſenſe, a ceremony in uſe among the ancients, and ſtill practiſed in ſeveral parts of the world: it conſiſted in waſhing the body, which was always done before ſacrificing, or even entering their houſes. Ablutions appear to be as old as any ceremonies, and external worſhip itſelf. Moſes enjoined them; the heathens adopted them; and Mahomet and his followers have continued them: thus they have got footing among moſt nations, and make a conſiderable part of moſt eſtabliſhed religions.—The Egyptian prieſts had their diurnal and nocturnal ablutions; the Grecians their ſprinklings; the Romans their luſtrations and lavations; the Jews their waſhing of hands and feet, beſide their baptiſms.—The ancient Chriſtians had their ablutions before communion; which the Romiſh church ſtill retain before their maſs, ſometimes after. The Syrians, Copts, &c. have their ſolemn waſhings on Good Friday: the Turks their greater and leſſer ablutions; their Ghaſt and Wodou, their Aman, Taharat, &c.

ABNER, the ſon of Ner, father-in-law to Saul, and general of all his forces, ſerved him on all occaſions with fidelity and courage. After the death of that prince, Abner ſet Iſhboſheth, Saul's ſon, on the throne. A war breaking out between the tribe of Judah, who had elected David king, and Iſrael, Abner marched againſt that prince with the flower of his troops, but was defeated. Abner afterward, being diſguſted, went over to David, and induced the chiefs of the army and the elders of Iſrael to declare for him. He was received by David with every mark of affection, which gave offence to Joab, by whom he was inſidiouſly put to death, A. M. 2956.

Abnoba || Aboccis.

ABNOBA, now ABENOW, in *Geography*, a long range of mountains in Germany, extending from the Rhine to the Necker, and having different names according to the different countries through which they ſtretch. About the river Maine they are called the *Oden* or *Otenwald;* between Heſſe and Franconia, the *Speſſart;* and about the duchy of Wirtemberg, where the Danube takes its riſe, they receive the name of *Baar*.

ABO, a maritime town in Sweden, ſituated on the promontory formed by the gulfs of Finland and Bothnia 120 miles north-eaſt from Stockholm, in E. Long. 21. 28. and N. Lat. 60. 10. It is a ſtapelſtad, or city which has the privilege of a foreign trade, and belongs to the *lane* or government and dioceſe of Abo. It is built on both ſides of the river Aurajocki, which have a communication by a wooden bridge. The ſtreets and lanes of Abo amount to 102; the number of houſes to 1100, which in 1780 contained above 2000 families. In 1791 the number of inhabitants was 8500.

A gymnaſium was eſtabliſhed at Abo by Guſtavus Adolphus in 1626, which was converted by Queen Chriſtina, in 1640, into an academy or univerſity, in which are now taught, anatomy, natural hiſtory, chemiſtry, and economics. The library founded by Queen Chriſtina conſiſts of above 10,000 volumes, beſides manuſcripts, ancient coins, medals, &c. The ſchool of anatomy is in conſiderable repute; and enjoys, it is ſaid, one very extraordinary privilege. By a particular regulation, all perſons who hold lands or penſions from the crown are bound to leave their bodies to be diſſected for the inſtruction of the ſtudents.

The trade of Abo is conſiderable. The exports conſiſt of iron, copper, pitch, tar, deals, &c. The imports are tobacco, coffee, ſugar, wine, ſalt, grain, hemp, and ſpiceries. In Abo are manufactured ſilk ribbands, fuſtian, ſail-cloth, leather, tiles, watches and clocks, paper, ſugar, and tobacco. The plantations of tobacco in this neighbourhood produce not leſs than 152,000 cwt. annually. (*Acerbi's Travels.*)

ABO-HUS, or ABO-SLOT, a very ancient caſtle in Finland, ſituated at the mouth of the river Aura, was the reſidence of Duke John, and the priſon of King Eric in the 16th century. It is at preſent employed as a magazine for corn and gunpowder, and as a priſon for ſtate offenders.

ABOARD, the inſide of a ſhip. Hence any perſon who enters a ſhip is ſaid to *go aboard*: but when an enemy enters in the time of battle, he is ſaid to *board*; a phraſe which always implies hoſtility.—To *fall aboard of*, is to ſtrike or *encounter* another ſhip when one or both are in motion, or to be driven upon a ſhip by the force of the wind or current.—*Aboard-main-tack*, the order to draw the main-tack, i. e. the lower-corner of the main-ſail, down to the CHESS-TREE.

ABOASAR, in *Geography*, a village in Lower Egypt, ſuppoſed to be the ancient Buſiris.

ABOCCIS, in *Ancient Geography*, the Abuncis of Ptolemy, a town of Ethiopia, ſituated on the weſtern ſide of the Nile near the great cataract.

Abocro ‖ Abomaſus.

ABOCRO, or ABORREL, in *Geography*, a town near the river Ankobar or Cobre, on the African Gold coaſt. It gives name to a republican province.

ABOLA, in *Geography*, a diviſion of the Agow, in Abyſſinia, is a narrow valley, through which runs a river of the ſame name, whoſe waters receive many tributary ſtreams from the loſty, rugged, and woody mountains that form the valley. In none of the rivers are any fiſh found, which Bruce aſcribes to their being dried up in the ſummer, and great rapidity in winter.

ABOLITION, implies the act of annulling, deſtroying, making void, or reducing to nothing. In our law, it ſignifies the repealing any law or ſtatute. The leave given by a prince or judge to a criminal accuſer to deſiſt from farther proſecution of the accuſed, is in the moſt appropriate ſenſe denominated *abolition*.

ABOLITION is particularly uſed among civilians, for remitting the puniſhment of a crime. It is, in this ſenſe, a kind of amneſty; the puniſhment, not the infamy, is taken off.

ABOLITION, in the Roman law, is the annulling a proſecution, or legal accuſation: and in this ſenſe, it is different from amneſty; for, in the former, the accuſation might be renewed by the ſame proſecutor, but in the latter, it was extinguiſhed for ever. Within 30 days after a public *abolition*, the ſame accuſer, with the prince's licence, was allowed to renew the charge; after a private *abolition*, another accuſer might renew it, but the ſame could not. *Abolition* was alſo uſed for expunging a perſon's name from the public liſt of the accuſed, hung up in the treaſury. It was either public, as that under Auguſtus, when all the names which had long hung up, were expunged at once; or private, when it was done at the motion of one of the parties. *Abolition* of debts, according to the laws of the Theodoſian code, was ſometimes granted to thoſe who were indebted to the fiſcus. A medal of the emperor Adrian repreſents that prince with a ſceptre in his left hand, and a lighted torch in his right, with which he ſets fire to ſeveral papers in preſence of the people, who teſtify their joy and gratitude by lifting up their hands towards heaven. The legend on the medal is, *Reliqua vetera* H. S. *nummis abolita*.

ABOLLA, in antiquity, a warm kind of garment, lined or doubled, worn by the Greeks and Romans, chiefly out of the city, in following the camp.—Critics and antiquaries are greatly divided as to the form, uſe, kinds, &c. of this garment. Papias makes it a ſpecies of the *toga*, or gown; but Nonnius, and moſt others, ſuppoſe it to be a ſpecies of the *pallium*, or cloak. The *abolla* ſeems rather to have ſtood oppoſed to the *toga*, which was a garment of peace, as the *abolla* was of war; at leaſt Varro and Martial place them in this oppoſite light. There ſeem to have been different kinds of *abollæ*, appropriated to different characters and occaſions. Even kings appear to have uſed the *abolla*: Caligula was offended with King Ptolemy for appearing at the ſhows in a purple *abolla*, the ſplendour of which drew the eyes of the ſpectators from the emperor to himſelf.

ABOMASUS, ABOMASUM, or ABOMASUS, names of the fourth ſtomach of ruminating animals. It is in the abomaſus of calves and lambs that the runnet or earning is formed wherewith milk is curdled. See ANATOMY, Part II.

Abomination ‖ Aborigines.

ABOMINATION, a term uſed in Scripture with regard to the Hebrews, who, being ſhepherds, are ſaid to have been an abomination to the Egyptians, becauſe they ſacrificed the ſacred animals of that people, as oxen, goats, ſheep, &c. which the Egyptians eſteemed as abominations, or things unlawful. The term is alſo applied in the ſacred writings to idolatry and idols, becauſe the worſhip of idols is in itſelf an abominable thing, and at the ſame time ceremonies obſerved by idolaters were always attended with licentiouſneſs and other odious and abominable actions. The *abomination of deſolation*, foretold by the prophet Daniel, is ſuppoſed to imply the ſtatue of Jupiter Olympius, which Antiochus Epiphanes cauſed to be placed in the temple of Jeruſalem. And the *abomination of deſolation*, mentioned by the Evangeliſts, ſignifies the enſigns of the Romans, during the laſt ſiege of Jeruſalem by Titus, on which the figures of their gods and emperors were embroidered, and placed upon the temple after it was taken.

ABON, ABONA, or ABONIS, in *Ancient Geography*, a town and river of Albion. The town, according to Camden, is Abingdon; and the river, Abhon or Avon. But by Antonine's Itinerary, the diſtance is nine miles from the Venta Silurum, or Caer-Went; others, therefore, take the town to be Porſhut, at the mouth of the river Avon, near Briſtol. Abhon or Avon, in the Celtic language, denotes a river.

ABORAS, in *Ancient Geography*, by Xenophon called Araxes, a river of Meſopotamia, which flows into the Euphrates at Circeſium. In the negociation between Diocleſian and Narſes, near the end of the third century, it was fixed as the boundary between the Roman and Perſian empire.

ABORIGINES, in hiſtory, (Dionyſius of Halicarnaſſus, Livy, Virgil); originally a proper name, given to a certain people in Italy, who inhabited the ancient Latium, or country now called *Campagna di Roma*. In this ſenſe the Aborigines are diſtinguiſhed from the Janigenæ, who, according to the falſe Beroſus, inhabited the country before them; from the Siculi, whom they expelled; from the Grecians, from whom they deſcended; from the Latins, whoſe name they aſſumed after their union with Æneas and the Trojans; laſtly, from the Auſonii, Volſci, Oenotrii, &c. neighbouring nations in other parts of the country. Whence this people came by the appellation is much diſputed. St Jerome ſays, they were ſo called, as being, *abſque origine*, the primitive planters of the country after the flood: Dionyſius of Halicarnaſſus accounts for the name, as denoting them the founders of the race of inhabitants of that country: others think them ſo called as being originally Arcadians, who claimed to be earth-born, and not deſcended from any people. Aurelius Victor ſuggeſts another opinion, viz. that they were called *Aborigines*, q. d. *Aberrigines*, from *ab* "from," and *errare* "to wander;" as having been before a wandering people. Pauſanias rather thinks they were thus called απο ορεων, "from mountains"; which opinion ſeems confirmed by Virgil, who, ſpeaking of Saturn, the legiſlator of this people, ſays,

Is genus indocile ac diſperſum montibus altis
Compoſuit, legeſque dedit.——

The Aborigines were either the original inhabitants of the country, ſettled there by Janus, as ſome imagine;

Abortion. ginc; or by Saturn, or Cham, as others; not long after the diſperſion, or even, as ſome think, before it: Or, they were a colony ſent from ſome other nation; who expelling the Siculi, the ancient inhabitants, ſettled in their place. About this mother nation there is great diſpute. Some maintain it to be the Arcadians, parties of whom were brought into Italy at different times; the firſt under the conduct of Oenotrius, ſon of Lycaon, 450 years before the Trojan war; a ſecond from Theſſaly; a third under Evander, 60 years before the Trojan war; beſides another under Hercules; and another of Lacedemonians, who fled from the ſevere diſcipline of Lycurgus: all theſe uniting, are ſaid to have formed the nation or kingdom of the Aborigines. Others will have them of barbarian rather than Grecian origin, and to have come from Scythia; others from Gaul. Laſtly, Others will have them to be Canaanites, expelled by Joſhua.

The term *Aborigines*, though ſo famous in antiquity, is uſed in modern geography only occaſionally as an appellative. It is given to the primitive inhabitants of a country, in contradiſtinction to colonies, or new races of people.

ABORTION, in *Midwifery*, the premature excluſion of a fœtus. See MIDWIFERY.

The practice of procuring abortions was prohibited by the ancient Greek legiſlators Solon and Lycurgus. Whether or not it was permitted among the Romans, has been much diſputed. It is certain the practice, which was by them called *viſceribus vim inferre*, was frequent enough; but whether there was any penalty on it before the emperors Severus and Antonine, is the queſtion. Nodt maintains the negative; and further, that thoſe princes only made it criminal in one particular caſe, viz. of a married woman's practiſing it out of reſentment againſt her huſband, in order to defraud him of the comfort of children: this was ordered to be puniſhed by a temporary exile. The foundation on which the practice is ſaid to have been allowed, was, that the fœtus, while *in utero*, was reputed as a part of the mother, ranked as one of her own viſcera, over which ſhe had the ſame power as over the reſt: beſides, that it was not reputed as a man, *homo;* nor to be alive, otherwiſe than as a vegetable: conſequently, that the crime amounted to little more than that of plucking unripe fruit from the tree. Seneca repreſents it as a peculiar glory of Helvia, that ſhe had never, like other women, whoſe chief ſtudy is their beauty and ſhape, deſtroyed the fœtus in her womb. The primitive fathers, Athenagoras, Tertullian, Minutius Felix, Auguſtin, &c. declaimed loudly againſt the practice as virtual murder. Several councils have condemned it. Yet we are told that the modern Romiſh eccleſiaſtical laws allow of diſpenſations for it. Egane mentions the rates at which a diſpenſation for it may be had.

The practice of artificial abortion is chiefly in the hands of women and nurſes, rarely in that of phyſicians; who, in ſome countries, are not admitted to the profeſſion without abjuring it. Hippocrates, in the oath he would have enjoined on all phyſicians, includes their not giving the *peſſus abortivus*, though elſewhere he gives the formal proceſs whereby he himſelf procured in a young woman a miſcarriage. It may, however, be obſerved, that often all the powers of art prove ineffectual, and no leſs often do the attempts prove the means of puniſhment by their fatal conſequences. Abortion || Abrabanel.

ABORTION, among gardeners, ſignifies ſuch fruits as are produced too early, and never arrive at maturity.

ABORTIVE, is, in general, applied to whatever comes before its legitimate time, or to any deſign which miſcarries.

Abortive Corn, a diſtemper of corn mentioned by M. Tillet, and ſuſpected to be occaſioned by inſects. It appears long before harveſt, and may be known by a deformity of the ſtalk, the leaves, the ear, and even the grain.

Abortive Vellum, is made of the ſkin of an abortive calf.

ABOTRITES, or ABODRITES, in *Hiſtory*, the name of a people bordering on Bulgaria in that part of Dacia contiguous to the Danube. The country of the Abodrites, now called Mecklenburg, was a part of the ancient Vandalia.

ABOUKIR, a ſmall town of Egypt, ſituated in the deſert between Alexandria and Roſetta. It is the ancient Canopus, and is ſituated, according to Mr Savary, ſix leagues from Pharos. Pliny ſays, from the teſtimonies of antiquity, that it was formerly an iſland: and its local appearance makes this credible; for the grounds around it are ſo low, that the ſea ſtill covered a part of them in the days of Strabo. The town is built upon a rock, which forms a handſome road for ſhipping, and was out of the reach of inundations. In the bay of Aboukir, a ſignal victory was obtained in 1798 by the Engliſh fleet over the French fleet. The town was taken from the Turks, after a vigorous defence, by the French in 1799, and retaken by the Engliſh in 1801.

ABOUT, the ſituation of a ſhip immediately after ſhe has tacked, or changed her courſe by going about and ſtanding on the other tack.—*About ſhip!* the order to the ſhip's crew for tacking.

ABOUTIGE, a town of Upper Egypt, in Africa, near the Nile, where they make the beſt opium in all the Levant. It was formerly a large, but now is a mean place. N. Lat. 26. 50.

ABRA, a ſilver coin ſtruck in Poland, and worth about one ſhilling ſterling. It is current in ſeveral parts of Germany, at Conſtantinople, Aſtracan, Smyrna, and Grand Cairo.

ABRABANEL, ABARBANEL, or AVRAVANEL, ISAAC, a celebrated rabbi, deſcended from King David, and born at Liſbon A. D. 1437. He became counſellor to Alphonſo V. king of Portugal, and afterwards to Ferdinand the Catholic; but in 1492 was obliged to leave Spain with the other Jews. In ſhort, after reſiding at Naples, Corfu, and ſeveral other cities, he died at Venice in 1508, aged 71. Abrabanel paſſed for one of the moſt learned of the rabbis; and the Jews gave him the names of the Sage, the Prince, and the Great Politician. We have a commentary of his on all the Old Teſtament, which is pretty ſcarce: he there principally adheres to the literal ſenſe; and his ſtyle is clear, but a little diffuſe. His other works are, A Treatiſe on the Creation of the World; in which he refutes Ariſtotle, who imagined that the world was eternal: A Treatiſe on the Explication of the Prophe-

cies

Abracadabra, Abraham.

cies relating to the Meſſiah, againſt the Chriſtians: A book concerning Articles of Faith; and ſome others leſs ſought after. Though Abrabanel diſcovers his implacable averſion to Chriſtianity in all his writings, yet he treated Chriſtians with politeneſs and good manners in the common affairs of life.

ABRACADABRA, a magical word, recommended by Serenus Samonicus as an antidote againſt agues and ſeveral other diſeaſes. It was to be written upon a piece of paper as many times as the word contains letters, omitting the laſt letter of the former every time, as in the margin †, and repeated in the ſame order; and then ſuſpended about the neck by a linen thread. *Abracadabra* was the name of a god worſhipped by the Syrians; ſo wearing his name was a ſort of invocation of his aid; a practice which, though not more uſeful, yet was leſs irrational, than is the equally heatheniſh practice among thoſe who call themſelves Chriſtians, of wearing various things, in expectation of their operating by a ſympathy, whoſe parents were Ignorance and Superſtition.

† abracadabra
abracadabr
abracadab
abracada
abracad
abraca
abrac
abra
abr
ab
a

ABRAHAM, the father and ſtock whence the faithful ſprung, was the ſon of Terah. He was deſcended from Noah by Shem, from whom he was nine degrees removed. Some fix his birth in the 130th year of Terah's age, but others place it in his father's 70th year. It is highly probable he was born in the city of Ur, in Chaldea, which he and his father left when they went to Canaan, where they remained till the death of Terah; after which, Abraham reſumed his firſt deſign of going to Paleſtine. The Scriptures mention the ſeveral places he ſtopped at in Canaan; his journey into Egypt, where his wife was carried off from him; his going into Gerar, where Sarah was again taken from him, but reſtored, as before; the victory he obtained over the four kings who had plundered Sodom; his compliance with his wife, who inſiſted that he ſhould make uſe of their maid Hagar in order to raiſe up children; the covenant God made with him, ſealed with the ceremony of circumciſion; his obedience to the command of God, who ordered him to offer up his only ſon as a ſacrifice, and how this bloody act was prevented; his marriage with Keturah; his death at the age of 175 years; and his interment in the cave of Machpelah, near the body of Sarah his firſt wife. It would be of little uſe to dwell long upon theſe particulars, ſince they are ſo well known. But tradition has ſupplied numberleſs others, the mention of one or two of which may not be unacceptable.

Many extraordinary particulars have been told relating to his converſion from idolatry. It is a pretty general opinion, that he ſucked in the poiſon with his milk; that his father made ſtatues, and taught that they were to be worſhipped as gods*. Some Jewiſh authors relate †, that Abraham followed the ſame trade with Terah for a conſiderable time. Maimonides ‡ ſays, that he was bred up in the religion of the Sabæans, who acknowledged no deity but the ſtars; that his reflections on the nature of the planets, his admiration of their motions, beauty and order, made him conclude there muſt be a being ſuperior to the machine of the univerſe, a being who created and governed it; however, according to an old tradition, he did not renounce Paganiſm till the 50th year of his age. It is related ||, that his father, being gone a journey, left him to ſell the ſtatues in his abſence; and that a man, who pretended to be a purchaſer, aſked him how old he was: Abraham anſwered, Fifty."—"Wretch that thou art (ſaid the other), for adoring at ſuch an age a being which is but a day old!" Theſe words greatly confounded Abraham. Some time afterwards, a woman brought him ſome flour, that he might give it as an offering to the idols; but Abraham, inſtead of doing ſo, took up a hatchet and broke them all to pieces, excepting the largeſt, into the hand of which he put the weapon. Terah, at his return, aſked whence came all this havock? Abraham made anſwer, that the ſtatues had had a great conteſt which ſhould eat firſt of the oblation; "Upon which (ſaid he), the god you ſee there, being the ſtouteſt, hewed the others to pieces with that hatchet." Terah told him this was bantering; for thoſe idols had not the ſenſe to act in this manner. Abraham retorted theſe words upon his father againſt the worſhipping of ſuch gods. Terah, ſtung with this raillery, delivered up his ſon to the cognizance of Nimrod, the ſovereign of the country: who exhorted Abraham to worſhip the fire; and, upon his refuſal, commanded him to be thrown into the midſt of the flames: "Now let your God (ſaid he) come and deliver you." But (adds the tradition) Abraham eſcaped from the flames unhurt.—This tradition is not of modern date, ſince it is told by St Jerome §; who ſeems to credit it in general, but diſbelieves that part of it which makes Terah ſo cruel as to be the informer againſt his own ſon. Perhaps the ambiguity of the word *Ur* * might have given riſe to the fiction altogether. Such as lay ſtreſs on the following words which God ſays to Abraham (Gen. xv. 7.), *I am the Lord that brought thee out of Ur of the Chaldees*, imagine that he ſaved him from a great perſecution, ſince he employed the very ſame words in the beginning of the decalogue to denote the deliverance from Egypt.

Abraham

§ *Tradit. Hebraic. in Geneſin.*

* It is the proper name of a city, and it alſo ſignified *fire*. The Lat. verſio Eſdras ix. has it thus *Qui eligiſti eum de igne Chaldeorum.*

Abraham is ſaid to have been well ſkilled in many ſciences, and to have wrote ſeveral books. Joſephus † tells us that he taught the Egyptians arithmetic and geometry; and according to Eupolemus and Artapan, he inſtructed the Phœnicians, as well as the Egyptians, in aſtronomy. A work which treats of the creation has been long aſcribed to him: it is mentioned in the Talmud ‡, and the rabbis Chanina and Hoſchia uſed to read it on the eve before the Sabbath. In the firſt ages of Chriſtianity, according to St Epiphanius ||, a heretical ſect, called *Sethinians*, diſperſed a piece which had the title of *Abraham's Revelation*. Origen mentions alſo a treatiſe ſuppoſed to be wrote by this patriarch. All the ſeveral works which Abraham compoſed in the plains of Mamre, are ſaid to be contained in the library of the monaſtery of the Holy Croſs on Mount Amaria in Ethiopia §. The book on the creation was printed at Paris 1552, and tranſlated into Latin by Poſtel: Rittangel, a converted Jew, and profeſſor at Konigſberg, gave alſo a Latin tranſlation of it, with remarks, in 1642.

† *Antiq.* lib. i. cap. 8.

‡ *Heidegger Hiſt. Patriarch.* tom. ii. p. 143.

|| *Adverſ. Har.* p. 236.

§ *Kirchem' Treatiſe of Libraries*, p. 142.

ABRAHAM *Ben Chaila*, a Spaniſh rabbi, in the 13th century, who profeſſed aſtrology, and aſſumed the character of a prophet. He pretended to predict the coming of the Meſſiah, which was to happen in the year 1358; but fortunately he died in 1303, fifty-five years before the time when the prediction was to be fulfilled.

* *Suidas in* Εαρωχ. See Joſ. xxiv. 2.

† *Apud Genebrand. in Chron.*

‡ *More Nevoch.* c. 29.

|| *Heidegger, Hiſt. Patriarch.* tom. iii. p. 36.

Abraham || Abraxas.

fulfilled. He wrote a book, *De Nativitatibus*, which was printed at Rome in 1545.

ABRAHAM USQUE, a Portugueſe Jew, who, in conjunction with Tobias Athias, tranſlated the Hebrew Bible into Spaniſh. It was printed at Ferrara, in 1553, and reprinted in Holland in 1630. This Bible, eſpecially the firſt edition, which is moſt valuable, is marked with ſtars at certain words, which are deſigned to ſhow that theſe words are difficult to be underſtood in the Hebrew, and that they may be uſed in a different ſenſe.

ABRAHAM, *Nicholas*, a learned Jeſuit, born in the diocеſe of Toul, in Lorrain, in 1489. He obtained the rank of divinity profeſſor in the univerſity of Pont-a-Mouſon, which he enjoyed 17 years, and died September 7. 1655. He wrote Notes on Virgil and on Nonnius; A Commentary on ſome of Cicero's Orations, in two vols. folio; an excellent collection of theological pieces in folio, entitled *Pharus Veteris Teſtamenti*; and A Hebrew Grammar in verſe.

ABRAHAMITES, an order of monks exterminated for idolatry by Theophilus in the ninth century. Alſo the name of another ſect of heretics who had adopted the errors of Paulus. See PAULICIANS.

ABRANTES, a town of Portugal, in Eſtremadura, ſeated on an eminence, in the midſt of gardens and olive trees, near the river Tajo, belongs to a marquis of the ſame name. It contains 35,000 inhabitants, four convents, an alms-houſe, and an hoſpital. W. Long. 7. 18. N. Lat. 39. 13.

ABRASAX, or ABRAXAS, the ſupreme god of the Baſilidian heretics. It is a myſtical or cabbaliſtic word, compoſed of the Greek letters α, σ, ρ, α, ξ, α, ς, which together, according to the Grecian mode of numeration, make up the number 365. For Baſilides taught, that there were 365 heavens between the earth and the empyrean; each of which heavens had its angel or intelligence, which created it; each of which angels likewiſe was created by the angel next above it; thus aſcending by a ſcale to the Supreme being, or firſt Creator. The Baſilidians uſed the word *Abraxas* by way of charm or amulet.

ABRASION is ſometimes uſed among medical writers for the effect of ſharp corroſive medicines or humours in wearing away the natural mucus which covs the membranes, and particularly thoſe of the ſtomach and inteſtines. The word is compoſed of the Latin *ab* and *rado*, *to ſhave* or *ſcrape off*.

ABRAVANNUS, in *Ancient Geography*, the name of a promontory and river of Galloway in Scotland, ſo called from the Celtic term *Aber*, ſignifying either the mouth of a river or the confluence of two rivers, and *Avon*, a river.

ABRAUM, in *Natural Hiſtory*, a name given by ſome writers to a ſpecies of red clay, uſed in England by the cabinetmakers, &c. to give a red colour to new mahogany wood. We have it from the iſle of Wight; but it is alſo found in Germany and Italy.

ABRAXAS, an antique ſtone with the word *abraxas* engraven on it. They are of various ſizes, and moſt of them as old as the third century. They are frequent in the cabinets of the curious; and a collection of them, as complete as poſſible, has been deſired by ſeveral. There is a fine one in the abbey of St Genevive, which has occaſioned much ſpeculation. Moſt of them ſeem to have come from Egypt: whence they are of ſome uſe for explaining the antiquities of that country. Sometimes they have no other inſcription beſides the word: but others have the names of ſaints, angels, or Jehovah himſelf annexed; though moſt uſually the name of the Baſilidian god. Sometimes there is a repreſentation of Iſis ſitting on a lotus, or Apis ſurrounded with ſtars; ſometimes monſtrous compoſitions of animals, obſcene images, Phalli and Ithyphalli. The graving is rarely good, but the word on the reverſe is ſometimes ſaid to be in a more modern ſtyle than the other. The characters are uſually Greek, Hebrew, Coptic, or Hetrurian, and ſometimes of a mongrel kind, invented, as it would ſeem, to render their meaning the more inſcrutable. It is diſputed whether the Veronica of Montreuil, or the granite obeliſk mentioned by Gori, be *Abraxaſes*.

Abreaſt || Abridgement.

ABREAST (a ſea term), ſide by ſide, or oppoſite to; a ſituation in which two or more ſhips lie, with their ſides parallel to each other, and their heads equally advanced. This term more particularly regards the line of battle at ſea, where on the different occaſions of attack, retreat, or purſuit, the ſeveral ſquadrons or diviſions of a fleet are obliged to vary their diſpoſitions, and yet maintain a proper regularity by ſailing in right or curved lines. When the line is formed abreaſt, the whole ſquadron advances uniformly, the ſhips being equally diſtant from and parallel to each other, ſo that the length of each ſhip forms a right angle with the extent of the ſquadron or line abreaſt. The commander in chief is always ſtationed in the centre, and the ſecond and third in command in the centres of their reſpective ſquadrons.—*Abreaſt*, within the ſhip, implies on a line with the beam, or by the ſide of any object aboard; as, the frigate ſprung a leak *abreaſt* of the main hatchway, i. e. on the ſame line with the main hatchway, croſſing the ſhip's length at right angles, in oppoſition to AFORE or ABAFT the hatchway.

ABRETENE, or ABRETTINE, in *Ancient Geography*, a diſtrict of Myſia, in Aſia. Hence the epithet *Abrettenus* given to Jupiter (Strabo); whoſe prieſt was Cleon, formerly at the head of a gang of robbers, and who received many and great favours at the hand of Antony, but afterwards went over to Auguſtus. The people were called *Abretteni*; inhabiting the country between Ancyra of Phrygia and the river Rhyndacus.

ABRIDGEMENT, in *Literature*, a term ſignifying the reduction of a book into a ſmaller compaſs.

The art of conveying much ſentiment in few words, is the happieſt talent an author can be poſſeſſed of. This talent is peculiarly neceſſary in the preſent ſtate of literature; for many writers have acquired the dexterity of ſpreading a few trivial thoughts over ſeveral hundred pages. When an author hits upon a thought that pleaſes him, he is apt to dwell upon it, to view it in different lights, to force it in improperly, or upon the ſlighteſt relations. Though this may be pleaſant to the writer, it tires and vexes the reader. There is another great ſource of diffuſion in compoſition. It is a capital object with an author, whatever be the ſubject, to give vent to all his beſt thoughts. When he finds a proper place for any of them, he is peculiarly happy. But rather than ſacrifice a thought he is fond of, he forces it in by way of digreſſion, or ſuperfluous illuſtration.

Abridgement.

illuſtration. If none of theſe expedients anſwer his purpoſe, he has recourſe to the margin, a very convenient apartment for all manner of pedantry and impertinence. There is not an author, however correct, but is more or leſs faulty in this reſpect. An abridger, however, is not ſubject to theſe temptations. The thoughts are not his own; he views them in a cooler and leſs affectionate manner; he diſcovers an impropriety in ſome, a vanity in others, and a want of utility in many. His buſineſs, therefore, is to retrench ſuperfluities, digreſſions, quotations, pedantry, &c. and to lay before the public only what is really uſeful. This is by no means an eaſy employment: To abridge ſome books, requires talents equal, if not ſuperior, to thoſe of the author. The facts, manner, ſpirit, and reaſoning muſt be preſerved; nothing eſſential, either in argument or illuſtration, ought to be omitted. The difficulty of the taſk is the principal reaſon why we have ſo few good abridgements: Wynne's abridgement of Locke's Eſſay on the Human Underſtanding, is perhaps the only unexceptionable one in our language.

Theſe obſervations relate ſolely to ſuch abridgements as are deſigned for the public. But,

When a perſon wants to ſet down the ſubſtance of any book, a ſhorter and leſs laborious method may be followed. It would be foreign to our plan to give examples of abridgements for the public: But as it may be uſeful, eſpecially to young people, to know how to abridge books for their own uſe. after giving a few directions, we ſhall exhibit an example or two, to ſhow with what eaſe it may be done.

Read the book carefully; endeavour to learn the principal view of the author; attend to the arguments employed: When you have done ſo, you will generally find, that what the author uſes as new or additional arguments, are in reality only collateral ones, or extenſions of the principal argument. Take a piece of paper or a common-place book, put down what the author wants to prove, ſubjoin the argument or arguments, and you have the ſubſtance of the book in a few lines. For example,

In the Eſſay on Miracles, Mr Hume's deſign is to prove, That miracles which have not been the immediate objects of our ſenſes, cannot reaſonably be believed upon the teſtimony of others.

Now, this argument (for there happens to be but one) is,

"That experience, which in ſome things is variable, "in others uniform, is our *only* guide in reaſoning "concerning matters of fact. A variable experience "gives riſe to probability only; an uniform experi- "ence amounts to a proof. Our belief of any fact "from the teſtimony of eye witneſſes is derived from "no other principle than our experience in the vera- "city of human teſtimony. If the fact atteſted be "miraculous, here ariſes a conteſt of two oppoſite "experiences, or proof againſt proof. Now, a mi- "racle is a violation of the laws of nature; and as a "firm and unalterable experience has eſtabliſhed theſe "laws, the proof againſt a miracle, from the very na- "ture of the fact, is as complete as any argument "from experience can poſſibly be imagined; and if "ſo, it is an undeniable conſequence, that it cannot be "ſurmounted by any proof whatever derived from hu- "man teſtimony."

Abridgement.

In Dr Campbell's Diſſertation on Miracles, the author's principal aim is to ſhow the fallacy of Mr Hume's argument; which he has done moſt ſucceſsfully by another ſingle argument, as follows:

"The evidence ariſing from human teſtimony *is not* "*ſolely* derived from experience: on the contrary, te- "ſtimony hath a natural influence on belief antecedent "to experience. The early and unlimited aſſent given "to teſtimony by children gradually contracts as they "advance in life: it is, therefore, more conſonant to "truth to ſay, that our *diffidence* in teſtimony is the "reſult of experience, than that our *faith* in it has this "foundation. Beſides, the uniformity of experience, "in favour of any fact, is not a proof againſt its be- "ing reverſed in a particular inſtance. The evidence "ariſing from the ſingle teſtimony of a man of known "veracity will go farther to eſtabliſh a belief in its be- "ing actually reverſed: If his teſtimony be confirmed "by a few others of the ſame character, we cannot "withhold our aſſent to the truth of it. Now, though "the operations of nature are governed by uniform "laws, and though we have not the teſtimony of our "ſenſes in favour of any *violation* of them; ſtill, if in "particular inſtances we have the teſtimony of *thou-* "*ſands* of our fellow-creatures, and thoſe too men of "ſtrict integrity, ſwayed by no motives of ambition or "intereſt, and governed by the principles of common "ſenſe, That they were actually eye witneſſes of theſe "violations, the conſtitution of our nature obliges us to "believe them."

Theſe two examples contain the ſubſtance of about 400 pages.—Making private abridgements of this kind has many advantages: It engages us to read with accuracy and attention; it fixes the ſubject in our minds; and, if we ſhould happen to forget, inſtead of reading the books again, by glancing a few lines, we are not only in poſſeſſion of the chief arguments, but recal in a good meaſure the author's method and manner.

Abridging is peculiarly uſeful in taking the ſubſtance of what is delivered by profeſſors, &c. It is impoſſible, even with the aſſiſtance of ſhort-hand, to take down, *verbatim*, what is ſaid by a public ſpeaker. Beſides, although it were practicable, ſuch a talent would be of little uſe. Every public ſpeaker has circumlocutions, redundancies, lumber, which deſerve not to be copied. All that is really uſeful may be comprehended in a ſhort compaſs. If the plan of the diſcourſe, and arguments employed in ſupport of the different branches, be taken down, you have the whole. Theſe you may afterwards extend in the form of a diſcourſe dreſſed in your own language. This would not only be a more rational employment, but would likewiſe be an excellent method of improving young men in compoſition; an object too little attended to in all our univerſities.

"The mode of reducing, ſays the author of the Curioſities of Literature, what the ancients had written in bulky volumes, practiſed in preceding centuries, came into general uſe about the fifth. As the number of ſtudents and readers diminiſhed, authors neglected literature, and were diſguſted with compoſition; for to write is ſeldom done, but when the writer entertains the hope of finding readers. Inſtead of original authors, there ſuddenly aroſe numbers of *abridgers*. Theſe men, amidſt the prevailing diſguſt

Abrincatarum, Abrogation.

for literature, imagined they ſhould gratify the public by introducing a mode of reading works in a few hours, which otherwiſe could not be done in many months; and, obſerving that the bulky volumes of the ancients lay buried in duſt, without any one condeſcending to examine them, the diſagreeable neceſſity inſpired them with an invention that might bring thoſe works and themſelves into public notice, by the care they took of renovating them. This they imagined to effect by forming abridgements of theſe ponderous volumes.

All theſe Abridgers, however, did not follow the ſame mode. Some contented themſelves with making a mere abridgement of their authors, by employing their own expreſſions, or by inconſiderable alterations. Others compoſed thoſe abridgements in drawing them from various authors, but from whoſe works they only took what appeared to them moſt worthy of obſervation, and dreſſed them in their own ſtyle. Others, again, having before them ſeveral authors who wrote on the ſame ſubject, took paſſages from each, united them, and thus formed a new work. They executed their deſign by digeſting in common places, and under various titles, the moſt valuable parts they could collect, from the beſt authors they read. To theſe laſt ingenious ſcholars, we owe the reſcue of many valuable fragments of antiquity. They happily preſerved the beſt maxims, the characters of perſons, deſcriptions, and any other ſubjects which they found intereſting in their ſtudies.

There have been learned men who have cenſured theſe Abridgers, as the cauſe of our having loſt ſo many excellent entire works of the ancients; for poſterity becoming leſs ſtudious, was ſatisfied with theſe extracts, and neglected to preſerve the originals, whoſe voluminous ſize was leſs attractive. Others on the contrary ſay, that theſe Abridgers have not been ſo prejudicial to literature, as ſome have imagined; and that had it not been for their care, which ſnatched many a periſhable fragment from that ſhipwreck of letters, which the barbarians occaſioned, we ſhould perhaps have had no works of the ancients remaining.

Abridgers, Compilers, and even Tranſlators, in the preſent faſtidious age, are alike regarded with contempt; yet to form their works with ſkill requires an exertion of judgement, and frequently of taſte, of which their contemners appear to have no conception. It is the great misfortune of ſuch literary labours, that even when performed with ability, the learned will not be found to want them, and the unlearned have not diſcernment to appreciate them."

ABRINCATARUM OPPIDUM, in *Ancient Geography*, the town of the *Abrincates* or *Abrincatui*; now *Avranches*, in France, ſituated on an eminence in the ſouth-weſt of Normandy, near the borders of Brittany, on the Engliſh channel. W. Long. 1. 10. N. Lat. 48. 40.

ABROGATION, the act of aboliſhing a law, by authority of the maker; in which ſenſe the word is ſynonymous with abolition, repealing, and revocation.

Abrogation ſtands oppoſed to *rogation*: it is diſtinguiſh from *derogation*, which implies the taking away only ſome part of a law; from *ſubrogation*, which denotes the adding a clauſe to it; from *obrogation*, which implies the limiting or reſtraining it; from *diſpenſation*, which only ſets it aſide in a particular inſtance; and from *antiquation*, which is the refuſing to paſs a law.

Abrokani Abruzzo.

ABROKANI, or MALLEMOLLI, a kind of muſlin, or clear, white, fine cotton cloth, brought from the Eaſt Indies, particularly from Bengal; being in length 16 French ells and 3 quarters, and in breadth 5 eighths.

ABROLHOS, in *Geography*, dangerous ſhoals or banks of ſand, about 20 leagues from the coaſt of Brazil. S. Lat. 18. 22. W. Long. 38. 45.

ABROMA, in *Botany*. See BOTANY *Index*.

ABROTANUM, in *Botany*. See ARTEMISIA, BOTANY *Index*.

ABROTONUM, in *Ancient Geography*, a town and harbour on the Mediterranean, in the diſtrict of Syrtis Parva in Africa; one of the three cities that formed Tripoly.

ABRUG-BANYA, in *Geography*, a populous town of Tranſylvania, in the diſtrict of Weiſſenburg. It is ſituated in a country which abounds with mines of gold and ſilver, and is the reſidence of the mine office, and chief of the metal towns. E. Long. 23. 24. N. Lat. 46. 50.

ABRUS, in *Botany*, the trivial name of the GLYCINE.

ABRUZZO, a province of Naples. The river Peſcara divides it into two parts; one of which is called Ulterior, of which *Aquila* is the capital; and the other Citerior, whoſe capital is *Chieti*. Beſides the Apennines, there are two conſiderable mountains, the one called Monte Cavallo, and the other Monte Majello; the top of which laſt is always covered with ſnow. Abruzzo is a cold country; but the rigour of the climate is not ſo great as to prevent the country from producing in abundance every thing requiſite for the ſupport of life. Vegetables, fruits, animals, and numberleſs other articles of ſuſtenance, not only furniſh ample proviſion for the uſe of the natives, but alſo allow of exportation. It produces ſo much wheat, that many thouſands of quarters are annually ſhipped off. Much Turkey wheat is ſent out, and the province of Teramo ſells a great deal of rice little inferior in quality to that of Lombardy. Oil is a plentiful commodity, and wines are made for exportation on many parts of the coaſt; but wool has always been, and ſtill is, their ſtaple commodity: the flocks, after paſſing the whole ſummer in the fine paſtures of the mountains, are driven for the winter into the warm plains of Puglia, and a few ſpots near their own coaſt, where the ſnow does not lie. There are no manufactures of woollens in the province, except two ſmall ones of coarſe cloth. The greateſt part of the wool is exported unwrought. No ſilk is made here, though mulberry trees would grow well in the low grounds.

Formerly the territory of Aquila furniſhed Italy almoſt excluſively with ſaffron; but ſince the culture of that plant has been ſo much followed in Lombardy, it has fallen to nothing in Abruzzo. In the maritime tracts of country the cultivation of liquorice has been increaſed of late years, but foreigners export the roots in their natural ſtate: in the province of Teramo there is a manufactory of pottery ware, for which there is a great demand in Germany, by the way of Trieſte, as it is remarkably hard and fine; but even this is going

Abruzzo. to decay, by being abandoned entirely to the ignorance of common workmen. It is not to be expected that any improvements will be made in arts and manufactures, where the encouragement and attention of superiors is wanting, and no pains taken to render the commodity more marketable, or to open better channels of sale for it. The only advantages these provinces enjoy, are the gift of benevolent nature; but she has still greater presents in store for them, and waits only for the helping hand of government to produce them. This whole coast, one hundred miles in length, is utterly destitute of sea ports; and the only spots where the produce can be embarked are dangerous inconvenient roads, at the mouths of rivers, and along a lee-shore: the difficulty of procuring shipping, and of loading the goods, frequently causes great quantities of them to rot on hand; which damps industry, and prevents all improvements in agriculture. The husbandman is a poor dispirited wretch, and wretchedness produces emigration: the uneven surface of the country occasions it to be inhabited by retail, if the expression may be used, rather than in large masses; for there is not a city that contains ten thousand people, and few of them exceed three thousand. Villages, castles, and feudatory estates are to be met with in abundance; but the numbers of their inhabitants are to be reckoned by hundreds, not thousands: in a word, the political and social system of the province shows no signs of the vigour which nature so remarkably displays here in all her operations.

The antiquary and the naturalist may travel here with exquisite pleasure and profit; the former will find treasures of inscriptions, and inedited monuments, belonging to the warlike nations that once covered the face of the country; the natural philosopher will have a noble field for observation in the stupendous mountains that rise on all sides. Monte-corno and Majello are among the most interesting. The first is like an aged monument of nature, bald, and horribly broken on every aspect: from various appearances, it is evident that its bowels contain many valuable veins of metallic ore; but the great difficulty of access renders the search of them almost impracticable. Majello has other merits, and of a gayer kind:—nature has clothed its declivities and elevated fields with an infinite variety of plants.

The character of the inhabitants varies a little among themselves, according to situation and climate, but essentially from the disposition of the natives of the more southern provinces. This proceeds from a difference of origin: for the Lombards, who were barbarians, but not cruel; poor, but hospitable; endowed with plain honest sense, though possessed of little acuteness or subtlety; remained peaceable proprietors of these mountainous regions, till the Normans, who were accustomed to a similar climate, came and dispossessed them. The Greeks who retained almost every other part of the kingdom under their dominion, never had any sway here. For this reason the Abruzzesi still bear a great resemblance to their northern progenitors or masters: to this day one may trace in them the same goodness of heart, but great indolence and repugnance to lively exertions; a fault that proceeds rather from a want of active virtue, than a disposition to wickedness. Hence it comes, that in these provinces, where the proximity of the frontier almost ensures impunity, fewer atrocious and inhuman deeds are heard of than in other parts of the realm. Remnants of ancient northern customs existed here so late as the beginning of this century, and, among the mountaineers, very evident traces of the Frank and Teutonic languages may be discovered. Absalom || Absimarus

ABSALOM, in *Scripture History*, the son of David by Maacah, was brother to Tamar, David's daughter, who was ravished by Amnon their eldest brother by another mother. Absalom waited two years for an opportunity of revenging the injury done to his sister: and at last procured the assassination of Amnon at a feast which he had prepared for the king's sons. He took refuge with Talmai king of Geshur; and was no sooner restored to favour, but he engaged the Israelites to revolt from his father. Absalom was defeated in the wood of Ephraim: as he was flying, his hair caught hold of an oak, where he hung till Joab came and thrust him through with three darts: David had expressly ordered his life to be spared, and extremely lamented him. The weight of Absalom's hair, which is stated at "200 shekels after the king's weight," has occasioned much critical discussion. If, according to some, the Jewish shekel of silver was equal to half an ounce avoirdupois, 200 shekels would be $6\frac{1}{4}$ pounds; or, according to Josephus, if the 200 shekels be equal to 5 minæ, and each mina $2\frac{1}{2}$ pounds, the weight of the hair would be $12\frac{1}{2}$ pounds, a supposition not very credible. It has been supposed by others, that the shekel here denotes a weight in gold equal to the value of the silver shekel, or half an ounce, which will reduce the weight of the hair to about 5 ounces; or that the 200 shekels are meant to express the value, not the weight. But it is not improbable, as some have alleged, that the whole difficulty has arisen from an error in transcribing the Hebrew numerals.

ABSCESS, in *Surgery*; from *abscedo*, to separate; a cavity containing *pus*; or a collection of puriform matter in a part: So called, because the parts which were joined are now separated; one part recedes from another, to make way for the collected matter. See SURGERY.

ABSCISSE, in *Conics*, a part of the diameter or transverse axis of a conic section, intercepted between the vertex or some other fixed point and a semiordinate. See CONIC SECTIONS.

ABSCONSA, a dark lantern used by the monks at the ceremony of burying their dead.

ABSENCE, in *Scots Law*: When a person cited before a court does not appear, and judgement is pronounced, that judgement is said to be *in absence*. No person can be tried criminally in absence.

ABSIMARUS, in *History*, having dethroned Leontius, cut off his nose and ears, and shut him up in a monastery, was proclaimed by the soldiers emperor of the East, A. D. 698. Leontius himself was also an usurper. He had dethroned Justinian II. who, afterwards, with the assistance of the Bulgarians, surprised and took Constantinople and made Absimarus prisoner. Justinian, now settled on the throne, and having both Absimarius and Leontius in his power, loaded them with chains, ordered them to lie down on the ground, and with a barbarous pleasure, held a foot on the neck of each for the space of an hour in presence of the people, who with shouts and exclamations sung, *Super aspidem*

Abſinthiated || Abſolute.

dem et baſiliſcum ambulabis, et conculcabis leonem et draconem. "Thou ſhalt walk on the aſp and the baſiliſk, and tread on the lion and the dragon." By the orders of Juſtinian, Abſimarus and Leontius were beheaded, A. D. 705.

ABSINTHIATED, any thing tinged or impregnated with abſinthium or wormwood. Bartholin mentions a woman whoſe milk was become abſinthiated, and rendered as bitter as gall, by the too liberal uſe of wormwood.

Vinum abſinthites, or *poculum abſinthiatum*, "wormwood wine," is much ſpoken of among the ancients as a wholeſome drink, and even an antidote againſt drunkenneſs. Its medical virtues depend on its aromatic and bitter qualities. Infuſed in wine or ſpirits, it may prove beneficial in caſes of indigeſtion or debility of the ſtomach.

ABSINTHIUM, in *Botany*, the trivial name of the common wormwood. See ARTEMISIA, BOTANY *Index*.

ABSIS, in *Aſtronomy*, the ſame with apſis. See APSIS.

ABSOLUTE, in a general ſenſe, ſomething that ſtands free or independent.

ABSOLUTE is more particularly underſtood of a being or thing which does not proceed from any cauſe, or does not ſubſiſt by virtue of any other being, conſidered as its cauſe; in which ſenſe, God alone is *abſolute*. *Abſolute*, in this ſenſe, is ſynonymous with *independent*, and ſtands oppoſed to *dependent*.

ABSOLUTE alſo denotes a thing that is free from conditions or limitations; in which ſenſe, the word is ſynonymous with *unconditional*. We ſay, an *abſolute* decree, *abſolute* promiſe, *abſolute* obedience.

ABSOLUTE Government, that in which the prince is left ſolely to his own will, being not limited to the obſervance of any laws except thoſe of his own diſcretion.

ABSOLUTE Equations, in *Aſtronomy*, is the aggregate of the optic and eccentric equations. The apparent inequality of a planet's motion, ariſing from its not being equally diſtant from the earth at all times, is called its optic equation, and would ſubſiſt even if the planet's real motion were uniform. The eccentric inequality is cauſed by the planet's motion being uniform. To illuſtrate which, conceive the ſun to move, or to appear to move, in the circumference of a circle, in whoſe centre the earth is placed. It is manifeſt, that if the ſun moves uniformly in this circle, it muſt appear to move uniformly to a ſpectator on the earth, and in this caſe there will be no optic nor eccentric equation; but ſuppoſe the earth to be placed out of the centre of the circle, and then, though the ſun's motion ſhould be really uniform, it would not appear to be ſo, when ſeen from the earth; and in this caſe there would be an optic equation, without an eccentric one. Imagine farther, the ſun's orbit to be not circular but elliptic, and the earth in its focus; it will be as evident that the ſun cannot appear to have an uniform motion in ſuch ellipſe: ſo that his motion will then be ſubject to two equations, the optic and the eccentric.

ABSOLUTE Number, in *Algebra*, is any pure number ſtanding in any equation without the conjunction of literal characters; as $2x + 36 = 48$; where 36 and 48 are abſolute numbers, but 2 is not, as being joined with the letter x.

Abſolution || Abſorption.

ABSOLUTION, in *Civil Law*, is a ſentence whereby the party accuſed is declared innocent of the crime laid to his charge.—Among the Romans, the ordinary method of pronouncing judgement was this: after the cauſe had been pleaded on both ſides, the præco uſed the word *dixerunt*, q. d. they have ſaid what they had to ſay; then three ballots were diſtributed to each judge, marked as mentioned under the article A; and as the majority fell of either mark, the accuſed was *abſolved* or condemned, &c. If he were abſolved, the prætor diſmiſſed him with *videtur non feciſſe*, or *jure videtur feciſſe*.

ABSOLUTION, in the *Canon Law*, is a juridical act, whereby the prieſt declares the ſins of ſuch as are penitent remitted.—The Romaniſts hold abſolution a part of the ſacrament of penance; the council of Trent, ſeſſ. xiv. cap. iii. and that of Florence, in the decree *ad Armenos*, declare the form or eſſence of the ſacrament to lie in the words of *abſolution*, I abſolve thee of thy ſins. The *formula* of abſolution, in the Romiſh church, is abſolute: in the Greek church, it is deprecatory; and in the churches of the reformed, declarative.

ABSOLUTION is chiefly uſed among Proteſtants for a ſentence by which a perſon who ſtands excommunicated, is releaſed or freed from that puniſhment.

ABSORBENT, in general, any thing poſſeſſing the faculty of *abſorbing*, or ſwallowing up another.

ABSORBENT Medicines, teſtaceous powders, or ſubſtances into which calcareous earth enters, as chalk, crabs eyes, &c. which are taken inwardly for drying up or abſorbing any acid or redundant humours in the ſtomach or inteſtines. They are likewiſe applied externally to ulcers or ſores with the ſame intention.

ABSORBENTS, or *ABSORBING Veſſels*, in *Anatomy*, a name given promiſcuouſly to the lacteal veſſels, lymphatics, and inhalant arteries, a minute kind of veſſels found in animal bodies, which imbibe fluids that come in contact with them. On account of their minuteneſs and tranſparency, they eſcape obſervation in ordinary diſſection. They have, however, been detected in every tribe of animals, and, in the animals which have been examined, in every part of the body. Thoſe which open into the ſtomach and inteſtines, and convey the chyle, which is a milky fluid, from theſe organs to the blood, have received the name of *lacteals*, or lacteal veſſels; and thoſe which open on the external ſurface, and the ſurface of all the cavities of the body, have been denominated *lymphatics*, from the lymph or colourleſs fluid which they contain. See ANATOMY.

ABSORBING, the ſwallowing up, ſucking up, or imbibing any thing: thus black bodies are ſaid to *abſorb* the rays of light; luxuriant branches, to *abſorb* or waſte the nutritious juices which ſhould feed the fruit of trees, &c.

ABSORPTION, in the animal economy, is the function of the abſorbent veſſels, or that power by which they take up and propel ſubſtances. This power has been aſcribed to the operation of different cauſes, according to the theories which phyſiologiſts have propoſed. Some attribute it to capillary attraction, others to the preſſure of the atmoſphere, and others to

Abſorption || Abſtemious.

an ambiguous or unknown cauſe, which they denominate *fuction*; for this laſt is nothing elſe than the elaſtic power of one part of the air reſtoring the equilibrium, which has been deſtroyed by the removal or rarefaction of another part.

Absorptions of the Earth, a term uſed by Kircher and others for the ſinking in of large tracts of land by means of ſubterranean commotions, and many other accidents.

Pliny tells us, that in his time the mountain Cymbotus, with the town of Curites, which ſtood on its ſide, were wholly abſorbed into the earth, ſo that not the leaſt trace of either remained; and he records the like fate of the city of Tantalis in Magneſia, and after it of the mountain Sypilus, both thus abſorbed by a violent opening of the earth. Galanis and Gamales, towns once famous in Phœnicia, are recorded to have met the ſame fate; and the vaſt promontory, called *Phegium*, in Ethiopia, after a violent earthquake in the night-time, was not to be ſeen in the morning, the whole having diſappeared, and the earth cloſed over it. Theſe and many other hiſtories, atteſted by the authors of greateſt credit among the ancients, abundantly prove the fact in the earlieſt ages; and there have not been wanting too many inſtances of more modern date. (*Kircher's Mund. Subter.* p. 77.)

Picus, a lofty mountain in one of the Molucca iſles, which was ſeen at a great diſtance, and ſerved as a land-mark to ſailors, was entirely deſtroyed by an earthquake; and its place is now occupied by a lake, the ſhores of which correſpond exactly to the baſe of the mountain. In 1556, a ſimilar accident happened in China. A whole province of the mountainous part of the country, with all the inhabitants, ſunk in a moment, and was totally ſwallowed up: The ſpace which was formerly land is alſo covered with an extenſive lake of water. And, during the earthquakes which prevailed in the kingdom of Chili, in the year 1646, ſeveral whole mountains of the Andes ſunk and diſappeared.

ABSORUS, Apsorus, Absyrtis, Absyrtides, Apsyrtides, Apsyrtis, and Absyrtium, (Strabo, Mela, Ptolemy); iſlands in the Adriatic, in the gulf of Carnero; ſo called from Abſyrtus, Medea's brother, there ſlain. They are either one iſland, or two ſeparated by a narrow channel, and joined by a bridge; and are now called *Cherſo* and *Oſero*.

ABSTEINEN, in *Geography*, a diſtrict near the river Memel in Little Lithuania. It is a mountainous country, but is fertile in grain, and abounds with ſheep and excellent horſes.

ABSTEMII, in church hiſtory, a name given to ſuch perſons as could not partake of the cup of the euchariſt on account of their natural averſion to wine. Calviniſts allow theſe to communicate in the ſpecies or bread only, touching the cup with their lip; which, on the other hand, is by the Lutherans deemed a profanation.

ABSTEMIOUS, is properly underſtood of a perſon who refrains abſolutely from all uſe of wine.

The hiſtory of Mr Wood, in the Medic. Tranſ. vol. ii. p. 261. art. 18. is a very remarkable exemplification of the very beneficial alterations which may be effected on the human body by a ſtrict courſe of abſtemiouſneſs.

The Roman ladies, in the firſt ages of the republic, were all enjoined to be abſtemious; and that it might appear, by their breath, whether or no they kept up to the injunction, it was one of the laws of the Roman civility, that they ſhould kiſs their friends and relations whenever they accoſted them. Abſtemiu || Abſtinence

ABSTEMIUS, Laurentius, a native of Macerata, profeſſor of belles lettres, in Urbino, and librarian of Duke Guido Ubaldo, under the pontificate of Alexander VI. He wrote, 1. Notes on moſt difficult paſſages of ancient authors. 2. Hecatomythium, i. e. A collection of an hundred fables, &c. which have been often printed with thoſe of Æſop, Phædrus, Gabrias, Avienus, &c. and a preface to the edition of Aurelius Victor publiſhed at Venice in 1505.

ABSTERGENT medicines, thoſe employed for reſolving obſtructions, concretions, &c. ſuch as ſoap, &c.

ABSTINENCE, in a general ſenſe, the act or habit of refraining from ſomething to which there is a ſtrong propenſity. Among the Jews, various kinds of abſtinence were ordained by their law. The Pythagoreans, when initiated, were enjoined to abſtain from animal food, except the remains of ſacrifices; and to drink nothing but water, unleſs in the evening, when they were permitted to take a ſmall portion of wine. Among the primitive Chriſtians, ſome denied themſelves the uſe of ſuch meats as were prohibited by that law, others regarded this abſtinence with contempt; of which St Paul gives his opinion, Rom. xiv. 1—3. The council of Jeruſalem, which was held by the apoſtles, enjoined the Chriſtian converts to abſtain from meats ſtrangled, from blood, from fornication, and from idolatry. Abſtinence, as preſcribed by the goſpel, is intended to mortify and reſtrain the paſſions, to humble our vicious natures, and by that means raiſe our minds to a due ſenſe of devotion. But there is another ſort of abſtinence, which may be called *ritual*, and conſiſts in abſtaining from particular meats at certain times and ſeaſons. It was the ſpiritual monarchy of the weſtern world which firſt introduced this ritual abſtinence; the rules of which were called *rogations*; but groſsly abuſed from the true nature and deſign of faſting. In England, abſtinence from fleſh has been enjoined by ſtatute ſince the Reformation, particularly on Fridays and Saturdays, on vigils, and on all commonly called *fiſh days*. The like injunctions were renewed under Queen Elizabeth: but at the ſame time it was declared, that this was done not out of motives of religion, as if there were any difference in meats; but in favour of the conſumption of fiſh, and to multiply the number of fiſhermen and mariners, as well as to ſpare the ſtock of ſheep. The great faſt, ſays St Auguſtin, is to abſtain from ſin.

Abstinence is more particularly uſed for a ſpare diet, or a ſlender parſimonious uſe of food. Phyſicians relate wonders of the effects of abſtinence in the cure of many diſorders, and protracting the term of life. The noble Venetian Cornaro, after all imaginable means had proved vain, ſo that his life was deſpaired of at 40, recovered, and lived to near 100, by the mere effect of abſtinence; as he himſelf gives the account. It is indeed ſurpriſing to what a great age the primitive Chriſtians of the eaſt, who retired from the perſecutions into the deſerts of Arabia and Egypt, lived,

Abſtinence

ved, healthful and cheerful, on a very little food. Caſſian aſſures us, that the common rate for 24 hours was 12 ounces of bread, and pure water: with ſuch frugal fare St Anthony lived 105 years; James the Hermit, 104; Arſenius, tutor of the emperor Arcadius, 120; St Epiphanius, 115; Simeon the Stylite, 112; and Romauld, 120. Indeed, we can match theſe inſtances of longevity at home. Buchanan informs us, that one Laurence arrived at the great age of 140 by force of temperance and labour; and Spotſwood mentions one Kentigern, afterwards called St Mongah or Mungo, who lived to 185 by the ſame means. Abſtinence, however, is to be recommended only as it means a proper regimen; for in general it muſt have bad conſequences when obſerved without a due regard to conſtitution, age, ſtrength, &c. According to Dr Cheyne, moſt of the chronical diſeaſes, the infirmities of old age, and the ſhort lives of Engliſhmen, are owing to repletion; and may be either cured, prevented, or remedied by abſtinence; but then the kinds of abſtinence which ought to be obſerved, either in ſickneſs or health, are to be deduced from the laws of diet and regimen.

Among the inferior animals, we ſee extraordinary inſtances of long abſtinence. The ſerpent kind, in particular, bear abſtinence to a wonderful degree. We have ſeen rattle-ſnakes which had lived many months without any food, yet ſtill retained their vigour and fierceneſs. Dr Shaw ſpeaks of a couple of ceraſtes (a ſort of Egyptian ſerpents), which had been kept five years in a bottle cloſe corked, without any ſort of food, unleſs a ſmall quantity of ſand in which they coiled themſelves up in the bottom of the veſſel may be reckoned as ſuch: yet when he ſaw them, they had newly caſt their ſkins, and were as briſk and lively as if juſt taken. But it is natural for divers ſpecies to paſs four, five, or ſix months every year, without either eating or drinking. Accordingly, the tortoiſe, bear, dormouſe, ſerpent, &c. are obſerved regularly to retire, at thoſe ſeaſons, to their reſpective cells, and hide themſelves, ſome in the caverns of rocks or ruins; others dig holes under ground; others get into woods, and lay themſelves up in the clefts of trees; others bury themſelves under water, &c. And theſe animals are found as fat and fleſhy, after ſome months abſtinence, as before.—Sir G. Ent * weighed his tortoiſe ſeveral years ſucceſſively, at its going to earth in October, and coming out again in March; and found, that of four pounds four ounces, it only uſed to loſe about one ounce. Indeed we have inſtances of men paſſing ſeveral months as ſtrictly abſtinent as other creatures. In particular, the records of the Tower mention a Scotchman impriſoned for felony, and ſtrictly watched in that fortreſs for ſix weeks, during which time he did not take the leaſt ſuſtenance; and on this account he obtained his pardon. Numberleſs inſtances of extraordinary abſtinence, particularly from morbid cauſes, are to be found in the different periodical Memoirs, Tranſactions, Ephemerides, &c. It is to be added, that, in moſt inſtances of extraordinary human abſtinence related by naturaliſts, there were ſaid to have been apparent marks of a texture of blood and humours, much like that of the animals above mentioned. Though it is no improbable opinion, that the air itſelf may furniſh ſomething for nutrition, it is certain, there are ſubſtances of all kinds, animal, vegetable, &c. floating in the atmoſphere, which muſt be continually taken in by reſpiration; and that an animal body may be nouriſhed thereby, is evident in the inſtance of vipers; which if taken when firſt brought forth, and kept from every thing but air, will yet grow very conſiderably in a few days. So the eggs of lizards are obſerved to increaſe in bulk, after they are produced, though there be nothing to furniſh the increment but air alone; in like manner as the eggs or ſpawn of fiſhes grow and are nouriſhed with the water. And hence, ſay ſome, it is that cooks, turnſpit dogs, &c. though they eat but little, yet are uſually fat. See FASTING.

Abſtinence
||
Abſtraction.

* *Phil. Tranſ.* N° 194.

ABSTINENTS, or ABSTINENTES, a ſect of heretics that appeared in France and Spain about the end of the third century. They are ſuppoſed to have borrowed part of their opinions from the Gnoſtics and Manicheans, becauſe they oppoſed marriage, condemned the uſe of fleſh meat, and placed the Holy Ghoſt in the claſs of created beings. We have, however, no certain account of their peculiar tenets.

ABSTRACT, in a general ſenſe, any thing ſeparated from ſomething elſe.

Abstract Idea, in *Metaphyſics*, is a partial idea of a complex object, limited to one or more of the component parts or properties, laying aſide or abſtracting from the reſt. Thus, in viewing an object with the eye, or recollecting it in the mind, we can eaſily abſtract from ſome of its parts or properties, and attach ourſelves to others: we can attend to the redneſs of a cherry, without regard to its figure, taſte, or conſiſtence. See ABSTRACTION.

Abstract Mathematics, otherwiſe called *Pure Mathematics*, is that which treats of magnitude or quantity, abſolutely and generally conſidered, without reſtriction to any ſpecies of particular magnitude; ſuch are Arithmetic and Geometry. In this ſenſe, abſtract mathematics is oppoſed to mixed mathematics; wherein ſimple and abſtract properties, and the relations of quantities primitively conſidered in pure mathematics, are applied to ſenſible objects, and by that means become intermixed with phyſical conſiderations: ſuch are Hydroſtatics, Optics, Navigation, &c.

Abstract Numbers, are aſſemblages of units, conſidered in themſelves, without denoting any particular and determinate things. Thus ſix is an abſtract number, when not applied to any thing; but if we ſay 6 feet, 6 becomes a concrete number. See the article NUMBER.

Abstract Terms, words that are uſed to expreſs abſtract ideas, Thus *beauty*, *uglineſs*, *whiteneſs*, *roundneſs*, *life*, *death*, are abſtract terms.

ABSTRACT, in *Literature*, a compendious view of any large work; ſhorter and more ſuperficial than an abridgement.

ABSTRACTION, in general, the art of abſtracting, or the ſtate of being abſtracted.

ABSTRACTION, in *Metaphyſics*, the operation of the mind when occupied by abſtract ideas. A large oak fixes our attention, and abſtracts us from the ſhrubs that ſurround it. In the ſame manner, a beautiful woman in a crowd, abſtracts our thoughts, and engroſſes our attention ſolely to herſelf. Theſe are examples of real abſtraction: when theſe, or any others of a ſimilar kind, are recalled to the mind after the objects themſelves

Abſtruſe
||
Abſyrtus.

themſelves are removed from our ſight, they form what are called *abſtract ideas*, or the mind is ſaid to be employed in abſtract ideas. But the power of abſtraction is not confined to objects that are ſeparable in reality as well as mentally: the ſize, the figure, the colour of a tree, are inſeparably connected, and cannot exiſt independent of each other; and yet we can mentally confine our obſervations to any one of theſe properties, neglecting or abſtracting from the reſt.

Abſtraction is chiefly employed theſe three ways. Firſt, When the mind conſiders any one part of a thing, in ſome reſpect diſtinct from the whole; as a man's arm, without the conſideration of the reſt of the body. Secondly, When we conſider the *mode* of any ſubſtance, omitting the ſubſtance itſelf; or when we ſeparately conſider ſeveral modes which ſubſiſt together in one ſubject. This abſtraction the geometricians make uſe of when they conſider the length of a body ſeparately, which they call *a line*, omitting the conſideration of its breadth and thickneſs. Thirdly, It is by abſtraction that the mind forms general or univerſal ideas: omitting the modes and relations of the particular objects whence they are formed. Thus, when we would underſtand a thinking being in general, we gather from our ſelf-conſciouſneſs what it is to think; and omitting thoſe things which have a particular relation to our own minds, or to the human mind, we conceive a thinking being in general.

Ideas formed in this manner, which are what we properly call *abſtract ideas*, become general repreſentatives of all objects of the ſame kind; and their names applicable to whatever exiſts conformable to ſuch ideas. Thus the idea of colour that we receive from chalk, ſnow, milk, &c. is a repreſentative of all of that kind; and has a name given it, *whiteneſs*, which ſignifies the ſame quality wherever found or imagined.

ABSTRUSE, ſomething deep, hidden, concealed, or far removed from common apprehenſions, and therefore not eaſily underſtood; in oppoſition to what is obvious and palpable. Thus metaphyſics is an abſtruſe ſcience; and the doctrine of fluxions, and the method *de maximis et minimis*, are abſtruſe points of knowledge.

ABSURD, an epithet applied to any thing that is contrary to human apprehenſion, and contradicts a manifeſt truth. Thus, it would be abſurd to ſay that 6 and 6 make only 10, or to deny that twice 6 make 12. When the term *abſurd* is applied to actions, it has the ſame import as *ridiculous*.

ABSURDUM, *reductio ad abſurdum*, is a mode of demonſtration employed by mathematicians when they prove the truth of a propoſition by demonſtrating that the contrary is impoſſible, or leads to an abſurdity. It is in this manner that Euclid demonſtrates the fourth propoſition of the firſt book of the Elements, by ſhowing that the contrary involves a manifeſt abſurdity, viz. "*That two ſtraight lines can incloſe a ſpace.*"

ABSYNTHIUM. See ARTEMISIA, BOTANY *Index*.

ABSYRTUS, in heathen mythology, the ſon of Æetes and Hypſea, and the brother of Medea. The latter running away with Jaſon, after her having aſſiſted him in carrying off the golden fleece, was purſued by her father; when, to ſtop his progreſs, ſhe tore Abſyrtus in pieces, and ſcattered his limbs in his way.

ABTHANES, in *Hiſtory*, a title of honour uſed by the ancient inhabitants of Scotland, who called their nobles *thanes*, which in the old Saxon ſignifies *king's miniſters*; and of theſe the higher rank were ſtyled *abthanes*, and thoſe of the lower *underthanes*.

Abthanes,
Abubeker.

ABUBEKER, or ABU-BECR, the firſt caliph, the immediate ſucceſſor of Mahomet, and one of his firſt converts. His original name was Abdulcaaba, ſignifying, *ſervant of the caaba* or *temple*, which, after his converſion to Mahometaniſm, was changed to Abdallah, *ſervant of God*; and on the marriage of the prophet with his daughter Ayeſha, he received the appellation of Abu Becr, *Father of the virgin*. Illuſtrious by his family, and poſſeſſed of immenſe wealth, his influence and example were powerful means of propagating the faith he had adopted, and in gaining converts to the new religion. Abubeker was a ſound believer, and although he lived in the greateſt familiarity with Mahomet, he had always the higheſt veneration for his character. He vouched for the truth of his revelations after his nightly viſits to heaven, and thus obtained the appellation of the *faithful*. He was employed in every miſſion of truſt or importance, was the conſtant friend of the prophet, and when he was forced to fly from Mecca, was his only companion. But notwithſtanding his blind devotion to Mahometaniſm, his moderation and prudence were conſpicuous in checking the fanatical zeal of the diſciples of the new religion, on the death of Mahomet. This event threatened deſtruction to the doctrines of Iſlamiſm. Its followers could not doubt that it had taken place, and they were afraid to believe it. In this uncertainty and fluctuation of belief, Omar drew his ſword, and threatened to cut in pieces all who dared to aſſert that the prophet was dead. Abubeker, with more coolneſs and wiſdom, addreſſed the people, *Is it*, ſays he, *Mahomet whom you adore, or the God whom he has revealed to you: Know that this God is alone immortal, and that all thoſe whom he has created are ſubject to death.* Appeaſed and reconciled by this ſpeech, they elected him ſucceſſor to Mahomet, and he aſſumed the modeſt title of caliph, which has continued with all his ſucceſſors. Ali, the ſon-in-law of the propiet, regarding the elevation of Abubeker as a violation of his legal rights to the ſucceſſion, refuſed at firſt to recogniſe the appointment, till he was forced by threats into compliance and ſubmiſſion. His partiſans, however, ſtill conſidered him as the legitimate ſucceſſor, and their opinion has prevailed among many Muſſulmans, who believe that the ſovereign authority, both ſpiritual and temporal, remains with his deſcendants.

The firſt part of the reign of Abubeker was unſettled and turbulent. Many of his ſubjects returned to idolatry, ſome embraced Chriſtianity, new impoſtors aroſe. Seduced by the example of Mahomet, they were dazzled with the hope of power and diſtinction, and were thus led on to deſtruction. He alone was received as the true prophet, all others were falſe. Abubeker, with the aſſiſtance of Caled, an able general, ſoon reduced to ſubmiſſion and obedience, or puniſhed with death, all thoſe who diſputed or reſiſted his authority. Tranquillity being eſtabliſhed at home, he ſent out his armies, under the ſame general, to propagate the Mahometan faith in Syria, which, after a bloody battle, was compelled to ſubmit to a new power, and to adopt a new religion. Damaſcus was afterwards beſieged; and

Abucco || Abundant.

and on the very day that it ſurrendered and opened its gates to his victorious arms, Abubeker expired in the 13th year of the Hegira.

The public conduct of this caliph was marked by prudence, equity, and moderation. Mild and ſimple in his manners, frugal in his fare, he diſcovered great indifference to riches and honours. Such was his liberality to the poor and to his ſoldiers, that he beſtowed on them the whole of his revenue. The treaſury being on his account quite exhauſted at his death, made Omar ſay, "that he had left a difficult example for his ſucceſſors to follow." A ſhort time before his death, he dictated his will in the following words: "This is the will of Abubeker, which he dictated at the moment of his departure from this world: At this moment when the infidel ſhall believe, when the impious ſhall no longer doubt, and liars ſhall ſpeak truth, I name Omar for my ſucceſſor. Muſſulmans, hear his voice, and obey his commands. If he rule juſtly, he will confirm the good opinion which I have conceived of him; but if he deviate from the paths of equity, he muſt render an account before the tribunal of the ſovereign judge. My thoughts are upright, but I cannot ſee into futurity. In a word, they who do evil, ſhall not always eſcaped with impunity." Abubeker firſt collected and digeſted the revelations of Mahomet, which had hitherto been preſerved in detached fragments, or in the memories of the Muſſulman believers; and to this the Arabians gave the appellation *Almoſhaf*, or the Book. The firſt copy was depoſited in the hands of Hafeſſa the daughter of Omar and the widow of Mahomet.

ABUCCO, Abocco, or Abochi, a weight uſed in the kingdom of Pegu. One abucco contains 12½ teccalis; two abuccos make a *giro* or *agire*; two *giri*, half a *hiza*; and a *hiza* weighs an hundred teccalis; that is, two pounds five ounces the heavy weight, or three pounds nine ounces the light weight of Venice.

ABUKESO, in *Commerce*, the ſame with Asian.

ABULFARAGIUS, Gregory, ſon of Aaron a phyſician, born in 1226, in the city of Malatia, near the ſource of the Euphrates in Armenia. He followed the profeſſion of his father; and practiſed with great ſucceſs: but he acquired a higher reputation by the ſtudy of the Greek, Syriac, and Arabic languages, as well as by his knowledge of philoſophy and divinity; and he wrote a hiſtory which does great honour to his memory. It is written in Arabic, and divided into dynaſties. It conſiſts of ten parts, being an epitome of univerſal hiſtory from the creation of the world to his own time. The parts of it relating to the Saracens, Tartar Moguls, and the conqueſts of Jenghis Khan, are eſteemed the moſt valuable. He profeſſed Chriſtianity, and was biſhop of Aleppo, and is ſuppoſed to have belonged to the ſect of the Jacobites. His contemporaries peak of him in a ſtrain of moſt extravagant panegyric. He is ſtyled the *king of the learned, the pattern of his times, the phœnix of the age, and the crown of the virtuous*. Dr Pococke publiſhed his hiſtory with a Latin tranſlation in 1663; and added, by way of ſupplement, a ſhort continuation relating to the hiſtory of the eaſtern princes.

ABUNA, the title given to the archbiſhop or metropolitan of Abyſſinia.

ABUNDANT NUMBER, in *Arithmetic*, is a number, the ſum of whoſe aliquot parts is greater than the number itſelf. Thus the aliquot parts of 12, being 1, 2, 3, 4, and 6, they make, when added together, 16. An abundant number is oppoſed to a *deficient* number, or that which is greater than all its aliquot parts taken together; as 14, whoſe aliquot parts are 1, 2, and 7, which make no more than 10: and to a *perfect* number, or one to which its aliquot parts are equal, as 6, whoſe aliquot parts are 1, 2, and 3. Abundantia || Abydos.

ABUNDANTIA, a heathen divinity, repreſented in ancient monuments under the figure of a woman with a pleaſing aſpect, crowned with garlands of flowers, pouring all ſorts of fruits out of a horn which ſhe holds in her right hand, and ſcattering grain with her left, taken promiſcuouſly from a ſheaf of corn. On a medal of Trajan ſhe is repreſented with two cornucopiæ.

ABUSAID Ebn Aljaptu, ſultan of the Moguls, ſucceeded his father, anno 717 of the Hegira. He was the laſt monarch of the race of Jenghis Khan, who held the undivided empire of the Moguls; for after his death, which happened the ſame year that Tamerlane was born, it became a ſcene of blood and deſolation, and was broken into ſeparate ſovereignties.

ABUS, in *Ancient Geography*, a river of Britain, formed by the confluence of the Ure, the Derwent, Trent, &c. falling into the German ſea, between Yorkſhire and Lincolnſhire, and forming the mouth of the Humber.

ABUSE, an irregular uſe of a thing, or the introducing ſomething contrary to the true intention thereof. In grammar, to apply a word *abuſively*, or in an *abuſive* ſenſe, is to miſapply or pervert its meaning.—A permutation of benefices, without the conſent of the biſhop, is termed *abuſive*, and conſequently null.

ABUTILON, in *Botany*, the trivial name of ſeveral ſpecies of the ſida. See Sida, Botany *Index*.

ABYDOS, in *Ancient Geography*, anciently a town built by the Mileſians, in Aſia, on the Helleſpont where it is ſcarce a mile over, oppoſite to Seſtos on the European ſide. Now both are called the *Dardanelles*. Abydos lay midway between Lampſacus and Ilium, famous for Xerxes's bridge, (Herodotus, Virgil); and for the loves of Leander and Hero, (Muſæus, Ovid;) celebrated alſo for its oyſters (Ennius, Virgil). The inhabitants were a ſoft effeminate people, given much to detraction; hence the proverb, *Ne temere Abydum calcare*, when we would caution againſt danger, (Stephanus).

Abydos, in *Ancient Geography*, an inland town of Egypt, between Ptolemais and Dioſpolis Parva, towards Syene; famous for the palace of Memnon and the temple of Oſiris. A colony of Mileſians; (Stephanus). It was the only one in the country into which the ſingers and dancers were forbidden to enter.

The city, reduced to a village under the empire of Auguſtus, now preſents to our view only a heap of ruins without inhabitants; but to the weſt of theſe ruins is ſtill found the celebrated tomb of Oſymandes. The entrance is under a portico 60 feet high, and ſupported by two rows of maſſy colums. The immoveable ſolidity of the edifice, the huge maſſes which compoſe it, the hieroglyphics it is loaded with, ſtamp it a work of the ancient Egyptians. Beyond it is a temple 300 feet long and 145 wide. Upon entering the monument we meet with an immenſe hall, the roof of which

Abydos || Abyſs.

which is ſupported by 28 columns 60 feet high, and 19 in circumference at the baſe. They are 12 feet diſtant from each other. The enormous ſtones that form the ceiling, perfectly joined and incruſted, as it were, one in the other, offer to the eye nothing but one ſolid platform of marble 126 feet long and 26 wide. The walls are covered with hieroglyphics. One ſees there a multitude of animals, birds, and human figures with pointed caps on their heads, and a piece of ſtuff hanging down behind, dreſſed in looſe robes that come down only to the waiſt. The ſculpture, however, is clumſy; the forms of the body, the attitudes and proportions of the members, ill obſerved. Amongſt theſe we may diſtinguiſh ſome women ſuckling their children, and men preſenting offerings to them. Here alſo we meet with the divinities of India. Monſieur Chevalier, formerly governor of Chandernagore, who reſided 20 years in that country, carefully viſited this monument on his return from Bengal. He remarked here the gods *Jaggrenate*, *Gones*, and *Vechnou* or *Wiſtnou*, ſuch as they are repreſented in the temples of Indoſtan. A great gate opens at the bottom of the firſt hall, which leads to an apartment 46 feet long by 22 wide. Six ſquare pillars ſupport the roof of it; and at the angles are the doors of four other chambers, but ſo choked up with rubbiſh that they cannot now be entered. The laſt hall, 64 feet long by 24 wide, has ſtairs by which one deſcends into the ſubterraneous apartments of this grand edifice. The Arabs, in ſearching after treaſure, have piled up heaps of earth and rubbiſh. In the part we are able to penetrate, ſculpture and hieroglyphics are diſcoverable as in the upper ſtory. The natives ſay that they correſpond exactly with thoſe above ground, and that the columns are as deep in the earth as their height above the ſurface. It would be dangerous to go far into thoſe vaults; for the air of them is ſo loaded with a mephitic vapour, that a candle can ſcarce be kept burning in them. Six lions heads, placed on the two ſides of the temple, ſerve as ſpouts to carry off the water. You mount to the top by a ſtaircaſe of a very ſingular ſtructure. It is built with ſtones incruſted in the wall, and projecting ſix feet out; ſo that being ſupported only at one end, they appear to be ſuſpended in the air. The walls, the roof, and the columns of this edifice, have ſuffered nothing from the injuries of time; and did not the hieroglyphics, by being corroded in ſome places, mark its antiquity, it would appear to have been newly built. The ſolidity is ſuch, that unleſs people make a point of deſtroying it, the building muſt laſt a great number of ages. Except the coloſſal figures, whoſe heads ſerve as an ornament to the capitals of the columns, and which are ſculptured *in relievo*, the reſt of the hieroglyphics which cover the inſide are carved in ſtone. To the left of this great building we meet with another much ſmaller, at the bottom of which is a ſort of altar. This was probably the ſanctuary of the temple of Oſiris.

ABYLA (Ptolemy, Mela); one of Hercules's pillars, on the African ſide, called by the Spaniards *Sierra de las Monas*, oppoſite to Calpe in Spain, the other pillar; ſuppoſed to have been formerly joined, but ſeparated by Hercules, and thus to have given entrance to the ſea now called the *Mediterranean*; the limits of the labours of Hercules (Pliny).

ABYSS, in a general ſenſe, denotes ſomething profound, and, as it were, bottomleſs. The word is originally Greek, ἄβυσσος; compounded of the privative α, and βυσσος, q. d. without a bottom. Abyſs.

Abyss, in a more particular ſenſe, denotes a deep maſs or fund of waters. In this ſenſe, the word is particularly uſed in the Septuagint, for the water which God created at the beginning with the earth, which encompaſſed it round, and which our tranſlators render by *deep*. Thus it is that darkneſs is ſaid to have been on the face of the abyſs.

Abyss is alſo uſed for an immenſe cavern in the earth, in which God is ſuppoſed to have collected all thoſe waters on the third day; which, in our verſion, is rendered the *ſeas*, and elſewhere the *great deep*. Dr Woodward, in his Natural Hiſtory of the Earth, aſſerts, That there is a mighty collection of waters encloſed in the bowels of the earth, conſtituting a huge orb in the interior or central parts of it; and over the ſurface of this water he ſuppoſes the terreſtrial ſtrata to be expanded. This, according to him, is what Moſes calls *the great deep*, and what moſt authors render *the great abyſs*. The water of this vaſt abyſs, he alleges, communicates with that of the ocean, by means of certain hiatuſes or chaſms paſſing betwixt it and the bottom of the ocean; and this and the abyſs he ſuppoſes to have one common centre, around which the water of both is placed; but ſo, that the ordinary ſurface of the abyſs is not level with that of the ocean, nor at ſo great a diſtance from the centre as the other, it being for the moſt part reſtrained and depreſſed by the ſtrata of earth lying upon it: but wherever theſe ſtrata are broken, or ſo lax and porous that water can pervade them, there the water of the abyſs aſcends; fills up all the cleſts and fiſſures into which it can get admittance; and ſaturates all the interſtices and pores of the earth, ſtone, or other matter, all around the globe, quite up to the level of the ocean.

The exiſtence of an abyſs or receptacle of ſubterraneous waters, is controverted by Camerarius *; and defended by Dr Woodward chiefly by two arguments: the firſt drawn from the vaſt quantity of water which covered the earth, in the time of the deluge; the ſecond, from the conſideration of earthquakes, which he endeavours to ſhow are occaſioned by the violence of the waters in this abyſs. A great part of the terreſtrial globe has been frequently ſhaken at the ſame moment; which argues, according to him, that the waters, which were the occaſion thereof, were coextended with that part of the globe. There are even inſtances of univerſal earthquakes; which (ſays he) ſhow, that the whole abyſs muſt have been agitated; for ſo general an effect muſt have been produced by as general a cauſe, and that cauſe can be nothing but the ſubterraneous abyſs †.

To this abyſs alſo has been attributed the origin of ſprings and rivers; the level maintained in the ſurfaces of different ſeas; and their not overflowing their banks. To the effluvia emitted from it, ſome even attribute all the diverſities of weather and change in our atmoſphere ‡. Ray ||, and other authors, ancient as well as modern, ſuppoſe a communication between the Caſpian ſea and the ocean by means of a ſubterranean abyſs: and to this they attribute it that the Caſpian does not overflow, notwithſtanding the great number of large rivers it receives, of which Kempfer reckons

* *Diſſert. Taur. Acta. Erud. ſupp.* tom. vi. p. 24.

† *Hiſt. of the Earth. Journal de Scavans*, tom. lviii. p. 393. *Memoirs of Literature*, tom. viii. p. 101, &c.

‡ *Holloway, Introd. to Woodward's Hiſt. of the Earth. Acta Erud.* 1727, p. 313.

|| *Phyſico-Theol.* Diſc. ii. c. 2. p. 76.

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kons above 45 in the compaſs of 60 miles; though others ſuppoſe that the daily evaporation may ſuffice to keep the level.

The different arguments concerning this ſubject may be ſeen collected and amplified in "Cockburn's Inquiry into the Truth and Certainty of the Moſaic Deluge," p. 271, &c. After all, however, this amazing theory of a central abyſs is far from being demonſtrated; it will perhaps in ſeveral reſpects appear inconſiſtent with ſound philoſophy, as well as repugnant to the phenomena of nature. In particular, if we believe any thing like elective attraction to have prevailed in the formation of the earth, we muſt believe that the ſeparation of the chaos proceeded from the union of ſimilar particles. It is certain that reſt is favourable to ſuch operations of nature. As, therefore, the central parts of the earth were more immediately quieſcent than thoſe remote from the centre, it [illegible] abſurd to ſuppoſe that the heavier and denſer bodies gave place to the more light and fluid; that the central part ſhould conſiſt of water only, and the more ſuperficial part of a cruſt or ſhell. Vid. "Whitehurſt's Inquiry into the original Formation of the Strata," &c. See DELUGE.

ABYSS is alſo uſed to denote hell; in which ſenſe the word is ſynonymus with what is otherwiſe called *Barathrum*, *Erebus*, and *Tartarus*; in the Engliſh Bible, the *bottomleſs pit*. The unclean ſpirits expelled by Chriſt, begged, *ne imperaret ut in abyſſum irent*, according to the vulgate; εις αβυσσον, according to the Greek, Luke viii. 31. Rev. ix. 1.

ABYSS is more particularly uſed, in *Antiquity*, to denote the temple of Proſerpine. It was thus called on account of the immenſe fund of gold and riches depoſited there; ſome ſay hid under ground.

ABYSS is alſo uſed in *Heraldry* to denote the centre of an eſcutcheon, In which ſenſe a thing is ſaid to be borne in abyſs, *en abyſme*, when placed in the middle of the ſhield, clear from any other bearing: He bears azure, a flower de lis, in abyſs.

ABYSSINIA, ABASSIA, or UPPER ETHIOPIA, in *Geography*, an empire of Africa within the torrid zone, which is comprehended between the 7th and 16th degrees N. Lat. and the 30th and 40th degrees of E. Long. By ſome writers of antiquity the title of *Ethiopians* was given to all nations whoſe complexion was black: hence we find the Arabians, as well as many other Aſiatics, ſometimes falling under this denomination; beſides a number of Africans whoſe country lay at a diſtance from Ethiopia properly ſo called. Thus the Africans in general were divided into the weſtern or Heſperian Ethiopians, and thoſe above Egypt ſituated to the eaſt; the latter being much more generally known than the former, by reaſon of the commerce they carried on with the Egyptians.

Different names.

From this account we may eaſily underſtand why there ſhould be ſuch a ſeeming diſagreement among ancient authors concerning the ſituation of the empire of Ethiopia, and likewiſe why it ſhould paſs under ſuch a variety of names. Sometimes, for example, it was named *India*, and the inhabitants *Indians*; an appellation likewiſe applied to many other diſtant nations. It was alſo denominated *Atlantia* and *Ethria*, and in the moſt remote periods of antiquity *Cephenia*; but more uſually *Abaſene*, a word ſomewhat reſembling *Abaſſia* or *Abyſſinia*, its modern names. On the other hand, we find Perſia, Chaldæa, Aſſyria, &c. ſtyled *Ethiopia* by ſome writers: and all the countries extending along the coaſts of the Red ſea were promiſcuouſly denominated *India* and *Ethiopia*. By the Jews the empire of Ethiopia was ſtyled *Cuſh* and *Ludim*. Abyſſinia.

Notwithſtanding this diverſity of appellations, and vaſt diffuſion of territory aſcribed to the Ethiopians, there was one country to which the title was thought more properly to belong than to any of the reſt; and which was therefore called *Ethiopia Propria*. This was bounded on the north by Egypt, extending all the way to the leſſer cataract of the Nile, and an iſland named *Elephantine*; on the weſt it had Libya Interior; on the eaſt the Red ſea, and on the ſouth unknown parts of Africa; though theſe boundaries cannot be fixed with any kind of preciſion. Situation of *Ethiopia Propria*.

In this country the ancients diſtinguiſhed a great variety of different nations, to whom they gave names either from ſome perſonal circumſtance, or from their manner of living. The principal of theſe were, 1. The *Blemmyes*, ſeated near the borders of Egypt; and who, probably from the ſhortneſs of their necks, were ſaid to have no heads, but eyes, mouths, &c. in their breaſts. Their form muſt have been very extraordinary, if we believe Vopiſcus, who gives an account of ſome of the captives of this nation brought to Rome. 2. The *Nobatæ*, inhabiting the banks of the Nile near the iſland Elephantine already mentioned, ſaid to have been removed thither by Oaſis to repreſs the incurſions of the Blemmyes. 3. The *Troglodytes*, by ſome writers ſaid to belong to Egypt, and deſcribed as little ſuperior to brutes. 4. The *Nubians*, of whom little more is known than their name, 5. The *Pigmies*, by ſome ſuppoſed to be a tribe of Troglodytes; but by others placed on the African coaſt of the Red ſea. 6. The *Aualitæ* or *Abalitæ*, of whom we know nothing more than that they were ſituated near the Abalitic gulf. 7. The *Struthiophagi*, ſo called from their feeding upon oſtriches, were ſituated to the ſouth of the Memnones. 8. The *Acridophagi*; 9. *Chelonophagi*; 10. *Ichthyophagi*; 11. *Cynamolgi*; 12. *Elephantophagi*; 13. *Rhizophagi*; 14. *Spermatophagi*; 15. *Hylophagi*; and, 16. *Ophiophagi*: all of whom had their names from the food they made uſe of, viz. locuſts, tortoiſes, fiſh, bitches milk, elephants, roots, fruits or ſeeds, and ſerpents. 17. The *Hylogones*, neighbours to the Elephantophagi, and who were ſo ſavage that they had no houſes, nor any other places to ſleep in but the tops of trees. 18. The *Pamphagi*, who uſed almoſt every thing indiſcriminately for food. 19. The *Agriophagi*, who lived on the fleſh of wild beaſts. 20. The *Anthropophagi*, or man-eaters, are now ſuppoſed to have been the Caffres, and not any inhabitants of Proper Ethiopia. 21. The *Hippophagi*, or horſe-eaters, who lay to the northward of Libya Incognita. 22. The *Macrobii*, a powerful nation, remarkable for their longevity; ſome of them attaining the age of 120 years. 23. The *Sambri*, ſituated near the city of Tenupſis in Nubia upon the Nile; of whom it is reported that all the quadrupeds they had, not excepting even the elephants, were deſtitute of ears. 24. The *Aſachæ*, a people inhabiting the mountainous parts, and continually employed in hunting elephants. Beſides theſe, there were a num- Different nations according to the ancients.

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ber of other nations or tribes, of whom we ſcarce know any thing but the names; as the Gapachi, Ptoemphanes, Catadupi, Pechini, Catadræ, &c.

First ſettlement.

In a country inhabited by ſuch a variety of nations, all in a ſtate of extreme barbariſm, it is rather to be wondered that we have any hiſtory at all, than that it is not more diſtinct. It has already been obſerved, that the Jews, from the authority of the ſacred writers no doubt, beſtowed the name of *Cuſh* upon the empire of Ethiopia: and it is generally agreed that Cuſh was the great progenitor of the inhabitants. In ſome paſſages of Scripture, however, it would ſeem that *Cuſh* was an appellation beſtowed upon the whole peninſula of Arabia, or at leaſt the greater part of it. In others, the word ſeems to denominate the country watered by the Araxes, the ſeat of the ancient Scythians or Cuſhites; and ſometimes the country adjacent to Egypt on the coaſt of the Red ſea.

A number of authors are of opinion, that Ethiopia received its firſt inhabitants from the country lying to the eaſt of the Red ſea. According to them, the deſcendants of Cuſh, having ſettled in Arabia, gradually migrated to the ſouth-eaſtern extremity of that country; whence, by an eaſy paſſage acroſs the ſtraits of Babelmandel, they tranſported themſelves to the African ſide, and entered the country properly called *Ethiopia*: a migration which, according to Euſebius, took place during the reſidence of the Iſraelites in Egypt; but, in the opinion of Syncellus, after they had taken poſſeſſion of Canaan, and were governed by judges.

Peopled originally from Arabia.

Abyſſinian tradition concerning it.

Mr Bruce makes mention of a tradition among the Abyſſinians, which, they ſay, has exiſted among them from time immemorial, that very ſoon after the flood, Cuſh the grandſon of Noah, with his family, paſſed through Atbara, then without inhabitants, till they came to the ridge of mountains which ſeparates that country from the high lands of Abyſſinia. Here, ſtill terrified with the thoughts of the deluge, and apprehenſive of a return of the ſame calamity, they choſe to dwell in caves made in the ſides of thoſe mountains, rather than truſt themſelves in the plains of Atbara; and our author is of opinion, that the tropical rains, which they could not fail to meet with in their journey ſouthward, and which would appear like the return of the deluge, might induce them to take up their habitations in theſe high places. Be this as it will, he informs us that it is an undoubted fact, "that here the Cuſhites, with unparalleled induſtry, and with inſtruments utterly unknown to us, formed to themſelves commodious, yet wonderful habitations in the heart of mountains of granite and marble, which remain entire in great numbers to this day, and promiſe to do ſo till the conſummation of all things."

Original habitations of the Cuſhites.

The Cuſhites having once eſtabliſhed themſelves among theſe mountains, continued to form habitations of the like kind in all the neighbouring ones; and thus following the different chains (for they never choſe to deſcend into the low country), ſpread the arts and ſciences, which they cultivated, quite acroſs the African continent from the eaſtern to the weſtern ocean. According to the tradition above mentioned, they built the city of Axum early in the days of Abraham. This, though now an inconſiderable village, was anciently noted for its ſuperb ſtructures, of which ſome remains are ſtill viſible. Among theſe are ſome belonging to a magnificent temple, originally 110 feet in length, and having two wings on each ſide; a double porch; and an aſcent of 12 ſteps. Behind this ſtand ſeveral obeliſks of different ſizes, with the remains of ſeveral others which have been deſtroyed by the Turks. There is alſo a great ſquare ſtone with an inſcription, but ſo much effaced that nothing can be diſcovered excepting ſome Greek and Latin letters, and the word *Baſilius*. Mr Bruce mentions ſome "prodigious fragments of coloſſal ſtatues of the dog-ſtar" ſtill to be ſeen at this place; and "*Sirr* (adds he), which, in the language of the Troglodytes, and in that of the low country of Meroe, exactly correſponding to it, ſignifies a *dog*, inſtructs us in the reaſon why this province was called *Sirè*, and the large river which bounds it *Sirr*."

Description of the city of Axum.

Abyſſinia.

Soon after building the city of Axum, the Cuſhites founded that of Meroe, the capital of a large iſland or peninſula formed by the Nile, much mentioned by ancient hiſtorians, and where, according to Herodotus, they purſued the ſtudy of aſtronomy in very early ages with great ſucceſs. Mr Bruce gives two reaſons for their building this city in the low country, after having built Axum in the mountainous part of Abyſſinia. 1. They had diſcovered ſome inconveniencies in their caves both in *Sirè* and the country below it, ariſing from the tropical rains in which they were now involved; and which prevented them from making the celeſtial obſervations to which they were ſo much addicted. 2. It is probable that they built this city farther from the mountains than they could have wiſhed, in order to avoid the fly with which the ſouthern parts were infeſted. This animal, according to Mr Bruce, who has given a figure of it, is the moſt troubleſome to quadrupeds that can be imagined. He informs us, that it infeſts thoſe places within the tropical rains where the ſoil is black and loamy, and no other place whatever. It is named *zimb* (by whom we are not informed), and has not been deſcribed by any other naturaliſt. It is of a ſize ſomewhat larger than a bee, thicker in proportion, and having broader wings, placed ſeparate like thoſe of a fly, and quite colourleſs, or without any ſpots. The head is large, with a ſharp upper jaw; at the end of which is a ſtrong pointed hair about a quarter of an inch long; and the lower jaw has two of theſe hairs: all of which together make a reſiſtance to the finger equal to that of a ſtrong hog's briſtle. One or all of theſe hairs are uſed as weapons of offence to the cattle; but what purpoſe they anſwer to the animal itſelf, our author does not ſay. So intolerable, however, are its attacks to the cattle, that they no ſooner hear its buzzing, than they forſake their food, and run about till they fall down with fright, fatigue, and hunger. Even the camel, though defended by a thick and ſtrong ſkin with long hair, cannot reſiſt the punctures of this inſect; which ſeem to be poiſonous, as they produce large putrid ſwellings on the body, head, and legs, which at laſt terminate in death. To avoid this dreadful enemy, the cattle muſt all be removed as quick as poſſible to the ſandy parts of Atbara, where they ſtay as long as the rains laſt, and where this dreadful enemy never ventures to follow them. The elephant and rhinoceros, who, on account of the quantity of food they require, cannot remove to theſe barren places, roll themſelves in the mud, which when dry, coats them over ſo hard, that

Meroe why founded.

Deſcription of a peſtilential fly.

Abyſſinia. that they are enabled to reſiſt the punctures of the inſect; though even on theſe ſome tubercles are generally to be met with, which our author attributes to this cauſe. Mr Bruce is of opinion, that this is the fly mentioned by Iſaiah, chap. vii. 18. 19. "And it ſhall come to paſs, in that day, that the Lord ſhall *hiſs* for the fly that is in the uttermoſt part of the rivers of Egypt; and they ſhall come and ſhall reſt all of them in the deſolate valleys, and in the holes of the rocks, and upon all thorns, and upon all buſhes." 'That is (ſays Mr Bruce), they ſhall cut off from the cattle their uſual retreat to the deſert, by taking poſſeſſion of theſe places, and meeting them there, where ordinarily they never come, and which therefore are the refuge of the cattle.'

Meroe, which lay in N. Lat. 16°, the exact limit of the tropical rains, was without the bounds aſſigned by nature to theſe deſtructive inſects; and conſequently a place of refuge for the cattle. Mr Bruce, on his return through the deſert, ſaw at Gerri, in this latitude, ruins, ſuppoſed to be thoſe of Meroe, and caves in the mountains immediately above them; for he is of opinion, that they did not abandon their caverns immediately after they began to build cities. As a proof of this, he mentions that Thebes, in Upper Egypt, was built by a colony of Ethiopians; and that near the ruins of that city, a vaſt number of caves are to be ſeen even up to the top of a mountain in the neighbourhood: all of which are inhabited at this day. By degrees, however, they began to exchange theſe ſubterraneous habitations for the cities they built above ground; and thus became farmers, artificers, &c. though originally their ſole employment had been commerce.

Magnificence of the ancient Indians and Egyptians.

On this ſubject Mr Bruce has given a very curious diſſertation; though how far the application of it to the Ethiopians may be juſt, we cannot pretend to determine. He begins with obſerving, that the magnificence of the Indians and Egyptians has been celebrated from the moſt remote antiquity, without any account of the ſources from whence all this wealth was derived: and indeed it muſt be owned, that in all hiſtories of theſe people, there is a ſtrange deficiency in this reſpect. The kings, we are to ſuppoſe, derived their ſplendour and magnificence from their ſubjects; but we are quite at a loſs to know whence their ſubjects had it: and this ſeems the more ſtrange, that in no period of their hiſtory are they ever repreſented in a poor or mean ſituation. Nor is this difficulty confined to theſe nations alone. Paleſtine, a country producing neither ſilver nor gold, is repreſented by the ſacred writers as abounding in the early ages with both thoſe metals in a much greater proportion than the moſt powerful European ſtates can boaſt of, notwithſtanding the vaſt ſupplies derived from the lately diſcovered continent of America. The Aſſyrian empire, in the time of Semiramis, was ſo noted for its wealth, that M. Monteſquieu ſuppoſes it to have been obtained by the conqueſt of ſome more ancient and richer nation; the ſpoils of which enriched the Aſſyrians, as thoſe of the latter afterwards did the Medes. This, however, Mr Bruce very juſtly obſerves, will not remove the difficulty, becauſe we are equally at a loſs to know whence the wealth was derived to that former nation; and it is very unuſual to find an empire or kingdom of any extent enriched by conqueſt. The kingdom of Macedon, for inſtance, though Alexander the Great overran and plundered in a very ſhort time the richeſt empire in the world, could never vie with the wealth of Tyre and Sidon. Theſe laſt were commercial cities; and our author juſtly conſiders commerce as the only ſource from whence the wealth of a large kingdom ever was or could be derived. The riches of Semiramis, therefore, were accumulated by the Eaſt India trade centering for ſome time in her capital. While this was ſuffered to remain undiſturbed, the empire flouriſhed: but by an abſurd expedition againſt India itſelf, in order to become miſtreſs at once of all the wealth it contained, ſhe loſt that which ſhe really poſſeſſed; and her empire was ſoon after entirely ruined. To the ſame ſource he attributes the riches of the ancient Egyptians; and is of opinion, that Seſoſtris opened up to Egypt the commerce with India by ſea; though other authors ſpeak of that monarch in very different terms. As the luxuries of India have ſomehow or other become the objects of deſire to every nation in the world, this eaſily accounts for the wealth for which Egypt has in all ages been ſo much celebrated, as well as for that with which other countries abounded; while they ſerved as a medium for tranſmitting thoſe luxuries to other nations, and eſpecially for the riches of thoſe which naturally produced the Indian commodities ſo much ſought after. This was the caſe particularly with Arabia, ſome of the productions of which were very much coveted by the weſtern nations; and being, beſides, the medium of communication between the Eaſt Indies and weſtern nations, it is eaſy to ſee why the Arabian merchants ſoon became poſſeſſed of immenſe wealth.

Beſides the territories already mentioned, the Cuſhites had extended themſelves along the mountains which run parallel to the Red ſea on the African ſide; which country, according to Mr Bruce, has "in all times been called *Sabo*, or *Azabo*, both which ſignify *South;* an epithet given from its lying to the ſouthward of the Arabian gulf, and which in ancient times was one of the richeſt and moſt important countries in the world. "By that acquiſition (ſays our author), they enjoyed all the perfumes and aromatics in the eaſt; myrrh, and frankincenſe, and caſſia; all which grow ſpontaneouſly in that ſtripe of ground from the bay of Bilur weſt of Azab to Cape Gardafui, and then ſouthward up in the Indian ocean, to near the coaſt of Melinda, where there is cinnamon, but of an inferior kind." As the Cuſhites or Troglodytes advanced ſtill farther ſouth, they met not only with mountains, in which they might excavate proper habitations, but likewiſe with great quantities of gold and ſilver furniſhed by the mines of Sofala, which, our author ſays, furniſhed "large quantities of both metals in their pure and unmixed ſtate, lying in globules without any alloy or any neceſſity of preparation or ſeparation." In other parts of his work, he labours to prove Sofala to have been the *Ophir* mentioned in Scripture.

Thus the Ethiopians, for ſome time after their ſettlement, according to Mr Bruce, muſt have been a nation of the firſt importance in the world. The northern colonies from Meroe to Thebes built cities, and made improvements in architecture; cultivated commerce, agriculture, and the arts; not forgetting

The Ethiopians at firſt a civilized and learned people.

Abyſſinia.

the ſcience of aſtronomy, for which they had an excellent opportunity by reaſon of the clearneſs of the ſky in the Thebaid. Their brethren farther to the ſouth, or thoſe who inhabited Ethiopia properly ſo called, were confined for ſix months to their caves by reaſon of the tropical rains, whence they were naturally led to purſuits of another kind. "Letters *, at leaſt one kind of them, and arithmetical characters (we are told), were invented by this middle part of the Cuſhites; while trade and aſtronomy, the natural hiſtory of the winds and ſeaſons, were what neceſſarily employed that part of the colony eſtabliſhed at Sofala moſt to the ſouthward."

* *Bruce's Travels.*

Account of the Ethiopian Shepherds.

While the Cuſhites were thus employed at home in collecting gold, gathering and preparing ſpices, &c. theſe commodities were ſent abroad into other countries by another ſet of people, named *Shepherds*, who acted as carriers to them, and who afterwards proved ſo formidable to the Egyptians. Theſe differed in their appearance from the Ethiopians, having long hair, and the features of Europeans; and were of a very dark complexion, though not at all like the blackmoors or negroes. They lived in the plain country in huts or moveable habitations, attending their cattle, and wandering up and down as various circumſtances required. By acting as carriers to the Cuſhites, they became a great and powerful people, poſſeſſing vaſt numbers of cattle, as well as a very conſiderable extent of territory. They poſſeſſed a ſtripe of land along the Indian ocean; and to the northward of that another along the Red ſea: but their principal habitation was the flat part of Africa between the northern tropic and the mountains of Abyſſinia, which country is now called *Beja*. This reaches from Maſuah along the ſea-coaſt to Suakem; then turns weſtward, and continues in that direction, having the Nile on the ſouth, the tropic of Cancer on the north, with the deſerts of Selima and Libya on the weſt. The next diſtrict belonging to theſe people was Meroe, now called *Atbara*, lying between the rivers Nile and Aſſaboras. A third diſtrict, now called *Derkin*, is a ſmall plain lying between the river Mareb on the eaſt, and Atbara on the weſt. But the moſt noble and warlike of all the Shepherds were thoſe who poſſeſſed the mountains of Habab, reaching from the neighbourhood of Maſuah to Suakem; which diſtrict is ſtill inhabited by them.

Different claſſes of them.

Theſe Shepherds, according to our author, were diſtinguiſhed by ſeveral different appellations, which may be ſuppoſed to denote different degrees of rank among them. Thoſe called ſimply *Shepherds*, our author ſuppoſes to have been the common ſort who attended the flocks. Another ſet were called *Hycſos* or *Agſos*, ſignifying "armed ſhepherds," who are ſuppoſed to have been the ſoldiers. A third were named *Agag*, ſuppoſed to be the chiefs or nobles of theſe armed ſhepherds; whence the title of *king of kings*, according to Mr Bruce, is derived; and he ſuppoſes *Agag* killed by Samuel to have been an Arabian ſhepherd.

The building of Carthage augmented the power of the Shepherds to a conſiderable degree, by reaſon of the vaſt quantity of carriage naturally belonging to a place of ſuch extenſive commerce, and which fell into the hands of the Lehabim, Lubim, or Libyan peaſents. An immenſe multitude of camels, in the early ages, anſwered the purpoſe of navigation: and thus we find that commerce was carried on by the Iſhmaelites as early as the days of Joſeph, from the ſouthern extremity of the Arabian peninſula. Theſe Shepherds, however, though generally the friends and allies of the Egyptians, who were alſo Cuſhites, ſometimes proved very bitter enemies to them, as is related in the hiſtory of that country. The reaſon of this may be deduced from the great oppoſition betwixt their manners and cuſtoms. The Egyptians worſhipped black cattle, which the Shepherds killed and uſed as food; the latter worſhipped the heavenly bodies, while the Egyptians were the groſſeſt idolaters, and worſhipped idols of all kinds that can be imagined. Hence a mere difference in religion might occaſion many bloody quarrels; though, if the above account can be depended upon as authentic, it is natural to imagine that the mutual connection of intereſts ſhould have cemented their friendſhip, whatever difference there might happen to be in opinions of any kind.

Abyſſinia.

Reaſon of the enmity between the Shepherds and Egyptians.

Beſides the Cuſhites and Shepherds, however, we muſt now ſeek for the origin of thoſe different nations which have already been mentioned. Mr Bruce allows that there are various nations inhabiting this country, who are fairer than either the Cuſhites or the Shepherds, and which, though they have each a particular name, are all known by the general title of *Habeſk*; which may be tranſlated by the Latin word *convenæ*, ſignifying a number of diſtinct people meeting accidentally in one place; and which our author maintains againſt Scaliger, Ludolf, and a number of others, to be a very juſt tranſlation, and quite conſonant to the hiſtory of the country.

Origin of the different Ethiopian nations.

The moſt authentic ancient hiſtory of this country, according to Mr Bruce, is the chronicle of Axum; the character of which, among the modern Abyſſinians, ſtands next to the ſacred writings themſelves; and conſequently muſt be eſteemed the higheſt Abyſſinian authority we have on the ſubject. According to this book, there was an interval of 5500 years between the creation of the world and the birth of Chriſt; 1808 years before which laſt event the empire of Abyſſinia or Ethiopia received its firſt inhabitants. Two hundred years after its ſettlement, it was ſo deſtroyed by a flood that it received the name of *Curé Midra*, or a country laid waſte; "or (ſays our author) as it is called in Scripture, *a land which the waters or floods had ſpoiled*," (Iſaiah xviii. 2.) The peopling of the country was finiſhed about 1400 years before Chriſt, by the ſettlement of a great number of people, ſpeaking different languages, who ſat down peaceably in the high lands of Tigré, in the neighbourhood of the Shepherds, with whom they were in friendſhip. Theſe people, according to tradition, came from Paleſtine; and our author is inclined to believe the whole of the relation to be true, as the time coincides with the expulſion of the Canaanitiſh nations by Joſhua, which happened about 1490 B. C. ten years before which there had been, according to Pauſanias, a flood in Ethiopia, which occaſioned prodigious deva ſtation. Ethiopia, he thinks, would afford the moſt ready aſylum for the fugitive Canaanites, as they muſt have long had a commercial intercourſe with that country; and he ſupports the opinion likewiſe from what Procopius mentions of two pillars extant in his time, on the coaſt

First ſettlement of Ethiopia, according to the Abyſſinian hiſtory.

The country laid waſte by a deluge.

Abyſſinia.

coaſt of Mauritania, with the following inſcription in the Phœnician language: "We are Canaanites, flying from the face of Joſhua the ſon of Nun, the robber." The authenticity of theſe inſcriptions, however, is much diſputed, and therefore it cannot go a great way in eſtabliſhing any hiſtorical point. The firſt and moſt conſiderable of the colonies above mentioned ſettled in the province of Amhara; the ſecond in Damot, one of the ſouthern provinces; the third in another province called *Laſta*, or *Tcheratza-Agow*, from *Tchera* their principal habitation; and a fourth in the territory of Galat.

Our author goes on to prove, that the Ethiopians in ancient times were not only the moſt learned people in the world, but that they ſpoke the original language, and were the inventors of writing. In what manner they came to degenerate from this character, and into their preſent ſtate of barbarity, cannot be known; this being a phenomenon equally unaccountable with the degeneracy of the Egyptians. Ethiopia conquered by Moſes.

According to ſome authors, the Ethiopians were conquered by Moſes; of which tranſaction we have the following account. Before the time of that legiſlator, the Ethiopians poſſeſſed the country of Thebais in Egypt: but, not content with this, they made an irruption into Lower Egypt, and penetrated as far as Memphis; where, having defeated the Egyptians, they threatened the kingdom with total deſtruction. The Egyptians, by the advice of their oracles, put Moſes at the head of their forces; who immediately prepared for invading the enemy's country. The Ethiopians imagined that he would march along the banks of the Nile; but Moſes choſe rather to paſs through ſome of the interior countries, though greatly infeſted with ſerpents, and where conſequently his march muſt be attended with much danger. To preſerve his men, he conſtructed a number of cheſts or panniers of the Egyptian reed papyrus, which he filled with the birds named *Ibis*, celebrated for their antipathy to ſerpents. As ſoon as he approached the tract abounding with theſe reptiles, a ſufficient number of the birds were let out, who preſently cleared the way for the army by deſtroying the ſerpents. Thus the Ethiopians were ſurpriſed in their own country, where they had dreaded no invaſion; their forces, being defeated in the field, were at laſt ſhut up in the capital Meroe, a city almoſt impregnable, by being ſurrounded with three rivers, the Nile, Aſtapus, and Aſtaboras. The daughter of the Ethiopian monarch, however, having an opportunity of ſeeing Moſes from the walls, fell in love with him, and offered to deliver up the city, provided he would ſwear to marry her. With this requiſition the Jewiſh legiſlator complied; but treated the inhabitants with great ſeverity, plundering the city, and putting many of the inhabitants to death. After this he ravaged the whole country, diſmantled all the places of ſtrength; and having thus rendered the Ethiopians incapable of attempting any thing againſt other nations for a conſiderable time, he returned in triumph to Egypt, after an abſence of ten years.

From the time of Moſes to that of Solomon, there is a chaſm in the Ethiopic hiſtory. After this, however, we are furniſhed with ſome kind of regular accounts. The hiſtory commences with the queen of Sheba, who came to viſit the Jewiſh monarch, and whom the Abyſſinians ſuppoſe to have been ſovereign of Ethiopia Propria; but Mr Bruce is of opinion that ſhe was only ſovereign of that territory on the eaſtern coaſt of Africa named *Saba*, which he ſays ought to be her title inſtead of *Sheba*. In favour of this opinion, he likewiſe urges, that it was cuſtomary for the Sabeans, or inhabitants of the African diſtrict named *Saba*, to be governed by women; whereas thoſe who inhabited the oppoſite ſide of the Arabian gulf, and who were named *Sabæan Arabs* or *Homerites*, were not only governed by kings, but would not allow their ſovereigns to go abroad anywhere under pain of being ſtoned to death. The Abyſſinians, as has been already hinted, claimed her for their ſovereign; and he informs us, that having received an account from Tamerin, an Ethiopian merchant, of the ſurpriſing wiſdom and wealth of Solomon, ſhe undertook the journey mentioned in Scripture, to aſcertain the truth of the report. In this ſhe was attended by a great many of her nobility, carrying along with her alſo magnificent preſents for the monarch ſhe intended to viſit. According to the Abyſſinian hiſtorians, ſhe was a Pagan at the time this journey was undertaken; but being ſtruck with admiration at the ſight of Solomon's grandeur, and the wiſdom he diſplayed, ſhe became a convert to the true religion. Another part of her hiſtory, by no means inconſiſtent with the character of Solomon, is, that ſhe returned in a ſtate of pregnancy; and within a year was delivered of a ſon, named *David* by Solomon; but by his mother *Menilek*, *Menelech*, or *Menelelheck*; that is, *another ſelf*. When he grew up, he was ſent to be educated at the court of his father Solomon; where having ſtaid ſome time, he was accompanied home by many doctors of the law, and other Iſraelites of diſtinction, particularly Azariah the ſon of Zadoc the high-prieſt. By theſe the Jewiſh religion was eſtabliſhed in Abyſſinia, where it continued till the introduction of Chriſtianity. The princeſs we ſpeak of is named *Makeda*, *Balkes*, or *Bulkis*, by the Abyſſinians. By our Saviour, and in the Ethiopic verſion of the Scripture, ſhe is ſtyled *The Queen of the South*, and is ſaid to have come from the uttermoſt parts of the earth, or of the habitable world. Hence the compilers of the Univerſal Hiſtory have inferred, that the princeſs ſtyled *The Queen of Sheba* in Scripture was really ſovereign of Ethiopia. "Ethiopia (ſay they) is more to the ſouth of Judæa than the territory or kingdom of Saba in Arabia Felix; conſequently has a better claim than that country for the dominions of the princeſs whom our Saviour calls *The Queen of the South*. Ethiopia is ſtyled *the remoteſt part of the habitable world* by Herodotus and Strabo; and therefore better agrees with what our Saviour has ſaid of the queen of Sheba, that ſhe came from 'the uttermoſt parts of the earth,' than Arabia. Nor can it be deemed a ſufficient reply to this argument, that Arabia Felix was the uttermoſt part of the earth in reſpect to Judæa, ſince it was bounded by the Red ſea: for that not only Egypt, but even Ethiopia, regions beyond that ſea, were known to and had a communication with the Jews, both before and in our Saviour's time, is indiſputably clear. Laſtly, From what has been ſuggeſted, it appears no improbable conjecture, that Judaiſm was not only known, at leaſt in a part of Ethiopia, Abyſſinia. Of the queen of Sheba.

Abyſſinia. Ethiopia, but nearly related to the eſtabliſhed religion there, at the beginning of the apoſtolic age, if not much earlier. After all, theſe two opinions, ſo contrary in appearance, may be made conſiſtent without great difficulty; ſince it is agreed, that Arabia and Ethiopia have anciently borne the ſame name, been included during certain intervals in one empire, and governed by one prince. Part of the Arabs and Ethiopians had the ſame origin, and very conſiderable numbers of the Abaſeni tranſported themſelves from Arabia Felix into Ethiopia; a circumſtance which ſufficiently proves the intercourſe that formerly ſubſiſted between the Cuſhites or Ethiopians of Aſia and Africa.

The Abyſſinian hiſtorians farther inform us, that the young prince Menilek was anointed and crowned king in the temple of Jeruſalem, before he returned to his own country; that Azariah was conſtituted high-prieſt; that he brought with him a Hebrew tranſcript of the law; and though this book is now loſt, having been burnt along with the church of Axum, the office is ſtill continued in the line of Azariah, whoſe ſucceſſors are ſtyled *Nebrits*, *high prieſts*, or *keepers of the church*, in that city; both church and ſtate being modelled exactly after that of Jeruſalem. Makeda continued to enjoy the ſovereignty for 40 years; and the laſt act of her reign was to ſettle the ſucceſſion to the throne. By this act the crown was declared hereditary in the family of Solomon for ever; it was alſo determined, that after her no woman ſhould be entitled to wear the crown or act as ſovereign of the country; but that the ſovereignty ſhould deſcend to the moſt diſtant heirs male, rather than to the females, however near; which two articles were to be conſidered as fundamental laws of the empire, not to be aboliſhed. Laſtly, That the male heirs of the royal family ſhould always be ſent priſoners to a high mountain, where they were to be confined till they ſhould be called to the throne, or as long as they lived. This cuſtom, according to Mr Bruce, was peculiar to Abyſſinia; the neighbouring Shepherds being accuſtomed to have women for their ſovereigns, which prevailed in the laſt century, and perhaps does ſo at preſent.

Makeda having eſtabliſhed theſe laws in ſuch a manner as not to be revocable, died in the year 986 B. C. The tranſactions of her ſon Menilek after his acceſſion are not pointed out, farther than that he removed his capital to Tigré. His reign can by no means be accounted proſperous; ſince in his time the empire was invaded by Shiſhak or Seſak the king of Egypt, who plundered the temple of Jeruſalem under Rehoboam. The like fate attended a rich temple which had been built at Saba the capital of the Ethiopian empire, and which might very probably occaſion the removal of the imperial ſeat to Tigré, as already mentioned. It is indeed pretty plain from Scripture, that Ethiopia, or great part of it, was ſubject to this monarch; as the Ethiopians or Cuſhites, mentioned in his army which invaded Judea, are joined with the Lubim or Libyans, and muſt therefore be accounted inhabitants of Ethiopia Proper. This is indeed no ſmall confirmation of the opinion of Sir Iſaac Newton, who agrees with Joſephus in ſuppoſing Shiſhak to have been the celebrated Seſoſtris of profane hiſtorians. Thus far we are certain, that in the paſſage of Scripture juſt now alluded to, the ſacred hiſtorian indirectly aſcribes the ſovereignty of Ethiopia to Shiſhak; and we do not find it anywhere hinted that another Egyptian monarch was poſſeſſed of this ſovereignty. Herodotus alſo plainly tells us, that Seſoſtris was maſter of Ethiopia, and that no other Egyptian but himſelf ever poſſeſſed that empire.

Ethiopia conquered by Shiſhak.

During the reign of Shiſhak, we know no particulars concerning the Ethiopians; but after his death, Sir Iſaac Newton is of opinion, that they defended Egypt againſt the Libyans, who had taken an opportunity of invading the country during the civil war which took place on the death of that great conqueror. In about ten years afterwards, however, according to the ſame author, they became aggreſſors; drowned the ſucceſſor of Shiſhak in the Nile, and ſeized on the whole kingdom; at which time Libya alſo fell into their hands. In the time of Aſa king of Judah, we find the combined hoſt of the Ethiopians and Lubim or Libyans, making an attack on the territories of that prince, to the number of more than a million. This may be reckoned a conſiderable confirmation of the piece of hiſtory juſt mentioned; as it is not eaſy to conceive how the two ſhould combine in ſuch a manner, unleſs Zerah was maſter of both. The total overthrow which the allied army received from Aſa, gave the inhabitants of Lower Egypt an opportunity of revolting; who being ſuſtained by an army of 20,000 auxiliaries from Phœnicia and Paleſtine, obliged Memnon, ſuppoſed to be the ſame with Amenophis, to retire to Memphis. Soon after this he was forced to leave Egypt altogether, and to retire into Ethiopia; but in about 13 years he returned with his ſon Ramaſſes at the head of a powerful army, and obliged the Canaanitiſh forces to retire out of Lower Egypt; a tranſaction denominated by the Egyptian writers the *ſecond expulſion of the Shepherds*.

Revolution after the time of Shiſhak.

Defeat of Zerah by Aſa king of Judah.

Sir Iſaac Newton is of opinion, that the Egyptian princes Menes, Memnon, and Amenophis, were the ſame perſon; and that by him Memphis was either originally built or firſt fortified, in order to prevent the Egyptians from entering Ethiopia. He is alſo ſuppoſed to have been the ſon of Zerah, and to have died at a very advanced age about 90 years after the deceaſe of Solomon. Thus, according to Sir Iſaac Newton's chronology, the moſt remarkable tranſactions of antiquity will be brought lower by ages than by the uſually received computations. According to this, the Argonautic expedition happened in the time of Amenophis; though ſome Greek writers inform us, that the ſame prince aſſiſted Priam king of Troy with a body of forces. He was ſucceeded by Ramaſſes, already mentioned, who built the northern portico of the temple of Vulcan at Memphis. The next was Moeris; who adorned Memphis, and made it the capital of his empire, about two generations after the Trojan war. Cheops, Caphrenus, and Mycerinus, ſucceeded in order to Moeris; the laſt being ſucceeded by his ſiſter Nitocris. In the reign of Aſychis her ſucceſſor, both Ethiopia and Aſſyria revolted from Egypt; which, being now divided into ſeveral ſmall kingdoms, was quickly ſubdued by Sabacon or So, the emperor of Ethiopia. This monarch, ſoon after his acceſſion to the throne of Egypt, allied himſelf with Hoſhea king of Iſrael; by which means the latter was induced to revolt

Of Menes and his ſucceſſors.

Abyſſinia. revolt from the Aſſyrians; and in conſequence of this, an end was put to the kingdom of Iſrael by Shalmaneſer king of Aſſyria, in the 24th year of the era of Nabonaſſar, and 720th before the commencement of the Chriſtian era. According to Herodotus, this monarch voluntarily reſigned the crown of Egypt after he had enjoyed it 50 years; but Africanus relates, that after a reign of eight years, he died in Egypt, in the ninth year of Hezekiah king of Judah. His ſucceſſor Sethon, ſuppoſed to be the Sevechus of Manetho, advanced to Peluſium with a powerful army againſt Sennacherib king of Aſſyria; when the bowſtrings of the Aſſyrians were gnawed in pieces by a great number of rats or mice, and thus they were eaſily defeated with great ſlaughter by the Egyptians. Hence Herodotus informs us, that the ſtatue of Sethon which he ſaw in Egypt had a mouſe in its hand. Sir Iſaac Newton, however, explains the whole in an allegorical manner. As the mouſe among the Egyptians was a ſymbol of deſtruction, he conjectures, that the Aſſyrians were on this occaſion overthrown with great ſlaughter; and that Sethon, in conjunction with Terhakah, either king of the Arabian Cuſhites, or a relation of Sethon, and his vicercy in Ethiopia Proper, ſurpriſed and defeated Sennacherib betwixt Libnah and Peluſium, making as great ſlaughter among his troops as if their ſhield-ſtraps and bowſtrings had been deſtroyed by mice.

nnacherib defeated by Sethon.

Ethiopia ubdued by Iſarhaddon.

In the 78th year of the era of Nabonaſſar, the empire of Ethiopia was ſubdued by Eſarhaddon king of Aſſyria; who held it three years, committing enormous cruelties both in that country and in Egypt. After his death the Ethiopians ſhook off the yoke, and maintained their independency till the time of Cyrus the Great, the firſt king of Perſia; who, according to the Greek hiſtorian Xenophon, ſeems to have alſo been ſovereign of Ethiopia. After his death they revolted, and his ſon Cambyſes unſucceſsfully attempted to reduce them. Herodotus informs us, that before he undertook this expedition, he ſent ſome of the Ichthyophagi ambaſſadors to the king of the Macrobii or long-lived Ethiopians, under pretence of ſoliciting his friendſhip, but in reality to obſerve the ſtrength of the country. Of this the Ethiopian prince was aware, and told the ambaſſadors that he knew their deſign, reproached Cambyſes with his injuſtice and ambition, and gave them his bow; telling them at the ſame time, that the Perſians might think of invading Ethiopia when they could eaſily bend it; and in the mean time, that their maſter ought to thank the gods who had never inſpired the Ethiopians with a deſire of extending their territories by conqueſt. Cambyſes had ſent by the ambaſſadors a rich purple robe, gold bracelets, a box of precious ointment, a veſſel full of palm wine, and other things, which he imagined would be acceptable to the Ethiopian monarch. But all theſe, excepting the wine, were deſpiſed. This, he owned, was ſuperior to any liquor produced in Ethiopia; and he did not ſcruple to intimate, that the Perſians, ſhort-lived as they were, owed moſt of their days to the uſe of this excellent liquor. Being informed by the ambaſſadors that a conſiderable part of the food made uſe of by the Perſians was bread, he ſaid that it was no wonder to find people who lived on *dung* unable to attain the longevity of the Macrobian Ethiopians. In ſhort, the whole of his anſwer was ſo contemptuous and diſguſting, that Cambyſes was filled with the greateſt indignation; in conſequence of which, he inſtantly began his march without taking time to make the neceſſary preparations, or even to procure proviſions of any kind for his army. Thus a famine enſued among them; which at laſt became ſo grievous, that the ſoldiers were obliged to eat one another: and Cambyſes himſelf, finding his life in great danger, was obliged to give orders for marching back again; which was not accompliſhed without the loſs of a great number of men. Another army which he ſent on an expedition againſt Ammonia, in order to deſtroy the celebrated oracle of Jupiter Ammon, periſhed entirely in the deſerts, being overwhelmed with the vaſt clouds of ſand frequently raiſed there by the wind.

Unſucceſsful expedition of Cambyſes againſt this country.

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At this time, it is doubtful whether Cambyſes would have accompliſhed his purpoſe even if he had found it practicable to march into the heart of Ethiopia. This empire had but a ſhort time before received a very conſiderable acceſſion of ſtrength by the deſertion of 240,000 Egyptians who had been poſted by Pſammenitus in different places on the frontiers. Theſe not having been relieved for three years, had gone over at once to the emperor of Ethiopia, who placed them in a country diſaffected to him; ordering them to expel the inhabitants, and take poſſeſſion of their lands. Notwithſtanding this, however, Sir Iſaac Newton hints, that Cambyſes conquered Ethiopia, about the 223d or 224th year of the era of Nabonaſſar; but his opinion in this reſpect does not appear to be well founded. We are told, indeed, that the Perſian monarch, notwithſtanding the misfortunes he met with in the expedition above mentioned, did really make himſelf maſter of ſome of the Ethiopic provinces which bordered on Egypt; and that theſe, together with the Troglodytes, ſent him an annual preſent of two chœnixes of unrefined gold, 200 bundles of ebony, five Ethiopian boys, and 20 elephants teeth of the largeſt ſize: but it appears improbable to the laſt degree, that even though Cambyſes had employed the whole of his reign in the attempt, he could have conquered the vaſt regions of Ethiopia Proper, Sennaar, and Abaſſia, which were all included in the Ethiopia of the ancients.

Ethiopia at this time a powerful empire.

Ethiopia ſuppoſed by Sir Iſaac Newton to have been conquered by Cambyſes.

When Xerxes invaded Greece, we find his army, according to Herodotus, was partly compoſed of Ethiopians, of whom Herodotus mentions two diſtinct races of people. One of theſe inhabited the Aſiatic coaſt, and differed from the Indians only in their hair and language. Their arms were the ſame with thoſe of India; they wore helmets made of the ſkins of horſes, the ears and manes of which ſerved them for tufts and plumes of feathers; their ſhields being made of the ſkins of cranes. The hair of the Aſiatic Ethiopians was long, but that of the weſtern tribes was frizzled. The latter were alſo differently armed, having darts lighted at one end and covered with leather. We are not informed particularly from what nations theſe troops were brought, nor whether they were natural ſubjects of the king of Perſia, or only auxiliaries: of conſequence we can conclude nothing certain concerning the dominion of the Perſian monarchs at this time over Ethiopia, further than that they might poſſeſs ſome of the provinces next to Egypt; while the main body

Ethiopians employed by Xerxes.

Abyſſinia. body of the empire being in a ſtate of independence, and unconnected with other parts of the world, is not taken notice of by the hiſtorians of thoſe times.

Though Alexander the Great had a deſire to know the ſources of the Nile, he did not ſuffer himſelf to be diverted by this curioſity from purſuing his grand expedition into Perſia. Ptolemy Euergetes, however, appears to have carried this curioſity to ſuch an extremity as to invade Ethiopia for no other purpoſe. It is ſurpriſing that the particulars of this expedition are not recorded by any hiſtorian, as it appears by an inſcription that he penetrated to the fartheſt parts of the empire, and conquered the moſt powerful nations in it. Of this we have the following account, which is looked upon by the beſt hiſtorians to be authentic. It was copied on the ſpot (being the weſtern entrance to Adule, one of the cities of Ethiopia) by Coſmas Egyptius, or, as ſome call him, Coſmas Indicopleuſtes, in the time of the emperor Juſtin I. by order of Eleibaan king of the Axumites, and of which the following account is given by the perſon who copied it. "Here (ſays he), facing the road to Axuma, ſtood a chair of white marble, conſiſting of a ſquare baſe, a ſmall thin column at each angle of this baſe, with a larger wreathed one in the middle, a ſeat or throne upon theſe, a back and two ſides. Behind this chair there was a large ſtone three cubits high, which had ſuſtained conſiderable injury from time. This ſtone and chair contained an inſcription to the following purpoſe: 'Ptolemy Euergetes penetrated to the fartheſt parts of Ethiopia. He ſubdued Gaza, Agame, Signe, Ava, Tiamo or Tziamo, Gambela, Zingabene, Angabe, Tiama, Athagaos, Calaa, Semene, Laſine, Zaa, Gabala, Atalino, Bega, the Tangaitæ, Anine, Metine, Sefea, Rauſo, Solate, the territory of Rauſo, and ſeveral other kingdoms. Among the nations he reduced, were ſome inhabiting mountains always covered with a deep ſnow; and others ſeated upon the ridges of hills, from whence iſſued boiling ſteams, and craggy precipices, which therefore ſeemed inacceſſible. Having finally, after all theſe conqueſts, aſſembled his whole army at Adule, he ſacrificed to Mars, Neptune, and Jupiter; for his great ſucceſs, he dedicated this chair or throne to Mars."

Ethiopia conquered by Ptolemy Euergetes.

Conqueſt of Ethiopia by the Romans.

From the time of this conqueror to that of the emperor Auguſtus, we meet with nothing of any conſequence relating to Ethiopia Proper. The Roman forces having about this time been drawn out of Egypt, in order to invade Arabia, Candace queen of Ethiopia, or perhaps rather of the iſland or peninſula of Meroe, took the opportunity of their abſence to make an irruption, with a numerous army, into the province of Thebais. As there was at that time no force to oppoſe her, ſhe met for ſome time with great ſucceſs; but hearing at laſt that Petronius, governor of Egypt, was in full march to attack her, ſhe retired into her own dominions. Petronius purſued her as far as Pſelcha, where with 10,000 men he gained an eaſy victory over 30,000 undiſciplined Ethiopian ſavages, armed only with poles, hatchets, and other clumſy or inſignificant weapons of a ſimilar nature. This victory was ſoon followed by the reduction of ſeveral fortreſſes; however, as the Roman ſoldiers were exceſſively incommoded by the heat of the climate, Petronius, notwithſtanding his ſucceſs, was obliged at laſt to retire. Soon after, Candace ſent ambaſſadors to Auguſtus himſelf with ſuch magnificent preſents, that the emperor is ſaid to have been thereby induced to grant her a peace on her own terms. From this time the Romans accounted themſelves maſters of Ethiopia. Auguſtus was complimented on the great glory he had acquired; and that he had, by reducing a country till that time unknown even to the Romans, finiſhed the conqueſt of Africa. No material alteration, however, took place in the affairs of Meroe, in conſequence of this conqueſt, whether real or pretended. Pliny informs us that it had been governed by queens, who bore the title of Candace, for ſeveral generations before that time; and ſo it continued to be afterwards, as we learn from Scripture, where we are informed that, in the reign of Tiberius, the ſovereign of Ethiopia was ſtill named Candace. Some indeed are of opinion that the Candace mentioned in the Acts of the Apoſtles was the ſame with her who had been conquered by Auguſtus; but this ſeems by no means probable, as the interval of time is by far too long to be allowed for the reign of a ſingle princeſs. Abyſſinia

From an anecdote of the debauched emperor Heliogabalus who was accuſtomed to confine his favourites, by way of diverſion, with old Ethiopian women, we may learn that ſome intercourſe took place between the two empires, and probably that the Ethiopians owned ſome kind of ſubjection to the Romans. The Blemmyes, a gang of monſtrous banditti, who inhabited the frontiers of Thebais, were vanquiſhed by the emperor Probus: but, towards the cloſe of the third century, we find them again become ſo powerful, that in conjunction with another nation called *Nobatæ*, who inhabited the banks of the Nile near Upper Egypt, they committed ſuch depredations in the Roman territories, that Diocleſian was obliged to aſſign lands to the latter, and to pay both of them a conſiderable ſum annually, to deſiſt from their former practices. Theſe expedients did not anſwer the purpoſe; the ſavages continued their depredations till the time of the emperor Juſtinian, who treated them with more ſeverity, and obliged them to remain at peace. We are told by Procopius, that before the time of Diocleſian, the Roman territories extended ſo far into Ethiopia, that their boundaries were not 23 days journey from the capital, ſo that probably the whole empire had been in a ſtate of dependence on them. Account of the Blemmyes.

From the time of this emperor to that of their converſion to Chriſtianity, we find nothing remarkable in the hiſtory of the Ethiopians. Three hundred and twenty ſeven years are counted from the time of our Saviour to that of Abreha and Atzbeha, or from Abra and Aſba, who enjoyed the kingdom when the goſpel was preached in Ethiopia by Frumentius. This man was a kinſman and companion of a philoſopher named Meropius, a native of Tyre; who having travelled all over India, died on an iſland of the Red ſea. After his death Frumentius, with another named Ædeſius, who had alſo been his companion, were brought before the king of Ethiopia, to whom that iſland was ſubject. He took them into his ſervice; making the one his treaſurer and the other his butler. On the death of this prince, the queen conceived ſuch a favour for them, that ſhe refuſed to allow them to depart out of the kingdom; but committed the management of her Ethiopia converted to Chriſtianity by Frumentius.

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her affairs entirely to Frumentius, who made uſe of his influence to diffuſe the Chriſtian religion throughout the country, and at laſt was appointed biſhop of Axuma. It is ſaid, however, that the court and principal people, if not the nation in general, relapſed into idolatry, which continued to prevail till the year 521, when they were again converted by their king Adad or Aidog.

The two princes Abra and Aſba, who reigned jointly in Ethiopia in the time of Frumentius, lived in ſuch harmony together, that their friendſhip became almoſt proverbial. After being converted to Chriſtianity, they adhered ſtrictly to the orthodox doctrine, refuſing to admit an Arian biſhop into their country. In the time of the emperor Conſtantius, however, this hereſy was introduced, and greatly favoured by that monarch; and an attempt was made to depoſe Frumentius on account of his refuſal to embrace it.

The two kings refuſe to admit Arianiſm.

The reign of theſe princes is remarkable for an expedition into Arabia Felix, called by the Mohammedan writers the war of the elephant, and which was undertaken on the following occaſion: The temple of Mecca, ſituated nearly in the middle of the Arabian peninſula, had been held in the greateſt veneration for near 1400 years; probably from the notion entertained by the people in the neighbourhood, that Adam pitched his tent on that ſpot. Here alſo was a black ſtone ſuppoſed to poſſeſs extraordinary ſanctity, as being that on which Jacob laid his head when he had the viſion of angels. The moſt probable account of the real origin of this temple, according to Mr Bruce, is, that it was built by Seſoſtris, and that he himſelf was worſhipped there under the name of Oſiris.

Account of the war of the elephant.

On account of the veneration in which this tower and idol were held by the Arabians, Mr Bruce ſuppoſes that the thought was firſt ſuggeſted of making it the emporium of the trade between India and Africa; but Abra, in order to divert it into another channel, built a very large temple near the Indian ocean in the country of the Homerites; and, to encourage the reſort of people to this new temple, he beſtowed upon it all the privileges of the former which ſtood in the city of Mecca. The tribe of Arabians named *Koreiſh*, in whoſe country Mecca ſtood, being exceedingly alarmed at the thoughts of having their temple deſerted, entered the new one in the night, burned all that could be conſumed, and beſmeared the remains with human excrements. Abra, provoked at this ſacrilege, aſſembled a conſiderable army, with which he inveſted Mecca, himſelf appearing on a white elephant, from whence the war took its name already mentioned. The termination of the war, according to the Arabian hiſtorians, was miraculous. A vaſt number of birds named *Ababil* came from the ſea, having faces like lions; each carrying in its claws a ſmall ſtone about the ſize of a pea, which they let fall upon the Ethiopian army in ſuch numbers, that every one of them was deſtroyed. At this time it is ſaid that the ſmall-pox firſt made its appearance; and the more probable account of the deſtruction of the Ethiopian army is, that they periſhed by this diſtemper.

Miraculous deſtruction of the Ethiopian army.

First appearance of the ſmallpox

The war of the elephant is ſuppoſed to have terminated in the manner above mentioned about the year 360; from which time to that of Eleſbaan, named alſo *Caleb*, and probably the ſame with the Adad or Adag already mentioned, we meet with nothing remarkable in the Ethiopic hiſtory. He engaged in a war with the Homerites or Sabæans in Arabia Felix, whom he overthrew in battle, and put an end to their kingdom; after which he embraced the Chriſtian religion in token of gratitude for the ſucceſs he had met with. In the time of this prince a violent perſecution of the Chriſtians took place in Arabia. The Jewiſh religion had now ſpread itſelf far into that peninſula; and in many places the profeſſors of it were become abſolute maſters of the country, inſomuch that ſeveral Jewiſh principalities had been erected, the ſovereigns of which commenced a ſevere perſecution againſt the Chriſtians. Among the reſt, one Phineas diſtinguiſhed himſelf by his cruelty, having prepared a great number of furnaces or pits filled with fire, into which he threw thoſe who refuſed to renounce Chriſtianity. The Chriſtians applied for relief to the emperor Juſtin; but he being at that time engaged in a war with the Perſians, could not interfere: however, in the year 522, he ſent an embaſſy to Eleſbaan, who was now alſo a member of the Greek church, intreating him to exert himſelf for the relief of the Chriſtians of Arabia. On this the emperor commanded his general Abreha, governor of the Arabian province Yemen, to march to the aſſiſtance of Aretas, ſon to a prince of the ſame name whom Phineas had burnt; while he himſelf prepared to follow with a more conſiderable force. But before the arrival of the Ethiopian monarch, young Aretas had marched againſt Phineas, and entirely defeated him. In a ſhort time afterwards the emperor himſelf arrived, and gave Phineas a ſecond defeat; but notwithſtanding theſe misfortunes, it does not appear that either the principality of Phineas or any of the other Jewiſh ones, was at this time overturned, though it ſeems to be certain, that at the time we ſpeak of, the Ethiopians poſſeſſed part of the Arabian peninſula. According to the Arabian hiſtorians, the war of the elephant, with the miraculous deſtruction of the Ethiopian army, already mentioned, took place in the reign of Eleſbaan.

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Reconverſion to Chriſtianity under Eleſbaan.

Chriſtians perſecuted in Arabia.

Cruelty of Phineas a Jewiſh prince.

He is defeated.

Some hiſtorians mention, that the Ethiopian monarchs embraced the doctrines of Mahomet ſoon after the impoſtor made his appearance; but this ſeems not to be well-founded; though it is certain that the *Najaſhi* or Ethiopian governor of Yemen embraced Mahometaniſm, and that he was related to the royal family. On this occaſion, however, the Ethiopians loſt all the footing they once had in Arabia; the governors being expelled by Mahomet and his ſucceſſors. They fled to the African ſide of the Red ſea with numbers of their ſubjects, where they erected ſeveral ſmall kingdoms, as Adel, Wypo, Hadea, Mara, and others, which ſtill continue.

Ethiopians driven out of Arabia.

During the conqueſts of the caliphs, the Jews were for ſome time everywhere driven out of their dominions, or oppreſſed to ſuch a degree that they voluntarily left them. Ethiopia offered them an aſylum: and in this country they became ſo powerful, that a revolution in favour of Judaiſm ſeemed ready to take place. One family had always preſerved an independent ſovereignty on a mountain called Samen, the royal reſidence being on the top of a high rock; and ſeveral other high and rugged mountains were uſed by that people as natural fortreſſes. Becoming by degrees

Number of Jews in Ethiopia increaſed.

Abyſſinia. grees more and more powerful, Judith the daughter of one of their kings formed a deſign of overturning the Ethiopian government, and ſetting aſide the family of Solomon, who had hitherto continued to enjoy the ſovereignty. This deſign was facilitated by ſeveral circumſtances. The empire had been weakened by an unſucceſsful war, famine, and plague; the throne was poſſeſſed by an infant; and the abſurd cuſtom of confining the whole royal family on a rock named *Damo*, gave her an opportunity of cutting them all off at once by ſurpriſing that place. Fortunately, however, the king himſelf eſcaped the general cataſtrophe, and was conveyed by ſome of the nobility of Amhara to the province of Xoa or Shoa; by which means the line of Solomon was preſerved, and afterwards reſtored, though not till after a very conſiderable interval.

Royal family of Ethiopia maſſacred by Judith.

The king eſcapes.

Judith having by this maſſacre eſtabliſhed her own power, aſſumed the imperial dignity, though in direct oppoſition to an eſtabliſhed and fundamental law of the empire already mentioned, that no woman ſhould enjoy the ſovereign authority. The people, however, ſeem to have ſubmitted quietly to her government, as ſhe ſat on the throne for 40 years, and afterwards tranſmitted the ſovereignty to her poſterity; five of whom reigned ſucceſſively in this country. We are not furniſhed with any particulars concerning their reigns; farther than that, during them, the people were greatly oppreſſed. By ſome means, of which hiſtorians have not given any account, another revolution took place; and a new ſet of uſurpers, related to the family of Judith, but not their direct lineal deſcendants, ſucceeded to the throne. Theſe were Chriſtians, and governed with much greater lenity than the Jewiſh ſovereigns had done; but ſtill, being uſurpers, none of their tranſactions are recorded in the Abyſſinian annals, excepting thoſe of Lalibala, who was accounted a ſaint. He lived in the end of the 12th or beginning of the 13th century, and proved a great prince. At that time the Chriſtians in Egypt were grievouſly perſecuted by the Saracens, who had a particular abhorrence at maſons, builders, and ſtone-cutters; looking upon them as the chief promoters of idolatry by the ornaments they put upon their works. Theſe were joyfully received by Lalibala; who, by affording them an aſylum in his dominions, ſoon collected a great number. They were employed by him in hewing churches out of the ſolid rock, after the example of the ancient Troglodytic habitations; and many works of this kind remain in the country to this day. He undertook, however, a ſtill more difficult and arduous taſk; no leſs than that of leſſening the ſtream of the Nile, and thus ſtarving the whole kingdom of Egypt, now in the hands of his enemies, and who perſecuted thoſe of his religion. From the account given by Mr Bruce of this project, it appears that there really is a poſſibility in nature of accompliſhing it; not indeed by turning the courſe of the Nile itſelf, but by diverting that of many of its branches, which are the means of conveying into it the water ſupplied by the tropical rains, and by which it overflows its banks annually. We are likewiſe aſſured by the ſame author, that Lalibala ſucceeded in his enterpriſe ſo far as to divert the courſe of two large rivers from the Nile, and that they have ever ſince flowed into the Indian ocean. He next proceeded to carry a level towards a lake named *Zaccia*, into which many rivers, whoſe ſtreams contribute to increaſe that of the Nile, empty themſelves; and had this been accompliſhed, there is no doubt that the loſs of ſo much water would have been very ſenſibly felt by the Egyptians. According to moſt hiſtorians, this enterpriſing monarch was prevented by death from putting his deſign in execution; though Mr Bruce informs us of a written account at Shoa, in which it was aſſerted, that he was diſſuaded from it by certain monks, who told him, that by ſending down ſuch a quantity of water to the eaſtern and dry parts of Africa, theſe countries would ſoon become ſo fertile and populous that they would rival the empire of Ethiopia, or at leaſt withdraw their allegiance from it entirely. The remains of theſe works were ſeen by the Portugueſe ambaſſador in 1522.

Judith uſurps the throne.

A new revolution.

Chriſtians perſecuted in Egypt fly to Ethiopia.

Lalibala undertakes to diminiſh the ſtream of the Nile.

All this time the princes of the line of Solomon had been obliged to content themſelves with the ſovereignty of the province of Xoa or Shoa, without making any attempt to regain their former dignity; but they were unexpectedly reſtored without bloodſhed or diſturbance by Naacueto Laeb the grandſon of Lalibala. This prince, who was of a gentle and pacific diſpoſition, was perſuaded by a monk named *Tecla Haimanout*, much celebrated for his ſanctity, to reſign the crown, to which, though he received it from his father, he could not pretend any abſolute right. In conſequence of the mediation of this monk, therefore, it was agreed that Naacueto ſhould give up the empire to Icon Amlac the lineal deſcendant of Solomon, who then poſſeſſed the ſovereignty of Shoa. In conſequence of this a portion of lands ſhould be irrevocably and irredeemably aſſigned to him and his heirs; and he ſhould likewiſe be allowed ſome marks of ſovereignty as a teſtimony of his former grandeur. In this treaty, however, the good monk did not forget his own intereſt. He had founded a famous monaſtery in Shoa, and was primate of the whole empire under the title of *Abuna*. He now inſiſted that one third of the kingdom ſhould be abſolutely ceded to himſelf for the maintenance of his own dignity, and the ſupport of the clergy, convents, &c. throughout the country; he alſo inſiſted that no native Abyſſinian ſhould ever enjoy the ſame dignity with himſelf, even though he ſhould have been choſen and ordained at Cairo, as was the cuſtom with the Abyſſinian prelates.

Reſtoration of the line of Solomon.

Theſe extraordinary terms were complied with, and Icon Amlac raiſed to the throne of Ethiopia. He did not, however, remove the ſeat of government from the province of Shoa; but continued at Tegulat the capital of that province during the whole of his lifetime, which continued 15 years after his acceſſion to the throne. We are ignorant of the tranſactions of his reign, as well as that of ſeveral of his ſucceſſors; five of whom aſcended the throne in as many years. From this quick ſucceſſion Mr Bruce is of opinion, that a civil war had taken place among the candidates for the throne: but the Abyſſinian annals make no mention of this; neither have we any particular account of the tranſactions of the empire till the time of Amda Sion, who began to reign in 1312. He was the ſon of Wedem Araad, the youngeſt brother of Icon Amlac, and ſucceeded to the throne on the death of his father. He profeſſed the Chriſtian religion; but his practice ſeems.

Uncertainty of the Abyſſinia hiſtory.

Reign of Amda Sion

Abyſſinia.

He is excommunicated for inceſt.

The monks baniſhed.

His expedition againſt the Mahometans.

They attack his camp in the night without ſucceſs.

They ſubmit, but quickly revolt again.

ſeems to have been very oppoſite to its precepts. He began his reign with living publicly with a concubine of his father's; and quickly after committed inceſt with his two ſiſters. On this he was firſt exhorted to repentance, and then excommunicated, by Honorius, a monk greatly celebrated for his ſanctity, and who has ſince been canonized. The prince, enraged at this indignity, cauſed the ſaint to be ſeverely whipped through every ſtreet of his capital. That night the town was by ſome unknown means ſet on fire and reduced to aſhes: the clergy perſuaded the people, that the blood of Honorius had turned to fire as it dropped on the ground, and thus occaſioned the cataſtrophe; but the king ſuſpecting that the monks themſelves had been the incendiaries, baniſhed or impriſoned them all, ſo that their hopes of exciting an inſurrection were diſappointed; and being diſperſed into thoſe provinces where the inhabitants were moſtly Jews or Pagans, they were now obliged to apply to what was certainly more incumbent upon them, viz. the diffuſion of the knowledge of the goſpel.

While the king was buſied with the monks, one of the factors, who had been entruſted with ſome of his commercial intereſts, was aſſaſſinated by the Moors in the province of Ifat; on which, without making the leaſt compiaint or expoſtulation, he aſſembled his troops, and with *ſeven* horſemen (A) fell upon the neareſt Mahometan ſettlements, maſſacring all he met without exception. Putting himſelf then at the head of his army, he proceeded in the moſt rapid career of deſolation, laying waſte the whole country with fire and ſword, and carrying off an immenſe booty.

For ſome time the Moors were ſo ſurpriſed, that they did not think of making oppoſition; but at laſt they took up arms, and attempted to ſurpriſe the Abyſſinian monarch in his camp, hearing that he had ſent out moſt of his army in detachments. With this view they approached the camp in the night time, expecting to have found the king and his few ſoldiers immerſed in ſleep. Unexpectedly, however, he had been joined by a conſiderable part of his army, whom he drew up in battle array to receive his enemies. An engagement enſued, in which the king behaved with great valour, killed the Mocriſh general with his own hand, and gained a complete victory. He then commanded ſuch of his ſoldiers as could not find houſes ready built, to build huts for themſelves, and a large tract of land to be plowed and ſown, as if he meant to ſtay in the country of the enemy during the rainy ſeaſon. The Mahometans now perceiving that they were in danger of being totally exterminated, willingly ſubmitted to the terms he pleaſed to impoſe upon them; while the monarch conciliated the affections of his people by dividing among them the vaſt plunder he had acquired in this expedition.

The Moors no ſooner found themſelves freed from any apprehenſions of immediate danger, than they prepared for a new revolt. The king having intelligence of their deſigns, ſecretly prepared to ſubdue them before they could have time to bring their matters to a ſufficient bearing. The Moors, however, being better prepared than he expected, began hoſtilities by ſurpriſing and plundering ſome villages belonging to the Chriſtians, and deſtroying their churches. A moſt formidable combination had taken place; and as the conſequence of allowing the confederate rebels to join their forces might have been very dangerous, the king uſed his utmoſt endeavours to prevent it. This deſign was in ſome meaſure facilitated by the ſuperſtition of Amano king of Hadea, one of the principal rebels. This man, by the advice of a conjurer in whom he put great confidence, inſtead of marching his troops to the aſſiſtance of his allies, remained at home with them, where he was defeated and taken priſoner by a detachment of the king's army. The governor of Amhara was next deſpatched againſt Saber-eddin the revolted governor of Fatigar, with orders to lay waſte the country, and uſe every method to force him to a battle, if he ſhould be diſinclined to venture it himſelf. Theſe orders were punctually executed; Saber-eddin was compelled to ſtand an engagement, in which he was defeated; the victors plundered his houſe, and took his wife and children priſoners. But in the mean time intelligence was received of a new revolt among the Falaſha, who had aſſembled a great army, and threatened to become very formidable; their chief keeping a cloſe correſpondence with Saber-eddin, as well as with the king of Adel. Theſe, however, ſhared the ſame fate with the reſt, being entirely defeated by Tzaga Chriſtos another Abyſſinian general, who ſoon after joined the king with his whole army. This proved fatal to the rebel cauſe: Saber-eddin, no longer able to ſupport himſelf againſt the royal forces, was obliged to ſurrender at diſcretion, and all the reſt were quickly reduced; ſo that the king was at leiſure to march againſt the kings of Adel and Mara, who having now united their forces, reſolved to give him battle. At this the Abyſſinian monarch was ſo exaſperated, that he determined to take a moſt ample vengeance on his enemies. In the preſence of his whole army, therefore, and a monk of uncommon ſanctity dreſſed in the ſame habit in which he uſually performed divine ſervice, the king made a long ſpeech againſt the Mahometans. He recounted the many violences which they had committed; and of which the kings of Adel and Mara had been principal promoters. He enumerated many examples of murder, ſacrilege, &c. of which they had been guilty; ſetting forth alſo that they had carried off great numbers of Chriſtians into ſlavery, and that the view of making ſlaves was now a great motive with them for making war. He diſclaimed every idea of commencing hoſtilities from any avaricious motive; as a proof of which, he denied that he would accept of any part of the plunder for his own uſe; concluding with a declaration, that he was now about to ſwear on the holy euchariſt, that, "though

Abyſſinia.

King of Hadea defeated and taken priſoner.

Another rebel chief defeated.

The Falaſha defeated.

The king marches againſt Adel, Mara, &c.

His ſpeech and oath in preſence of his army.

(A) On this Mr Bruce remarks, that "it has been imagined the number ſhould be increaſed to 70; but there would be little difference in the raſhneſs of the action." The word in the Abyſſinian annals which he tranſlates is *ſeven*; but if we increaſe the number at all, it ought more probably to be *ſeven hundred* than ſeventy.

Abyſſinia. but 20 of his army ſhould join him, he would not turn his back upon Adel or Mara, till he had either forced them to tribute and ſubmiſſion, or entirely extirpated them and annihilated their religion." After this ſpeech, he took the oath in the preſence of the whole army; who not only applauded him with loud ſhouts, but proteſted that they looked upon themſelves to be all bound by the oath he had taken. As he had mentioned in his ſpeech that the plunder had been purchaſed by the lives of their Chriſtian brethren, they determined to ſhow their abhorrence at keeping any of it on theſe terms. Taking lighted torches in their hands, therefore, they ſet fire to the whole plunder that had been amaſſed ſince the beginning of the war; and having thus reduced themſelves to a ſtate of poverty, they prepared to ſhow their Chriſtianity by thirſting, not after the wealth, but the blood of their enemies.

Enthuſiaſm of his troops.

Notwithſtanding the enthuſiaſm of the whole army on this occaſion, the expedition was attended with great difficulties. Theſe aroſe principally from ſuperſtition; and as, on the one hand, the Abyſſinians were by this principle laid under conſiderable diſadvantages, their adverſaries on the other enjoyed equal advantages from no better cauſe. The Abyſſinians, according to Mr Bruce, are very credulous with reſpect to genii or ſpirits which go about doing miſchief in the dark. Hence they are afraid of travelling, but eſpecially of fighting, in the night-time; becauſe they imagine that the world is then entirely given up to theſe beings, who are put out of humour by the motions of men, or of any other terreſtrial creature. In the night-time therefore an Abyſſinian dares not even throw a little water out of a baſon, leſt it ſhould fall upon ſome ſpirit and provoke it to vengeance. The Moors, on the other hand, though equally fearful, ſecure themſelves againſt theſe inviſible enemies by means no leſs ridiculous than the fears themſelves. A verſe of the Koran, ſewed up in leather, and worn round their neck or arm, is ſufficient to defy the power of the moſt miſchievous ſpirit. Under ſuch powerful protection, therefore, they laugh at the terrors of the Abyſſinians, and are on all occaſions ready to attack them in the night-time, and even prefer that ſeaſon rather than any other for coming to an engagement. Senſible of this advantage, and encouraged by the little loſs which attended even a defeat in theſe nocturnal encounters, they determined on the preſent occaſion to avoid any pitched battles, and to content themſelves with haraſſing the king's army with continual ſkirmiſhes of this kind. Thus, though the Abyſſinian monarch had always the advantage, his troops ſoon began to complain; and, on the commencement of the rainy ſeaſon, inſiſted on being allowed to return. This was by no means agreeable to a prince of ſuch a martial diſpoſition as Amda Sion. He therefore told them, that, if they were afraid of rains, he would conduct them to a country where there were none; meaning Adel, which, though likewiſe within the limits of the tropical rains, has them at another ſeaſon than that in which they fall in Abyſſinia. Thus he perſuaded his army again to ſet forward: but was ſo grievouſly haraſſed by the nocturnal attacks of the Moors, that he was once more in danger of being deſerted; and when by his eloquence he had found means to diſſipate the apprehenſions of the ſoldiers, he was ſeized with a violent fever which threatened his life. The ſoldiers now expected that they were ſoon to return; but while they indulged themſelves in the careleſſneſs which uſually attends an expectation of this kind, they accidentally received intelligence that the Moors, having aſſembled an army of 40,000 men, were in full march to attack them, and at a very ſmall diſtance. The king was now free from fever, but ſo weak that he fainted on attempting to put himſelf in readineſs for going out to battle. Still, however, his reſolution continued firm and unalterable; having recovered from his faint, waſhed and refreſhed himſelf, he made a ſpeech to his ſoldiers, filled with the moſt enthuſiaſtic expreſſions of confidence in the juſtice and goodneſs of the cauſe in which he was engaged, and in the continuance of the divine favour and protection. "As it never was my opinion (ſaid he), that it was my own ſtrength and valour, or their want of it, which has ſo often been the cauſe of preſerving me from their hands; ſo I do not fear at preſent that my accidental weakneſs will give them any advantage over me, as long as I truſt in God's power as much as I have ever done." By this ſpeech the drooping ſpirits of the Abyſſinians were revived; and they only begged that their monarch would now truſt to the valour of his troops, and not expoſe his perſon to ſuch danger as he had uſually done. He promiſed to comply with their requeſt; but matters were ſoon thrown into confuſion by a report that the Moors had poiſoned the wells and enchanted all the running water in the front of the army. The poiſoned wells, however, were eaſily avoided; and a prieſt of vaſt ſanctity was diſpatched a day's journey before the army to diſenchant the waters by his bleſſings; which, having the advantage of the good qualities of the element itſelf on their ſide, were doubtleſs more powerful than the ſpells of the infidels. Not content with this, the king cauſed a river to be conſecrated by the name of *Jordan*; but while his men were employed in bathing themſelves in this holy water, the *Fits-Auraris*, an officer who had been diſpatched with a party of men who always go before the Abyſſinian armies, was attacked and driven back on the main body by a detachment of the enemy, who had along with them a number of women provided with drugs to poiſon and ſpells to enchant the waters. A dreadful panic now ſeized the whole army. Unmindful of the promiſes made to their king, they not only refuſed to advance, but for the moſt part reſolved to leave the camp, and return homewards without delay. The king, ſenſible that all was loſt if this pernicious ſcheme ſhould be adopted, did his utmoſt to encourage and perſuade them to return to their duty; but perceiving that nothing was to be gained by reaſoning with men ſo much terrified, he only requeſted that ſuch as could not be induced to fight, would not leave their places, but ſtand quiet ſpectators of the battle. Even this had very little effect: ſo that, finding the enemy now ready to make an attack, he ordered his maſter of the horſe, with only five others, to attack the left wing of the enemy; while he, with a ſmall party of his ſervants, made an attack on the right. This deſperate action was attended with ſucceſs. The king, notwithſtanding the weakneſs he yet laboured under, killed with his own hand two of the commanding officers of the enemy's right wing; while his ſon diſpatched another

Abyſſinia.

The king ſeized with a dangerous fever.

Excеſſive ſuperſtition of both parties.

The king's troops haraſſed.

His troops diſheartened.

Struck with a panic, they refuſe to engage.

He begins the fight with a few attendants.

Abyſſinia. ther of conſiderable rank belonging to the left. This had ſuch an effect upon the whole Mooriſh army, that they began evidently to loſe courage; while the Abyſſinians, aſhamed of their conduct, now ruſhed furiouſly on to reſcue their prince from danger. The battle continued for ſome time with great obſtinacy; but at laſt the centre and left wing of the Moors were entirely defeated. The right wing, compoſed principally of Arabians, retired in a body; but not knowing the country, they entered a deep valley ſurrounded by perpendicular rocks entirely covered with wood. The Abyſſinians, imagining they had nothing more to do, began to ſtrip and mangle the bodies of the killed and wounded; but the king, perceiving that the Arabians had brought themſelves into a ſituation from whence they never could be extricated, obliged his ſoldiers to deſiſt from this barbarous employment, and even killed two of them who diſobeyed his orders. The army was then divided into two parts, one of which ſurrounded the devoted Arabians, while the other was ſent a day's journey after the remainder of the Moors. Both parties proved equally ſucceſsful. The king, with part of his diviſion, attacked the Arabians in front, while the reſt rolled great ſtones down from the tops of the rocks upon them. By this they were thrown into ſuch confuſion, that being neither able to fly nor reſiſt, they were all killed to a man. The fate of the Moors was little better. The other diviſion of the Abyſſinian army found them lying round a large pool of water, which they lapped like as many dogs. In this helpleſs ſituation there was nothing requiſite but to order them to be ſlaughtered; and this cruel order was punctually executed. The ſoldiers imagining they ſhould now diſcharge their vow to heaven, wearied themſelves with ſlaughter; till at laſt, being almoſt ſatiated with blood, they made a few priſoners, among whom was Saleh king of Mara, with his queen; the former of whom was hanged by order of Amda Sion, and the latter cut in pieces, and her body given to the dogs by the ſoldiers.

he Moors feated,

d almoſt tirely cut F.

This ſignal victory was gained in the end of July 1316; but as the rains at that ſeaſon ſet in with violence, moſt of the army now again inſiſted on their returning home without delay. The king and principal officers, however, were of opinion, that the advantages ſo dearly purchaſed ought by all means to be purſued till they had either reduced the Mahometans to ſubjection, or at leaſt deprived them of all power to make attacks on the empire with any proſpect of ſucceſs. This opinion being adopted, the king ſent back the baggage, women, and others who could be of no uſe to the army; retaining only the veteran ſoldiers, who were able to encounter more than ſix times the number of ſuch enemies as he could expect to meet with.

mda Sion urſues his dvantage.

Advancing farther into the Mahometan territories, he took up his reſidence in a large town called *Zeyla*; from whence he, that very night, ſent out a detachment to ſurpriſe a large village in the neighbourhood named *Taraca*. This was executed with ſucceſs; the men were maſſacred, and the women kept to ſupply the places of thoſe who had been ſent away. Continuing ſtill to advance, he detached parties to lay waſte the countries all round; and in this expedition he had the good fortune to cut off two of the principal authors of the conſpiracy againſt him. He then proceeded to

is further nquests.

invade Talab and Abalge in the territories of the king of Adel. That monarch, now rendered deſperate by the view of approaching ruin, had aſſembled all the troops he could raiſe, in order to make one laſt effort againſt the enemy; but conducted himſelf with much leſs prudence than he ought to have done when contending with ſuch an experienced and vigilant adverſary. Amda Sion, confident of ſucceſs, took no leſs care how to prevent the enemy from eſcaping than how to gain the victory. For this purpoſe he deſpatched parties of horſe to lie in wait in all thoſe avenues by which he ſuppoſed that the Moors might attempt to make their eſcape; after which, falling furiouſly on the Adelians himſelf, and being well ſupported by his troops, he gained a complete victory; the king of Adel, with great numbers of his men, being killed on the ſpot, and almoſt all the reſt by the parties of horſe whom the Abyſſinian monarch had poſted in ambuſh to intercept them.

Abyſſinia. Adel invaded.

The king of Adel defeated and killed.

As the loſs of this battle rendered the affairs of the Adelians quite deſperate, the three young princes, ſons of the late king, with their uncle, waited upon Amda Sion with rich preſents, which they laid at his feet in the moſt humble manner, putting their foreheads in the duſt, and intreating his pardon; profeſſing their ſubjection and readineſs to obey his commands, provided that he would ſpare the remainder of their country and property. To this the king made a very unfavourable reply, reproaching them with indignities done to himſelf; but eſpecially with the ſacrilege they had committed in burning churches and murdering prieſts, deſtroying alſo defenceleſs people in villages, merely becauſe they imagined that he could not protect them. To puniſh theſe and other crimes, he ſaid, he was now in the heart of their country; and he was determined never to turn his back upon Adel while he had ten men capable of drawing their ſwords; for which reaſon he commanded them to return and expect the approach of his army.

The princes of Adel ſubmit.

By this fierce ſpeech the brother and two eldeſt children of the king of Adel were ſo diſheartened, that they could not ſpeak; but the youngeſt ſon made a very ſpirited ſpeech, in which he attempted to ſoften the king by complimenting his valour, and, ſhowing that it was unworthy of his character to puſh the war againſt a people who were already conquered and defenceleſs. All the anſwer he could obtain, however, was, that unleſs the queen with the reſt of the royal family, and the principal people of the nation, would come by to-morrow evening and ſurrender themſelves as the princes had done, he would lay waſte the territory of Adel, from the place where he ſat to the Indian ocean. On this the princes earneſtly requeſted their mother to ſubmit without reſerve to the clemency of the Abyſſinian monarch, and to wait upon him next morning; but ſhe was prevented from this by ſome of the nobility who had formerly adviſed the war, and who juſtly ſuſpected danger to themſelves if they ſhould be obliged to ſubmit unconditionally to the conqueror. They reſolved, therefore, once more to venture a battle; and the better to enſure ſucceſs, they bound themſelves by an oath to ſtand by each other to the laſt extremity. At the ſame time they diſpatched meſſengers to the princes, requeſting them to make their eſcape with all manner of expedition, and to head the army themſelves;

Are unfavourably received.

The war continues.

all

Abyſſinia. all of whom were determined to conquer or die as ſoon as the royal family ſhould be out of the enemy's hands. By this conduct the Abyſſinian monarch was ſo much irritated, that he divided his army into three parts; two of which he commanded to enter the territory of the enemy by different routes, and to exterminate both man and beaſt wherever they came; while he himſelf, with the third, took the ſtraight road to the place where the new Adelian army was encamped. Here he found a number of infantry drawn up and ready to engage him; but, beſides theſe, there was a multitude of old men, women, and even children, all armed with ſuch weapons as they could procure. Surpriſed at this ſight, he ordered a party of horſe to diſperſe them; but this was found impoſſible; ſo that he was obliged to call in the detachments he had ſent out, with orders to fall upon the enemy by the neareſt way they could advance. The engagement was for a long time very doubtful; and in oppoſition to Amda Sion appeared the young king of Wypo, who everywhere encouraged his troops, and made the moſt obſtinate reſiſtance. The Abyſſinian monarch having obſerved him, ſheathed his ſword, and arming himſelf with a bow, choſe the broadeſt arrow he could find, and took ſo juſt an aim, that he ſhot the young prince through the ſide of the neck, and his head inclining to one ſhoulder he ſoon fell down dead. On this the ſpirit of the Adelians entirely forſook them, and they betook themſelves to flight; but unluckily falling in with two Abyſſinian detachments coming to the king's relief, they were ſo completely deſtroyed, that only three of them are ſaid to have made their eſcape. On the ſide of the Abyſſinians, however, the victory was dearly purchaſed; many of the principal officers being killed, and ſcarcely one of the cavalry eſcaping without a wound.

An obſtinate battle.

The Moorish army entirely cut off.

Dreadful devaſtations.

The remainder of this expedition conſiſted only in the deſtruction and burning of towns and villages, and maſſacres of helpleſs people, on pretence of retaliating the injuries committed by the Mahometans againſt the Chriſtians. At laſt, weary of conqueſt and of carnage, this victorious monarch, who never ſuffered a defeat in any battle, returned in triumph to his capital, where he ended his days after a reign of 30 years. In his time we find that the royal family were not confined, as had been the uſual practice from the time of the queen of Sheba to the maſſacre by Judith; for Saif Araad, the ſon and ſucceſſor of Amda Sion, diſtinguiſhed himſelf in one of the battles in which his father was engaged.

The royal family not confined as formerly.

Though the new prince, as appears from what has been juſt now obſerved, was by no means deſtitute of military talents, the Abyſſinian empire enjoyed a profound peace during his reign. The only remarkable tranſaction was the relief given by him to the Coptic patriarch, whom the ſultan of Egypt had thrown into priſon. At this time a great trade was carried on through the deſert by caravans between Cairo and Abyſſinia, as well as from Cairo to Suakem on the Red ſea; but the Ethiopic monarch having ſeized the merchants from Cairo, and ſent parties of horſe to interrupt the caravans in their paſſage, the ſultan was ſoon content to releaſe the patriarch, whom he had impriſoned only with a view to extort money.

Reign of Saif Araad.

In the reign of Theodorus, who held the crown of Ethiopia from the year 1409 to 1412, we find an infringement made on the treaty between Icon Amlac and the Abuna Tecla-Haimanout formerly mentioned. By that treaty the Abuna was to have a full third of the whole empire for the ſupport of his own dignity and that of the church: but Theodorus, juſtly conſidering this as an unreaſonable acquiſition, reduced it very conſiderably, though he ſtill allowed a very ample revenue out of every province of the empire; and even this has been conſidered by ſeveral of his ſucceſſors as far too large, and conſequently has been frequently abridged by them. The annals of this prince's reign are very defective, and Mr Bruce ſuppoſes that they have been mutilated by the eccleſiaſtics; which, conſidering what we have juſt now related of his reducing their revenues, is by no means improbable. By his ſubjects he was conſidered as ſuch a ſaint, that to this day the people believe he is to riſe again and to reign a thouſand years in Abyſſinia; during which period war is to ceaſe, and happineſs to be univerſally diffuſed.

Of Theodorus.

Abyſſinia.

Is celebrated as a ſaint.

From the time of Theodorus to that of Zara Jacob, who began his reign in 1434, the Abyſſinian annals furniſh us with little or nothing of any conſequence. The character of this prince is repreſented as by no means inferior to that of Theodorus, or indeed of any monarch that ever ſat on the throne of Ethiopia, or any other kingdom in the world. He is, in ſhort, ſet forth as another Solomon, and a model of what ſovereigns ought to be; though, from ſome particulars of his reign, his character ſhould ſeem to be rather exaggerated. The firſt remarkable tranſaction of this great monarch was his ſending an embaſſy to the council of Florence. The ambaſſadors were certain prieſts from Jeruſalem, who in that aſſembly adhered to the opinions of the Greek church; and the embaſſy itſelf was judged to be of ſuch conſequence as to be the ſubject of a picture in the Vatican. This prince obtained alſo a convent at Rome from the pope for the uſe of the Abyſſinians; which is ſtill preſerved, though very ſeldom viſited by thoſe for whom it was deſigned. He ſeems to have been very deſirous of keeping up a correſpondence with the Europeans as well as the Aſiatics; and in his time we firſt read of a diſpute in Abyſſinia with the *Frangi* or Franks on the ſubject of religion. This was carried on in preſence of the king between one Abba George and a Venetian painter, Franciſco de Branco Lone, in which the former confuted and even convinced his antagoniſt; but from this time we find a party formed for the church of Rome, and which probably took its riſe from the embaſſy to the council of Florence.

Zara Jacob ſaid to equal Solomon.

Sends an embaſſy to the council of Florence

A party for the church of Rome formed.

The prince of whom we now treat was the firſt who introduced perſecution on a religious account into his dominions; and for this reaſon, moſt probably, he is ſo highly commended by the eccleſiaſtics. The ſtate of religion in Abyſſinia was now indeed very corrupt. The Greek profeſſion had been originally eſtabliſhed from the church of Alexandria; but in the low provinces bordering on the coaſt of Adel, the Mahometan ſuperſtition prevailed. Many of that perſuaſion had alſo diſperſed themſelves through the towns and villages in the internal parts of the empire, while in not a few places the groſſeſt idolatry ſtill took place; ſuch as the worſhip of the heavenly bodies, the wind, trees, cows, ſerpents, &c. All this had hitherto paſſed unnoticed; but in the reign of Zara Jacob, ſome families

Religious perſecution introduced.

Abyſſinia.

lies being accuſed of worſhipping the cow and ſerpent, were brought before the king, who pronounced ſentence of death upon them. Their execution was followed by a royal proclamation, that whoever did not carry on his right hand an amulet with theſe words upon it, "I renounce the devil for Chriſt our Lord," ſhould not only forfeit his perſonal eſtate, but be liable to corporeal puniſhment. The ſpirit of perſecution thus begun, quickly diffuſed itſelf, and an inquiſitor was appointed to ſearch for criminals. This was one Amda Sion, the king's chief confidant, who pretended to all that abſurd and auſtere devotion common to religious hypocrites. In this he was flattered with uncommon parade and attendance, the uſual rewards of people of that ſtamp; as he never appeared abroad but with a great number of ſoldiers, trumpets, drums, and other enſigns of military dignity waiting upon him. He kept alſo a number of ſpies, who brought him intelligence of thoſe who were ſecretly guilty of any idolatrous or treaſonable practices; after which, proceeding with his attendants to the houſe of the delinquent, he cauſed the family firſt ſupply himſelf and his party with refreſhments, and then ordered the unhappy wretches to be all put to death in his preſence. Among thoſe who ſuffered in this barbarous manner were the two ſons-in-law of the king himſelf, who had been accuſed by their wives, the one of adultery, and the other of inceſt; on which ſlight ground they were both put to death in their own houſes, in ſuch a manner as deſervedly threw an odium on the king. His conduct was afterwards ſo ſeverely condemned by a certain clergyman from Jeruſalem, that a reformation ſeems to have been produced; and no mention is afterwards made of the inquiſitor or perſecution during this reign.

Amda Sion a cruel inquiſitor.

Murder of the king's ſon-in law.

Perſecution ſuppreſſed.

The attention of the king was now called off from religion to the ſtate of his affairs in the different provinces of the kingdom. As the Moorish provinces were very rich, by reaſon of the extenſive trade they carried on, and frequently employed their wealth in exciting rebellion, it became neceſſary that the ſovereign himſelf ſhould examine into the circumſtances and diſpoſitions of the ſeveral governors, which was likewiſe proper on another account, that he might aſſign to each the ſum to be paid. On this occaſion he divided the empire more diſtinctly, and increaſed the number of governments conſiderably; which being done, he ſet about repairing the churches throughout the country, which had fallen into decay, or been deſtroyed in the war with the Mahometans. So zealous was he in this reſpect, that having heard of the deſtruction of the church of the Virgin in Alexandria by fire, he inſtantly built another in Ethiopia, to repair the loſs which Chriſtianity might have ſuffered.

Affairs of the kingdom regulated.

Churches repaired.

The laſt public tranſaction of this prince's reign was the quaſhing of a rebellion which ſome of his governors had entered into; but whatever glory he might acquire from this or any other exploit, his behaviour with regard to his domeſtic affairs muſt certainly place him in a very diſadvantageous light. In the decline of the king's life, the mother of the heir-apparent conceived ſuch an extreme deſire to behold her ſon in poſſeſſion of the throne, that ſhe began to form ſchemes for obliging his father to take him into partnerſhip with him in the government. Theſe being diſcovered, her huſband cruelly cauſed her to be whipped to death: and finding that his ſon afterwards performed certain ſolemnities at her grave in token of regard for her, he cauſed him to be loaded with irons and baniſhed to the top of a mountain; where he would probably have been put to death, had not the monks interfered. Theſe having invented prophecies, dreams, and revelations, that none but the young prince Bæda Mariam was to poſſeſs the throne, the old king ſubmitted to the decrees of Heaven, and relaxed in his ſeverity.

The queen put to a cruel death

Abyſſinia.

On the acceſſion of the new king in 1468, the old law for impriſoning all the royal family was revived, and a mountain named *Geſhen* choſen for the purpoſe. Having thus ſecured himſelf from any danger of a rival in caſe he ſhould undertake a foreign expedition, he proclaimed a pardon to all thoſe who had been baniſhed during the former reign, and thus ingratiated himſelf with his people: after which he began to prepare for war. At this the neighbouring princes, particularly the king of Adel, being alarmed, ſent ambaſſadors requeſting the continuance of peace. The Abyſſinian monarch told them, that his deſign was to deſtroy the Dobas; a race of ſhepherds very wealthy, but extremely barbarous, profeſſing the Pagan religion, and greatly reſembling the Gallas. The reaſon of his commencing hoſtilities againſt them was, that they made continual inroads into his country, and committed the greateſt cruelties; on which account he determined not to make war as with a common enemy, but to exterminate and deſtroy them as a nuiſance. The king of Adel was no ſooner poſſeſſed of this piece of intelligence, than he communicated it to the Dobas; deſiring them to ſend their women and children, with their moſt valuable effects, into his country, till the invaſion ſhould be over. This propoſal was readily embraced; but Bæda having got notice of it, ſeized an avenue through which they muſt neceſſarily paſs, and maſſacred every one of the company. After this, entering their country, he committed ſuch devaſtations, that they were glad to ſubmit, and even to renounce their religion in order to free themſelves from ſuch a dreadful enemy. The king then turned his arms againſt Adel, where he was attended with his uſual ſucceſs; a moſt complete victory being gained over the Moors by the Abyſſinian general: but while the king himſelf was advancing towards that country, with a full reſolution to reduce it to the moſt abject ſtate of miſery, he was ſeized with a pain in his bowels, which occaſioned his death.

The royal family again confined.

War with the Dobas reſolved on.

They are maſſacred.

Death of the king.

The diſcovery of the kingdom of Ethiopia or Abyſſinia by the Europeans took place about this time. It has already been obſerved, that ſome intercourſe by means of individuals had been carried on betwixt this country and Italy; but the knowledge conveyed to Europeans in this manner was very imperfect and obſcure. Even the ſituation of the country had been forgot; and though ſome confuſed notions were entertained of a diſtant Chriſtian prince who was likewiſe a prieſt, Marco Paulo, the famous Venetian traveller, aſſures that he had met with him in Tartary; and it was univerſally agreed, that his name was *Joannes Preſbyter*, *Prete Janni*, or *Preſter John*. When the Portugueſe began to extend their diſcoveries along the coaſt of Africa, more certain intelligence concerning this prince was obtained. Bemoy, one of the kings of the

Diſcovery of Abyſſinia by the Europeans.

Of Preſter John.

Abyſſinia. the Juloffes, a nation on the weſtern coaſt of Africa, had aſſured the Portugueſe navigators of the exiſtence of ſuch a prince ſo ſtrongly, that the king determined to ſend ambaſſadors to him; and the diſcovery was of the greater conſequence, that a paſſage to the Eaſt Indies was now attempted both by land and ſea. The ambaſſadors were named *Peter Covillan* and *Alphonſo de Paiva*. Theſe were ſent to Alexandria in Egypt, from whence they were to ſet out on their journey; the intent of which was, to explore the ſources of the Indian trade, the principal markets for the ſpice, &c. but above all, to diſcover whether it was poſſible to arrive at the Eaſt Indies by ſailing round the continent of Africa.

Ambaſſadors ſent from the king of Portugal.

Account of their travels. In the proſecution of this ſcheme our two travellers went from Alexandria to Cairo; from thence to Suez at the bottom of the Red ſea; from Suez they took their route to Aden, a wealthy and commercial city beyond the ſtraits of Babel Mandel. Covillan now ſet ſail for India, and De Paiva for Suakem. The latter loſt his life without making any diſcovery; but Covillan paſſed over to Calicut and Goa. From thence he returned to the continent of Africa, viſiting the gold mines of Sofala, and paſſing from thence to Aden and Cairo; at which place he was informed of the death of his companion. In this city he was met by two Jews with letters from the king of Abyſſinia. One of theſe Jews was ſent back with letters to the Abyſſinian monarch; but with the other he proceeded to the iſland of Ormus in the Perſian gulf. Here they ſeparated; the Jew returning home, and Covillan repaſſing the ſtraits of Babel Mandel, whence he proceeded to Aden, and afterwards entered the Abyſſinian dominions.

The reigning prince at this time was named *Alexander*; and when Covillan arrived, he was employed in levying contributions upon his rebellious ſubjects. He met with a kind reception; and was conveyed to the capital, where he was promoted to the higheſt poſts of honour, but never allowed to return to Europe again. The intelligence, however, which he tranſmitted to the court of Portugal proved of much importance. He not only deſcribed all the ports of India he had ſeen, with the ſituation and wealth of Sofala, but adviſed the king to proſecute the diſcovery of the paſſage round Africa with the utmoſt diligence; affirming, that the cape at the ſouthern extremity of the continent was well known in India; and accompanying the whole with a chart which he had obtained from a Moor, and which ſhowed exactly the ſituation of the cape and neighbouring countries.

Important intelligence conveyed to Portugal by Covillan.

Reign of Alexander. Covillan arrived in Ethiopia about the year 1490; and the prince to whom he addreſſed himſelf was Alexander the ſon of Bæda Mariam, a prince endowed with many good qualities, and no leſs verſed in military affairs than any of his predeceſſors. His reign was diſturbed by plots and rebellions, which at laſt proved fatal to him. From his early years he manifeſted a great deſire to make war on the king of Adel, who ſeems to have been the natural rival of the Ethiopic princes. But the Adelian monarch, having now become ſenſible that he was not able to cope with ſuch powerful adverſaries, took the moſt effectual way of ſecuring himſelf; viz. by gaining over a party at the court of Abyſſinia. In this he had now ſucceeded ſo well, that when Alexander was about to invade Adel, Za Saluce the prime miniſter, with many of the principal nobility, were in the intereſt of his adverſary. Not being apprized of this treachery, however, Alexander intruſted this miniſter with the command of a great part of his forces; and with theſe the latter abandoned him in the heat of an engagement. Alexander and the few troops who remained with him, however, were ſo far from being diſheartened by this treachery, that they ſeemed to be inſpired with freſh courage. The king having killed the ſtandard-bearer of the enemy, and thus become maſter of the green enſign of Mahomet, the enemy began to give way; and on his killing the king of Adel's ſon, immediately after, they quitted the field altogether. The victory was not by any means complete; neither was Alexander in a ſituation to purſue the advantage he had gained. Having therefore challenged the Moors to a ſecond engagement, which they declined, he returned with a deſign to puniſh his perfidious miniſter Za Saluce, who had endeavoured to excite the governors of all the provinces to revolt as he went along. The traitor, however, had laid his plots too well; ſo that his ſovereign was murdered in two days after his arrival in the capital. Za Saluce did not enjoy the rewards he expected from his treachery: for having attempted to excite a revolt in the province of Amhara, he was attacked by the nobility there; and his troops deſerting him, he was taken priſoner without any reſiſtance, his eyes were put out, and himſelf expoſed on an aſs, to the curſes and deriſion of the people.

Abyſſin He is de- ſerted by his prime miniſter and moſt his army battle, h gains a tory.

Alexand murdere

Alexander was ſucceeded by an infant ſon, who reigned only ſeven months; after which his younger brother Naod was choſen king by the unanimous voice of the people. He proved a wiſe and virtuous prince; but the late misfortunes, together with the corruption introduced at court by the Mahometans, had ſo unhinged the government, that it became very difficult to know how to manage matters. Judging very properly, however, that one of the moſt effectual methods of quieting the minds of the people would be an offer of a general pardon; he not only proclaimed this, but likewiſe, "That any perſon who ſhould upbraid another with being a party in the misfortunes of paſt times, or ſay that he had been privy to this or that conſpiracy, had received bribes from the Moors, &c. ſhould be put to death without delay." On his entering upon government, he found it neceſſary to prepare againſt an enemy whom we have not heretofore mentioned, viz. Maſſudi, prince of a diſtrict named *Arar*, which lay in the neighbourhood of Adel. This chieftan being a man of a very enterpriſing and martial diſpoſition, and a moſt violent enthuſiaſt in the Mahometan cauſe, had made a vow to ſpend 40 days annually in ſome part of the Abyſſinian dominions during the time of Lent. For this purpoſe he kept a ſmall body of veteran troops, with whom he fell ſometimes on one part, and ſometimes on another of the frontiers, putting to death without mercy ſuch as made reſiſtance, and carrying off for ſlaves thoſe who made none. For 30 years he continued this practice; beginning exactly on the firſt day of Lent, and proceeding gradually up the country as the term advanced. His progreſs was greatly facilitated by the ſuperſtition of the people themſelves, who kept that faſt with ſuch rigour as almoſt

Reign of Naod.

Maſſudi ravages Abyſſinia territorie

Meditates a war againſt Adel.

Abyſſinia. moſt entirely to exhauſt their ſtrength; ſo that Maſſudi having never met with any oppoſition, was always ſure of ſucceſs, and thus came to be reckoned invincible. On the preſent occaſion, however, he experienced a prodigious reverſe of fortune. Naod having enjoined his ſoldiers to live in the ſame full and free manner during the faſt as at any other time, and having ſet the example himſelf, marched out againſt his enemy; who, being ignorant of the precaution he had taken, advanced with his uſual confidence of ſucceſs. The Abyſſinian monarch, ſtill pretending fear, as if on account of the weakneſs of his men, pitched his camp in very ſtrong ground, but left ſome paſſages open to it, that the enemy might make an attack. This was done contrary to the advice of their leader; and the conſequence was, that almoſt every one of them was cut off. On this the king of Adel ſent ambaſſadors to ſolicit a continuance of the peace with himſelf; which was granted, upon condition that he reſtored all the ſlaves whom Maſſudi had carried off in his laſt year's expedition; with which the Mahometan chief thought proper to comply rather than engage in ſuch a dangerous war.

He is defeated.

Naod having thus freed his country from the danger of any foreign invaſion, applied himſelf to the cultivation of the arts of peace, and reforming the manners of his ſubjects, in which he ſpent the remainder of his days. He died in 1508, after a reign of 13 years; and was ſucceeded by his ſon David III. a child of 11 years of age. Though the affairs of the empire were at preſent in ſuch a ſtate as required a very prudent and active adminiſtration, the empreſs Helena, widow of Bæda Mariam, had intereſt enough to get the crown ſettled on the infant juſt mentioned. This proceeded partly from her deſire of engroſſing all the power into her own hands, and partly from a wiſh to keep peace with Adel her native country. Theſe ends could not be accompliſhed but by keeping a minor on the throne of Abyſſinia; which was therefore her conſtant object as long as ſhe lived. But though this might not have been attended with any very bad conſequence had the two nations been left to decide the quarrel by themſelves, the face of affairs was now quite changed by the interference of the Turks. That people having now conquered almoſt the whole of Arabia to the Indian ocean, being likewiſe on the point of reducing Egypt, and having a great advantage over their adverſaries in uſing fire-arms, now projected the conqueſt of India alſo. In this indeed they were always diſappointed by the ſuperior valour of the Portugueſe; but as this conqueſt remained a favourite object with them, they did not abandon their attempts. In the countries which they had conquered, they exacted ſuch enormous contributions from the merchants, that vaſt numbers of them fled to the African ſide of the Red ſea, and ſettled on the coaſt of Adel. The Turks ſurpriſed at the increaſe of trade in this country, which they themſelves had occaſioned, reſolved to ſhare in the profits. For this purpoſe they took poſſeſſion of Zeyla, a ſmall iſland in the Red ſea, directly oppoſite to the coaſt of Adel; and erected a cuſtomhouſe in it, where they oppreſſed and ruined the trade as in other places. Thus both Adel and Abyſſinia were threatened with a moſt formidable enemy, which it would have been utterly out of their power to have reſiſted, had not the deſire of poſſeſſing India conſtantly prevented the Turks from directing their ſtrength againſt theſe countries. Helena was ſenſible enough of the dangerous ſituation of the empire, but preferred the gratification of her ambition to the good of her country; however, that ſhe might preſerve herſelf from the attacks of ſuch a formidable enemy, it was now thought proper to enter into an alliance with the Portugueſe. The ambaſſador from Portugal, Peter Covillan, was denied the liberty of returning to his own country, as has been already related; and as, for ſome time paſt, it had not been obvious how he could be of much uſe, he had begun to fall into oblivion. The preſent emergency, however, recovered his importance. The empreſs was ſenſible of the neceſſity ſhe lay under of having ſome perſon who underſtood both the Abyſſinian and Portugueſe languages before ſhe could open any correſpondence with that nation, and who might likewiſe inform her of the names of the perſons to whom her letters ought to be addreſſed. By him ſhe was now inſtructed in every thing neceſſary to the ſucceſs of her embaſſy. The meſſage was committed to one Matthew an Armenian merchant, with whom a young Abyſſinian was joined; but the latter died by the way. The letters they carried are by Mr Bruce ſuppoſed to have been partly the work of Covillan and partly of the leſs experienced Abyſſinian confidants of the empreſs. They began with telling the king, that Matthew would give him information of her whole purpoſe, and that he might depend on the truth of what he ſaid: but in the latter part the whole ſecret of the embaſſy was diſcloſed, and a force ſufficient to deſtroy the Turkiſh power was expreſsly ſolicited. Among the other particulars of this embaſſy alſo it is ſaid, that a third part of Abyſſinia was offered in caſe her requiſitions were complied with; but this, as well as the embaſſy itſelf, was always denied by David when he came of age.

Abyſſinia.

An embaſſy ſent to Portugal.

David III.

Abyſſinia in danger from the Turks.

Matthew, though raiſed from the rank of merchant to that of an ambaſſador, could not, it ſeems, act according to his new dignity in ſuch a manner as to ſcreen himſelf from the moſt mortifying and dangerous imputations. Having arrived at Dabul in the Eaſt Indies, he was ſeized as a ſpy, but relieved by Albuquerque the viceroy of Goa; and that not out of any regard to his character as ambaſſador, but becauſe he himſelf had a deſign upon Abyſſinia. This viceroy uſed his utmoſt endeavours to induce Matthew to deliver his commiſſions to him; but the ambaſſador conſtantly refuſed to ſhow any letter he had, except to the king of Portugal in perſon, and in his own kingdom. This put him out of favour with the viceroy; while his attendants, diſpleaſed at the mean appearance of the man, inſiſted ſometimes that he was a ſpy from the ſultan, at others that he was a cook, an impoſtor, or a menial ſervant. Matthew, however, perceiving that he was now out of danger, maintained that his perſon was ſacred, and inſiſted on being treated as the repreſentative of a ſovereign. He let the viceroy, biſhop, and clergy know, that he had with him a piece of the wood of the true croſs, ſent as a preſent to the king of Portugal: and he required them, under pain of ſacrilege, to pay reſpect to the bearer of ſuch a precious relic, and to celebrate its arrival as a feſtival. This was inſtantly complied with, and a ſolemn proceſſion inſtituted; but very little re-

The ambaſſador ill uſed.

Abyſſinia. gard appears to have been paid to this ambaſſador either in his temporal or ſpiritual character, as he could not obtain leave to depart for Portugal till 1513, which was three years after he arrived in India. In his paſſage he was extremely ill-treated by the ſhipmaſters with whom he ſailed: but of this they ſoon had cauſe to repent; as on their arrival at Lisbon they were all put in irons, and would probably have died in confinement, had not Matthew made interceſſion for them with the king.

Maſſudi renews his depredations.

In the mean time, Maſſudi having recovered from the defeat given him by Naod, and formed alliances with the Turks in Arabia, had renewed his depredations on the Abyſſinian territories with more ſucceſs than ever. Such a number of ſlaves had been, by his aſſiduity, ſent to Mecca, that he was honoured with a green ſilk ſtandard (an emblem of the true Mahometan faith), with a tent of black velvet embroidered with gold, and he was likewiſe made Sheykh of Zeyla; ſo that, as this iſland was properly the key to the Abyſſinian empire, he could neither be rewarded with greater honour nor profit. This happened when David had attained the age of 16; and in conſequence of ſuch ſurpriſing ſucceſs, the king of Adel, never a hearty friend to Abyſſinia, determined to break the peace with that empire and make an alliance with Maſſudi. Having taken this reſolution, the two princes invaded Abyſſinia with their joint forces, and in one year carried off 19,000 Chriſtian ſlaves, ſo that a general terror was ſpread over the whole empire. David, already impatient of the injuries his people had ſuſtained, determined to raiſe an army, and to head it in perſon as his anceſtors had done, contrary to the advice of the empreſs, who conſidering only his youth and inexperience in military affairs, wiſhed him to have employed ſome of his veteran officers. A very powerful army was raiſed, and ample ſupplies of all kinds were procured. With one part of his forces the emperor took the road to Auſſa the capital of Adel; ſending the other under the command of an officer named the *Betwudet*, to meet the Mooriſh army, which was then ravaging part of Abyſſinia. It was natural to be imagined, that the Moors, on hearing that an army was marching to deſtroy the capital of their country, would abandon the thoughts of conqueſt or plunder to preſerve it. In doing this, David knew that they had certain defiles to paſs before they could reach Adel. He ordered the Betwudet therefore to allow them to enter theſe defiles; and before they could get through, he himſelf, with the main body of the army, marched to attack them at the other end. Thus the Moors were completely hemmed in by a ſuperior army: but beſides this unfavourable ſituation, they were farther diſpirited by Maſſudi. That hero came, on the morning of the engagement, to the king of Adel, informing him that his own time was now come; that he had been certainly told by a prophet, long ago, that if this year (1516) he ſhould fight the king of Abyſſinia in perſon, he ſhould loſe his life. He was aſſured that the Abyſſinian monarch was then preſent, having ſeen the ſcarlet tent which was uſed only by the ſovereigns of that country; and therefore adviſed the king of Adel to make the beſt of his way over the leaſt ſteep part of the mountain before the engagement began. The Adelian monarch, who had at any rate no great inclination to fight, was not inſpired with courage by this ſpeech: he therefore followed the advice given him; and, with a few of his friends, paſſed the mountain, leaving his troops to their fate. The Moors, in the mean time, being abandoned by one leader, and having another devoted to deſtruction, ſhowed an uncommon backwardneſs to engage, which was taken notice of by their enemies. Maſſudi, however, as ſoon as he ſuppoſed the king of Adel to be out of danger, ſent a trumpet to the Abyſſinian camp, with a challenge to any man of quality in the army to fight him; on condition that the party of the victorious champion ſhould be accounted conquerors, and that the armies ſhould immediately ſeparate without further bloodſhed. The challenge was inſtantly accepted by a monk named *Gabriel Andreas*; who, in the reign of Bæda Mariam, had been condemned to loſe the tip of his tongue for ſpeaking ſlightly of the king's proclamation of amneſty. Maſſudi ſhowed no reluctance to preſent himſelf; but received ſuch a ſtroke from his antagoniſt with a two-handed ſword as almoſt cut his body in two, and he immediately fell down dead. Andreas cut off his head; and throwing it at the king's feet, cried out, "There is the Goliath of the infidels." This became the ſignal for a general engagement, notwithſtanding the terms ſtipulated by Maſſudi before the combat. The Moors were quickly repulſed by the king's troops, and driven backward through the defile. At the other end they were met by the Betwudet (B), who drove them back to the king's forces; ſo that at laſt being forced to fly to the mountains, they were all ſlaughtered by the peaſants, or periſhed with hunger and thirſt.

Abyſſinia.

He is killed.

The Moors defeated and deſtroyed.

David marches againſt him.

Maſſudi propheſies his own death.

The ſame day that this victory was gained over the Moors by David, being in the month of July 1516, the iſland of Zeyla in the Red ſea was taken and the town burnt by the Portugueſe fleet under Lopez Suarez de Alberguiera. The Abyſſinian ambaſſador, Matthew, in the mean time, had been received with the greateſt marks of eſteem in Portugal. The utmoſt attention was paid to his embaſſy; he was lodged in the moſt ſplendid manner; and his maintenance was ſuitable to his lodging. The king prepared an embaſſy on his part, and ſent home Matthew on board the Indian fleet commanded by Lopez. The ambaſſador ordered for Abyſſinia was one Edward Galvan, a man who had filled many ſtate departments with the utmoſt applauſe; but who by reaſon of his age, being now 86, was certainly very unfit for ſuch a diſtant and perilous voyage. He died accordingly on the iſland of Camaran in the Red ſea, where Suarez had imprudently landed, and paſſed the winter in the utmoſt diſtreſs for want of proviſions of every kind. This admiral was ſucceeded by Lopez de Seguyera; who ſailed firſt to the iſland of Goa in the Eaſt Indies, where he fitted out a ſtrong fleet; after which he returned to the Red ſea, and landed on the iſland of Maſuah, having

Zeyla taken by the Portugueſe.

Embaſſy from the king of Portugal.

(B) This is the title of one of the officers in Abyſſinia, not the proper name of a man.

Abyſſinia. ing along with him Matthew, about the authenticity of whoſe miſſion there had been ſuch diſputes. At his firſt approach the inhabitants fled; but at laſt he was accoſted by a Chriſtian and a Moor from the continent, who informed him that the coaſt oppoſite to Maſuah was part of the kingdom of Abyſſinia, and that it was governed by an officer named the *baharnagaſh*; that all the inhabitants of the iſland were Chriſtians; that the reaſon of their flying at the ſight of the Portugueſe fleet was that they took them for Turks, who frequently made deſcents, and ravaged the iſland, &c. The admiral diſmiſſed them with preſents; and ſoon after had a viſit from the governor of Arkeeko, a town on the continent; who informed him, that about 24 miles up the country there was a monaſtery, ſeven of the members of which were now deputed to wait upon him. Theſe inſtantly knew Matthew, and congratulated him in the warmeſt manner upon his return from ſuch a long voyage. An interview ſoon took place between the baharnagaſh himſelf and Lopez. The Abyſſinian informed him, that the coming of the Portugueſe had been long expected, in conſequence of certain ancient prophecies; and that he himſelf and all the officers of the emperor were ready to ſerve him. They parted with mutual preſents; and all doubt about Matthew being now removed, he prepared to ſet out for the emperor's court; while Roderigo de Lima was nominated ambaſſador in place of Galvan who died. Along with them were 15 Portugueſe; all men of the moſt determined courage, and who would heſitate at nothing which they thought might contribute to the glory of their king, their own honour, or the advantage of their country. Their preſent journey indeed was much more perilous than their voyage from Portugal to Abyſſinia. The emperor was at this time in the ſouthern part of his dominions, but the Portugueſe had landed on the northern part; ſo that they had almoſt the whole breadth of the empire to paſs before they could meet with him. The very firſt journey they attempted was through a wood ſo thick that it could ſcarce afford a paſſage either to man or beaſt, while the interſtices of the trees were ſo interwoven with briers and thorns of various kinds, that their paſſage was rendered almoſt impracticable. This was rendered ſtill more terrible by the vaſt numbers of wild beaſts they ſaw, and which ſeemed only to be prevented from devouring them by the appearance of ſo many men together. The rainy ſeaſon was alſo now begun; ſo that they were expoſed to inceſſant deluges of water deſcending from the clouds, beſides frequent and violent ſtorms of wind, thunder, and lightning, &c. To add to their misfortunes, an epidemic fever broke out among them, which carried off Matthew and one of the ſervants of Don Roderigo. At laſt, after a moſt tedious and toilſome journey, from the 16th of April to the 18th of October 1520, the Portugueſe ambaſſador, with his retinue, came within ſight of the Abyſſinian camp at the diſtance of about three miles. His reception was by no means favourable; for inſtead of being immediately admitted to the preſence of the emperor, he was waited on by one of the officers of ſtate, ſtyled, in token of humility, *Hadug Ras*, or *commander of aſſes*; who cauſed him pitch his tent three miles farther off from the camp: and it was not till five years afterwards that he was enabled to finiſh the buſineſs of his embaſſy, and obtained leave to depart for Portugal. Abyſſinia.

During all this time, not a ſingle word had paſſed relating to the affairs of the two nations; ſo that it is difficult to imagine what might have been the deſign of the Abyſſinian emperor. At laſt, having reſolved to ſend an embaſſy to Portugal, he allowed Roderigo to depart, but detained two of his people; appointing Zaga Zaab, an Abyſſinian monk, his ambaſſador to Portugal.

This long intercourſe betwixt two ſuch diſtant nations, however, could not but greatly alarm the Mahometan powers, who were natural enemies to both. Selim, the Turkiſh ſultan, having been conſtantly defeated by the Portugueſe in the eaſt, and alarmed at the thoughts of having a fleet of that nation in the Red ſea, where they might greatly annoy his ſettlements on the coaſt of Arabia, determined to carry his arms to the African ſide; while the king of Adel, having ſtrengthened himſelf by alliances with the Turkiſh officers in Arabia, was now become a much more formidable enemy than before. This was ſoon experienced in a battle with the Adelians; in which the Abyſſinian monarch was overthrown with the loſs of almoſt all his great officers and principal nobility, beſides a vaſt number of private men. The victory was principally owing to the aſſiſtance given by the Turks; for the army was commanded by Mahomet ſurnamed *Gragné*, i. e. *left-handed*, governor of Zeyla, which had now received a Turkiſh garriſon. This man, having the conqueſt of Abyſſinia greatly at heart, reſolved, as ſoon as poſſible, to effect ſomething deciſive; and therefore having ſent to Mecca all the priſoners taken in his late expedition, he obtained in return a conſiderable number of janizaries, with a train of portable artillery. Thus the fortune of the war was entirely decided in favour of the Adelians and Turks; the emperor was defeated in every battle, and frequently hunted from place to place like a wild beaſt. The Moors, finding at laſt no neceſſity for keeping up an army, overran the whole empire in ſmall parties, everywhere plundering and burning the towns and villages, and carrying off the people for ſlaves.

This deſtructive war continued till the year 1537; when Gragné ſent a meſſage to the emperor, exhorting him not to fight any longer againſt God, but to make peace while it was in his power, and give him his daughter in marriage: on which condition he would withdraw his army; but otherwiſe he would reduce his empire to ſuch a ſtate that it ſhould be capable of producing nothing but graſs. David, however, ſtill refuſed to ſubmit; replying, that he put his confidence in God, who at preſent only chaſtiſed him and his people for their ſins; but that Gragné himſelf, being an infidel, and enemy to the true religion, could not fail of coming in a ſhort time to a miſerable end. This unſucceſsful negotiation was followed by ſeveral encounters, in which the emperor was conſtantly defeated; in one of them his eldeſt ſon was killed, and in another his youngeſt was taken priſoner; ſo that he now ſeemed entirely deſtitute, being obliged to wander on foot, and all alone, hiding himſelf throughout the day among the buſhes on the mountains.

The invincible conſtancy with which this forlorn monarch bore his misfortunes, proved a matter of ſurpriſe

At laſt allowed to depart with an ambaſſador from the emperor.

Bad effects of this delay.

The emperor defeated by the Moors.

The Adelians, aſſiſted by the Turks, defeat the emperor.

He refuſes to ſubmit.

Abyſſinia

priſe both to friends and enemies. Many of his veteran ſoldiers, compaſſionating the diſtreſſes of their ſovereign, ſought him out in his hiding places; ſo that he once more found himſelf at the head of a ſmall army, with which he gained ſome advantages that ſerved to keep up his own ſpirits and thoſe of his adherents. His greateſt enemy was Ammer, one of Gragné's officers, who headed the rebellious Abyſſinians, and who had formed a ſcheme of aſſaſſinating the king; but, inſtead of accompliſhing his purpoſe, he himſelf was aſſaſſinated in 1538 by a common ſoldier, on what account we are not informed.

By the death of Ammer and the ſmall ſucceſſes which David himſelf had obtained, the affairs of Abyſſinia ſeemed to revive; but ſtill there was no probability of their being ever brought to a fortunate iſſue.

A new embaſſy to Portugal.

An embaſſy to Portugal was therefore thought of in good earneſt, as the miſchievous effects of ſlighting the proffered friendſhip of that power were now ſufficiently apparent. One of the attendants of Roderigo, named John Bermudes, who had been detained in Abyſſinia, was choſen for this purpoſe; and to his temporal character of ambaſſador was added that of Abuna, primate or patriarch. John, who was not a clergyman originally, had received all the inferior eccleſiaſtical orders at once, that the ſupreme one might be thus conferred upon him; but happening to be a great bigot to the popiſh religion, he would not accept of his new dignity but with a proviſo, that his ordination ſhould be approved by the pope. This was indirectly ſubmitting the church of Abyſſinia to that of Rome; to which David would never have agreed, had it not been for the deſperate ſituation of his affairs at that time. John was therefore allowed to do as he thought proper: when paſſing through Arabia and Egypt to Italy, he had his confirmation confirmed by the pope; after which he ſet out on the buſineſs of his embaſſy. On his arrival at Lisbon, he was acknowledged by the king as patriarch of Alexandria, Abyſſinia, and of the ſea; for this laſt title had alſo been conferred upon him by his Holineſs. Entering then upon the purpoſe of his embaſſy, he began by putting Zaga Zaab in irons for having waſted ſo much time, and done nothing effectual ſince he had left Abyſſinia. Then he repreſented to the king the diſtreſſes of the Abyſſinians in ſuch a ſtrong light, and inſiſted ſo violently for relief to them, that an order was very ſoon procured for 400 muſketeers to be ſent by Don Garcia de Noronha to their relief. To accelerate the progreſs of the intended ſuccours, John himſelf propoſed to ſail in the ſame fleet with Don Garcia; but his voyage was delayed for a whole year by ſickneſs, occaſioned, as he ſuppoſed, by poiſon given him by Zaga Zaab, the monk whom he had impriſoned, and who had been ſet at liberty by the king. After his recovery, however, he ſet ſail for India, where he arrived in ſafety. The death of Don Garcia, which happened in the mean time, occaſioned another delay; but at laſt it was reſolved, that Don Stephen de Gama, who had ſucceeded to Don Garcia, ſhould undertake an expedition to the Red ſea, in order to burn ſome Turkiſh galleys which then lay at Suez. But intelligence having in the mean time been received of the intended voyage, theſe veſſels had withdrawn themſelves. Anchoring then in the port of Maſuah, Don Stephen ſent over to

A body of Portugueſe ordered to aſſiſt the emperor.

Arkeeko on the continent to procure freſh water and other proviſions; but the Turks and Moors being now entirely maſters of that coaſt, the goods he had ſent in exchange were ſeized without any thing being given in return. A meſſage was brought back, importing, that the king of Adel was now maſter of all Ethiopia, and conſequently that no trade could be carried on without his leave; but if Don Stephen would make peace with him, the goods ſhould be reſtored, a plentiful ſupply of water and all kinds of proviſions granted, and amends likewiſe made for 60 Portugueſe who had been killed at Zeyla. Theſe had run away from the fleet on its firſt arrival in the Red ſea, and landed on the coaſt of Adel, where they could procure no water; of which the barbarians took advantage to decoy them up the country; where, having perſuaded them to lay down their arms, they murdered them all. To this Don Stephen returned a ſmooth anſwer, ſent more goods, obtained proviſions, and promiſed to come aſhore as ſoon as a Mahometan feſtival, which the ſavages were then celebrating, ſhould be over. This treaty was carried on with equal bad faith on both ſides; but Don Stephen had now the advantage by obtaining the proviſions he ſtood in need of. Theſe were no ſooner brought on board, than he ſtrictly forbade all intercourſe with the land; and chooſing out 600 men, he attacked the town of Arkeeko, killed the governor, and ſent his head to the Abyſſinian court; maſſacring at the ſame time all the people in the town he met with.

Abyſſinia

The ſuccours arrive and take the town Arkeeko.

During this long interval, a conſiderable change had taken place in the Abyſſinian affairs. We have already ſeen that David had been reduced to great diſtreſs; but afterwards met with ſome little ſucceſſes, which ſeemed to indicate an approaching change of fortune. In theſe, however, he was ſoon diſappointed. A Mahometan chief called *Vizir Mugdid* made an attack upon the rock Geſhen, where the royal family were kept; and finding it entirely unguarded, aſcended without oppoſition, and put every perſon to the ſword. This laſt diſaſter ſeems to have been too great for the reſolution even of this heroic prince, as he died the ſame year 1540. He was ſucceeded by his ſon Claudius, who, though then but about 18 years of age, was endowed with all the great qualities neceſſary for managing the affairs of the empire in ſuch a dreadful criſis, and had made conſiderable progreſs before the arrival of the Portugueſe.

Affairs of Abyſſinia during this interval.

Royal family maſſacred.

Death of David, and acceſſion of Claudius to the empire.

On his acceſſion, the Moors, deſpiſing his youth, inſtantly formed a league among themſelves to cruſh him at once; but, like almoſt all others too confident of victory, they neglected to take the proper precautions againſt a ſurpriſe. This was not unobſerved by Claudius; who falling upon one party which lay next to him, gave them a total defeat. The king purſued them the whole day of the engagement, the enſuing night, and part of the following day; putting to death without mercy every one who fell into his hands. This exceſſive ardour very much damped the ſpirits of his enemies, and at the ſame time inſpired his own party with the moſt ſanguine hopes of ſucceſs; whence he ſoon appeared at the head of ſuch an army as convinced his enemies that he was by no means to be deſpiſed. They now found it neceſſary to deſiſt from the practice they had ſo long continued, of plundering and ravaging

A powerful league formed againſt the new emperor.

The Moors defeated.

Abyſſinia. ravaging the country; to call in their ſcattered parties, unite their troops, and ſpend the rainy ſeaſon in ſuch parts of Abyſſinia as they had conquered, without returning into Adel, as had hitherto been uſual with them. They now came to a reſolution to force the king to a general engagement, in which they hoped to prove victorious by dint of numbers. For this purpoſe all the rebel chiefs in Abyſſinia were called in, and a formidable army collected. They waited only for one very experienced chief named *Jonathan*; after whoſe junction they determined to attack the royal army without delay. But Claudius took his poſts at all times with ſuch judgement, that any attempt upon his camp would have been almoſt deſperate; and getting intelligence where Jonathan lay with his forces, he marched out in the night time, came upon him quite unprepared, defeated and killed him, ſending his head to the reſt of the confederacy by a priſoner, the only one he had ſpared out of all thoſe who were taken. By the ſame meſſenger a defiance was ſent to the Moors, and many opprobrious epithets were beſtowed upon them; but though the armies approached one another, and continued for ſeveral days under arms, the Moors were ſo much intimidated that they would by no means venture an engagement.

Jonathan, a rebel chief, defeated and killed.

By this victory the ſpirits of the Abyſſinians were ſo much elevated, that they flocked in from all parts to join their prince; and even many of the Mahometans, having experienced the lenity of the Chriſtian government, choſe rather to ſubmit to Claudius than to the Turks and Adelians. The king, however, was in danger of being aſſaſſinated by one Ammer, a treacherous governor; who knowing that he had retired to ſome diſtance from his army to celebrate the feſtival of Eaſter, attempted to ſurpriſe him when almoſt deſtitute of attendants; but Claudius having timely notice of his deſigns, laid an ambuſh for him with a conſiderable part of his army which he headed in perſon. The rebel, not being equally well informed, fell into the ſnare, was defeated, and almoſt his whole army cut off on the 24th of April 1541.

Unſucceſsful attempt to aſſaſſinate Claudius.

Such was the ſituation of affairs when the Portugueſe arrived. The head of the governor of Arkeeko had been received by the queen, who regarded it as a happy inſtance of the valour of her allies, and as a preſage of future victories. The Portugueſe admiral, Don Stephen de Gama, loſt no time in employing the men allowed by the king to aſſiſt the Abyſſinians. Theſe were in number 450; but as the officers who commanded them were all noblemen of the firſt rank, the army was conſiderably increaſed by the number of their ſervants. The ſupreme command was given to Don Chriſtopher de Gama the admiral's youngeſt brother. Almoſt every man on board, however, was ambitious to ſhare in the glory of this enterpriſe; whence great complaints were made by thoſe who were not allowed to go: and hence, Mr Bruce informs us, the bay in the iſland of Maſuah, where the admiral's galley rode, had the name of *Bahia dos Agravados*; the bay of the *injured*, not of the *ſick*, as has been erroneouſly ſuppoſed.

Derivation of the name of a bay in Maſuah.

The Portugueſe under Don Chriſtopher de Gama ſet out to meet the emperor.

This gallant army inſtantly ſet forward by the moſt eaſy road through the Abyſſinian territories, in order to join the emperor. Still, however, the way was ſo rugged, that the carriages of their artillery gave way, and they were therefore obliged to conſtruct new ones as they went along ſplitting the barrels of old muſkets to furniſh them with iron, which was extremely ſcarce in Abyſſinia. In this journey the general was met by the empreſs, attended with her two ſiſters and a great many others of both ſexes, whom he ſaluted with drums beating and colours flying, accompanied by a general diſcharge of the fire-arms, to their great confuſion and terror. Her majeſty, whoſe perſon was entirely covered, indulged the Portugueſe general with a view of her face; and after a mutual exchange of civilities, the queen returned with 100 muſketeers appointed by him as her guard. After eight days-march, through a very rugged country, Don Chriſtopher received a defiance in very inſulting terms from Gragné the Mahometan general, which was returned in the ſame ſtyle. An engagement took place on the 25th of March 1542; in which little was done by either party beſides wounding both the commanders: however, Gragné, though greatly ſuperior in horſe, had already felt ſo much of the Portugueſe valour, that he did not chooſe to venture a ſecond battle.

Abyſſinia.

Interview with the empreſs.

Battle between the Portugueſe and the Moors.

As the ſeaſon was now far advanced, the Portugueſe put themſelves into winter-quarters; while Gragné remained in their neighbourhood, in hopes of forcing them to a battle before they could be joined by the king, who advanced for the purpoſe as faſt as poſſible. This being the caſe, it was to the laſt degree imprudent in Don Chriſtopher to think of venturing an engagement without previouſly forming a junction with his royal ally; eſpecially as Gragné had now doubled the number of his horſe, increaſed his train of artillery, and otherwiſe received conſiderable reinforcements. Unfortunately, however, the Portugueſe general ſuffered himſelf to be hurried away by the impetuoſity of his own temper; and paying regard to the defiances and reproaches of a barbarian whom he ought to have deſpiſed, was induced, contrary to all advice that could be given, to venture an engagement at a vaſt diſadantage. Yet when the armies encountered each other, the ſuperiority of the Portugueſe was ſo great, that victory ſeemed likely to be decided in their favour. On this Gragné ordered ſome artillery to be pointed againſt the Abyſſinian allies. Theſe, entirely unaccuſtomed to fire arms, fled almoſt at the firſt diſcharge. Gragné, well knowing that it was his intereſt to deſtroy the Portugueſe, who were only 400 in number, ordered no purſuit againſt the Abyſſinians, but fell with his whole force upon the Europeans. Even yet his ſucceſs was doubtful, till Don Chriſtopher, expoſing himſelf too much, was ſingled out and ſhot through the arm. This produced ſuch confuſion, that a total defeat, with the loſs of the camp, enſued; when the barbarians, according to cuſtom, put to death all the wounded, and began to abuſe the women, who had all retired into the tent of the general. This being obſerved by a noble Abyſſinian lady married to one of the Portugueſe, ſhe ſet fire to ſome barrels of gunpowder which happened to be in the tent, and thus periſhed along with her raviſhers.

Don Chriſtopher raſhly engages at a diſadvantage.

He is wounded and defeated.

Don Chriſtopher, who by his raſhneſs had occaſioned this diſaſter, obſtinately refuſed to fly, till he was put into a litter by force, and ſet off along with the queen and patriarch, who happened to be preſent. The two latter had ſet off before the battle; but Don Chriſto-

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Abyſſinia.

pher ſent ſome horſemen in purſuit of them, by whom they were brought back, and reproached by the general for the bad example they had ſhown to the army. Arriving at the approach of night in a wood where there was a cave, Don Chriſtopher entered it to have his wound dreſſed, but obſtinately refuſed to proceed farther. Next day he was taken; betrayed, as is moſt probable, by a woman whom he loved; who is ſaid to have pointed out this cave to him, and promiſed to ſend ſome friends to convey him into a place of ſafety. Inſtead of this, a party of the enemy entered the cave; and on his readily informing them of his name, they inſtantly carried him in triumph to Gragné. Here, after ſeveral inſults had paſſed on both ſides, the barbarian, in a fit of paſſion, cut off his head; which was ſent to Conſtantinople, and his body cut in pieces and diſperſed through Abyſſinia.

Takes ſhelter in a cave, is taken, and put to death.

Gragne, abandoned by his allies, is defeated and killed.

This cruelty of Gragné proved more detrimental to his cauſe than a complete victory gained by the other party could have been. On the one hand, the Portugueſe were ſo exaſperated by the loſs of their leader, that they were ready to embark in the moſt deſperate undertakings, in order to revenge his death; on the other, the Turks, on whom he principally depended, were irritated to the laſt degree at the diſappointment of ſharing his ranſom, which they imagined would have been an immenſe ſum; and therefore abandoned their leader to return to their own country. Gragné, thus left to decide the quarrel with his Africans, was quickly defeated by Claudius; and in another engagement which took place on the 10th of February 1543, his troops were defeated and himſelf killed. This laſt misfortune was owing to his boldneſs in advancing before his army which was giving way, ſo that he became known to the Portugueſe. On this he was ſingled out by a Portugueſe named *Peter Lyon*, who had been valet de chambre to Don Chriſtopher. This man, to make his aim more ſure, crept for a conſiderable way along the bank of a river towards the place where Gragné was; and when come ſufficiently near, ſhot him quite through the body. Finding himſelf mortally wounded, he quitted the field of battle; and was followed by Lyon, who in a ſhort time ſaw him fall from his horſe. He then came up to him, and cut off one of his ears, which he put in his pocket, and returned to the battle to do what further ſervice he could. The next day Gragné's body was found by an Abyſſinian officer, who cut off his head and claimed the merit of killing him; but Lyon having pulled out the ear which he carried in his pocket, vindicated his own right to the reward which was to be given to the other. On this occaſion the Mooriſh army was almoſt entirely deſtroyed; Gragne's wife and ſon were taken priſoners, with Nur the ſon of Mugdid, who deſtroyed the royal family; and it had been happy for Claudius, as we ſhall afterwards ſee, that he had put theſe priſoners to death. Very ſoon after this engagement, the emperor had intelligence that Joram, a rebel chief who had once reduced his father David to great diſtreſs, was advancing rapidly in hopes of being ſtill able to be preſent at the battle. This was the laſt of his father's enemies on whom Claudius had to revenge himſelf; and this was effectually done by a detachment of his army, who poſted themſelves in his way, fell upon him unexpectedly, and cut him in pieces with all his men.

Joram a rebel chief defeated and killed.

Abyſſinia.

Claudius being now freed from all apprehenſion of foreign enemies, began to turn his thoughts towards the reparation of the damages occaſioned by ſuch a long war, and the ſettlement of religious affairs. We have already mentioned, that John Bermudes was appointed by the Pope, as he ſaid, patriarch of Alexandria, Abyſſinia, and of the ſea. This however, is ſaid by others to have been a falſehood; that John was originally ordained by the old patriarch of Abyſſinia; and that the Pope did no more than give his ſanction to this ordination, without adding any new one of his own. But whether this was ſo or not, certain it is, that John, who was very inſolent in his behaviour, and of a turbulent diſpoſition, now began to inſiſt that Claudius ſhould not only embrace the doctrines of the church of Rome, but eſtabliſh that religion throughout the empire, which he ſaid his father David had engaged to do; and which, conſidering the extreme diſtreſs in which he was involved, it is very probable that he did. Claudius, however, was of a different opinion, and refuſed to alter the religion of the country; upon which a contention began, which was not ended but by the total expulſion of the Catholics, and the cutting off all communication with Europeans. At that time the Portugueſe and Abyſſinians intermarried, and attended religious worſhip promiſcuouſly in each others churches: ſo that the two nations might have continued to live in harmony, had it not been for the miſbehaviour of Bermudes. Claudius, perceiving the violence and overbearing diſpoſition of the man, took every opportunity of ſhowing his attachment to the Alexandrian or Greek church; denying that he had made any promiſe of ſubmitting to the ſee of Rome. On this Bermudes told him that he was accurſed and excommunicated; the king in return called him a Neſtorian heretic; to which Bermudes replied by calling him a liar, and threatened to return to India, and carry all the Portugueſe along with him. To this inſolent ſpeech Claudius anſwered, that he wiſhed indeed that Bermudes would return to India; but that he would not allow the Portugueſe, nor any perſon, to leave his territories without permiſſion.

Diſturbances on affairs of religion.

Altercation betwixt the emperor and the patriarch Bermudes.

Thus matters ſeemed likely to come to an open rupture; and there can be no doubt that the worſt extremities would have followed, had not the emperor been reſtrained by the fear of the Portugueſe valour on the one hand if he ſhould attempt any thing againſt them, and the hopes of further advantages ſhould he retain them in his ſervice. For theſe reaſons he bore with patience the inſults of the patriarch; attempting to gain the reſt of the Portugueſe over to his ſide. He ſucceeded perfectly with their commander Arius Dias, who privately renounced the church of Rome, and was baptized into that of Abyſſinia by the name of *Marcus* or *Marco*; in conſequence of which, the emperor, looking upon him as a naturalized ſubject, ſent him a ſtandard with the Abyſſinian arms to be uſed inſtead of thoſe of Portugal. This, however, was not delivered; for a Portugueſe named *James Brito*, meeting the page who carried it, took it from him and killed him with his ſword. The apoſtaſy of Arius is ſaid to have been owing to the great honours which had been conferred upon

The Portugueſe commander renounces the Romiſh religion.

Abyſſinia. upon him by the Abyſſinian monarch: for having, in an expedition againſt Adel, defeated and killed the king, and taken the queen priſoner, he beſtowed her in marriage on Arius; and that the match might be equal, he raiſed him alſo to the royal dignity, by giving him the kingdoms of Doar and Belwa.

He is inſted with oyal dig-ity.

The altercation on the ſubject of religion becoming every day more violent, Bermudes was prohibited by the emperor from ſending any farther orders to the Portugueſe, they being now under the command of Marco the Abyſſinian captain-general; meaning Arius Dias, to whom the name of Marco had been lately given. To this the patriarch replied, that being ſubjects of the king of Portugal, they were under no obligation to obey a traitor to his king and religion; and that ſince his majeſty ſtill perſiſted in refuſing to ſubmit to the pope, he was reſolved to leave the empire with his forces. The emperor, however, ſtill inſiſted that he was abſolute in his own dominions; and he expected the Portugueſe to pay obedience to his general, and none elſe. The Portugueſe, enraged at this declaration, reſolved to die ſword in hand rather than ſubmit to ſuch terms; and therefore began to fortify their camp in caſe of any attack. The emperor on this, thinking a defiance was given him in his own territories, ordered the camp to be inſtantly attacked. The attempt was accordingly made, but with very little ſucceſs; the Portugueſe having ſtrewed the ground with gunpowder, ſet fire to it as the Abyſſinians marched along, which deſtroyed great numbers, and intimidated the reſt to ſuch a degree that they inſtantly fled. Finding it in vain to think of reducing them by force, the emperor is then ſaid to have been adviſed by Marco to conſult his own ſafety, and break the power of the Portugueſe by artifice. With this view he ſent for the patriarch, pretended to be very ſorry for his frequent breach of promiſe, and deſirous to make what amends for it he could. Inſtead of complying with the patriarch's demands, however, he firſt ordered his ſubjects to ſupply them with no proviſions: then he ſtopped the mouths of the Portugueſe by a conſiderable quantity of gold, giving the patriarch himſelf a very valuable preſent; adding to all this a large ſupply of proviſions; but at the ſame time taking proper methods to diſperſe their leaders into different parts of the empire, ſo that they ſhould find it impoſſible ever to reunite in a body.

Hoſtilities etween he Abyſinians and Portugueſe

Such is the account given of this tranſaction by the Portugueſe hiſtorians; but that of Mr Bruce, who ſays that he tranſlated his from the Abyſſinian annals, is ſomewhat different. He only informs us, that the quarrel betwixt the Portugueſe and Abyſſinians was inflamed by the "incendiary ſpirit of the brutiſh Bermudes: from reproaches they came to blows; and this proceeded ſo far, that one night the Portugueſe aſſaulted the king's tent, where they ſlew ſome and grievouſly wounded others." The event, however, was that no abſolute quarrel ever took place betwixt this emperor and any of the Portugueſe, excepting this patriarch, whom he was on the point of baniſhing to one of the rocks uſed as priſons in Abyſſinia. This was diſpenſed with on the interpoſition of Gaſpar de Suza the new Portugueſe commander (who had ſucceeded Arius Dias), and another named *Kaſmati Robel*, both of whom were in great favour with the emperor; and Bermudes perſuaded to withdraw to India. According to Mr Bruce he repaired to Dobarwa, where he remained two years quite neglected and forlorn, ſaying maſs to no more than ten Portugueſe who had ſettled there after the defeat of Don Chriſtopher. He then went to Maſuah; and the wind ſoon becoming favourable, he embarked in a Portugueſe veſſel, carrying with him the ten perſons to whom he had officiated as prieſt. From Goa he returned to Portugal, and continued there till his death. On the other hand, the Portugueſe writers inform us, that he was narrowly watched by order of the emperor; and that Gaſpar de Suza, the Portugueſe commander, had orders to put him to death if he ſhould attempt to make his eſcape. Bermudes, however, being determined at all events to make his eſcape, pretended to be ill of the gout, and that a change of air was neceſſary for his recovery; for which reaſon he went to the town above mentioned, where there was a monaſtery. On this pretence he was allowed to croſs the kingdom of Tigré, accompanied by eight faithful ſervants, with whom he reached Dobarwa unſuſpected. Here he remained concealed in a monaſtery for two years before he could find an opportunity of getting to the iſland of Maſuah, from whence he proceeded to Goa.

Abyſſinia. Bermudes leaves Abyſſinia.

The emperor was ſcarce freed from this troubleſome prieſt, when he was in danger of being involved in new difficulties by the intruſion of others into his dominions. Ignatius Loyola, founder of the order of the Jeſuits, was at that time at Rome; and ſo much attached to the cauſe of the pope, that he propoſed to go in perſon to Abyſſinia, in order to make a thorough converſion of both prince and people. His holineſs, however, who, from what he had already ſeen of Ignatius, conceived that he might be of greater uſe to him by ſtaying in Europe, ſent in his ſtead Nugnez Barretto, one of the ſociety of Jeſuits, whom he inveſted with the dignity of patriarch, and honoured with a letter to Claudius. With theſe commiſſions, and a number of prieſts, Baretto ſailed for Goa in the Eaſt Indies; by which, however diſtant, the only paſſage to Abyſſinia was at that time. On his arrival at that place he was informed that the Abyſſinian monarch had ſuch a ſteady averſion to the church of Rome, that there was no probability of his meeting with a favourable reception. For this reaſon it was judged more proper to ſend ſome clergymen of inferior dignity, with proper credentials, as ambaſſadors to the emperor from the governor of India, without running the riſk of having any affront put upon the patriarch. Theſe were Oviedo biſhop of Hierapolis, Carneyro biſhop of Nice, and ſeveral others, who arrived ſafely at Maſuah in the year 1558. Claudius, on hearing of their arrival, was greatly pleaſed, as ſuppoſing that a new ſupply of Portugueſe ſoldiers was arrived. Finding, however, that they were only prieſts, he was very much mortified, but ſtill reſolved to give them a civil reception. But a more important conſideration, and which concerned the welfare of the empire in the higheſt degree, now claimed his attention. This was the appointment of a ſucceſſor to the throne, Claudius himſelf having no ſon. A project was therefore ſet on foot for ranſoming Prince Menas, the emperor's youngeſt brother, who had been taken priſoner by the Moors in the time of David, and hitherto detained in captivity on a high mountain in Adel.

A new deputation from the Pope,

Prince Menas is redeemed from captivity.

This

Abyſſinia. This was not likely to be accompliſhed; for the Moors would not willingly part with one who they knew was their mortal enemy, that he might be raiſed to the ſovereignty of a great empire. By detaining him priſoner alſo, they might reaſonably hope for diſputes concerning the ſucceſſion to the Abyſſinian throne; which would enable them to attack the empire with advantage. In theſe circumſtances, it is probable that Claudius would have found great difficulty in procuring his brother's liberty, had it not been that the ſon of the famous Gragné had been taken in that battle in which his father was killed, and in like manner confined on a mountain in Abyſſinia. A propoſal was then made to his mother, who had eſcaped into Atbara, that her ſon ſhould have his liberty, provided the king's brother ſhould be reſtored. This was accepted; and by means of the Baharnagaſh of Maſuah, an exchange was made. Four thouſand ounces of gold were given for the ranſom of Menas, which were divided between the Moors and the baſhaw of Maſuah; while on his part Claudius ſet at liberty Ali Gerad the ſon of Gragné without any farther demand.

According to Bermudes's account of theſe times, the widow of Gragné was taken priſoner at the battle in which her huſband was killed, and was afterwards married to Arius Dias. In this caſe we muſt ſuppoſe her to have been the ſame with the *queen of Adel*, mentioned as his conſort by other hiſtorians: but Mr Bruce treats this account as a mere fable; and informs us, that by means of Nur the ſon of Mugdid, murderer of the royal family as already related, ſhe made her eſcape into Atbara. On that occaſion Nur fell in love with her; but ſhe refuſed to marry any man unleſs he brought her the head of Claudius, who had killed her former huſband. To attain his wiſhes, therefore, Nur, now governor of Zeyla, undertook the taſk; and when Claudius marched towards Adel, ſent him a challenge to fight; telling him that there was yet a particular inſtrument for ſhedding the blood of the Abyſſinian princes, and deſiring him to be prepared, as he was very ſoon to ſet out to attack him. The emperor did not decline the combat, but is ſaid to have been adviſed againſt this expedition by all his friends. This advice ſeems to have proceeded from a number of prophecies, probably trumped up by the clergy, that he ſhould be unfortunate, and loſe his life in the campaign. Theſe prophecies ought no doubt to have had weight with him, as they moſt certainly indicated a ſpirit of diſaffection among his troops; and the event accordingly evinced that it was ſo. The Abyſſinians fled almoſt on the firſt fire, leaving the king in the midſt of his enemies, attended only by 18 Portugueſe and 20 horſemen of Abyſſinia, who continued faithful to the laſt. All theſe were killed after the moſt deſperate reſiſtance; the king himſelf receiving upwards of 20 wounds before he fell. His head was cut off, and brought by Nur to his miſtreſs, who hung it up on a tree before her door. Here it remained for three years, when it was at laſt bought by an Armenian merchant, who buried it at Antioch in the ſepulchre of a ſaint of the ſame name. Nur gained on this occaſion a very complete victory; the king and moſt of the principal nobility being killed, a great number made priſoners, and the camp taken with an immenſe booty. On his return to Adel, he refuſed to accept of any

Nur determines to deſtroy Claudius.

Defeat and death of the emperor.

congratulations, or to allow rejoicings to be made for his victory, but paſſed along in the habit of a common ſoldier mounted on an aſs; ſaying, that he owed the victory to the mercy of God alone, who had immediately interpoſed for the deſtruction of the Chriſtian army. Abyſſinia.

This fatal engagement took place on the 22d of March 1559; and as the ſucceſſion had been already ſettled, Menas aſcended the throne without any oppoſition. On his acceſſion he found his affairs in great confuſion, and he had ſtill to contend with foreign and domeſtic enemies. The firſt of theſe was Radaet the king of the Jews, who had a territory in the empire of Abyſſinia, the capital of which was on a rock named *Samen*. The cauſe of this quarrel is not known, but the event was unfortunate; the king being obliged to abandon the enterpriſe, after having beſtowed a conſiderable time upon it. This was followed by an attempt to aſſaſſinate him, which had very near taken place; and this again by a conſpiracy among his principal nobles headed by Iſaac the Baharnagaſh. He had been a very faithful ſervant of the late emperor Claudius; but ill uſed by Menas, who was of a very haughty and moroſe diſpoſition. In attempting to ſuppreſs this rebellion, the firſt attempts of the emperor were likewiſe ineffectual, his forces being attacked by ſurpriſe and entirely defeated. Soon after this, Iſaac proclaimed Taſcar the nephew of Menas, who was then at liberty, king of Abyſſinia; hoping thereby to ſtrengthen his cauſe, and enable him to cope with the emperor, who was aſſembling a powerful army againſt him. This expedient did not anſwer the purpoſe. His army was entirely defeated by Menas; Taſcar taken priſoner, and thrown headlong from the top of a precipice; and Iſaac himſelf eſcaped with great difficulty to the confines of his own government in the neighbourhood of Maſuah. Here he entered into an alliance with the Turkiſh baſhaw of Maſuah; whoſe friendſhip he gained by putting him in poſſeſſion of the town of Dobarwa, with the flat country adjacent, which abounds with the proviſions wanted at Maſuah, and is looked upon as the key to the province of Tigré and the high lands of Abyſſinia. Beſides this, Iſaac ſtrengthened himſelf alſo by an alliance with the Portugueſe; which, had their numbers been at all conſiderable, muſt have been very formidable. Their inclination to deſert their former protector and ally the emperor, proceeded entirely from the ſhameful behaviour of their prieſts, who never would be ſatisfied without enſlaving the emperor as well as his ſubjects to the tyranny of Rome. We have already ſeen that Bermudes had proceeded ſo far on this ſubject, that he narrowly eſcaped with his life. His ſucceſſor Oviedo (for the patriarch Nugnez died by the way) fared ſtill worſe. On his introduction to the emperor Claudius, he informed him, that the pope and king of Portugal now expected no leſs than an immediate fulfilment of his engagements of ſubmiſſion to the ſee of Rome. This requiſition was made with ſuch an air of inſolence, that the prince could ſcarce conceal his reſentment; but reſtraining his paſſion, he promiſed to conſider of it, and to call meetings of the learned in theſe matters to debate the point. This was a very fruitleſs taſk; and therefore Oviedo thought proper to quit the court towards the end of December 1558; leaving behind him an inſolent letter addreſſed to the

Reign of Menas.

Rebellion of Iſaac th Baharnagaſh.

He is defeated.

Allies wit the Turks and Portu gueſe.

Reaſon of their quar rel with t emperor.

Portugueſe

Abyſſinia. Portugueſe and ſuch converts as they had made; in which he exhorted them not to converſe with ſchiſmatics, and the Abyſſinians to forſake their errors. Being now debarred from acceſs to the emperor, he began to entertain the people with ſeditious diſcourſes; which practice he continued during the remaining part of the reign of Claudius and the beginning of that of Menas. The latter, perceiving the pernicious tendency of his diſcourſes, poſitively commanded him to deſiſt; which the patriarch refuſing, the emperor fell upon him with his own hands, beat him ſeverely, tore his clothes and beard, and took his chalice from him that he might thus be diſabled from ſaying maſs: after which he baniſhed him, with Francis Lopez another of his aſſociates, to a barren mountain, where they remained ſeven months in great miſery. Not content with this, he iſſued many ſevere edicts againſt the Portugueſe; prohibited them from intermarrying with the Abyſſinians; and ſuch of the Abyſſinian women as were already married to Portugueſe huſbands, he commanded not to accompany them to their churches. His next ſtep was to call Oviedo again into his preſence, and command him, under pain of death, inſtantly to leave his dominions. The inſolent and fooliſh prieſt refuſed obedience to this expreſs command: he declared that he would obey God rather than man; and preſenting his bare neck to the emperor, deſired him to ſtrike and put an end to his life at once. Menas drew his ſword, but was prevented by the queen and officers who ſtood near him from giving the fatal ſtroke. A ſecond beating and baniſhment to the mountain ſucceeded; and in the latter part of the ſentence all the Portugueſe prieſts as well as others were included. The Portugueſe, however, determined not to ſubmit to ſuch an indignity; and therefore, to a man, joined Iſaac; who, in expectation of more auxiliaries from India, profeſſed a great deſire of embracing the Romiſh religion. The king was very apprehenſive, and not without reaſon, of the arrival of more Portugueſe; but it appears that Oviedo had not ſufficient intereſt to procure the ſupply he promiſed. An engagement, therefore, took place without them, in which Menas was again victorious; though the battle was not ſo deciſive as to put an end to the rebellion.

Oviedo baniſhed to a mountain.

s commanded to eave the mpire, but efuſes.

entence of aniſhment aſſed on all he Portuueſe, who hereupon oin the ebels.

ſaac again efeated.

The emperor died a ſhort time after his victory, and was ſucceeded in 1563 by his ſon Sertza Denghel, then only 12 years of age. The beginning of his reign was diſturbed by new rebellions; which, however, were happily ſuppreſſed. Iſaac, with his allies the baſhaw and the Portugueſe, ſeem to have remained for ſome time unmoleſted; and in the year 1569, a kind of accommodation took place. It is by no means eaſy to ſay how the Portugueſe were again received into favour after ſuch flagrant treachery and rebellion. Mr Bruce only ſimply tells us that "Oviedo and the Portugueſe did not appear at court." This indeed is not to be wondered at, as they had been ſo lately at open war with the emperor. Other accounts ſay, that after the laſt battle with Iſaac, "their name became ſo odious to all the Abyſſinians, eſpecially to their monarchs, that they would never ſuffer any of them to be in their army from that time." Some of theſe accounts ſay alſo, that Menas was defeated and killed in another battle; others, that he was driven to ſome high mountains, where he wandered about till death put an end to his miſery. Accounts of this kind, however, are by Mr Bruce treated as mere falſehoods, and expreſsly contradictory to the annals of thoſe times. All we can ſay upon the ſubject therefore is, that after the defeat of Iſaac, the Portugueſe, not excepting Oviedo himſelf, remained in Abyſſinia, where they were more favourably dealt with by the new emperor than they had been by his father; though he was no friend to their religion, as ſuppoſing it to be deſtructive of monarchy and all civil government. It is probable alſo, that the various diſturbances which happened, together with his own tender age during the beginning of his reign, would prevent him from paying that attention to them which he would otherwiſe have done. The Galla, a very barbarous nation, and who have at laſt greatly reduced the power of the Ethiopian monarchs, made frequent inroads during this reign; and in the year 1576, a league was formed by Mahomet king of Adel, with Iſaac and the Turkiſh baſhaw, who had either continued their hoſtilities or renewed them about this time. The emperor, however, marched with ſuch expedition, that he did not allow them time to join their forces; and attacking them ſeparately, gained a complete victory over them all. Almoſt the whole Mooriſh army was deſtroyed; but while the emperor entered Adel with a deſign to make a full end of his enemies on the eaſt, he received information that the Galla had invaded his dominions on the weſt. Traverſing the whole breadth of the empire therefore with the utmoſt expedition, he came up with theſe enemies, who were afraid to encounter him. On this he turned his arms againſt the Falaſha, obliging them to deliver up their king, whom he baniſhed to a mountain. Then invading the country of the Galla and Falaſha, he ravaged it for four years ſucceſſively, protecting at the ſame time the kingdom of Narea from the inroads of theſe barbarians.

Iſaac and the baſhaw league with the king of Adel;

but are entirely defeated.

The emperor invades and ravages the country of the Galla and Falaſha.

While Sertza Denghel employed himſelf in repreſſing the incurſions of the Galla, one Cadward Baſha, a Turkiſh officer of great valour and experience, who had been inveſted with the office of baſhaw of Maſuah, began to make inroads into the province of Tigré. The emperor haſtened to oppoſe him; but in his paſſage committed great devaſtations in the country of the Falaſha, in order to provoke them to deſcend from their mountains and come to an engagement. Theſe Falaſha profeſs the Jewiſh religion, and were then governed by a king named *Geſhen*. This monarch, provoked at the ravages and deſtruction he beheld, deſcended with vaſt numbers of his ſubjects, in order to revenge it; but was killed, and his army utterly defeated by the Abyſſinians, on the 19th of January 1594. The victorious Sertza then haſtened to encounter the baſhaw; who, confident of the ſuperiority of his own troops, not only waited for him patiently, but gave him every advantage he could deſire. A very deſperate battle enſued; the event of which was doubtful, till Robel, commander of part of the king's houſehold troops, who were armed with pikes, attacked that part of the Turkiſh horſe where he ſaw the baſhaw, and killed the officer who carried the ſtandard. In doing this he broke his pike; but though then deſtitute of any other weapon than a ſhort crooked knife which the Abyſſinians always carry in their girdles, he inſtantly puſhed up to the baſhaw, and with it wounded him mortally

Tigre invaded by Cadward Baſhaw.

King of the Falaſha defeated and killed.

The baſhaw defeated and killed.

Abyſſinia.

tally in the throat. This unexpected event inſtantly decided the victory; the Turkiſh horſe betook themſelves to flight, and the reſt of the army ſoon followed their example. A dreadful ſlaughter enſued among the Moors, who were purſued to the iſland of Maſuah; and many were driven into the deſerts, where they periſhed with thirſt. After this, marching back to the weſtern part of his territories, the emperor proceeded to Narea, deſtroying the Galla as he went along. His laſt expedition was towards Damot to chaſtiſe ſome rebels there. Before he ſet out, a prieſt of great ſanctity and talent for divination, is ſaid to have warned him not to undertake the war; but his advice was rejected with contempt: on which he requeſted him only not to eat the fiſh taken out of a certain river; but this advice was alſo neglected, and the fiſh being really of a poiſonous nature, the king died in conſequence of eating them.

Death of the emperor.

Two ſucceſſors nominated.

On the death of Sertza Denghel a diſpute enſued about the ſucceſſion. In the beginning of his ſickneſs the late king had named for his ſucceſſor his ſon Jacob, a boy of only ſeven years of age; but finding death approaching, he named his nephew Za Denghel, as being come to the years of manhood, and more fit for the government of ſuch a numerous and turbulent people. This laſt reſolution proved highly diſagreeable to the queen and ſome of the principal nobility, who wiſhed for a minority, during which they might engroſs the power into their own hands. In conjunction with her two ſons in-law, Keſla Wahad and Ras Athanaſius, therefore, the empreſs determined to raiſe Jacob to the throne, notwithſtanding the final determination of the late king above mentioned. This was put in execution immediately after the death of Sertza Denghel; Jacob was raiſed to the throne, and Za Denghel confined in an iſland of the lake Dembea or Tzana. An attempt was likewiſe made to ſeize Socinios, natural ſon to Facilidas grandſon of the unfortunate David, who had likewiſe a claim to the throne; for his not being born of a lawful marriage was no objection in Abyſſinia. Socinios, however, no ſooner ſaw the fate of his couſin Za Denghel, than he withdrew himſelf from the power of his enemies; and Za Denghel himſelf, after being a ſhort time confined in the iſland above mentioned, found means to eſcape, and took refuge among the inacceſſible mountains of Gojam.

Jacob raiſed to the throne.

Thus diſappointed in their attempts on the princes, the empreſs, with her two ſons-in-law, were obliged to pretend loyalty to Jacob, whom they governed till he was 17 years of age. The young king then perceiving that his tutors were taking ſome ſteps to prolong their dominion over him, took the government into his own hands, and baniſhed one Za Selaſſe, whom they had employed in the execution of their projects, to the kingdom of Narea. The conſpirators, alarmed at this bold exertion of royal prerogative, determined inſtantly to depoſe Jacob, and raiſe Za Denghel, whom they had baniſhed, to the throne. This, however, was now a matter of ſome difficulty, as he had concealed himſelf ſo effectually among the mountains of Gojam, that he could ſcarce be found out. His retreat being at laſt diſcovered, Ras Athanaſius took an opportunity of inſulting Jacob, even while ſitting on the throne; called him an obſtinate, ſtubborn, and fooliſh boy; declared him degraded from the imperial dignity, and that Za Denghel was coming to ſupplant him. Jacob perceiving by the inſolence of this ſpeech, that he was entirely in the power of his enemies, left his palace in the night, in order to fly to the mountains of Samen, where his mother's relations were, from whom he expected protection. He got to the borders of that country, but was there diſcovered, ſeized, and brought back to his rival, who was now ſeated on the throne. Za Denghel, however, with a clemency not very uſual in Abyſſinia, did not either put him to death, or mutilate him in ſuch a manner, as to render him incapable of afterwards enjoying the kingdom; but contented himſelf with baniſhing him for life, to Narea.

Za Denghel raiſed to the throne.

Abyſſinia.

Jacob baniſhed.

Za Denghel was no ſooner ſettled on the throne, than he unluckily behaved in ſuch a manner as to alienate the affections of his people from him entirely. This was occaſioned by his attachment to the church of Rome. Ever ſince the time that the Portugueſe had joined Iſaac the Baharnagaſh, the entrance into Abyſſinia had been ſhut up by the Turks, ſo that no new miſſionaries could have acceſs; and all thoſe who came with Oviedo being dead, the Romiſh religion had languiſhed for want of preachers to ſupport it. The laſt of theſe died in 1596; and all the reſt having been dead ſome time before, little could be expected from the labours of a ſingle perſon. Next year Melchior Sylvanus, a vicar of the church at Goa, was ſent on a miſſion to Abyſſinia; being ſuppoſed to be a proper perſon for this work, on account of his language and complexion which might baffle the vigilance of the Turks. He entered without being ſuſpected; but the great defeat given the Turks by Sertza Denghel, already mentioned, had reduced their power ſo much, that leſs danger now attended this expedition than formerly, and other miſſionaries quickly followed.

Decline of the Romiſh religion in Abyſſinia.

The moſt learned, as well as the beſt qualified for the undertaking in every reſpect, was *Peter Paez*, who came to this country in the year 1600; and on his taking upon him the whole charge of the miſſion, Sylvanus returned to India. The new miſſionary did not at firſt affect to intrude himſelf on the emperor; but taking up his reſidence at the convent of Fremona in the province of Tigré, he firſt applied to the ſtudy of the learned language of the Abyſſinians called *Geez*, and in which their books are uſually written. In this he made ſuch progreſs as quickly to ſurpaſs the natives themſelves; after which he ſet up a ſchool, where the children of the Portugueſe and Abyſſinians were taught promiſcuouſly. The progreſs made by his ſcholars was ſo great, that he was ſpoken of at court, and recommended in the warmeſt terms to the emperor Jacob before his depoſition. On this he was ſent for, and appeared before the court in 1604; where, to the great diſſatisfaction of the Abyſſinian monks, he received ſuch honours as are uſually beſtowed on men of the firſt quality. Next day, in a diſpute before the king, two of his ſcholars, whom he had brought along with him, fairly vanquiſhed the beſt theologians that could be found to oppoſe them. Maſs was then ſaid in the Romiſh manner; and this was followed by a ſermon, which in the purity and elegance of its diction (whatever the ſubſtance might be) excelled any thing that had ever been compoſed in the Abyſſinian language.

Peter Paez reſtores it.

He arrives at court.

Though Paez had been called to court by Jacob, yet Za Denghel was on the throne before he arrived, and

it

Abyſſinia.

The emperor embraces the Catholic religion.

it was he who witneſſed the diſpute and heard the ſermon. He was ſo much charmed with the latter, that he inſtantly reſolved to embrace the religion of the church of Rome; which reſolution he ſoon after communicated to ſeveral of his friends, and even to Pacz himſelf; but under an oath of ſecrecy. The emperor's own zeal, however, rendered this oath of no uſe; for in a little time he iſſued proclamations forbidding the obſervation of the Jewiſh Sabbath, and wrote letters to Pope Clement VIII. and Philip III. of Spain, deſiring a ſupply of mechanics to inſtruct his people in the uſeful arts, and Jeſuits to teach them religion.

His imprudent conduct occaſions a rebellion.

This precipitate conduct had the effect which might have been expected. The Abyſſinians were generally diſaffected to the church of Rome, and no pains had been taken to gain them over: they were alſo turbulent, ſavage, and rebellious; ever ready to revolt; and now had a ſavourable opportunity of excuſing their treaſons upon pretence of zeal for religion. This opportunity was quickly made uſe of by Za Selaſſe, whom, as we have already mentioned, Jacob had baniſhed; but who, on the advancement of Za Denghel, had probably been ſet at liberty. This traitor having

The emperor excommunicated.

firſt held many ſeditious meetings in private, prevailed on the Abuna, or Abyſſinian patriarch, to excommunicate the king, and abſolve his ſubjects from their allegiance. He then ſet out for the territory of Gojam, where the people had always been remarkable for their averſion to the church of Rome. In this place, therefore, he found no difficulty in raiſing an army to fight againſt his ſovereign. Za Denghel, who was an expert warrior, did not fail to go in queſt of him with

An army raiſed againſt him.

what forces he could raiſe; but ſoon found, by the great deſertion among his troops as he paſſed along, how much the excommunication pronounced by the Abuna had availed. This was ſo alarming, that John Gabriel, an experienced Portugueſe officer, adviſed him to decline an engagement for the preſent, and take ſhelter in ſome fortreſs until his ſubjects ſhould return to a ſenſe of their duty. This ſalutary advice was rejected, from the abſurd notion that it was a diſhonour not to fight a rebel who had deſied his ſovereign. In the beginning of the engagement, victory ſeemed to favour the royal cauſe. The Portugueſe carried every thing before them, and routed that wing of the enemy which oppoſed them. In the other wing, however, the cowardly and treacherous Abyſſinians deſerted their king, who was quickly ſurrounded by his

He is abandoned by his troops and killed.

enemies, and left in a deſperate ſituation. A body of nobility, with his own officers and domeſtics, attended him and fought deſperately in his defence. Za Denghel himſelf, being an excellent horſeman, and admirably ſkilled in the uſe of arms, performed aſtoniſhing feats of valour. At laſt he was thrown to the ground, grievouſly wounded in the breaſt by a lance. Notwithſtanding this, he inſtantly recovered himſelf, drew his ſword, and reſiſted his aſſailants ſo violently, that they were fain to keep at a diſtance and annoy him with miſſile weapons. In this ſituation he ſtood till almoſt fainting with fatigue and loſs of blood; when the traitor Za Selaſſe, puſhing up his horſe violently againſt him, threw him to the ground by a blow on the forehead, and a multitude then ruſhing upon him he was diſpatched with many wounds.

Abyſſinia.

His death univerſally lamented.

The news of Za Denghel's death were received with ſuch general indignation throughout the Abyſſinian empire, that the rebels durſt not name any ſucceſſor. As it ſeemed natural to think, however, that Jacob would now be re-elected, meſſengers were diſpatched to acquaint him of his good fortune; but during this

The empire claimed by Socinios.

interval Socinios appeared, not as a candidate, but as already in poſſeſſion of the empire, and ready to ſupport his rights by force of arms. His firſt ſtep was to let Ras Athanaſius know his pretenſions to the throne, and deſire his aſſiſtance with his army, promiſing to reward him as ſoon as it ſhould be in his power. Without waiting for any anſwer, he advanced ſo rapidly, that Athanaſius had ſcarce time to conſider what he ſhould reply, when a ſecond meſſage was ſent, importing that Socinios was in the neighbourhood, and ordering preparations to be made for receiving him as his ſovereign. This expeditious mode of action ſo much confounded Athanaſius, that he complied with the requiſitions, ſaluting him king, and joining his troops to his. Thus ſucceſsful in his firſt attempt, Socinios made a ſimilar one on Za Selaſſe. In this, however, he was diſappointed. Za Selaſſe having firſt ſent an equivocal anſwer, marched againſt him with his whole army; while Socinios, happening to fall ſick, and putting little confidence in Athanaſius, withdrew to the mountains of Amhara. Athanaſius likewiſe, not knowing to whom he ſhould attach himſelf,

He is obliged to retire.

withdrew his forces, and ſtood neuter.

Za Selaſſe had refuſed to join Socinios, in expectation that Jacob would make his appearance, whom he rather wiſhed to enjoy the crown than Socinios; as under the former he might hope to engroſs all the power to himſelf. For a long time, however, no anſwer was returned to his meſſages; his troops became impatient; ſo that fearing leſt a mutiny or general deſertion ſhould take place, he diſpatched a meſſenger to Socinios, acknowledging him for emperor. But ſcarce

Jacob ſet up in oppoſition to him.

was this done, when a meſſenger arrived from Jacob, informing him that he was then in Dembea, and promiſing Za Selaſſe great honours if he would acknowledge him for his ſovereign. With theſe terms the traitor inſtantly complied, and his example was followed by Athanaſius; while Socinios, not as yet able to reſiſt all his enemies, retired again to Amhara. This, however, he was not long of accompliſhing. Jacob was by no means poſſeſſed of equal military ſkill; and though Za Selaſſe was an experienced officer, yet his extreme perfidy, pride, and obſtinacy, rendered it very dangerous to have any concern with him. This

Bad conduct and defeat of Za Selaſſe

appeared remarkably in the preſent caſe. His pride in the firſt place would not allow him to join his forces to thoſe of Jacab, leſt the latter, who was inferior in military ſkill, ſhould have a ſhare in the victory he was

Jacob's general.

to gain. Then, intoxicated with his opinion of himſelf, he neglected to behave with the caution neceſſary in the neighbourhood of ſuch an experienced general as Socinios, which gave the latter an opportunity of cutting off almoſt his whole army. Being now obliged to fly with a few attendants to Jacob's camp, he met with an indifferent reception on account of his defeat; for which reaſon he made propoſals to join Socinios. The latter accepted his offer, though he could put no confidence in one who had been guilty of ſuch complicated treachery; only he thought it would be an

Abyſſinia.

Jacob defeated and killed.

advantage to put it out of his power to join his antagoniſt. Jacob, on the other hand, confident in his numbers, which are ſaid to have been almoſt 30 to 1, advanced boldly to give his antagoniſt battle. Socinios declined the engagement till he had drawn him into a ſituation where his forces could not act with advantage. A dreadful carnage enſued, Jacob himſelf perithed among the multitude, and his body was never afterwards found. In this battle alſo was killed the wicked prieſt Abuna Petros, who was the occaſion of Za Denghel's death, as we have already related. Ras Athanaſius eſcaped by the ſwiftneſs of his horſe, and took refuge in a neighbouring monaſtery. He was afterwards pardoned at the interceſſion of Peter Paez; but his goods and eſtate being confiſcated on various occaſions, he fell into univerſal contempt, was abandoned by his wife, and died at laſt of want. According to the Abyſſinian accounts, Socinios ordered the purſuit to be ſtopped as ſoon as he ſaw the head of Abuna Petros; but the Portugueſe writers inform us, that he kept it up with the utmoſt vigour throughout the whole day and part of the night. They particularly mention, that a number of Portugueſe, who had joined the army of Jacob, loſt their lives on this occaſion, by falling over a precipice which they could not avoid in the dark. One of theſe named *Manual Gonſalvez* had the good fortune to light on a tree, where he ſat till morning in great terror, but at laſt was relieved and made his eſcape.

By this victory Socinios was fully eſtabliſhed on the throne, though his ſituation might ſtill be accounted precarious by reaſon of the rebellious diſpoſition of many of the provinces. He began with making a general proclamation of pardon, excepting only the murderers of Za Denghel, with whom he had been in terms of intimate friendſhip. Being informed therefore, that one *Mahardin*, a Moor, had given him the firſt wound in that battle in which he was killed, he ordered his head to be inſtantly ſtruck off with an axe before the gate of the palace.

Socinios favours the Portugueſe.

The Portugueſe were much favoured by this prince; and they were become very numerous by continual intermarriages with the Abyſſinians; the male children were always trained to the uſe of fire arms by their parents, and incorporated as ſoldiers with them; and they were now all united in one body under an experienced officer named *John Gabriel*, whom we have already had occaſion to mention. As their numbers and valour made them objects of conſideration, Socinios determined to attach them to himſelf as much as poſſible; and the beſt means to do this he knew was by favouring their prieſts. Peter Paez was therefore ſent for to court; where a diſpute concerning the ſupremacy of the pope and the two natures of Chriſt (the great ſubjects of debate in Abyſſinia), took place, and a ſermon was preached with as great ſucceſs as that in Za Denghel's time. The king firſt enlarged the territory poſſeſſed by the Jeſuits at Fremona; after which he declared to Paez his reſolution of embracing the Catholic religion; giving him at the ſame time two letters, one to the king of Portugal, the other to the pope, the purport of which was to requeſt a number of more Portugueſe to deliver Abyſſinia from the incurſions of the Galla, as they had formerly done from the yoke of the Moors.

He reſolves to embrace the Catholic religion

Before any thing of importance could be done in matters of religion, the king was called forth to ſuppreſs a rebellion which had already taken place. An impoſtor had appeared, who called himſelf *Jacob* the late king, and pretended to have eſcaped from the battle; but ſo much wounded in the face that he kept one ſide of it conſtantly covered to conceal the deformity. He made his appearance among the mountains of Habab near Maſuah; and being joined by great numbers of people, Sela Chriſtos, brother to the king, and governor of Tigré, marched againſt him. The impoſtor's troops, though numerous, fled at the firſt onſet; but he eſcaped to the mountains, where it was very difficult to follow him. This, however, was attempted; and a great many of the poſts he had taken were ſtormed like as many forts; but ſtill the impoſtor himſelf, though driven from place to place, found means to make good his retreat to the country lying between the mountains of Habab and the territory of the Baharnagaſh. Thither he was purſued by Sela Chriſtos; but that general, finding the rebellion likely to ſpread through the whole province of Tigré, thought proper now to acquaint his brother Socinios with the ſtate of affairs, and to deſire his aſſiſtance. The king, though at that time he had ſent away moſt of his troops in an expedition againſt the Shangalla and Gongas, who dwell on the north-weſt of Abyſſinia, ſet out immediately with ſuch troops as he could collect. Theſe were but few in number; his cavalry, particularly, amounting to no more than 530, beſides a ſmall reinforcement brought by his brother Emana Chriſtos, governor of Amhara. As he proceeded, he was informed that a party of Galla were lodged on a hill at no great diſtance from him. Determining to cut them off, he ſurrounded the hill where they were poſted; but having cauſed his cavalry to advance before, and paſs a deep ravine, they were almoſt entirely deſtroyed, while the reſt of the army were ſeized with ſuch a panic that they refuſed to ſtir. In this extreme danger, the Galla paſſed the ravine to attack them; but the king having advanced ſingly, and killed the firſt of them, his troops, aſhamed of their cowardice, ruſhed forward on the enemy, and gained a complete victory, which obliged the ſavages to leave the province they infeſted at that time.

Abyſſinia.

An impoſtor pretending to be the late emperor Jacob appears.

Is defeated

The Galla defeated.

The misfortune of the cavalry on this occaſion quickly occaſioned a report that the king had been defeated; of which the impoſtor Jacob did not fail to take advantage; and deſcending from his mountains, committed great devaſtations in the low country. But though attended by a great multitude, who likewiſe fought with more obſtinacy than formerly, he was ſtill defeated by Sela Chriſtos with a force greatly inferior. But before any thing effectual could be done for his reduction, the Galla made a dreadful irruption into the ſouthern provinces, murdering all who fell into their hands, and burning and deſtroying towns, churches, and villages, in the moſt dreadful manner. The king bore thoſe exceſſes for ſome time with patience, till at laſt he drew them into ſuch a diſadvantageous ſituation, that being ſurrounded by his forces, and inferior in number as well as in valour, they were all cut off to a man, with the loſs of only 400 on the part of the Abyſſinians. Soon after this victory the king underwent the ceremony of coronation. He then marched

The impoſtor Jacob again defeated.

An army of Galla cut off.

Coronation of the king

Abyſſinia

ed againſt the impoſtor Jacob; but the latter was too ſenſible of the ſuperiority of his rival to face him in the field. He therefore retired again to his mountains, while the king left the ſuppreſſion of the rebellion to an experienced officer named Amſala Chriſtos; who employed two young men, who had been outlawed for murder, to aſſaſſinate the impoſtor. This being done, it was found that the pretended Jacob was no other than a herdſman among thoſe mountains to which he ſo conſtantly fled for refuge; and that he had neither wound nor ſcar on his face, but had kept one half of it covered to conceal the little reſemblance he bore to Jacob whom he perſonated.

The impoſtor Jacob aſſaſſinated.

The king being now freed from this rebellion, began again to turn his thoughts towards religion. His firſt ſtep was to make a handſome preſent to the Jeſuits; but he ſoon ſhowed his inexperience in religious matters, by attempting to reconcile the two contending parties in his empire. Before he could ſee the folly of this attempt, however, his attention was called by a moſt dangerous rebellion, which was begun by one Melchizedec, a ſervant of the late Sertza Denghel, but a man of great experience in war. He was firſt oppoſed by Sanuda, a brave officer; but being totally deſtitute of troops, he was obliged to apply to the attendants of the king of Sennaar, who had been depoſed by his ſubjects, and was at that time in Abyſſinia. Theſe readily joined him; and a bloody battle enſued, in which Sanuda was ſo totally defeated, that he alone had the good fortune to eſcape, and that grievouſly wounded, his men being all killed on the ſpot. On this misfortune Socinios ſent his brother Emana Chriſtos with a conſiderable force to reduce the rebels. Melchizedec finding himſelf oppoſed by ſuch an able general, exerted himſelf to the utmoſt, in order to raiſe a force ſufficient to reſiſt him; and in this he ſucceeded ſo well, that his army ſoon ſtruck terror into all the neighbouring country, notwithſtanding the preſence and known valour of the king's brother. A prince of the blood-royal, named *Arzo*, was likewiſe found out and proclaimed king, in order to give ſome ſanction to the rebels; ſoon after which they boldly marched to meet the royal army. The engagement took place on the 9th of March 1611, and was fought with great obſtinacy on both ſides; the advantage even appeared for ſome time on that of the rebels; till Emana Chriſtos, perceiving that all was at ſtake, puſhed deſperately forward to the place where Melchizedec himſelf was. The latter ſeeing no probability of avoiding a ſingle combat, which he did not chooſe to try, inſtantly turned his horſe and fled; and the reſt of the army ſoon followed his example. Melchizedec, however, did not much avail himſelf of this cowardice; for he was cloſely purſued by the peaſants, taken priſoner, and executed as a traitor, together with ſeveral of his principal officers. The fate of Prince Arzo, whom, to ſupport their cauſe, the rebels had proclaimed king, is not known.

Dangerous rebellion begun by Melchizedec.

Defeats one of the king's generals.

Cauſes Arzo be proclaimed king.

Is defeated, taken priſoner, and put to death.

This victory, ſo far from extinguiſhing the ſpirit of rebellion, ſeemed to have inflamed it beyond all bounds: for news were now received that the whole country round the head of the Nile to the province of Tigré had revolted; ſo that there was a neceſſity for the immediate preſence of the emperor himſelf; and even this was inſufficient, as the rebels were diſperſed over

The rebellion continues.

ſuch a large tract of territory. His two brothers, Emana and Sela Chriſtos, were therefore both employed againſt different rebel chiefs, while the king marched againſt thoſe who were moſt formidable. The principle on which this war was carried on ſeems to have been very cruel, viz. that of killing all the men, and carrying off the women and children for ſlaves. This was rigidly executed, firſt upon the inhabitants of a mountainous diſtrict named *Guſman* on the Nile; though, at the interceſſion of the miſſionary Peter Paez, the women and children, inſtead of being ſold for ſlaves, were given to the Jeſuits to be educated in the Catholic religion. The Gongas and Agows were next attacked with equal ſucceſs, and ſtill greater cruelty; one of their tribes named *Zalabaſſa*, being almoſt entirely exterminated: but this, inſtead of having any good effect, ſeemed to multiply the rebels ſtill more. The Agows and Galla invaded the provinces in the neighbourhood; and another impoſtor, whoſe true name was *Amdo*, but who pretended to be the unfortunate emperor Jacob, appeared as a competitor for the crown. This laſt rebel proved much more formidable than any of the reſt. He was indeed ſurpriſed before he had time to collect any forces; but Gideun, king of the Jews of Samen, having killed the guards who watched him, ſet the impoſtor at liberty, and ſupported his cauſe. Thus he ſoon collected a very formidable army, with which he defeated and killed an officer named *Abram*, who oppoſed him with a conſiderable force. This brought Socinios himſelf againſt him, who inſtantly attacked the Jewiſh monarch Gideon, as being the principal ſupport of his cauſe. As the country of the Jews was naturally ſtrong, and very full of fortified places, the reduction of it was evidently a very difficult taſk. The firſt place attacked was a fortreſs named *Maſſiraba*; which, though very ſtrongly fortified and garriſoned, was ſoon taken by ſtorm, and every one in it put to the ſword without diſtinction. Hotchi and Amba Za Hancaſſe, two other ſtrong fortreſſes, ſhared the ſame fate. A fourth, named *Senganat*, no leſs ſtrong than any of the former, was alſo taken; Gideon himſelf narrowly eſcaping with his life in the attack. Diſcouraged therefore by ſo many misfortunes, and apprehending the total ruin of his country, this prince at laſt was content to ſue for peace; which was granted on condition that Amdo ſhould be delivered up. This traitor was condemned to a puniſhment very unuſual among Chriſtians, viz. that of being crucified; but in nailing him to the croſs, his cries and groans ſo much affected the king, that he ordered him to be taken down and beheaded.

Abyſſinia.

Cruel manner of carrying on the war.

Amdo, another impoſtor, aſſiſted by the Jews.

War with Gideon.

Amdo delivered up and put to death.

The war was now reſumed againſt the Gongas and Guba; whom the king annually invaded for the purpoſe of making ſlaves. In this expedition his officers not only executed their commiſſion againſt theſe ſavages, but likewiſe carried off a great number of cattle from the Agows, who were then at peace with the emperor. This conduct was highly reſented by Socinios, who obliged them to make reſtitution of what they had taken away; and the doing them juſtice in this particular, had more effect in reducing the reſt of theſe people to obedience, than all the cruelties which had been committed ſince the beginning of the war.

Other military expeditions.

In 1616, the emperor ſet out on an expedition againſt the Galla: but this was laid aſide on the death

Abyſſinia. of his eldeſt ſon, for whom he entertained a great affection. It was ſucceeded by a very cruel order againſt the Jews, whom Socinios now determined to exterminate without any apparent occaſion. His commands, however, were executed with the utmoſt punctuality, ſo that very few eſcaped; and among the reſt periſhed their prince Gideon lately mentioned. He was ſuppoſed to be immenſely rich, and to have concealed his riches, which have been ſought for in vain by the Abyſſinians from that time to the preſent. The children of the murdered Jews were ſold for ſlaves; and ſuch of the profeſſion as were ſcattered through the empire, had orders to renounce their religion and be baptized, under pain of death. Thus almoſt the whole Jewiſh religion was extinguiſhed at once, as moſt of them choſe rather to embrace Chriſtianity than ſuffer death. In token of the ſincerity of their converſion, they were all ordered to plough and harrow on the Sabbath day.

The Jews exterminated.

Succeſsful expedition againſt the Galla.

After this maſſacre, the expedition againſt the Galla was reſumed, and carried on with the uſual cruelty: while the Galla never once appeared to prevent the deſolation of their country. Next year, however, a new aſſociation was made among theſe ſavages, and the empire invaded by them in two different parts at once. One of their armies was cut off to a man before they had time to begin their ravages; while the other fled on the firſt approach of the royal army, leaving their wives, children, and baggage, to the mercy of the enemy. Thus the king was left for a ſhort time at reſt from rebellions or foreign invaſions; and this interval he determined to make uſe of in making war on his neighbour the king of Sennaar, from whom he had formerly received an affront. In this expedition he was aſſiſted by one Wed Ageeb, a prince of the Arabs, who lived on the frontiers of Abyſſinia. The allies proceeded with their uſual cruelty, killing all the men, and ſelling the women and children for ſlaves. Vaſt numbers of cattle were carried off; and the victorious armies returned with an immenſe booty. The next expedition was againſt Fatima queen of the Shepherds, otherwiſe called *queen of the Greeks*, who reſided on the north-eaſt of Atbara. In this alſo the king proved ſucceſsful, though leſs blood was ſhed than uſual: but it was not long before this extraordinary ſucceſs met with a ſevere check by the entire loſs of an Abyſſinian army; the favourite ſon of the emperor himſelf being killed in the engagement, with ſome of the beſt officers in the empire.

War with Sennaar, &c.

Progreſs of the Romiſh religion.

All this time Peter Paez had applied himſelf with the utmoſt aſſiduity to the converſion of the Abyſſinians to the Catholic faith; and in this undertaking he had been attended with wonderful ſucceſs. He was indeed ſingularly qualified for an undertaking of this kind among a rude and barbarous people: for beſides an uncommon ſhare of learning, he poſſeſſed an eminent degree of ſkill in the mechanical arts; by which he was enabled to teach the Abyſſinians how to build houſes of ſtone and lime, which they had never known before. In theſe he was at firſt maſon, carpenter, ſmith, and architect, himſelf; and thus, to the aſtoniſhment of the whole empire, he built ſome churches and a palace for the king. His univerſal genius prepared the people for the reception of his opinions; while the barbarous ignorance and ſavage manners of his antagoniſts tended to prejudice every one againſt their tenets, though ever ſo juſt in themſelves. Sela Chriſtos, the king's brother, is ſaid to have been converted by only reading the Abyſſinian books with attention; in which, it ſeems, the ignorance of the prieſts had been diſplayed in an extraordinary manner. We have already ſeen how well the emperor himſelf was diſpoſed towards the Romiſh church; and his example was followed by many of the principal people of the kingdom. At laſt the Abyſſinian patriarch, named *Simon*, made a complaint that irregularities in religion had been committed, and diſputes held on matters of faith, without calling him, or permiſſion granted him, to ſupport the clergy in theſe controverſies. As Socinios had no high opinion of this prieſt's learning or eloquence, he did not imagine that any harm could enſue to the cauſe from granting what he wanted. A public diſpute was accordingly appointed; in which Simon's inferiority was ſo apparent, that Socinios now publicly declared his belief in the two natures of Chriſt.

Excellent character of Peter Paez.

Abyſſinia.

While the converſion was in this proſperous way, letters arrived from the pope and king of Spain, but without any promiſe of the temporal aſſiſtance which had been ſolicited; though they aſſured him of an ally far ſuperior, the Holy Spirit himſelf, provided the emperor continued firm in his reſolutions of embracing the Catholic faith. Socinios would probably have been as well ſatisfied with an account of a reinforcement of ſoldiers; but as matters ſtood, he was obliged to be content, and reſolved to ſubmit in form to the pope, renouncing for ever his connexion with the Greek church. As it was improper, however, to ſend letters on a ſubject of ſuch importance by a common meſſenger, proper perſons were to be appointed who might occaſionally aſſume the character of ambaſſadors, and act accordingly. This being reſolved on, the next thing was to determine the way by which the ambaſſadors were to reach Europe. The uſual track by Maſuah was now ſhut up on account of the rebellion which exiſted in the neighbouring provinces; ſo that the more eligible way ſeemed to be through Narea and the provinces to the ſouthward, by which they might reach Melinda, and from thence embark for Goa.

Letters from the pope and king of Spain.

Determine to ſubmit to the pope.

The ambaſſadors were choſen by lot; which falling firſt on Antonio Fernandez, he named Fecur Egzie as his companion; and, all things being ſettled, theſe two ſet out for Gojam in the beginning of March 1613. It ſeems ſurpriſing that the Abyſſinian monarch ſhould have ſent ambaſſadors on ſuch a dangerous expedition through barbarous countries, without being accompanied by a proper guard. This, however, ſeems undoubtedly to have been the caſe; as we hear of no other attendants than ten Portugueſe, whom Fecur Egzie took with him, ſix of whom were to go no farther than Narea, but the other four were to proceed to India: forty men armed with ſhields and javelins were alſo granted, but this force was much too ſmall to anſwer any uſeful purpoſe. Sela Chriſtos indeed furniſhed them with guides from the barbarous nations in the neighbourhood of Narea, taking hoſtages for the ſecurity of the travellers; but the inſufficiency of theſe precautions ſoon appeared. Our travellers had proceeded but two days journey into the country

Ambaſſadors ſet out for Europe.

Account of their journey.

Abyſſinia. country of the Gongas, when they were treated in ſuch a hoſtile manner, that one of the Portugueſe was obliged to return with Fernandez to complain of the treatment of the ſavages. On this information Sela Chriſtos inſtantly diſpatched three officers, with a proper number of troops, to chaſtiſe them; by which means the ambaſſadors got ſafe to Mine, the name of ſome miſerable villages on a ford of the Nile. Here they croſſed the river on ſkins blown up, and next day entered the country of the Pagan Galla; and ſoon after, though not without great difficulty, they reached the kingdom of Narea, the moſt ſouthern province of the Abyſſinian empire, but quite ſurrounded by the Galla. Here they were received with great kindneſs by the commanding officer of the firſt fortified place they came to; but on being introduced to the king himſelf, they met with a very indifferent reception. This was owing to the inſinuations of an Abyſſinian monk, that they were to bring Portugueſe ſoldiers that way into Abyſſinia; which would be deſtructive to his kingdom. On calling a council, it was reſolved to ſend them into the kingdom of Bali; ſo that they would be obliged to paſs through a much more difficult and dangerous road than what was firſt intended. Having thus, as he ſuppoſed, provided againſt the danger which threatened his kingdom, he made them a preſent of 50 pieces of gold, recommending them at the ſame time to the ambaſſador from the ſovereign of Gingiro, through which they were next to paſs.

On leaving Narea, they received a convoy of 80 ſoldiers to conduct them ſafely to their next ſtage; after which they paſſed four days through countries totally laid waſte by the Galla, and where they were obliged to hide themſelves for fear of meeting with theſe ſavages. Proceeding ſtill through woods and vaſt chains of mountains, they came to the river Zebee, or more properly *Kibbee*, from its white colour reſembling melted butter, as the word imports. Fernandez deſcribes this river as larger than the Nile, and vaſtly more rapid. They paſſed it by a kind of bridge, but certainly a moſt tremendous one. The channel of the river is full of rocks; and betwixt every two of theſe a ſingle tree was laid, ſo elaſtic that it would bend with the weight of one perſon; while the vaſt height of the precipice, and the ſight of the roaring current below, was ſufficient to ſtrike the boldeſt with terror. At a ſmall diſtance from this bridge was a ford, through which it was neceſſary that their mules ſhould paſs; which being accompliſhed without any accident, though with difficulty and danger, they entered the territory of Gingiro. Here they were hoſpitably received by the ſovereign, and after a mutual exchange of preſents proceeded to Sangara, the capital of another ſmall kingdom named *Cambat*, which was at this time governed by a Moor named *Amelmal*. During the time of their reſidence here, one Manquer, a ſchiſmatic Abyſſinian, arrived, who inſinuated to the king that the recommendations they had brought along with them were falſe. This reduced them to the neceſſity of ſtaying there till meſſengers could be ſent to Socinios to know whether it was ſo or not; which occaſioned a delay of three months. At laſt orders were brought to ſend them off immediately. This favourable anſwer procured the diſmiſſion of the ambaſſadors with preſents; while the malicious Manquer was detained priſoner. He eſcaped, however, and overtook them in the next kingdom, named *Alaba*, which was governed by a Moor named *Aliko*. Here he acuſed them of a deſign to overturn the Mahometan religion altogether: which ſo exaſperated the barbarian, that he threatened them all with death; and actually put them in priſon, where ſome of the Portugueſe died. At laſt, after holding a council, in which Manquer gave his voice for putting them to death, it was reſolved that they ſhould be ſent back to Amelmal; which was accordingly done, and from his dominions they returned to Abyſſinia. Thus ended this memorable embaſſy, by which the pope was deprived of any authentic documents which might ſhow that any Abyſſinian emperor had ever voluntarily ſubmitted to him; and there can be no doubt that this miſcarriage, more than any thing elſe, prevented the eſtabliſhment of Popery in this country.

Abyſſinia.

Deſcription of the river Zebee.

The ambaſſadors are obliged to return.

Socinios had now gone ſo far in favour of the Catholic party, that he began to ſhare in ſome meaſure the fate of Za Denghel; numberleſs conſpiracies being formed againſt him, which it was undoubtedly owing only to the altered ſituation of affairs by the preaching and aſſiduity of Peter Paez, that he was able to withſtand. The conſpirators were at this time ſupported, not only by the Abuna, but by Emana Chriſtos himſelf, the king's brother, whom we have frequently had occaſion to mention. Their firſt ſtep was the very ſame which had been ſo ſucceſsfully taken by Za Selaſſe in the time of Za Denghel, viz. to pronounce ſentence of excommunication on the emperor. He was at that time abſent on an expedition againſt the Agows; but returned immediately on hearing what was tranſacted in his abſence; informing the Abuna, that if he did not recal the excommunication without delay, his head ſhould pay the forfeit. This ſpirited declaration had ſuch an effect, that the anathema was annulled, and the conſpiracy diſſolved for that time. It was next reſolved between Emana Chriſtos the king's brother, Julius his ſon-in-law, and Kella Wahad maſter of the houſehold, to aſſaſſinate the king in his palace. To accompliſh this purpoſe it was concerted that they ſhould deſire an audience; that Julius ſhould enter firſt, and preſent a petition of ſuch a nature as would probably be refuſed: on this he was to begin an altercation; and during the continuance of it the other two aſſaſſins were to come up, and ſtab their ſovereign before he had time to put himſelf in a poſture of defence. Happily for Socinios, however, he was informed of his danger by a page juſt before Julius made his appearance: on which, inſtead of refuſing the petition, he granted it immediately; ſo that there was no room for diſpute. He then got up to walk; which was ſcarce done when Emana Chriſtos alſo came; on which Socinios invited them all to the terrace to walk with him. This prevented their falling upon him at that moment; and as they ſuppoſed they would have ſtill a better opportunity on the terrace, they readily conſented. But Socinios having opened a private door, at which he entered firſt, drew it quickly after him, and as this door had a ſpring-lock made by Peter Paez, which ſhut it in the inſide, but could not be opened from without, the conſpirators were diſappointed. Being alſo ſenſible that their deſign had been diſcovered, they were obliged for ſome time to keep at a diſtance, but did not for that reaſon abandon their wicked pro-

A number of rebellions on account of religion.

The Abuna excommunicates the emperor, but is obliged to withdraw his ſentence.

Attempt to aſſaſſinate the emperor.

It miſcarries.

jects.

Abyſſinia.

The rebellious ſpirit of the conſpirators continues.

jects. Their next ſcheme was to be put in execution when the king was abſent on an expedition againſt the people of Sennaar, who had made a violent irruption into the Abyſſinian territories. The object now was not the aſſaſſination of the emperor, but of his brother Sela Chriſtos; becauſe the emperor had taken the government of Gojam from Emana Chriſtos, who was a ſchiſmatic, to give it to Sela Chriſtos, who was a violent Catholic. The enterpriſe was begun by Julius; who iſſued a proclamation, that all thoſe who believed two natures in Chriſt ſhould leave the province of Tigré, where he was governor; and that ſuch as were true friends to the Alexandrian faith ſhould repair to his ſtandard to fight for it. He then ordered the goods of all the Catholics in Tigré to be confiſcated; and marched without delay into Gojam, in hopes to ſurpriſe Sela Chriſtos. But here the whole ſcheme was baffled by the vigilance and activity of the emperor; for he having received information of what was going forward, returned into that province before the conſpirators had received certain intelligence of his having left it. This ſo much damped the ardour of Emana Chriſtos and Keſla Wahad, that they ſtood aloof without attempting any thing till Julius ſhould try his fortune. That rebel was at firſt very much diſconcerted; but ſoon recovering his courage, advanced to the place where the Nile iſſues out of the lake of Dembea, where he met with the Abuna. Being confirmed by that prieſt in his wicked deſigns, he reſolved, by his advice, to fall upon the king before he could be joined by Sela Chriſtos, Simon himſelf (the Abuna) offering to ſhare his fortune: and to confirm all, a new and ſolemn excommunication was pronounced againſt the king and all his adherents. Socinios, alarmed at theſe proceedings, ſent a meſſage to Sela Chriſtos, deſiring him to come to his aſſiſtance as faſt as poſſible. In the mean time he himſelf advanced to meet Julius; but choſe his poſts ſo judiciouſly, that he could not be forced to an engagement without great diſadvantage on the part of the enemy. Notwithſtanding this, Julius pitched his camp cloſe to that of the king, with a deſign to force him to a battle at all events. This raſh action was followed by one ſtill worſe, Simon had perſuaded him, that as ſoon as the royal army ſhould ſee him, they would abandon the ſtandard of the emperor to join his. On this, without farther conſideration, he ruſhed into the camp of Socinios with a very few attendants, and reached the emperor's tent. Here he was known by the guards, and inſtantly diſpatched with all his followers; the whole army betook themſelves to flight after his death, and were purſued with great ſlaughter by the royaliſts. The plunder of the camp was immenſe, Julius having brought all his riches, which he had amaſſed by a long courſe of extortion, into the field along with him; and all of theſe were diſtributed among the ſoldiers. A vaſt number of cattle were likewiſe taken, which Socinios diſtributed among the prieſts, judges and lay-officers. By this complete victory the whole ſcheme of the conſpirators was overthrown. Emana Chriſtos having no forces capable of coping with his brother, and unwilling, as we have ſaid, to aſſiſt Julius openly, had retired to a high mountain named *Melca Amba*, in the territory of Gojam. Here he was inveſted by Af Chriſtos, an experienced general, whom Sela Chriſtos had left governor when he joined the emperor. Emana, who was likewiſe an expert commander, would have made a vigorous defence; but unfortunately the mountain was ſo deſtitute of water, that in three days he was delivered up by his own men, to ſave themſelves from periſhing with thirſt. On being brought to the king, he was tried in a full aſſembly of judges, and condemned to death; but the king pardoned and ſet him to Amhara.

Julius the emperor's ſon-in-law firſt appears in arms.

Is deſerted by his aſſociates.

Socinios excommunicated a ſecond time.

Raſhneſs and death of Julius.

Emana Chriſtos taken, but pardoned.

Abyſſinia.

This terrible conſpiracy had been occaſioned by the diſpute concerning the two natures of our Saviour: another quickly followed on account of the diſpute concerning the Sabbath-day; the Abyſſinian church inſiſting on the obſervance of the ſeventh day of the week as a Sabbath, and the Romiſh church on the obſervance of the firſt day. The author of this rebellion was one Jonael, who had been concerned in the expedition formerly mentioned, in which the Agows cattle were driven away, and afterwards reſtored by the king. It is more than probable that his reſentment on this account contributed much to increaſe his zeal on the preſent occaſion; but whatever was the real cauſe, religion was the ſole pretence. He began with a moſt inſolent but anonymous letter to the king; in which the arguments of the Alexandrians for the obſervance of the Jewiſh Sabbath were ſtated, and the contrary doctrine condemned with the utmoſt virulence of expreſſion. The king himſelf was reviled in the moſt opprobrious manner, compared to another Diocleſian, the Jeſuits ſaid to be relations of Pontius Pilate, and all of them devoted to hell without redemption. By this ſtupid performance the king was ſo much offended, that he added a clauſe to the former proclamation, commanding that "all out-door work, ſuch as plowing and ſowing, ſhou'd be publicly followed by the huſbandman on the Saturday, under penalty of paying a web of cotton cloth for the firſt omiſſion, the value of the cloth to be 5s.; the ſecond offence to be puniſhed by a confiſcation of moveables, and the offence not to be pardoned for ſeven year." To this Socinios added a ſpeech from the throne in vindication of himſelf, concerning the part he had taken in religious matters; and to ſhow that he was in earneſt, cauſed the tongue of a monk to be cut out for denying the two natures of Chriſt, and one of his generals to be whipt for obſerving the Jewiſh Sabbath.

Another rebellion by Jonael.

In the mean time Jonael having collected what forces he could, openly declared againſt his ſovereign; but not daring to meet him in the field, he retired into the country of the Galla, on hearing that Socinios was approaching him with an army. On this the king entered their territories, and laid them waſte; which created a diſſenſion among the ſavages themſelves; one party being for affording him protection, the other for delivering him up. This being made known to the king, he ſent a few preſents to the faithleſs barbarians of Jonael's party; who returned his kindneſs by ſending him the head of the rebel, though but a ſhort time before they had fought with their brethren for his reſcue.

He is murdered by the Galla.

A more formidable enemy than Jonael, however, ſtill remained. The province of Damot was one of the moſt diſaffected to Socinios in the whole empire; and to this place the greateſt part of the religious fa-

Another rebellion.

natics

Abyſſinia.

natics in other provinces had retired. They now muſtered up an army of more than 12,000 men, among whom were 400 monks, all of them armed with ſhields, lances, and ſwords; inſpired, beſides, with ſuch a degree of religious enthuſiaſm, that they expected to be rendered invulnerable by all terreſtrial weapons, and that armies of angels would fight in their cauſe. Againſt theſe Sela Chriſtos was diſpatched with about 7000 excellent ſoldiers; and as the general himſelf was a zealous Roman Catholic, as well as moſt of his men, we need not doubt that both parties imagined themſelves ſure of the protection of heaven, and conſequently that the encounter would be very violent. The two armies met on the 16th of October 1620; but Sela Chriſtos was unwilling to deſtroy the infatuated people, who he knew would be unable to reſiſt his veteran troops. He therefore firſt ſhowed them his ſuperiority in ſome ſkirmiſhes; and then ſent a pathetic meſſage, offering a general pardon if they would lay down their arms. The meſſengers, however, were not allowed to approach, ſo that an engagement became unavoidable. The numbers of the rebels, as Sela Chriſtos had foreſeen, availed very little againſt the diſcipline of the veterans he commanded. The 400 monks made a moſt obſtinate reſiſtance; and did not yield till after 180 of them had been killed on the ſpot.

Deſperate enthuſiaſm of the monks.

The emperor publicly renounces the Alexandrian faith.

Socinios, having once more vanquiſhed his enemies, now determined to ſhow his attachment to the church of Rome more openly. Having therefore ſent for Peter Paez, he told him his final reſolution to embrace the Catholic religion in its full extent; after which he renounced the Alexandrian church in the moſt explicit manner. His renunciation was followed by a proclamation vindicating his conduct; in which, beſides the arguments uſed for the pope's ſupremacy, &c. he inſiſted much on the bad lives of the clergy of the oppoſite party, and for which it appeared that there was in reality too much foundation. This was the laſt work of the excellent miſſionary Peter Paez, who died of a fever immediately after his leaving the king. The example of the ſovereign, however, had very little effect upon his ſubjects. The proclamation was followed by a new rebellion in Amhara. Unluckily the enemies of his brother Sela Chriſtos had perſuaded Socinios to deprive him of his government: and there was no other in the kingdom who could be intruſted with ſuch an important commiſſion; ſo that the king ſoon found himſelf under a neceſſity of replacing and committing to him the charge of the war againſt the rebels. In this he was attended with his uſual ſucceſs: for the rebel chief, finding himſelf unable to contend with his enemy, repaired for aſſiſtance to the Galla; who no ſooner had him in their power than they killed him on the firſt offer of the imperial general, mangling his body in ſuch a manner that ſcarce a bit of it remained to be ſent to his antagoniſt.

A new rebellion breaks out.

The rebel chief murdered by the Galla.

In the mean time news of the revolution in religious matters which had taken place in Abyſſinia, arrived in Europe. Though the embaſſy to the pope and king of Spain could not paſs, as has already been related, yet frequent accounts had been otherwiſe tranſmitted; which produced ſuch an effect, that a new ſet of miſſionaries, with a patriarch (Alphonſo Mendez) at their head, were ſent to Abyſſinia. They arrived at Gorgora, the ſeat of royal reſidence, in the beginning of the year 1626; and at the very firſt audience of the emperor, it was agreed that he ſhould take an oath of ſubmiſſion to the pope. The ceremony was performed with all the ſplendour that could be contrived: the patriarch then preached a ſermon on the pope's ſupremacy in the Portugueſe language, intermixed with Latin quotations; which is reported to have greatly confirmed the faith of the emperor and his brother, though neither of them underſtood a word of the languages in which it was preached. An anſwer to this unintelligible diſcourſe was made in the Amharic language, which was equally unintelligible to the patriarch and his attendants; and to this the patriarch added a few words of a reply equally ill underſtood. At the concluſion of the diſpute, an oath of the pope's ſupremacy was taken by the emperor himſelf on his knees, then by the princes, and afterwards by all preſent, according to their different ſtations. Sela Chriſtos, not contented with taking the oath, drew his ſword, and in words not eaſily underſtood, denounced vengeance on "thoſe who fell from their duty:" and he likewiſe added to the oath of ſupremacy another to the emperor and Facilidas the prince royal; but if the latter ſhould fail in the defence of the Catholic faith, he ſwore to be his greateſt enemy: nor would he be ſatisfied without impoſing this clauſe upon all the officers, whether civil or military, then preſent.

Abyſſinia.

Socinios takes an oath of ſubmiſſion to the pope.

Violent conduct of Sela Chriſtos,

This violent conduct of Sela Chriſtos procured him a number of enemies, and at laſt was the occaſion of his deſtruction; but that of the king and patriarch ſet the whole empire in a flame. An excommunication was firſt pronounced upon all who did not keep the oath: a proclamation was next iſſued, that all prieſts ſhould previouſly embrace the Catholic religion under pain of death; and that every one, under the ſame penalty, ſhould obſerve Lent and Eaſter, according to the rules of the Romiſh church. The patriarch proceeded in the ſame ſtyle; reordaining the clergy, conſecrating the churches over again, rebaptizing the people, even ſuch as were full grown, abrogating circumciſion, polygamy, and divorce (for theſe had been allowed by the Alexandrian church), and reducing the moveable feaſts entirely to the rules of the church of Rome.

and of the emperor and patriarch.

Though polygamy and divorce are no doubt inconſiſtent with the pure doctrines of the goſpel, yet it was very improper to meddle with theſe practices at once in ſuch a violent manner. Beſides the confuſion that this would naturally occaſion in private families, theſe practices gave occaſion to many queſtions in law, which it belonged to the civil judges to decide; but now theſe were all ſubjected to the authority of the patriarch: and from ſome other ſteps taken by this prelate, it appeared that he intended to encroach much farther upon the civil authority. One of theſe related to the church lands; which in Ethiopia are granted by the king, and reſumed at his pleaſure; others being granted in their place, ſo that neither prieſts nor monks have any property in them. On the preſent occaſion, an Abyſſinian nobleman had poſſeſſed ſome lands belonging to a Catholic monk; for which he was called before the patriarch. On his refuſing to ſubmit to this new tribunal, he was inſtantly condemned to reſtore the lands; but refuſing this alſo, the patri-

An Abyſſinian nobleman excommunicated.

A new patriarch and miſſionaries arrive in Abyſſinia.

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arch took an opportunity, as he was attending the emperor at church, to pronounce ſentence of excommunication againſt him, giving him over at once, ſoul and body, to the devil.—On hearing this terrible ſentence pronounced, the nobleman fainted away, and was with difficulty recovered. On the interceſſion of the emperor, however, the curſe was taken off; but the incident produced a very diſagreeable effect on the minds of the people, who from that day began to entertain a greater averſion than ever to the Roman Catholics and their prieſts. This averſion was greatly increaſed by the abſurd conduct of the patriarch, in ordering the body of an Abyſſinian ſaint to be taken up, and thrown out of the grave in an ignominious manner, becauſe it had been buried under the altar of a church, which he imagined was thus defiled. In all other reſpects, the patriarch behaved in ſuch an inſolent and overbearing manner, that the effects of his oppreſſion ſoon began to be univerſally felt, and the Catholic religion began very quickly to decline.—The firſt ſtroke given to it was the alteration of the liturgy; which was done at the deſire of the emperor. Ever ſince the eſtabliſhment of the Catholic religion, the Latin maſs book, &c. had been made uſe of according to the practice of the church of Rome; but as it ſeemed very unreaſonable to impoſe this at once upon the Ethiopians, Socinios ordered the patriarch to make ſuch alterations in the old Abyſſinian liturgies as he thought proper, that the people might thus have an opportunity of paying their devotions in a language they underſtood. The patriarch, not being able to aſſign any ſolid reaſon to the contrary, was obliged to comply; but no ſooner was this done than the people made uſe of their old liturgies entirely, without the leaſt regard to the innovations of the patriarch. In the midſt of the confuſion which daily took place from theſe cauſes, the Galla made a dreadful invaſion, and cut off one of the emperor's generals with his whole army: nor were all the abilities of Sela Chriſtos, who had ſo often diſtinguiſhed himſelf, ſufficient to retrieve matters; ſo that the ſavages, after having ravaged the country for ſome time at pleaſure, returned home loaded with booty. This misfortune was followed by the revolt of Tecla Georgis the king's ſon-in-law; who not only made religion the pretence for taking up arms, but inſulted the Catholics in the moſt outrageous manner; collecting their images and other religious trinkets into a heap, and then publicly ſetting fire to them. After this he called before him his own chaplain, named *Abba Jacob*, who was a Catholic, ſtripped him of his pontificals, and killed him with his own hand. A reconciliation with Socinios was now impoſſible; ſo that he had no reſource but in arms. In this however, he was equally unſucceſsful with the other rebels in this reign; being defeated, taken priſoner, and put to death along with his ſiſter Abdeſa, notwithſtanding the interceſſion of a Catholic miſſionary for him, and that of the queen and ladies of the court for his ſiſter.

Body of an Abyſſinian ſaint thrown out of the grave.

Catholic liturgy altered.

An army cut off by the Galla.

Tecla Georgis, the king's ſon-in-law, revolts.

Is defeated, taken, and executed.

As the reaſons given by the king for refuſing ſuch powerful interceſſion were purely religious, the people became more and more averſe to a profeſſion ſo extremely oppreſſive and ſanguinary as that of Rome ſeemed to be. A revolt of the Agows quickly followed; not that religion had really any ſhare in their determinations, but that they were exaſperated by the ſlavery and oppreſſion to which they ſaw themſelves ſubjected. They now therefore ſet up Melcha Chriſtos, a prince of the royal blood, as a pretender to the crown; and ſoon put on ſuch a formidable appearance, that the king himſelf thought proper to march againſt them with an army of 30,000 fighting men, which with the ſervants and other attendants amounted to more than 80,000. Melcha Chriſtos retired with his troops to the craggy mountains of the country; and being imprudently followed by the emperor, rolled down ſuch quantities of ſtones from the precipices, that Socinios was obliged to retreat with great precipitation, after having loſt almoſt one half of his army.

Revolt of the Agows, who ſet up Melcha Chriſtos.

On this defeat the emperor found himſelf obliged to apply to Sela Chriſtos, whom he had again diſgraced and deprived of his government. He ſucceeded in giving the rebels a dreadful overthrow, which for ſome time entirely broke their power; but this ſucceſs was quickly followed by the revolt of Læca Mariam, a near relation of the king. He alſo was defeated, and obliged to retire to a mountain ſo ſteep, that though he aſcended it in ſafety, he was dathed in pieces with many of his followers in attempting to deſcend; the reſt, who eſcaped this danger, being killed by their purſuers. Still, however, the rebel Melcha Chriſtos was unſubdued; againſt whom Prince Facilidas, the heir-apparent to the throne, was ſent, having under him a nobleman of moſt diſtinguiſhed character named *Keba Chriſtos*. The latter was defeated and killed, without its being in the power of Facilidas to do any thing towards the ſuppreſſion of the rebellion. This misfortune was followed by the death of Fecur Egzie, formerly ambaſſador with Antonio Fernandes to the pope, but now lieutenant general to Sela Chriſtos. He was cut off with a ſmall body of troops by the Galla; and from many misfortunes befalling the imperial troops the power of Melcha Chriſtos was augmented to ſuch a degree, that he now began to act as a king, and appointed a deputy-governor to one of the provinces. His opinion of his own importance, however, had almoſt proved his ruin; for the new governor having appointed a great feſtival on a Saturday, in oppoſition to the royal edict, he was attacked by a party of the king's troops, and entirely routed with the loſs of 4000 of his men. This defeat was revenged by an overthrow given to Prince Facilidas himſelf; the blame of which was laid upon Sela Chriſtos. The latter, as we have often had occaſion to obſerve, was not only a moſt valiant commander, but a rigid Catholic; and theſe two qualities might naturally have been thought to ſecure him in favour with the emperor. His violent conduct in regard to the Catholic religion, however, had raiſed him ſo many enemies, that accuſations were perpetually brought againſt him; and one diſgrace conſtantly followed another, notwithſtanding all his ſervices. The preſent accuſation was brought by one Leſana Chriſtos, whom Sela Chriſtos had formerly condemned to death. For this offence he had received a pardon from Socinios; and he now revenged himſelf upon his former judge by accuſing him to his ſovereign. Sela Chriſtos was not unmindful of this conduct; and therefore, as ſoon as he had him in his power, put him to death without regarding the pardon he had received. The emperor

The rebels defeated by Sela Chriſtos.

Læca Mariam's revolt and death.

Several misfortunes befal the emperor.

A rebel general entirely defeated.

Prince Facilidas defeated.

Sela Chriſtos univerſally hated.

on

Abyſſinia.

Deprived of the government of Gojam. Revolt of the new governor.

on this deprived him of the government of Gojam, which he gave to Serca Chriſtos, who was ſuppoſed to be a dependent on Prince Facilidas, and was beſides couſin to the emperor himſelf. The new governor, on his entering upon office, promiſed ſolemnly to ſupport the Catholic religion; but no ſooner did he arrive in Gojam than he ſolicited Prince Facilidas to rebel againſt his father, and re-eſtabliſh the Alexandrian faith. This was not the only inſtance in which he ſhowed his diſobedience. He had received the charge of a caravan which came annually from Narea; but inſtead of acting properly in this reſpect, he employed himſelf in driving off the cattle of the Agows and Damots, who expected no harm, and were conſequently quite unprepared. Such numbers of them were carried off on this occaſion, that 100,000 are ſaid to have been ſent to the Abyſſinian market. Socinios, when informed of ſuch an atrocious robbery, ordered him to reſtore the cattle, and to ſurrender himſelf priſoner; but inſtead of complying with this order, he again ſolicited Facilidas to revolt againſt his father. For this he was ſharply reproved; but now, determined to make the world believe that the prince had entered into his ſchemes, he ſent a public meſſage to him, in which he was deſired to come and take poſſeſſion of the kingdom. Facilidas impriſoned the perſon who brought this treaſonable meſſage, and ſoon after ſent him to Socinios; but Serca Chriſtos ſtill perſiſted in his mad attempts. He now propoſed to aboliſh the Romiſh religion throughout the kingdom; and with that view attacked a convent which Sela Chriſtos had built in Gojam: but the fathers having been furniſhed with ſome fire-arms, made ſo good a defence, that he was obliged to give over the enterpriſe. He then took the laſt ſtep to complete his folly, by openly revolting againſt the emperor, and ſetting up a prince of the blood-royal in oppoſition to him, whom he had found living in obſcurity among his mother's relations. To cut off all poſſibility of reconciliation with the emperor, he renewed the ſacrilegious practices of Georgis, and put to death a prieſt for refuſing to deny the two natures of Chriſt. Thus he procured a multitude of enthuſiaſts to join him; but when the affair came to a deciſion, and Prince Facilidas with a well-diſciplined army was ſent againſt him, it then became evident how little the fanaticiſm of a tumultuous rabble availed againſt the ſkill of a regular army. The rebels fought, however, with great obſtinacy till moſt of them were killed, their commander being obliged to take refuge on a mountain; from whence, being unable to make his eſcape, he at laſt came down and ſurrendered at diſcretion. We need not doubt of his fate; but notwithſtanding the execution of this rebel, another ſtill remained. This was Melcha Chriſtos, againſt whom the emperor next prepared to march. He now found, however, the bad conſequences of having acted ſo violently in favour of the Catholic religion. His army was ſo diſaffected, that he could ſcarcely put any confidence in them. For this reaſon he iſſued a proclamation, that ſuch as choſe to obſerve the Wedneſday as a faſt inſtead of Saturday, had liberty to do ſo. This and ſome other indulgencies being reported to the patriarch, the latter ſharply reproved him as committing an encroachment on the prieſthood; and put him in mind of the puniſhment of leproſy inflicted upon Uzziah for aſſuming the prieſt's office. Thus an altercation commenced; and it was evident, from the behaviour of Socinios, that his extreme favour for the Romiſh religion began to decline. After this he ſet out for the country of Laſta, where Melcha Chriſtos was, and the entrance to which was guarded by very high and rugged mountains. Among theſe the rebels had ſtrongly fortified themſelves; but were driven from four poſts by the king's troops, ſo that the latter imagined a complete victory had been gained. Aſſembling themſelves, however, on the top of another high mountain, the rebels watched their opportunity; and deſcending ſuddenly upon them, cut off great numbers, and obliged the reſt to make a precipitate retreat. Another campaign was therefore neceſſary; but now the army loſt all patience. They were become weary of making war on their countrymen, and, after ſlaughtering them in the field, ſeeing the intervals between the campaigns filled up with numerous executions of thoſe who had eſcaped the ſword. A deputation was therefore ſent from the ſoldiers by Prince Facilidas, who, though he had never declared his ſentiments openly, was ſtrongly ſuſpected of being no friend to the Catholics. The purport of the deputation was, that they did not mean to ſay that the Romiſh profeſſion was a bad one, but it was ſuch as they could not underſtand; and conſequently there could be no merit on their part in profeſſing it. They were ready, however, to lay down their lives for the public good, provided their ancient religion was reſtored; but this was a point they would not give up, and without which they would neither concern themſelves in the quarrel, nor even wiſh ſucceſs to the emperor's arms. With regard to the Romiſh religion, they added this declaration, perhaps the ſtrongeſt poſſible mark of averſion, that they did not *wiſh* to know any thing about it. Socinios, therefore, according to the Abyſſinian accounts, promiſed to reſtore the Alexandrian faith, on condition that he returned victorious from Laſta. The army then readily agreed to follow him wherever he pleaſed; while the rebels, having left their fortreſſes in Laſta, probably from a confidence in their own ſtrength, boldly marched towards the royal army. In the engagement, however, they did not ſhow their uſual alacrity, and were ſoon defeated with the loſs of 8000 men. Many of their beſt officers were killed on the ſpot, and Melcha Chriſtos himſelf eſcaped only by the ſwiftneſs of his horſe.

Abyſſinia.

The emperor defeated.

The army requires the reſtoration of the Alexandrian faith.

Melcha Chriſtos defeated.

He is defeated, taken, and put to death.

The emperor relaxes in his ſeverity concerning religion, which is reſented by the patriarch.

By this victory the power of the rebels was broken; but it was not attended with the ſame ſatisfaction to the people with which other victories were wont to be accompanied. On viewing the field of battle along with Facilidas next day, the prince is ſaid to have made a pathetic ſpeech to his father; in which he told him, that the bodies of the men he ſaw dead on the field of battle were neither thoſe of Pagans nor Mahometans, but of his own Chriſtian ſubjects; and that victories of this kind were like driving a ſword into his own entrails. "* How many men (ſays he) have you ſlaughtered? how many more have you yet to kill? We are become a proverb even to the Pagans and Moors for carrying on this war; and for apoſtatizing, as they ſay, from the faith of our anceſtors." The king did not make any reply at that time; but the effects of the

Pathetic ſpeech of Prince Facilidas to his father concerning the war.

* *Bruce's Travels*, vol ii. 4° p. 943.

Abyſſinia. prince's words were ſoon apparent. The patriarch took the firſt opportunity of upbraiding him with his ingratitude to the Catholics, and deſerting the religion whoſe profeſſors had by their prayers obtained ſuch a ſignal victory. To this Socinios replied in general, that he had done every thing in his power to eſtabliſh the Catholic religion; for which he had ſhed the blood of thouſands, and had ſtill as much more to ſhed: but that he ſhould conſider of the matter, and acquaint him with his final reſolution. This was by no means favourable; for next day, in a meſſage to the patriarch, he recounted the many rebellions which had been excited on account of religion; and concluded with telling him, that though the faith of Rome was not a bad one, yet the people of Abyſſinia did not underſtand it. For this reaſon he was determined to grant a toleration, by allowing ſuch as profeſſed the Catholic faith to do ſo in peace, and ſuch as rather choſe that of Alexandria to do the ſame. The patriarch replied, that he had no objection to grant this indulgence to ſuch as had not yet embraced the Catholic faith; but thoſe who had done ſo could not be permitted to renounce it without a grievous ſin. Thus a new ſyſtem of perſecution would have commenced: but the emperor, underſtanding well the purport of his diſcourſe, replied, that if this was the caſe, he was no longer maſter of his own kingdom; and immediately afterwards iſſued a proclamation, wherein he declared the Alexandrian faith reſtored, with the altars for the ſacrament, liturgy, and every other thing belonging to it; at the ſame time, that being now old and infirm, he himſelf reſigned the crown and empire to Facilidas.

An univerſal toleration granted.

Oppoſed by the patriarch.

The emperor reſtores the Alexandrian faith, and reſigns the kingdom.

This remarkable proclamation was made on the 14th of June 1632; after which Socinios took no farther care of public affairs; nor did he long ſurvive this tranſaction. He died on the 7th of September this year, and with him fell all the hopes of the Jeſuits. Facilidas, as had been rightly conjectured, was an inveterate enemy to the Catholic faith. As ſoon therefore as he had obtained the government, even before he took upon himſelf the title of king, the Catholics were everywhere diſplaced from offices of truſt and honour; but as ſoon as he found himſelf eſtabliſhed on the throne, a letter was ſent to the patriarch, informing him, that as the Alexandrian faith was now reſtored, it was become indiſpenſably neceſſary for him to leave the kingdom, eſpecially as the new Abuna was on the way, and only deferred his journey till the Romiſh prieſts ſhould be out of the country. For this reaſon he commanded the patriarch, with all his brethren, to leave their convents throughout the empire, and retire to Fremona in the kingdom of Tigré, there to wait his further pleaſure. The patriarch attempted to ſoften him by many conceſſions, but in vain; on the 9th of March 1633 he was ordered, with the reſt of the fathers, to proceed immediately for Fremona. This they were obliged to comply with; but the emperor, underſtanding that they were about to eſtabliſh themſelves, and to ſolicit ſuccours from Spain to accompliſh their purpoſes by force, he ſent orders to the patriarch, inſtantly to deliver up all the gunpowder they had at that place, and to prepare, without delay, to ſet out for Maſuah. Still the infatuated and obſtinate prieſt determined not to comply with the emperor's orders. At laſt he thought proper to deliver up the gunpowder; but reſolved to leave his companions behind him, and to diſperſe them as much as poſſible through the empire, in caſe he himſelf ſhould be obliged to embark at Maſuah; which, however, he did not by any means intend. For this purpoſe he applied to the Baharnagaſh, named *John Akay*, then in rebellion againſt the emperor; who carried them all off from Fremona in the night time, under a guard of ſoldiers, and lodged them ſafely in a ſtrong fortreſs named *Adicotta*. Here the patriarch imagined that he might remain in ſafety till he ſhould be able to procure ſuccours from India. In this, however, he was deceived. John conveyed them from place to place, through many unwholeſome ſituations, till their ſtrength as well as their patience was exhauſted. At laſt, on receiving a preſent of gold, he allowed them to return to their old habitation Adicotta. Facilidas, then, being determined at all events to get rid of ſuch troubleſome gueſts, endeavoured to prevail upon John by bribes to deliver them into his hands. John was too delicate to comply with this requeſt, which he ſuppoſed would be a violation of hoſpitality; but he conſented, on receiving a proper compenſation, to ſell them to the Turks. Two were left in Abyſſinia, in hopes of ſoon ſharing the crown of martyrdom; and this indeed Facilidas did not delay to put them in poſſeſſion of, both being ordered for execution as ſoon as he got them into his power. Not content with this, and being perpetually apprehenſive of freſh invaſions from Europe, he entered into a treaty with the Turkiſh baſhaws to keep the ports of Maſuah and Suakem ſhut againſt them; by which their entrance into Abyſſinia would be effectually prevented.

Abyſſinia.

He applies for protection to the Baharnagaſh, then in rebellion.

The patriarch and other miſſionaries ſold to the Turks.

During theſe tranſactions, the emperor took the moſt effectual methods otherwiſe to eradicate the Romiſh religion, by cutting off the principal perſons who profeſſed it, or obliging them to renounce their profeſſion. The principal of theſe was his uncle Sela Chriſtos, who had deſerved ſo well of the late emperor Socinios, and of the whole empire in general. His exceſſive bigotry in religious matters proved the cauſe of his deſtruction, as has formerly been hinted. When it was propoſed to him to renounce his faith, he abſolutely refuſed to do ſo, either to avoid the greateſt puniſhment the king could inflict, or to obtain the greateſt gift he had in his power to beſtow. On this he was baniſhed to an unhealthy diſtrict among the mountains of Samen; but as even here he kept up a correſpondence with the Jeſuits, and wiſhed to facilitate the introduction of more Portugueſe from India, he was ſentenced to be hanged on a cedar tree.

Sela Chriſtos put to death.

The new emperor an enemy to the Catholics.

The patriarch commanded to quit Abyſſinia.

The expulſion of the preſent race of miſſionaries did not entirely diſcourage the Europeans from attempting to introduce a freſh miſſion into Abyſſinia. The obſtinate, haughty, and rebellious ſpirit of the Jeſuits was univerſally condemned, and regarded as the cauſe of the extreme averſion ſhowed by the emperor and the whole empire againſt the doctrines they profeſſed. It was therefore hoped, and not without ſome appearance of reaſon, that the point might ſtill be gained, provided the miſſion were undertaken by others leſs violent and inſidious in their behaviour. After the execution of thoſe who remained in Abyſſinia, ſix Capuchins, the reformed order of St Francis, were ſent with protections from the Grand Signior to facilitate their paſſage into

A new miſſion undertaken by ſix Franciſcan Capuchins.

Abyſſinia. into Abyſſinia, where they hoped to revive the drooping, or rather loſt, cauſe of the Catholic religion. The event of this undertaking was truly unfortunate. The Galla murdered two who attempted to enter Abyſſinia by the way of Magadoxa. Two who arrived ſafely in the country were ſtoned to death; while the remaining two, hearing at Maſuah of the fate of their companions, returned home with the melancholy account of it. This bad ſucceſs did not deter three others from making the ſame attempt a ſhort time afterwards; but they having imprudently informed Facilidas of their intention, were murdered by the baſhaw of Maſuah, who had received orders from him to this purpoſe. So particular was the emperor with regard to the execution of this order, that he cauſed the baſhaw to ſend him the ſkin of their faces and heads; that he might know by their faces that they were Europeans, and by their ſhaved heads that they were prieſts.

Four of them murdered, and the other two return.

Three others murdered by order of Facilidas.

The Catholic faith was now totally ſuppreſſed, but the ſpirit of rebellion ſtill prevailed; and Melcha Chriſtos continued as much in oppoſition to his ſovereign as when he firſt took up arms on pretence of religion. At firſt he met with extraordinary ſucceſs; totally defeated the royal army, though commanded by Facilidas in perſon; after which, purſuing his good fortune, he made himſelf maſter of the capital, entered the palace, and was formally crowned king. This, however, was the laſt of his good fortune. Facilidas having quickly recruited his army, ſent three able generals to attack his rival, who was now acting the ſovereign in his palace. The rebels were attacked and ſurrounded before they expected an enemy, were almoſt entirely cut off, and Melcha Chriſtos himſelf was killed in the engagement.

Melcha Chriſtos ſtill continues in rebellion.

Is defeated and killed.

The victory over Melcha Chriſtos was followed by ſeveral ſucceſsful expeditions againſt the Agows and Galla; but in the 6th year of the reign of this emperor, the rebels of Laſta, who ſeemed determined not to yield while there remained a poſſibility of reſiſtance, choſe the ſon of Melcha Chriſtos for their king, and again began their depredations on the neighbouring provinces. Facilidas marched againſt them with his uſual activity; but had the misfortune to loſe the greateſt part of his army by cold among the mountains of Laſta, though it was then the time of the equinox, and conſequently the ſun was only 12° from being vertical, the latitude of Laſta being no more than 12°, and the ſun 12 hours in the day above the horizon.—Before this rebellion could be ſuppreſſed, another was begun, at the head of which was Claudius the king's brother. He had not the ſame good fortune with the rebels of Laſta; but was quickly defeated, taken priſoner, and baniſhed to a mountain called *Wechnè*; which ſerved from that time for the impriſonment of the princes of the blood royal. The ſuppreſſion of one rebellion, however, ſeemed to have no other effect than that of giving riſe to another. A new expedition was to be undertaken againſt the Agows and Shangalla; but they had poſted themſelves ſo advantageouſly, that the royal army was entirely defeated without being able to make any impreſſion on their enemies. Facilidas, however, knowing that this defeat could be attended with no other bad conſequence than the loſs of the men, which had already happened, marched directly againſt the rebels of Laſta without attempting to revenge the defeat he had ſuſtained. The rebel general, weary of a contention, in which he probably ſaw that he would be finally unſucceſsful, choſe to ſubmit unconditionally to the emperor; who, though he at firſt affected to treat him with ſeverity, ſoon after releaſed him from priſon, beſtowing upon him large poſſeſſions in Begemder, with his daughter Theoclea in marriage.

The rebels choose his ſon for their leader.

The emperor's army periſhes with cold.

Princes of the blood again impriſoned on a mountain.

Facilidas defeated by the Agows and Shangalla.

Abyſſinia.

The rebels of Laſta ſubmit.

Facilidas died in the month of October 1665, and was ſucceeded by his ſon Hannes. This prince was ſuch an enthuſiaſt for Chriſtianity, that in the very beginning of his reign he iſſued a proclamation, forbidding the Mahometans to eat any fleſh but what was killed by Chriſtians; but ſo far was he from any inclination to favour the Catholics, that he ordered all their books which could be found in the empire to be collected and burnt. Much of his time was ſpent in regulations of church matters, and in contentions and trifling diſputes with the clergy; which conduct ſo diſguſted his ſon Yaſous, that he fled twice from the capital, but was purſued and brought back. The laſt time was in the year 1680, when he found his father ill of the diſtemper of which he died. Hannes expired on the 19th of July that year, having lived at peace during the whole of his reign, excepting ſome trifling expeditions againſt the Shangalla and rebels of Laſta.

Reign of Hannes.

Yaſous, who ſucceeded to the throne with the approbation of the whole kingdom, was of a very different diſpoſition from his father. Generous, active, and brave, he was leſs bigotted, and differed from him conſiderably in religious principles. Having ſettled church matters as he thought proper, his next ſtep, and the moſt glorious action of his whole reign, was to pay a viſit to thoſe of the royal family who were confined on the mountain of Wechnè. He found them in the moſt miſerable condition; all in tatters, and many almoſt naked; their revenue having been ill paid by his father, who was of a ſordid diſpoſition, and the little they received having been embezzled by their keepers. Yaſous was greatly moved at this ſpectacle, ordered a large ſum of money to be divided among them for preſent relief, clothed them according to their rank, and ſettled matters ſo that no part of their revenue could ever afterwards be improperly applied. To the governor of the mountain he aſſigned a large tract of territory, to make amends for the profit he had been accuſtomed to derive from the revenue of the princes; and finally, he left all the priſoners at the foot of the mountain, at perfect liberty either to take up their reſidence again on it or any where elſe. By theſe extraordinary inſtances of royal munificence the emperor ſo effectually gained the affection of his relations, that they unanimouſly determined to return to their former ſtate of confinement: and during the whole time of his reign not one of them ever appeared as a competitor for the crown.

Reign of Yaſous.

His generoſity to the baniſhed princes.

Though Yaſous is ſaid to have poſſeſſed all the qualities which conſtitute a great and good monarch, the natural turbulence of his ſubjects, and the reſtleſs diſpoſition of the monks, ſoon began to ſhow themſelves by new ſeditions. Theſe were preceded by a violent irruption of the Galla, who were overthrown, as uſual, with great ſlaughter; but ſoon after, being ſolicited by ſome monks who had drawn over a party of the

Irruption of the Galla, ſeditions of the monks, rebellion, &c.

Agows

Abyſſinia. Agows to their ſide, the diſturbances were renewed. A grandſon of Socinios, who had fled to the Galla when Facilidas firſt baniſhed the princes to Wechnè, was proclaimed king. A multitude of ſavages immediately flocked to his ſtandard, ſo that he was ſoon at the head of a very formidable army, while the Agows and other malecontents were ready to join him as ſoon as he ſhould repaſs the Nile. The king, however, entirely diſconcerted the ſcheme by his activity; for, advancing with the utmoſt celerity, he reached the banks of the Nile before the Galla on the other ſide were ready to join their allies on this ſide of it. The Agows were ſo confounded at his preſence, that they allowed him to paſs the river unmoleſted. The Galla were equally ſurpriſed at ſeeing the war transferred into their own country; and, with their uſual fickleneſs, deſerted the prince whoſe cauſe they had pretended to eſpouſe. A few remained faithful, but were utterly defeated by the forces of Yaſous; the unhappy prince himſelf, whoſe name was *Iſaac*, being taken priſoner, and put to death in the preſence of his rival. After this, many great exploits were performed againſt the rebellious Agows, Galla, and other ſavages: but which, as they produced no other conſequence than that of eſtabliſhing the emperor's character for perſonal valour and military ſkill, we ſhall here paſs over; only remarking, that, in the opinion of his ſubjects, one of his campaigns was the moſt glorious ever recorded in the annals of Abyſſinia. The moſt memorable events in the preſent reign regarded religion, and a renewal of the correſpondence betwixt Europe and Abyſſinia; of which we have a particular account from Mr Bruce, to the following purpoſe. About the end of the 17th century, a number of Franciſcans from Italy ſettled at Cairo in Egypt, and were maintained at the expence of the fathers in Paleſtine, though pretending to be independent of their ſuperior the guardian of Jeruſalem. The latter, diſpleaſed at this method of proceeding, offered to ſupply the miſſion to Egypt entirely at the expence of Paleſtine, and likewiſe to furniſh from thence miſſionaries capable of inſtructing the people in the Chriſtian religion. This propoſal meeting with a favourable reception at Rome, a new ſet of miſſionaries from Jeruſalem, called by our author *Capuchins*, appeared at Cairo; from whence the Franciſcans were baniſhed, only two of them being allowed to remain in that city. The others returned to Rome; where, finding that they could not re-eſtabliſh themſelves by fair means, they had recourſe to artifice and fiction. It was now pretended, that, on the expulſion of the Jeſuits from Abyſſinia, a great number of Catholic Chriſtians had fled into the neighbouring countries of Nubia and Sennaar, where they found themſelves ſo grievouſly oppreſſed by the Mahometans, that, without ſome ſpiritual aſſiſtance, they would be under the neceſſity of renouncing their religion. This ſtory being confirmed by the two Franciſcans who remained at Cairo, the cauſe of theſe ſuppoſed Chriſtians was eagerly eſpouſed by the religious in Italy, and a new miſſion ſet on foot at the expence of the pope for their relief, which continues to this day under the title of the *Ethiopic Miſſion*. The miſſionaries had it alſo in charge to penetrate if poſſible into Abyſſinia; and to keep up, as far as was in their power, the Catholic faith, until a better opportunity

Quelled by the emperor.

Attempt to revive the religious miſſions from Europe.

ſhould offer of making an attempt to convert the whole empire. For this purpoſe a convent was procured for them at Achmim in Upper Egypt; and permiſſion was granted, notwithſtanding their former baniſhment, to ſettle two of their order at Cairo independent of the fathers of Paleſtine. Abyſſinia.

While theſe tranſactions paſſed in Italy and Egypt, Louis XIV. of France was in the height of his glory. He had attempted to rival the ancient Greeks and Romans in the magnificence of his works; but his conduct with regard to religion, his perſecution of the Proteſtants, and revocation of the edict of Nantz, had ſtigmatized him throughout the greateſt part of Europe as a bloody and mercileſs tyrant. To wipe off this ſtain, the Jeſuits, his great ſpiritual directors, formed a ſcheme of inducing the emperor of Abyſſinia to ſend an embaſſy to France; after which they hoped that they might get themſelves replaced in the Ethiopic miſſion, to the excluſion of the Franciſcans. The king, whoſe pride was very much flattered by the propoſal, readily embraced it; but the pope's conſent was ſtill neceſſary. His holineſs was by no means pleaſed with this intruſion of a temporal prince into ſpiritual affairs: nevertheleſs, he did not chooſe to enter into any conteſt; but that he might undo with one hand what he did with the other, he appointed ſix Jeſuits, of whom Verſeau, the ambaſſador of Louis to himſelf, was one, to be miſſionaries to Abyſſinia, but the ſuperior of the Franciſcans to be his legate *à latere* at that court; providing him with ſuitable preſents for the emperor and principal nobility.

The Jeſuits now finding themſelves in danger of being ſupplanted by the Franciſcans, applied to the pope to know which of the two orders ſhould make the firſt attempt to enter Abyſſinia; but received no other anſwer than that thoſe who were moſt expert ſhould do ſo. Verſeau, probably diſpleaſed at this conduct of the pope, went to a convent in Syria of which he was ſuperior, without making any attempt to enter Ethiopia: therefore the miſſion remained in the hands of two perſons of oppoſite profeſſions, a Jeſuit and a Franciſcan; the name of the latter being *Paſchal*, an Italian; and of the former *Brevedent*, a Frenchman. The latter was accounted a man of learning and probity, zealous in the cauſe of his religion, but by no means imprudent or raſh in his attempts to promote it.

In the mean time an unforeſeen accident procured admittance to the miſſionaries into Abyſſinia more readily than could have been expected in the preſent ſituation of affairs. Yaſous and his ſon had both been attacked by a ſcorbutic diſorder which threatened to turn to a leproſy; on which one Hagi Ali, a Mahometan factor at Cairo, received orders to bring with him an European phyſician on his return to Abyſſinia. It happened that this man had formerly been acquainted with Friar Paſchal, who had adminiſtered ſome medicines to him. He now propoſed that Paſchal ſhould accompany him to Abyſſinia in the character of a phyſician; and that Friar Anthony, another of his own order, ſhould go with him as his companion. But this ſcheme was fruſtrated by Maillet the French conſul, who had the charge of the whole from Louis XIV. and wiſhed that the Jeſuits alone ſhould have the conduct of the miſſion. For this purpoſe he repreſented to

Yaſous falls ſick, and ſends for a European phyſician.

Friar Paſchal and another Friar undertake the office.

Abyſſinia. to Hagi Ali, that Friar Paſchal underſtood nothing of medicine; but he promiſed to furniſh him with another, whoſe ſkill he extolled above all thoſe of ancient or modern times. Hagi Ali, who knew nothing of the matter, readily agreed to Maillet's propoſal; and Charles Poncet a Frenchman, who had been bred a chemiſt and apothecary, was appointed to the office of phyſician, with Father Brevedent to attend him as his ſervant. Thus the ſcheme of the Franciſcans was for the preſent overthrown: but unluckily Maillet employed one Ibrahim Hanna, a Syrian, to write letters to the Abyſſinian monarch and ſome of his principal nobility, which he deſired him to ſubmit to the inſpection of one Francis, a Capuchin or monk of the Holy Land, and conſequently an enemy to the Franciſcans. Ibrahim, not being acquainted with the monk he mentioned, and thinking any other would anſwer as well, carried the letters to one of the ſame name, but of the Franciſcan order. Thus the whole ſecret was divulged at once; and the Franciſcans, with the malevolence eſſential to ſuch religious miſcreants, reſolved on the deſtruction of Poncet and his attendants. At preſent, however, their ſanguinary intentions were defeated; Poncet ſet out immediately after he had received his commiſſion, and arrived ſafe at Gondar the capital of Abyſſinia, with his attendant Father Brevedent, on the 21ſt of July 1699. Brevedent died on the 9th of Auguſt; but Poncet lived to execute his commiſſion, by making a full cure of his royal patient. On the 2d of May 1700, he ſet out on his return for Europe, and arrived at Maſuah without any bad accident.

It has been already obſerved, that the main end of this undertaking was to procure an embaſſy from Abyſſinia to the French monarch; and this end alſo was gained. An ambaſſador was procured, but unluckily not ſuch a one as M. Maillet the chief manager of the whole project deſired. This man intoxicated with abſurd notions of nobility and diſtinctions of rank, could not make allowance for the difference between the appearance of an ambaſſador from a barbarous monarch, however powerful, and one from the ſovereign of a civilized and polite nation. The ambaſſador ſent by Yaſous, therefore, having been originally no other than a cook, could not be agreeable to a man of ſuch a diſpoſition. The preſents ſent by the Abyſſinian monarch indeed, had they arrived, would have probably conciliated matters. Theſe were, an elephant, ſome Abyſſinian young women, &c. but unluckily the elephant died, and the ambaſſador was robbed of all the reſt by a Turkiſh baſhaw. Maillet, therefore, naturally proud, imperious, and covetous, thought proper to call in queſtion the authenticity of Morat the ambaſſador's miſſion, to call Poncet himſelf a liar, and not to allow the former to proceed to France. The tranſactions on this occaſion are ſet forth at length by Mr Bruce, greatly to the diſgrace of Maillet; but as details of this kind would ſwell the preſent article beyond due bounds, we muſt refer the curious reader to the work juſt mentioned.

Thus the ſcheme of procuring an embaſſy from Abyſſinia having proved abortive, the next project of the Jeſuits was to get an embaſſy ſent from France, whoſe object was to be the cementing a perpetual peace betwixt the two nations, and to eſtabliſh a laſting and commercial intercourſe; though, whatever friendſhip or good-will might take place, it was evident that there was not a ſingle article that could be exchanged between them, nor was there any ready communication betwixt the two countries either by ſea or land. The perſon pitched upon as ambaſſador was M. de Roule, vice-conſul at Damietta. He is characterized by Mr Bruce as "a young man of ſome merit, who had a conſiderable degree of ambition, and a moderate ſkill in the common languages ſpoken in the eaſt: but abſolutely ignorant of that of the country to which he was going, and, what was worſe, of the cuſtoms and prejudices of the nations through which he was to paſs. Like moſt of his countrymen, he had a violent predilection for the dreſs, carriage, and manners of France, and a hearty contempt for thoſe of all other nations: this he had not addreſs enough to diſguiſe; and this endangered his life." Beſides theſe diſadvantages, he had the misfortune to be under the diſpleaſure of all thoſe of his own nation who reſided at Cairo; ſo that the merchants were very much averſe to his embaſſy; and, as the Franciſcans and Capuchins were his mortal enemies, he had not a ſingle friend in the world except Maillet and the Jeſuits. Unluckily the conſul miſſed him in one of the moſt material articles, and which was undoubtedly of the utmoſt conſequence to him in the accompliſhment of his purpoſe, viz. the preſents neceſſary to be taken with him for the barbarous people through whoſe country he was to paſs. Brocades, ſatins, and trinkets of various kinds, according to Mr Bruce, were the proper wares; but inſtead of this, he had taken along with him mirrors of various kinds, with the pictures of the king and queen of France, wearing crowns upon their heads. The former of theſe ſubjected him to the imputation of being a magician: while the latter, if ſhown to a Mahometan, would bring upon him the charge of idolatry. The worſt misfortune of all was the malice and treachery of the Franciſcans, who had already prejudiced againſt him the people of the caravan with whom he was to go, the governors of the provinces through which his road lay, and the brutal and barbarous inhabitants of Sennaar, who lie in the way betwixt Egypt and Abyſſinia. The conſequence of all this was, that he was murdered at the laſt-mentioned place with all his retinue. The Franciſcan friars, who had preceded him to Sennaar, left it before his arrival, and returned immediately after. There cannot therefore be the leaſt doubt that they were the authors of his murder; though the bigotted diſpoſition of Louis XIV. prevented all inquiry into the matter; ſo that the particular ſteps they took to accompliſh their deſigns were never publiſhed to the world.

The aſſaſſination of De Roule was preceded by that of Yaſous emperor of Abyſſinia, who fell by a conſpiracy of his wife and ſon, occaſioned by a fit of jealouſy in the former. He was ſucceeded by his ſon Tecla Haimanout, who had conſpired againſt him. Before his death, he had diſpatched a meſſage to the king of Sennaar, requiring him to afford M. de Roule protection at his court, and a ſafe conduct from it; but when the meſſenger was within three days journey of the capital of that kingdom, he received news of the aſſaſſination of Yaſous. On this he returned

Abyſſinia.

M. de Roule ſent ambaſſador from France.

He is murdered.

Yaſous aſſaſſinated.

Abyſſinia

turned in great haſte to Gondar, in order to have the letters of protection renewed by Tecla Haimanout the reigning prince. This was readily done: but before the meſſenger could reach Sennaar, he was informed that De Roule was already aſſaſſinated; on which he returned with ſtill greater haſte than before. The Abyſſinian monarch, provoked at ſuch a ſcandalous violation of the law of nations, declared his intention of commencing hoſtilities againſt the king of Sennaar; and for this purpoſe aſſembled his army. But this was ſcarce done, before he was informed that a rival, named Amda Sion, had been ſet up againſt him by the friends of his father Yaſous, and had been for ſome time privately collecting troops to ſurpriſe him before he could be ready to make any oppoſition. It was therefore neceſſary to employ the army deſtined againſt Sennaar to reduce this rebel to obedience; and ſcarce was this done, when the emperor himſelf was aſſaſſinated; ſo that all thoughts of revenging the death of M. Roule were laid aſide.

The new emperor intends to revenge his death;

but is himſelf murdered.

Reign of Theophilus.

Tecla Haimanout periſhed in 1706, and was ſucceeded by his uncle Tiffilis, or Theophilus; whoſe firſt care was to apprehend all thoſe ſuſpected to have been concerned in the death of his predeceſſor. Thus the murderers of Yaſous, whom Tecla Haimanout had inſtigated, imagined themſelves ſecure, and came to court without any fear of danger: but no ſooner did Theophilus get them into his power, than he cauſed them all to be put to death without exception; the queen herſelf being publicly hanged on a tree. Not ſatisfied with avenging the death of Yaſous by the execution of his murderers, he did the ſame with thoſe of Tecla Haimanout; putting to death all who were immediately in his own power, and commanding the governors of the provinces to do the ſame with thoſe whom they could find within their juriſdiction. One of theſe named Tigi, who had been formerly Betwudet, having eſcaped into the country of the Galla, raiſed a very conſiderable army, with which he invaded Abyſſinia, where he committed the moſt dreadful cruelties. Theophilus engaged him on the 28th of March 1709; when, with a force greatly inferior, he gained a complete victory. A number of the Galla fled to a church, hoping to be protected by the ſanctity of the place; but the emperor telling his ſoldiers that it was defiled by thoſe who were in it, commanded it to be ſet on fire, ſo that every one periſhed. Tigi, with his two ſons, were taken priſoners, and put to death. The king himſelf did not long ſurvive his victory; falling ſick of a fever, of which he died in September 1709.

Execution of the queen and other regicides.

Tigi revolts, but is defeated, taken and put to death.

Line of Solomon ſet aſide.

After the death of Theophilus, the line of Solomon by the queen of Sheba was ſuperſeded a ſecond time, and a ſtranger of the name of *Ouſtas* ſeated on the Abyſſinian throne. The extreme ſeverity of Theophilus in puniſhing the murderers of both Yaſous and Tecla Haimanout gave occaſion to this; for as both princes had been aſſaſſinated in conſequence of conſpiracies formed by the principal people of the nation, the number of conſpirators was ſo great, that the parties concerned had intereſt ſufficient to influence the election of the new monarch, even in this moſt capital reſpect, of his not being a deſcendant of Solomon. Excepting this ſingle defect, he was in every reſpect worthy of the kingdom, and was already the higheſt ſubject in it. Scarce was he ſeated on the throne, however, when a dangerous conſpiracy was formed againſt him by the very perſons by whom he had been placed upon it. Ouſtas baffled their deſigns, by ſeizing the principal conſpirators before they had time to bring their ſchemes to a bearing: and ſeveral people of the firſt rank were condemned to loſe their noſes, or to be put to death. After this, the emperor undertook an expedition againſt the Shangalla, according to the barbarous cuſtom of the Abyſſinian monarchs, who hunt theſe poor people merely for the ſake of making ſlaves; ſlaughtering the men without mercy as well as many of the women, and carrying off only the boys and girls into captivity. In this he met with perfect ſucceſs; and was about to attempt the conqueſt of the whole country, when he was called back by the news that his prime miniſter Teſa Chriſtos was dead. While the emperor remained in his capital at Gondar, he was taken ſuddenly ill; which he at firſt imputed to witchcraft, and therefore uſed ſome antidotes; among which the ſmoking of the palace with gunpowder was one. But this was done ſo careleſsly by the ſervants, that the whole building was conſumed; an accident looked upon by the people in general as a very bad omen, eſpecially as the king's complaint increaſed every day. At laſt the principal officers came to pay him a viſit of condolence, as they pretended; but in reality to obſerve the nature of his diſtemper, and to conſult whether or not it was likely to continue till they could fall upon means to deprive him of the government. Ouſtas underſtood their intentions, and therefore ſummoned all his ſtrength to aſſume for a moment the appearance of health; ſo that the officers found him as uſual engaged in buſineſs. Being thus diſconcerted, it became neceſſary to make ſome apology for a viſit ſo extraordinary and formal; for which they were at firſt ſomewhat at a loſs: on recollection, however, they told him, that, hearing he had been ſick, which they happily found was not the caſe, they had come to make a propoſal concerning the ſucceſſion; profeſſing a deſire that he would quiet the minds of his own family, and of the people in general, by appointing his ſon Faſil ſucceſſor to the throne after his deceaſe. Ouſtas gave them an equivocal anſwer; but the diſcourſe concerning Faſil happening to be overheard by the ſoldiers, a violent mutiny enſued, and all the officers who had come to viſit Ouſtas were killed. Part of the town was ſet on fire in the confuſion; and at laſt a proclamation was made, that David ſon of Yaſous was king of Abyſſinia. The prince was then ſent for from the mountain, and arriving at Gondar, was crowned on the 30th of January 1714. The diſtemper of Ouſtas in the mean time continuing to increaſe, he died on the 10th of February the ſame year.

Abyſſinia

The emperor falls ſick.

Ouſtas depoſed, and David proclaimed emperor.

Death of Ouſtas.

The new emperor was a rigid Alexandrian in principle; but Ouſtas had been ſo far favourable to the Catholics, as to entertain ſome of their prieſts, though in a private manner. As it was the cuſtom, however, to call a convocation of the clergy on the acceſſion of every new emperor, the monks and others inſiſted upon one being called on the preſent occaſion; the more eſpecially that a new Abuna was come from Egypt, and the lenity ſhown to the Catholics by Ouſtas had excited the jealouſy of the Abyſſinian clergy in the higheſt

Reign of David.

Abyſſinia. highest degree. This assembly proved fatal to three Romish priests, whom Ouſtas had protected and supported for some time. They were brought before the king and Abyſſinian clergy; who shortly asked them, whether they believed that the council of Chalcedon was to be accepted as a rule of faith, and that Pope Leo lawfully presided in it? To both these questions they answered in the affirmative: on which, without farther trial, they were condemned to be stoned; and the sentence was instantly put in execution by the furious and ignorant multitude, only one person in the whole assembly exclaiming against it as unjust. The priests being thus gratified in one instance, insisted that Abba Gregorius, who had acted as an interpreter to the three just mentioned, should also be put to death; but this was prevented by David, who found, upon inquiry, that he had only done so in obedience to the express commands of Ouſtas his sovereign.

Three Romish priests put to death.

Here we must take notice, that though the faith of Abyſſinia is always said to be the same with that of Alexandria, it is not for that reason to be imagined that the clergy are all of the same mind. On the contrary, many different parties exist among them, who hate one another no less than all of them do the church of Rome. The principal of these in the time we speak of were the monks of Debra Libanos and those of St Eustathius, to which last the emperor himself belonged. On the arrival of a new abuna, it is customary to interrogate him before the emperor and assembly of the clergy, which of the two opinions he adheres to. The emperor at present, not thinking his presence necessary, sent the betwudet with the principal persons of both parties to hear the profession of the new abuna, which was afterwards to be proclaimed to the people. The latter, probably not willing to contend with either party, gave an equivocal answer. But with this the king himself was dissatisfied; and therefore, without consulting the abuna farther, he caused it to be proclaimed, that the new abuna's profession was the same with that of the monks of St Eustathius. This was highly resented by the monks of Debra Libanos, who instantly ran to the abuna, and from him received a profession directly contrary to what had been proclaimed by the king's order. Not satisfied with this, they continued their tumult, disregarding the imminent danger they were in of falling under the king's displeasure. One of their number was so infatuated as to cry out, that he saw a cherub with a flaming sword guarding the door of the house where they were. Unluckily, however, they continued their assembly so long, and behaved in such a seditious manner, that the emperor sent against them a body of Pagan Galla; who fell upon them sword in hand, killed upwards of 100 of the ringleaders, and then sallying out into the street, destroyed indiscriminately every one they met.

Dissensions among the Abyssinian clergy.

Great massacre of the clergy and heirs.

The massacre continued till the next day at noon, when a stop was put to it by the king's proclamation. The vast quantity of blood so wantonly shed, however, could not but occasion great discontent throughout the capital, and the bad effects of it soon appeared. The king was universally hated, and numberless conspiracies were talked of; but before any pretender to the crown appeared, David himself fell sick, the cause of which was found to be poison. The perpetrators of this crime being known, were instantly put to death; but nothing could save the life of the emperor, who died the 9th of March 1719 in great agony. Abyssinia.

The king poisoned.

David was succeeded by his brother Bacuffa; who in the beginning of his reign proved very severe and cruel, cutting off almost all the nobility who could be supposed to have had any share in the conspiracies and seditions of former reigns. In the latter part of it he became much more mild, and was beloved by his subjects. He was succeeded in 1729 by his son Yasous II. who continued long under the regency of his mother; and as soon as he took the management of affairs upon himself, was disturbed with continual seditions and rebellions. In one of these the city of Gondar was made a field of battle, and was so frequently set on fire, as to be almost entirely reduced to ruins. Having at last succeeded in reducing all his enemies to obedience, he encouraged and promoted the arts of peace, repairing and ornamenting his palaces, in which he employed some Greek artists. For this he renounced the diversion of hunting, and the barbarous expeditions against the Shangalla: but this way of life proved so disagreeable to his turbulent subjects, that a severe satire was published against him, under the title of "The expeditions of Yasous the Little." Indignant at this reproach, he determined on an expedition against the kingdom of Sennaar; and having made the necessary preparations, invaded it with a formidable army, without the least pretence of provocation, or making any declaration of war. As he proceeded into the country of the enemy, he allowed his soldiers everywhere to exercise the greatest cruelties, to destroy every living creature with the sword, and every thing combustible with fire. Some of the Arabs joined him as he went along; many more fled from his presence; and a body of them tried to oppose him. These last were utterly defeated; and Yasous without delay prepared to march to Sennaar the capital of the kingdom. As he still went on, the king Baady, being assisted by Hamis prince of a territory named *Dar Foor*, surprised one division of his army so effectually, that they were all cut off to the number of 18,000. Yasous, however, still continued his destructive progress; though he gave over all thoughts of reducing the capital, or subduing the kingdom. He returned triumphant to Gondar, making a great show of the plunder he had acquired; though the dejected countenances of many of his army showed that they were by no means pleased with expeditions of this kind. The king himself was supposed to behold the distress of his subjects on this occasion with a malicious pleasure, on account of their impatience and turbulence in times of peace, and their forcing him into a war when he had no inclination for it. In a short time, however, the people were perfectly comforted for the loss of their brethren. In the late unfortunate action they had lost all those holy utensils, which it is usual in Abyssinia to carry into the field of battle in order to ensure victory. Among these was a picture of the crown of thorns which was put upon our Saviour's head; some pieces of the true cross upon which he suffered; a crucifix which had spoken on many occasions; with many other sacred relics of equal value. Soon after the battle all these were redeemed by the priests at an extravagant rate; no less than 8000 ounces of gold having been given

Reign of Bacuffa.

Of Yasous II.

Cultivates the arts of peace.

Is lampooned by his subjects, and undertakes an expedition against Sennaar.

A division of his army cut off.

Religious utensils redeemed at an extravagant rate.

Abyſſinia

for the ſpeaking crucifix; and for the reſt, we are to ſuppoſe a proportional price had been paid. On the arrival of this trumpery at Gondar, the greateſt rejoicings were made, and Yaſous was aſtoniſhed at the people having ſo ſoon forgot the loſs of their countrymen and relations.

Soon after theſe tranſactions the abuna died; but though it was cuſtomary for the Abyſſinian monarchs to advance the money neceſſary to bring a new one from Alexandria, Yaſous found himſelf obliged to lay a tax upon the churches for defraying it at this time, having ſpent all his ready money in repairing and ornamenting his palaces. Three prieſts, conſigned to the care of as many Mahometan factors, were ſent to Egypt for the new patriarch; but they were detained for ſome time by the naybe or prince of Maſuah, who extorted from them one half of the money given by the emperor for bringing the abuna from Cairo. Yaſous no ſooner heard that they were detained at Maſuah, than he ſent orders to Suhul Michael governor of Tigré to refuſe proviſions to the inhabitants of Maſuah, which would ſoon reduce the naybe to obedience: but as Michael intended ſoon to quarrel with the king himſelf, he was not in any haſte to obey the orders he received. The travellers were therefore detained ſo long, that on their arrival at Jidda, they found they had loſt the monſoon; and, what was worſe, the ſcheriff of Mecca would not allow them to paſs without a freſh extortion. Their money was now exhauſted; but the rapacious ſcheriff put one of their number in priſon; where he continued for a twelvemonth till the money arrived: and from this time theſe extortions were changed into a ſtated tribute; 75 ounces of gold (about 186l. ſterling) being granted for leave of paſſage to Cairo for the abuna; 90 ounces to the ſcherif, and as many to the naybe, for allowing the abuna to paſs from Cairo: an agreement which ſubſiſts to this day. Several other inſults of this kind being received from the naybe, Yaſous at laſt diſcovered that there was a ſtrict alliance betwixt him, the governor of Tigré, and the Baharnagaſh; any one of whom, had he thought proper, could have cruſhed this pitiful prince with the ſmalleſt effort. On this the emperor determined to march againſt him in perſon; but was prevented by a rebellion which had been purpoſely excited in the country of Azab and that of the Dobas. The rebels were eaſily overthrown: but thus the expedition againſt the naybe was delayed for a year; during which interval the emperor ſent for Michael to Gondar. This order was poſitively refuſed, and a war enſued. Michael, unable to contend with the emperor to the open field, took to a high mountain, the uſual refuge of Abyſſinian rebels. Here alſo his bad fortune purſued him; all his poſts were taken by ſtorm excepting one, which, it was evident, would likewiſe have been carried, though not without a very great expence of men. Here Michael requeſted a capitulation; and to enſure favourable terms, he deſired to put into the hands of Yaſous a great quantity of treaſure, which would otherwiſe be diſſipated among the common ſoldiers. This being done, Michael deſcended with a ſtone upon his head, as confeſſing himſelf guilty of a capital crime, with a deſign to make ſubmiſſion to the emperor. This was prevented for one day by a violent ſtorm of wind and rain; from which moment the Abyſſinians believe he began converſe with the devil: but Mr Bruce informs us, that he has often heard him ſay it was Michael the archangel who was his correſpondent.

Abyſſinia

The meſſengers ſent for the new abuna inſulted and robbed.

A ſtated tribute for the paſſage of the abuna.

The emperor determines to puniſh the naybe of Maſuah, but is prevented.

War with Michael governor of Tigre.

Michael obliged to capitulate.

Yaſous was firmly determined to put this rebel to death, notwithſtanding the quantity of gold he had received; nevertheleſs a promiſe was extorted from him that he would ſpare his life. As ſoon as Michael came into his preſence, the emperor was filled with indignation, retracted his promiſe, and ordered him to be carried out and put to death before his tent door. The execution of the ſentence, however, was prevented by the interceſſion of all the officers of any conſideration in the court or army. Such univerſal ſolicitation could not be withſtood: Michael was pardoned; but with theſe remarkable words, that the emperor waſhed his hands of all the innocent blood which Michael ſhould ſhed before he brought about the deſtruction of his country, which he knew he had been long meditating.

Yaſous is obliged to act on his contrary to his own inclination.

Michael continued for ſome time in priſon; but was afterwards ſet at liberty, and even reſtored to his government of Tigré. No ſooner was he reinſtated in this dignity, than, collecting an army, he attacked Kaſmati Woldo governor of Amhara, defeated him in two battles, and forced him to take refuge among the Galla, whom he ſoon after bribed to murder him. In other reſpects he behaved as a moſt dutiful ſubject, gave the king the beſt intelligence, and ſupplied him with ſoldiers better accoutred than he had ever before beheld. He was alſo more humble than before his misfortune; nor did an increaſe of his favour and influence make him deviate from the line he had preſcribed. Having begun to gain friends by bribery, he continued to add one bribe to another to ſecure the old, and to gain new ones by the ſame means, pretending all the while to no kind of dignity or honour, not even to ſuch as was juſtly due to his own rank. Thus he became ſuch a favourite with the emperor, that he beſtowed upon him the governments of Enderta and Siré, in addition to that of Tigré; ſo that he was now maſter of almoſt one half of Abyſſinia. During the reign of Yaſous, however, he attempted nothing. The foundations of the diſturbances which ſucceeded were laid by the queen-mother, towards the end of the reign of Yaſous. This emperor had been married when very young to a lady of Amhara, by whom he had two ſons named Adigo and Aylo; but as his wife pretended to interfere in matters of ſtate, he was perſuaded by his mother to baniſh both her and her children to Wechné. After this his mother choſe a wife for him from among the Galla; a people of all others the moſt obnoxious to the Abyſſinians, both on account of the horrid barbarity of their manners, and the continual wars which from time immemorial had taken place between the two nations. The new queen was the daughter of one Amitzo, a prince who had once hoſpitably entertained Bacuffa before he became emperor; and his people were eſteemed the leaſt barbarous of the whole. A prejudice againſt her, however, againſt her offſpring, and the emperor himſelf, never to be effaced, now took place among the Abyſſinians; but this did not ſhow itſelf during the reign of Yaſous. The emperor died on the 21ſt of June 1753, being the 24th year of his reign, not without ſuſpicion of being poiſoned by his mother's relations, who were now attempting

He is ſet at liberty and raiſed to the higheſt honours.

Cauſe of the great civil war in Abyſſinia.

Death of Yaſous.

Abyſſinia. tempting to engroſs the whole power of the empire into their hands.

eign of as. On the death of Yaſous, his ſon Ioas by the Galla princeſs juſt mentioned ſucceeded to the throne without any oppoſition. The diſcontent which had taken place in the former reign about the power aſſumed by the relations of the old queen, now began to ſhow itſelf more openly; and it was complained that a relationſhip to her was the only way to preferment, by which means the old families, whoſe merit had often ſaved the ſtate, were totally excluded from every ſhare of favour.

he Galla troduced to Abyſſinia. On the acceſſion of the young king, a party of Galla horſe, ſaid to be about 1200 in number, were ſent as the portion of his mother; and theſe were quickly followed by a number of private perſons from motives of curioſity, or hopes of preferment, who were embodied to the number of 600 into a troop of infantry, the command of which was given to Wooſheka. The great favour in which theſe people were at court ſoon induced many others to make their appearance. Two

wo of e king's ncles arre, and groſs all e power. of the king's uncles were ſent for by his expreſs deſire; and they brought along with them a troop of 1000 horſe. By the time they arrived the queen was dead; but her two brothers, named *Brulhe* and *Lubo*, finding that the king put an entire confidence in them, determined to make a party at court. This was eaſily effected; every thing was governed by Gallas; even the king himſelf affected to ſpeak their language; while the Abyſſinians were to the laſt degree mortified at ſeeing their inveterate enemies thus eſtabliſhing a dominion over them in the heart of their own country. At laſt the king thought proper to appoint his uncle Lubo to the government of Amhara; but this produced ſuch exceſſive diſcontent, that he was fain to retract his nomination, leſt a civil war ſhould have enſued. While the empire was thus divided into two parties, Suhul

hul Michael arrives at art. Michael came to Gondar in a very ſplendid manner, on an application from the exiled prince of Senaar to be reſtored to his kingdom. This prince, when conducted into the preſence of the emperor, proſtrated himſelf before him, owned himſelf his vaſſal, and was put in poſſeſſion of the government of Ras el Feel upon the frontiers, with a large revenue, where he was adviſed to ſtay till the diſputes which ſubſiſted at that time ſhould ſubſide. This ſalutary advice, however, he had

ng of nnaar rdered. not prudence to comply with; but ſuffering himſelf to be decoyed from his aſylum in Atbara, was taken priſoner and murdered.

In the mean time the Abyſſinian prime miniſter Welled de l'Oul, died. He had hitherto moderated the fury of the oppoſite parties by his wiſe and prudent conduct; but no ſooner was he taken out of the way, than a moſt dreadful ſcene of confuſion and civil war took place, which raged with the utmoſt violence while

te of the erent ties. Mr Bruce was in Abyſſinia, and ſeemed not likely to come to any termination when he left it. The whole empire was divided into two great factions: at the head of the one was the old queen, mother of Yaſous; and at the head of the other, Ioas himſelf the emperor, with his Galla relations. Matters were firſt brought to a criſis by the imprudence of the emperor himſelf in beſtowing the government of Begemder upon Brulhe one of his Galla uncles. The government of this province had been lately reſigned into the hands of the queen by an old officer named *Ayo*; and it was ſuppoſed that his ſon named *Mariam Barea*, univerſally allowed to be one of the moſt accompliſhed noblemen of the kingdom, was to ſucceed him in this government. This opinion was farther confirmed by the marriage of Mariam himſelf with Ozoro Eſther, a daughter of the old queen by her ſecond huſband. Unfortunately a quarrel had happened between Kaſmati Ayo, the old governor of Begemder, and Suhul Michael, a little before the reſignation of the former, and continued undecided till Mariam took the office upon him. The occaſion was quite trifling; nevertheleſs, as Mariam had refuſed to ſubmit to the deciſion of the judges, whom he ſtigmatized as partial and unjuſt, inſiſting that the king ſhould either decide the affair in perſon, or that it ſhould be referred to the deciſion of the ſword, he thus fell under the imputation of being a diſobedient and rebellious ſubject. In conſequence of this, Ioas looked upon him ever afterwards with an evil eye; and now deprived him, by proclamation, of the government of Begemder, giving it to his own Galla uncle Brulhe, of whom we have already made ſo much mention. This unexpected promotion threw the whole empire into a ferment. As Begemder was a frontier province bordering on the country of the Galla, there was not the leaſt doubt, that, immediately on the acceſſion of Brulhe to his new office, it would be overrun by that race of barbarians, remarkable for their ſavage manners almoſt beyond all the other nations in Africa. This was the more dangerous as there was not above a day's journey betwixt the frontiers of Begender and Gondar, the capital of the whole empire. Mariam Barea himſelf, who had a high ſenſe of honour, was particularly hurt at the manner in which he was deprived of his dignity, and condemned with his family to be ſubject to a race of Pagans, whom he had often defeated in battle, and obliged to acknowledge him as their ſuperior. All remonſtrance, however, was vain. Brulhe, under the ſanction of the imperial command, advanced with an army to take poſſeſſion of his new dignity: but ſo exceedingly averſe were the Abyſſinians to follow him in this expedition, that the army diſbanded itſelf ſeveral times after it had been collected; and it took up almoſt a year before he could proceed from the place where his camp was, at the lake Tzana or Dembea, to the frontiers of Begemder, though ſcarce a day's journey diſtant. Mariam Barea beheld his operations with great contempt, employing his time in the diſpatch of ordinary buſineſs, and endeavouring to reconcile himſelf to the king, but without ſucceſs. As his laſt effort, he ſent a remonſtrance to the emperor; in which, after many proteſtations of duty and obedience, he reminded him, that, at his inveſtiture into the office of governor of Begemder, he had ſworn not to allow any of the Galla to enter his province: that, ſhould he deviate from the obſervance of this oath, the ſafety of the princes in Wechnè would be endangered; they would conſtantly be liable to the invaſions of the Pagans, and probably be extirpated, as had already happened at two different times; and he begged of the emperor, if he was determined to deprive him of his government, to beſtow it rather upon ſome Abyſſinian nobleman; in which caſe he promiſed to retire, and live in private with his old father. He had, however, formed a reſolution, which he thought it his duty to ſubmit to the emperor, that if his ma-

Abyſſinia.

Brulhe made governor of Begemder. An univerſal ferment enſues.

Is oppoſed by Mariam Barea.

Abyſſinia. jeſty ſhould think proper to come, at the head of a Galla army, to invade his province, he would retire to the farthest extremity of it, till he was ſtopped by the country of the Galla themſelves; and, ſo far from moleſting the royal army, he might be aſſured, that though his own men might be ſtraitened, every kind of proviſion ſhould be left for his majeſty. But if an army of Galla, commanded by one of that nation, ſhould enter the province, he would fight them at the well of Fernay, on the frontiers, before one of them ſhould drink there, or advance the length of a pike into the province.

This remonſtrance had no effect upon the emperor. He returned a ſcoffing anſwer, announcing the ſpeedy arrival of Brulhe, whom he thought ſure of victory: but, at the ſame time, to ſhow that he did not put his confidence entirely in his proweſs, he created Suhul Michael governor of Samen, which lay next to Tigré in the way to Begemder, ſo that no obſtruction might lie in the way of that officer's march to Gondar, in caſe there ſhould be any occaſion for him. Mariam, provoked at the manner in which he was undervalued in the king's meſſage, gave an ironical reply, in which he alluded to the name of *Brulhe*, in the Abyſſinian language ſignifying a kind of *bottle;* this he told him would be broken on the rocks of Begemder, if ſent into that country.

Farther promotion of Michael.

Brulhe defeated and killed.

On receiving this laſt meſſage from Mariam, he king inſtantly ordered the army to be put in motion; but the Abyſſinians had unanimouſly determined not to act offenſively againſt their countrymen. Brulhe therefore was left to decide the affair with his Galla. Mariam kept exactly to his word in the declaration he had made to the king, not ſtirring out of his province, nor allowing the leaſt attempt to be made to haraſs his enemy, till they were drawn up at the well above mentioned, where he met them with his army. The Galla, unſupported by the Abyſſinian troops, were utterly unable to bear the ſhock of Mariam's army, and therefore ſoon betook themſelves to flight; but a part of them, who were ſurrounded by the cavalry, fought valiantly till they were all cut to pieces. Mariam had given the moſt expreſs orders to take Brulhe alive; or, if that could not be done, to allow him to make his eſcape. One of his ſervants, however, obſerving him in the field, puſhed up through the enemy to the place where he was, and running him twice through with a lance, left him dead on the ſpot.

Mariam Barea was no ſooner informed of the death of his rival, than he cried out in great emotion, that Suhul Michael, with the whole army from Tigré, would attack him before autumn. In this he was not deceived. Ioas inſtantly diſpatched an expreſs for Michael, ordering his attendance, and inveſting him with the dignity of Ras, by which he became poſſeſſed of unlimited power both civil and military. Michael himſelf had for a long time ſeen that matters would come to this criſis at laſt, and had provided for it accordingly. He now ſet out with an army of 26,000 men, all of them the beſt ſoldiers in the empire, and 10,000 of them armed with muſkets. As he paſſed along, his troops deſolated the country wherever they came, but he encumbered his army by nothing uſeleſs; allowing his men to carry along with them neither women, tents, beaſts of burden, nor even proviſions.

Michael created Ras.

Commits great devaſtations.

The ſubſiſtence of his troops was abundantly provided for by the miſerable inhabitants of the provinces through which he paſſed; and, not ſatisfied with this, he inſiſted on a contribution in money from all the diſtricts within a day's march of thoſe places where he was; the leaſt delay was followed by the ſlaughter of the inhabitants and deſtruction of their houſes. Towns, villages, and buildings of every kind, were ſet on fire as he paſſed along; the people fled from all quarters to the capital for refuge, as from the face of the moſt inveterate enemy; and Ioas himſelf was now ſenſible of his having been in the wrong to inveſt him with ſuch unlimited power. On his arrival at the capital, Michael took poſſeſſion of all the avenues, as if he meant to beſiege it; ſo that an univerſal conſternation enſued. Inſtead of offering any hoſtility, however, he waited with the utmoſt reſpect on the emperor, proceeding immediately from the royal preſence to his own houſe, where he ſat in judgement, as the nature of his office required him to do. No ſooner had he taken upon him this new office, however, than he executed juſtice in ſuch a rigorous and impartial manner as made the boldeſt offenders tremble. Some parties of his own ſoldiers, preſuming upon the licence that had hitherto been granted them, entered Gondar and began to plunder as they had done in other places; but, on the very firſt complaint, their commander cauſed 12 of them to be apprehended and hanged. Their execution was followed by 50 others in different quarters of the city; after which he gave the charge of the capital to three officers who were to preſide over three quarters, himſelf taking care of the fourth. Two civil judges were appointed to aſſiſt each officer in a diſtrict, two were left in the king's houſe, and four of them held a court of judicature in his own. Thus the inhabitants, finding, that inſtead of bloodſhed and maſſacre, they were to expect nothing but ſtrict equity and moderation, became reconciled to Michael the day after his arrival, and lamented only that he had not come ſooner to relieve them from the anarchy and confuſion in which they had been held ſo long. To ſo great a degree of perfection indeed did he bring his legiſlation, that a very ſhort time after he entered the city, a loaf of bread, a bottle of water, and an ounce of gold, were expoſed in the market-place on the head of a drum night and day for ſome time, without any one offering to take them away. This was the more remarkable as there was then a ſcarcity of proviſions, and Michael himſelf would allow but a very ſcanty ſupply of water to be carried into the city; thereby giving the inhabitants to underſtand, that if he ſhould ſet fire to it as he had done to other places, it would not be in their power to quench the flames.

Abyſſinia

Arrives at Gondar.

Executes juſtice impartially.

The capital being thus ſecured in perfect obedience, Michael next prepared to ſet out on his expedition againſt Mariam Barea. Senſible, however, that the deſtruction of this worthy nobleman would be attended with a great degree of odium, he was reſolved that none of it, or at leaſt as little as poſſible, ſhould fall upon himſelf. For this purpoſe, he inſiſted that the emperor ſhould march in perſon from Gondar, and carry all his ſoldiers along with him. Thus he had an opportunity of throwing the whole blame upon Ioas, and repreſenting himſelf as no more than a paſſive inſtrument in the affair. He alſo took every occaſion of

Marches againſt Mariam Barea

praiſing

Abyſſinia

praiſing his antagoniſt for his virtues, and cenſuring the emperor for attempting to cut off ſuch an excellent officer.

In the mean time Mariam Barea keeping exactly to the terms of the laſt remonſtrance he had ſent to Ioas, retired before him to the extremity of the province. Ioas and Michael advanced furiouſly, burning and deſtroying every thing as they went along. An engagement at laſt enſued at a place called *Nefas Muſa*, on the extreme borders of Begemder, when Mariam could not retreat without going out of the province. As the royal army was more than twice the number of the other, and commanded by an officer of ſuperior ſkill, victory was not long of being decided in its favour. Mariam with 12 of his officers, took refuge in the country of the Galla; but were immediately delivered up by that faithleſs people. He was put to death by Lubo the brother of Brulhe, who is ſaid with his own hands to have cut his throat as a ſheep is commonly killed in this country, and afterwards to have diſfigured the body in a ſhocking manner. The head was cut off, and carried to Michael's tent, who would not allow it to be uncovered in his preſence. It was afterwards ſent to the family of Brulhe in the country of the Galla, to ſhow them what attention had been given to revenge his death; and this diſpleaſed the Abyſſinians even more than any thing that had yet happened ſince the beginning of the conteſt. The 12 officers, who were taken along with him, ſought protection in the tent of Ras Michael, to which they were ſuffered to eſcape by Wooſheka their keeper. Lubo, however, intended likewiſe to have ſacrificed them as he had done Mariam, and therefore ſent Wooſheka to demand them: but no ſooner had he unfolded his errand, than Michael in a rage, called to his attendants to cut him in pieces before the tent door; which would certainly have been done, had he not fled with the utmoſt precipitation.

Mariam defeated.

Betrayed by the Galla, and cruelly murdered.

Some o his officers protected by Michael.

The ſcandalous aſcendency which the Galla always manifeſted over the king, had greatly diſpleaſed Michael; who expreſſed himſelf ſo freely on the ſubject, that a coolneſs took place between them. Another officer named *Waragna Faſil*, a Galla by birth, had inſinuated himſelf into the king's favour, and greatly diſtinguiſhed himſelf at the battle of Nefas Muſa. It was no wonder, therefore, that he ſoon became a rival to Michael; and this rivalſhip was greatly augmented by the following circumſtance. Near the field of battle at Nefas Muſa was a houſe of Mariam Barea, where Ozoro Eſther his widow now was. Being ſurrounded by pleaſant and verdant meadows, Faſil encamped there for the ſake of his cavalry. No other deſign was at that time apparent; however, his preſence greatly alarmed the princeſs. She had along with her at that time a nobleman named *Ayto Aylo*, who had been at the battle of Sennaar; but had there been terrified to ſuch a degree, that he reſolved to renounce the world ever after and turn monk. In this character he was now with Ozoro Eſther: and though he refuſed to be concerned in any military affairs, he was ſtill conſulted by both parties as a kind of oracle. In the preſent emergency, therefore, he told the princeſs that there was only one way by which ſhe could ſecure herſelf from the cruelty of the Galla, and becoming a prey to one or other of the murderers of her huſband; and that was by immediately eſpouſing Ras Michael. Ozoro was perfectly ſenſible of the propriety of the advice, and therefore ſet out next morning in company with Aylo to Michael's tent. Here ſhe threw herſelf at his feet on the ground; and refuſing to riſe, Aylo explained her errand, informing the Ras that ſhe intended to beſtow herſelf upon him in marriage, as being the only perſon not guilty of her former huſband's death capable of affording her protection in her preſent ſituation. Michael ſaw clearly the advantages attending ſuch a match; and therefore having cauſed the army to be drawn up in order of battle, as if for a review, he ſent for a prieſt, and was married to the princeſs in the ſight of all his men. The ceremony was followed by the loud acclamations of the whole army; and Ioas was ſoon informed of the reaſon. He expreſſed his diſpleaſure at the match, however, in ſuch unequivocal terms, that a mutual hatred from that moment commenced. This was ſoon made public by a very trifling accident. One day while the army was marching, Michael being much incommoded by the ſun which affected his eyes, threw a white handkerchief over his head to keep off the heat. This was inſtantly told the king, who took it as an affront offered to himſelf; for in Abyſſinia it is unlawful to cover the head on any occaſion whatever in preſence of the emperor, or even within ſight of the palace where he lodges. Ioas was no ſooner informed of the ſuppoſed affront, than he ſent to the Ras to know upon what account he preſumed to cover his head in his preſence; but though the covering was inſtantly taken off, it was thought that no atonement could ever be made for ſuch a grievous offence. Soon after this a quarrel happening between Faſil and a perſon named *Guſho*, likewiſe a man of great conſequence, complaint was made to the Ras, who, as civil judge, ſummoned both parties before him. Faſil abſolutely refuſed to obey any ſuch juriſdiction; and the affair being laid before the other judges, it was given in favour of Michael, and Faſil declared to be in rebellion. This was followed by a proclamation depriving him of his government of Damot, and every other public office he held. Faſil, however, had no mind to ſubmit to this diſgrace; and therefore, after holding a long conference with the king, departed with his army, encamping on the high road betwixt Damot and Gondar, where he intercepted the proviſions coming from the ſouthward to the capital. This was followed by an attempt to aſſaſſinate the Ras. A ſhot was fired from one of the windows of the palace into the houſe where he ſat in judgement; the diſtance being ſo ſmall, that he could eaſily be ſeen from the palace while thus employed. The ball, however, miſſed Michael, but killed a dwarf who was ſtanding before him fanning the flies from his face. As it was evident that this ſhot muſt have been fired with the knowledge of the king, it was rightly judged to be the commencement of hoſtilities. Ioas inſtantly removed to a diſtance, but ſent Wooſheka with orders to the Ras to return to Tigré without ſeeing his face; declaring, at the ſame time his own uncle Lubo governor of Begemder and Amhara. Michael could ſcarcely be prevailed upon to ſee Wooſheka, and told him that he ſhould certainly be put to death the next time he appeared in his preſence. Next day Ioas ſent a meſſage to the Ras by four judges, commanding him to return to Tigré without

Abyſſinia.

Michael marries the princeſs Ozoro Eſther.

Diſagreement between the king and Michael.

Final quarrel betwixt Michael and Faſil.

A ſhot fired at Michael from the palace window.

Abyſſinia. without the leaſt delay, under pain of his higheſt diſpleaſure. Michael returned a formal anſwer, concluding, that he expected the king himſelf to be ready to march againſt Faſil to-morrow. To this an abſolute refuſal was given: on which Michael iſſued a proclamation, commanding all the Galla to leave the capital next day under pain of death: in caſe of diſobedience they were declared outlaws, and liable to be killed by the firſt that met them if they were found 24 hours after the proclamation in the capital, or to the ſame penalty if they were found in the kingdom after ten days. An engagement took place a ſhort time after, in which Faſil was totally defeated, and obliged to retire into Damot. In this engagement ſome of the king's black horſe were taken. Theſe are all ſlaves, and ſubject to no other commands but thoſe of his majeſty himſelf. Their appearance clearly ſhowed that they muſt have been ſent by the king to fight againſt the Ras. All of them were therefore brought before the latter, and interrogated by whoſe orders they had come to the battle. Two refuſed to give any anſwer, and had their throats cut in preſence of their companions. A third plainly told him that they had been ſent by the king; who had likewiſe ordered an Armenian to fire out of the palace window at Ras Michael. On this the priſoners were diſmiſſed; but aſſaſſins inſtantly diſpatched to put an end to the king's life; which they accompliſhed, and buried him in a church dedicated to St Raphael.

Faſil defeated by Michael.

Ioas aſſaſſinated.

On the death of Ioas, Michael, now abſolute maſter of Abyſſinia, ſet up for emperor Hannes, brother to the late king Bacuffa, an old man who had reſided almoſt all his lifetime on the mountain of Wechnè, and being entirely unacquainted with the affairs of the world was on this account probably ſuppoſed by Michael to be the more proper for his purpoſes. Hannes had been maimed by the loſs of his hand, on purpoſe to incapacitate him for the throne; but this objection was laughed at by the Ras. He found him, however, poſſeſſed of a quality much more inimical to his own purpoſes; and that was, an abſolute averſion at meddling with the affairs of government: ſo that he could not by any means be induced to take the field againſt Faſil. Michael therefore was obliged to ſet out by himſelf; but thinking it improper to leave a king of any kind behind him in the capital, he had the old man poiſoned before his departure; putting his ſon Tecla Haimanout in his place.

Hannes ſet up by Michael, and ſoon after poiſoned.

The young emperor, according to Mr Bruce's account, was of a fair complexion, leſs tawny than a Neapolitan or Portugueſe, owing to his having been born in the mountain. He was endowed with many princely accompliſhments; and ſo much attached to Michael Ras, that he called him *Father* from the time of his acceſſion, waiting upon him when indiſpoſed with the affection of a ſon. There being now no objection therefore, Michael marched againſt Faſil without delay, and entirely defeated him on the 3d of December 1769. On this occaſion Wooſheka was taken priſoner, and afterwards flead alive, notwithſtanding the interceſſion of ſome of Michael's officers for him; his ſkin being afterwards formed into a bottle. This piece of cruelty was attributed to Ozoro Eſther; whom Mr Bruce repreſents as the moſt humane and merciful of women; though he is obliged to allow, that on the preſent occaſion, as well as on every other which regarded her former huſband, ſhe entirely forgot her character. The night on which this miſerable victim was deſtroyed, ſhe appeared in the king's tent dreſſed like a bride; and in a little time returned in triumph to Gondar.

Reign of Tecla Haimanout.

Faſil defeated.

Abyſſinia.

Soon after theſe tranſactions, Mr Bruce entered Abyſſinia. He arrived at Maſuah when there was only a report of Hannes's being ill, and Mr Bruce was ſuppoſed to be his phyſician, though in truth that emperor was already dead. Here he was ill-treated by the naybe, with a deſign to extort money, and afterwards probably to put him to death, as was his cuſtom with other ſtrangers. He eſcaped the danger, however, by the protection of Achmet, nephew and heir apparent to the nayhe; and by his own prudent and reſolute behaviour, threatening his adverſaries with the arrival of a Britiſh man of war in caſe of any injury; ſhowing the Grand Signior's protection; making uſe of the name of Ras Michael, now ſo formidable, and to whom he had obtained a recommendation, &c. After many vexations and delays, he was at laſt allowed to depart; and a guide, by name *Saloome*, was ſent along with him. This man was brother in-law to the naybe, and a profeſſed Chriſtian; but a traitor in his heart, and who wiſhed to do every thing in his power to hurt our traveller. He was furniſhed with another guide, however, by his friend Achmet, to inform him where to pitch his tent, and other neceſſary particulars.

Mr Bruce's arrival and adventures in Abyſſinia.

On the 15th of November 1769 Mr Bruce left Arkeeko, on the eaſtern coaſt of Africa, and proceeded ſouthwards for Gondar the capital of Abyſſinia. After an hour's journey, he pitched his tent near a pit full of rain water, where he remained all day; and in the evening a meſſenger arrived from the naybe, who took away the guide *Saloome*. Next day the latter returned in company with Achmet the naybe's nephew, already mentioned. The latter cauſed him depoſite in his hands Saloome's full hire, as though he had gone the whole length he had promiſed. Four of the men were commanded to go back to Arkeeko, and others put in their place: after which Achmet told Mr Bruce, that he was not to take the road through Dobarwa, though near, becauſe it belonged to the naybe; but that Saloome knew another by a place called *Dixan*, which belonged to himſelf, and where he could enſure him of a good reception. In this journey he told him that he would be obliged to croſs the mountain of Taranta, the higheſt in Abyſſinia; but the fatigue of this would be more than recompenſed by the aſſurance of ſafety and the curioſity of the place. Taking leave of Achmet in a very friendly manner, therefore, Mr Bruce with his company finally ſet out on their journey the evening of the 16th. For the ſhort ſpace they had travelled, the ground was covered with graſs broader in the leaf than ours; but in a little time the ſoil became hard, dry, gravelly, and full of acacia or Egyptian thorn. Next day (the 17th) they changed their courſe from ſouth to weſt; and ſoon arrived at a range of mountains ſtanding ſo cloſe to one another, that there was no paſſage between them excepting what was worn by torrents of water; the bed of one of which conſequently now became their road. In the evening they pitched their tent at ſome diſtance from this torrent, which had ſcarcely any water in it when they left it; but all the afternoon there had been an appearance of rain, with much

Sets out from Arkeeko.

Account of the country through which he paſſed.

Abyſſinia.

much thunder and lightning, at a diſtance. On a ſudden they heard a noiſe among the mountains louder than thunder; and inſtantly ſaw the torrent, ſwelled immenſely by the diſtant rains, now running like a rapid river, and the foremoſt part of it advancing in its bed in a body of water about the height of a man. Having run for ſome time in this violent manner, the current, no longer ſupplied by the rains, began to diminiſh, and by the next morning was quite gone. Among theſe mountains the nights are cold even in ſummer.

Sudden ſwell of a torrent.

On the 18th the journey was reſumed in the bed of the torrent, which now ſcarcely had any water: though the ſtones were rendered very ſlippery by the quantity of rain which had fallen. Leaving this diſagreeable road, they came to a fine rivulet; which being the firſt clear water they had ſeen from the time Mr Bruce left Syria, was exceedingly agreeable. They proceeded along the banks of this river for ſome time; and ſoon after leaving it, they came to another of the ſame kind: but next day were obliged to reſume their courſe in the bed of a torrent. The mountains in this part of the world are exceſſively rugged and full of precipices, entirely deſtitute of ſoil, and covered with looſe ſtones of a black colour. On the ſide of the torrent in which they marched, however, there grew very large ſycamore trees, ſome of them little leſs than 7½ feet in diameter. Their branches afforded ſhelter to an infinite number of birds; many of them without ſong; but others having notes very different from the European kinds, and peculiar to the continent of Africa. Moſt of thoſe which had very beautiful colours were of the jay or magpie kind. The trees were loaded with figs; but they came to nothing, by reaſon of the ignorance of the ſavages, who knew not the proceſs of caprification. The ſtreams of water themſelves, which at this ſeaſon were found ſo delightful, run only after October: they appear on the other ſide of the mountains when the ſummer rains in Abyſſinia are ceaſing; at other times, no water is to be met with, excepting what is contained in ſtagnant pools.

Notes of the African birds different from thoſe of Europe.

On the 20th of November they began to aſcend the high mountain of Taranta. Their road was now exceſſively rugged and uneven, interſected with monſtrous gullies and holes made by the torrents, as well as by huge fragments of rocks which had tumbled down. It was with the utmoſt difficulty that they could carry the aſtronomical inſtruments up the hill; in which work Mr Bruce himſelf, and one of his attendants named *Yaſine*, a Moor, bore a principal ſhare. The only misfortune they met with was, that their aſſes being unloaded, and committed to the care of a ſingle perſon, refuſed to aſcend this barren mountain; and in ſpite of all that their drivers could do, ſet off at a briſk trot for the fertile plains below. Luckily, however, they were afterwards recovered by four Moors ſent after them, and the journey reſumed without any material interruption. The beaſts were now become much more tractable, having been ſeen and purſued by the hyænas with which that mountain abounds.

Account of the mountain Taranta.

Taranta is ſo deſtitute of earth, that there was no poſſibility of pitching a tent upon it; ſo that our travellers were obliged to take up their lodging in one of the caves with which it abounds. The under part of the mountain produces in great plenty the tree called *kolquall*, which was here obſerved in greater perfection than in any other place throughout the whole journey. The middle part produced olives which carried no fruit; and the upper part was covered with the oxycedras or Virginia cedar, called *arze* in the language of the country. On the top is a ſmall village named *Halai*, inhabited by poor ſhepherds, who keep the flocks of the rich people of the town of Dixan below. They are of dark complexion, inclining to yellow; their hair black, and curled artificially by means of a ſtick, and which our author ſuppoſes to be the ſame with the *criſping-pin* mentioned, Iſa. iii. 22. The men have a girdle of coarſe cotton cloth, ſwathed ſix times round their middle; and they carry along with them two lances, and a ſhield made of bulls hides. Beſides theſe weapons, they have in their girdles a crooked knife with a blade about 16 inches in length, and three in breadth at the lower part. There is here great plenty of cattle of all kinds; the cows generally of a milk white, with dewlaps hanging down to their knees; their horns wide like thoſe of the Lincolnſhire cattle; and their hair like ſilk. The ſheep are all black both here and throughout the province of Tigré; having hair upon them inſtead of wool, like the reſt of the ſheep within the tropics; but remarkable for its luſtre and ſoftneſs, without any briſtly quality. On the top of the mountain is a plain, which, at the time our author was there, they had ſown with wheat. The air ſeemed exceſſively cold, though the barometer was not below 59° in the evening. On the weſt ſide the cedars, which on other parts are very beautiful, degenerate into ſmall ſhrubs and buſhes.

Abyſſinia.

Of the village Halai, and inhabitants of the mountains.

Beautiful cattle, &c.

The road down this mountain was for ſome time nothing inferior in ruggedneſs to what they had met with in aſcending it; but as they approached Dixan, it became conſiderably better. This is the firſt town on the Abyſſinian ſide of Taranta. It is ſeated on the top of a hill of a form exactly conical, ſurrounded by a deep valley like a ditch; and no acceſs to it but by a path which winds round the hill. The inhabitants were formerly exterminated by Michael Ras; and the ſucceeding race, in Mr Bruce's time, were of a very indifferent character, being, as he ſays, compoſed of the worſt people from the territories of the Baharnagaſh and the province of Tigré, on both of which it borders. Here he was in danger from the treachery of Saloome, who wiſhed to have decoyed him into the power of ſome aſſaſſins. Finding that this could not be done, he ſurrounded Mr Bruce and his retinue with a body of armed men; but they were diſperſed by the authority of Hagi Abdelcarder, the friend of Achmet, who had received orders to provide for the ſafety of the travellers. The only trade carried on here is that of buying and ſelling ſlaves; who are ſtolen from Abyſſinia, chiefly by the prieſts, and ſent into Arabia and India.

Town of Dixan deſcribed.

The next ſtage was from Dixan to Adowa, capital of the province of Tigré. Leaving Dixan on the 25th of November, they pitched their tent the firſt night under a large ſpreading tree called *daroo*, which Mr Bruce ſays was one of the fineſt he ſaw in Abyſſinia, being about 7½ feet in diameter. They had been joined by ſome Moors driving 20 loaded aſſes and two bulls, which in that country are likewiſe uſed as beaſts of burden,

Journey to Adowa, the capital of Tigré.

Abyſſinia. burden. Here, our author ſays, he recovered a tranquillity of mind which he had not enjoyed ſince his arrival at Maſuah; but they were now entirely without the dominions of the naybe, and entered into thoſe of the emperor. Saloome attended them for ſome way, and ſeemed diſpoſed to proceed; but one of the company, who belonged to the Abyſſinian monarch, having made a mark in the ground with his knife, told him, that if he proceeded one ſtep beyond that, he would bind him hand and foot, and leave him to be devoured by wild beaſts.

His treacherous guide obliged to return.

The country becomes more fertile as he paſſes along.

Being now in a great meaſure delivered from their fears and embarraſſments, the company proceeded on their journey with pleaſure, through a much better country than they had hitherto paſſed. In ſome places it was covered with wild oats, wood, high bent graſs, &c. but, in not a few places, rocky and uneven. Great flocks of a bird as large as a turkey, called, in the Amharic language, *erkoom*, were ſeen in ſome places. A large animal of the goat kind, called *agazan*, was found dead and newly killed by a lion. It was about the ſize of a large aſs, and afforded a plentiful repaſt. Numbers of kolquall trees were alſo ſeen; and the ſides of the river Habeſh were adorned with a beautiful tree of the ſame name with the ſtream. There were in this place alſo many flowers of various kinds, particularly jeſſamine. The mountains of Adowa, which they came in ſight of on the 5th of December, are totally unlike any thing to be met with in Europe; their ſides being all perpendicular rocks, like ſteeples or obeliſks of many different forms.

Adowa deſcribed.

Adowa, though the capital of an extenſive province or kingdom, does not contain above 300 houſes; but occupies nevertheleſs a large ſpace, by reaſon of the incloſures of a tree called *wanzey*, which ſurround each of the houſes. It ſtands on the declivity of a hill, ſituated on the weſt ſide of a ſmall plain ſurrounded by mountains. It is watered by three rivulets which never become dry even in the greateſt heats. A manufacture is carried on here of a kind of coarſe cotton cloth, which paſſes for money throughout all Abyſſinia. The houſes are built of rough ſtone cemented with mud; lime being only uſed in the conſtruction of thoſe at Gondar, and even there it is very bad.

Our traveller was very hoſpitably entertained at Adowa by one Janni, with whom he reſided during his ſtay there. Leaving it on the 17th of December, he viſited the ruins of Axum, once the capital of the empire. Here are 40 obeliſks, but without any hieroglyphics. A large one ſtill remains, but the two largeſt are fallen. There is alſo a curious obeliſk, of which he gives a figure, with other antiquities which our limits will not allow us to enlarge upon. The town has at preſent about 600 houſes, and carries on manufactures of the coarſe cotton cloth already mentioned. It is watered by a ſmall ſtream which flows all the year, and it is received into a fine baſon 150 feet ſquare, where it is collected for the uſe of the neighbouring gardens. Its latitude was found by Mr Bruce to be 14° 6′ 36″ north.

Viſits the ruins of Axum.

On the 20th of January 1770, our traveller ſet out from Axum. The road was at firſt ſmooth and pleaſant, but afterwards very difficult; being compoſed of ſtones raiſed one above another, the remains of a magnificent cauſeway, as he conjectures. As they paſſed farther on, however, the air was everywhere perfumed by a vaſt number of flowers of different kinds, particularly jeſſamine. One ſpecies of this, named *agam*, was found in ſuch plenty, that almoſt all the adjacent hills were covered by it; the whole country had the moſt beautiful appearance; the weather was exquiſitely fine, and the temperature of the air agreeable. In this fine country, however, Mr Bruce had the firſt opportunity of beholding the horrible barbarity of the Abyſſinians, in cutting off pieces of fleſh from the bodies of living animals, and devouring them raw; but notwithſtanding this extreme cruelty, they have the utmoſt horror and religious averſion at pork of every kind; inſomuch that Mr Bruce durſt not venture to taſte the fleſh of a wild boar, juſt after having aſſiſted in the deſtruction of five or ſix. Abyſſinia.

Monſtrous barbarity of the Abyſſinians.

During the remaining part of the journey from Adowa to Sirè, the country continued equally beautiful, and the variety of flowers and trees greatly augmented; but as a report was propagated that Ras Michael had been defeated by Faſil, they now met with ſome inſults. Theſe, however, were but trifling; and on the 22d in the evening they arrived ſafely at Sirè, ſituated in N. Lat. 14° 4′ 35″.

Sirè deſcribed.

This town is ſtill larger than Axum; but the houſes are built of no better materials than clay, and covered with thatch; the roofs being in the form of cones, which indeed is the ſhape of all thoſe in Abyſſinia. It ſtands on the brink of a very ſteep and narrow valley, through which the road is almoſt impaſſable. It is famous for a manufacture of cotton cloth, which, as we have already obſerved, paſſes for money throughout the whole empire. At ſome times however, beads, needles, antimony, and incenſe, will paſs in the ſame way. The country in the neighbourhood is extremely fine; but the inhabitants are ſubject, by reaſon of the low ſituation, to putrid fevers. On leaving it on the 24th, our travellers paſſed through a vaſt plain, where they could diſcern no hills as far as the eye could reach, excepting ſome few detached ones ſtanding on the plain, covered with high graſs, which the inhabitants were then burning. The country to the northward is flat and open. In the way to Gondar, however, lies that ridge of mountains called *Samen*; of which one named *Lamalmon* is the moſt remarkable, and by ſome ſuppoſed to be the higheſt in Abyſſinia. Betwixt Sirè and theſe mountains the river Tacazze runs, which, next to the Nile, is the largeſt in Abyſſinia. Mr Bruce informs us that it carries near one third of the water which falls on the whole empire; and when paſſing it, he ſaw the marks of its ſtream, the preceding year, 18 feet perpendicular above the bottom; nor could it be aſcertained whether this was the higheſt point to which it had reached. It has its ſource in the diſtrict of Angot, riſing from three ſources like the Nile, in a flat country, about 200 miles to the S. E. of Gondar. It is extremely pleaſant; being ſhaded with fine lofty trees, the water extremely clear, and the banks adorned with the moſt fragrant flowers. At the ford where they croſſed, this river was fully 200 yards broad, and about three feet deep; running very ſwiftly over a bottom of pebbles. At the very edge of the water the banks were covered with tamariſks, behind which grew tall and ſtately trees, that never loſe their leaves. It abounds with fiſh; and is inhabited by crocodiles and hippopotami; Tacazze river deſcribed.

Abyſſinia. hippopotami; the former of which frequently carry off people who attempt to croſs the river upon blown up ſkins. The neighbouring woods are full of lions and hyænas. The Tacazze is marked by Mr Bruce in his map as a branch of the Aſtaboras, which falls into the Nile. The latitude of the ford was found to be 13° 42′ 45″.

Mountainous country of Samen deſcribed. This river was paſſed on the 26th of January; after which our travellers entered into the country of Samen; the governor of which, Ayto Teſfos, had never acknowledged the authority of Ras Michael, nor any of the emperors ſet up by him ſince the death of Ioas. The country therefore was hoſtile; but the uncertainty of the event of the war, and the well-known ſeverity of Michael's diſpoſition, preſerved our traveller and his company from any inſult, excepting a feeble and unſucceſsful attempt to extort money. Here Mr Bruce obſerves that the people were more flat-noſed than any he had hitherto ſeen in Abyſſinia. The path among the mountains was for the moſt part exceedingly dangerous, having a precipice of vaſt height cloſe by it which way ſoever you turn. The mountains appeared of very extraordinary ſhapes; ſome being like cones; others high and pointed like columns, pyramids, or obeliſks. In one place a village was obſerved in ſuch a dangerous ſituation, that ſcarce the diſtance of a yard intervened between the houſes and a dreadful precipice. Below it is a plain of about a mile ſquare, covered with citron and lemon trees. A river named *Mai-Lumi* riſes above this village, and falls into the wood, where it divides in two; one branch ſurrounding the north and the other the ſouth part of the plain; then falling down a rock on each ſide, they unite; and having run about a quarter of a mile farther, the ſtream is precipitated in a cataract 150 feet high. The lions and hyænas were very numerous among theſe mountains, and devoured one of the beſt mules our travellers had. The hyænas were ſo bold, that they ſtalked about as familiarly as dogs, and were not intimidated by the diſcharge of fire arms. Their voracity was ſuch, that they ate the bodies of thoſe of their own ſpecies which our travellers had killed in their own defence.

Extreme voracity of the hyænas.

Lamalmon mountain deſcribed. On the 7th of February they began to aſcend Lamalmon by a winding path ſcarcely two feet broad, on the brink of a dreadful precipice, and frequently interſected by the beds of torrents, which produced vaſt irregular chaſms in it. After an aſcent of two hours, attended with incredible toil, up this narrow path, they came to a ſmall plain named *Kedus* or *St Michael*, from a church of that name ſituated there. This plain is ſituated at the foot of a ſteep cliff, terminating the weſtern ſide of the mountain, which is as perpendicular as a wall, with a few trees on the top. Two ſtreams of water fall down this cliff into a wood at the bottom; and as they continue all the year round, the plain is thus preſerved in continual verdure. The air is extremely wholeſome and pleaſant. On aſcending to the very top of the mountain, where they arrived on the 9th of February, our travellers were ſurpriſed to find, that though from below it had the appearance of being ſharp-pointed, it was in reality, a large plain, full of ſprings, which are the ſources of moſt rivers in this part of Abyſſinia. Theſe ſprings boil out of the earth, ſending forth ſuch quantities of water as are ſufficient to turn a mill. A perpetual verdure prevails; and it is entirely owing to indolence in the huſbandman if he has not three harveſts annually. Lamalmon ſtands on the north-weſt part of the mountains of Samen; but though higher than the mountains of Tigré, our author is of opinion that it is conſiderably inferior to thoſe which are ſituated on the ſouth-eaſt. The plain on the top is altogether impregnable to an army, both by reaſon of its ſituation and the plenty of proviſions it affords for the maintenance of its inhabitants; even the ſtreams on the top are full of fiſh. Here the mercury in the barometer ſtood at 20$\frac{7}{8}$ inches. Abyſſinia.

Journey to Gondar. During the time our travellers remained at Lamalmon, a ſervant of Ras Michael arrived to conduct them ſafely to the capital, bringing a certain account of the victory over Faſil: ſo that now the difficulties and dangers of their journey were over. The country appeared better cultivated as they approached the capital; and they ſaw ſeveral plantations of ſugar canes which there grow from the ſeed. In ſome places, however, particularly in Woggora, great damage is done by ſwarms of ants, rats, and mice, which deſtroy the fruits of the earth. Mr Bruce had already experienced the miſchief ariſing from a ſmall ſpecies of ant, whoſe bite was not only more painful than the ſting of a ſcorpion, but which iſſued out of the ground in ſuch numbers as to cut in pieces the carpets and every thing made of ſoft materials to which they could have acceſs.

Miſchief done by ants.

Arrival at Gondar. When Mr Bruce approached the capital, he was dreſſed like a Moor: and this dreſs he was adviſed to keep until he ſhould receive ſome protection from government; his greateſt, indeed his only, danger ariſing from the prieſts, who were alarmed at hearing of the approach of a Frank to the capital. This was the more neceſſary, as the emperor and Michael Ras were both out of town. For this reaſon alſo he took up his reſidence in the Mooriſh town at Gondar; which is very large, containing not fewer than 3000 houſes. The only inconvenience he underwent here was the not being allowed to eat any fleſh: for we have already taken notice of a law made by one of the emperors, that none of his ſubjects ſhould eat fleſh but ſuch as had been killed by Chriſtians; and a deviation from this would have been accounted equal to a renunciation of Chriſtianity itſelf. Here he remained till the 15th of February; when Ayto Aylo waited upon him, and addreſſed him in the character of phyſician, which he had aſſumed. By this nobleman he was carried to the palace of Koſcam, and introduced to the old queen. His advice was required for one of the royal family who was ill of the ſmallpox; but a ſaint had already undertaken his cure. The event, however, proved unfortunate; the patient died, and the ſaint loſt his reputation. Our limits will not allow us to give any particular account of the ſteps by which Mr Bruce arrived at the high degree of reputation which he enjoyed in Abyſſinia. In general, his ſucceſs in the practice of medicine; his ſkill in horſemanſhip and the uſe of fire-arms, which by his own account muſt have been very extraordinary; his prudence in evading religious diſputes; as well as his perſonal intrepidity and preſence of mind, which never once failed him, even in the greateſt emergencies; all conſpired to render him agreeable to people of every denomination. By the king he was promoted to the government of Ras-el-Feel, was his

Mr Bruce introduced to the queen.

Is promoted and held in great eſtimation.

Abyſſinia. conſtant attendant on all occaſions, and was with him in ſeveral military expeditions; but never met with any opportunity of diſtinguiſhing his perſonal valour, though he had the command of a body of horſe at one of the battles fought at a place named *Serbraxos*. Thus honoured and employed, he had an ample opportunity of exploring the ſources and cataracts of the Nile, as well as the geography and natural products of the whole country; obtaining alſo leave at laſt to return home. We cannot, however, praiſe the benevolence of his ſpirit at his departure. It has already been obſerved, that he was in ſome danger from the prieſts on his firſt arrival, on account of their ſuſpecting him to be a Jeſuit; for that is the meaning which they affix to the word *Frank* or *European*. As he conſtantly attended the eſtabliſhed worſhip of the country, however, and carefully avoided all diſputes on the ſubject of religion, he became at laſt not only unſuſpected, but very intimate with many of the principal eccleſiaſtics. From one of theſe named *Tenſa Chriſtos*, he aſked a benediction immediately before he departed; which piece of unexpected humility ſo affected the prieſt, that it brought tears in his eyes. The benediction was conveyed in the ſimple form, "God bleſs you." A troop of inferior prieſts who attended would needs bleſs him alſo; and probably were pleaſed at having it in their power to beſtow a benediction publicly on a man of ſuch conſequence: but to the bleſſings of theſe poor monks Mr Bruce replied *in Engliſh*, "Lord ſend you all a halter, as he did Abba Salama!" This Abba Salama had been an eccleſiaſtic of great conſequence; but of a very diſſolute life, and at laſt hanged for his crimes. The monks imagined he had been recommending them to their patriarch Abba Salama, and with great devotion anſwered "Amen."

His departure from the country.

Event of the war before he left the country.

The hiſtory of the war after Mr Bruce's arrival is related at great length in his work. The king Tecla Haimanout ſtill kept his ground, and was at laſt acknowledged by almoſt the whole empire, though ſucceſs did not always attend his arms. An uſurper, named *Socinios*, was reduced and made a ſervant in the king's kitchen; but was afterwards hanged for theft. Ras Michael, notwithſtanding all his ſkill in military affairs, was not able to get the better of Faſil; and his exceſſive cruelty, avarice, and ambition, diſguſted every one. An attempt was even made to aſſaſſinate him; and his ſpiritual friend (Michael the archangel, according to his own report, or the devil, according to that of the Abyſſinians) at laſt forſook him; ſo that he was carried off priſoner by a party of the rebels. After this misfortune he was much dejected, imputing it to the want of the ſpiritual aſſiſtance juſt mentioned, and which it ſeems had withdrawn itſelf ſome time before. His wife Ozoro Eſther, whom Mr Bruce characterizes as the handſomeſt woman he ever ſaw, was in great favour with the king at the time our traveller left Abyſſinia. As the king himſelf was a handſome young man, there is no improbability in ſuppoſing with Mr Bruce, that "they were not inſenſible to each other's merits;" and as ſhe was ſometimes honoured with a *private audience*, where Michael himſelf "bore no part in the converſation," we ſhall conclude our hiſtory of this ſingular empire by a conjecture, that ſoon after Mr Bruce's departure, Michael either died by courſe of nature, he being then very old, or was cut off by his enemies; on which Tecla Haimanout, having fully ſettled the affairs of his empire, became poſſeſſed of the beautiful Ozoro Eſther, and commenced his reign with great glory. Abyſſinia.

Geography of ancient Ethiopia.

With regard to the geographical deſcription of ancient Ethiopia, little can be ſaid; as not even the boundaries of the empire itſelf, much leſs thoſe of the particular diſtricts which compoſed it, were known. The ancient writers, however, agreed that it was very mountainous: but they mention no mountains of any conſequence excepting Garbata and Elephas, whoſe ſituation is not well aſcertained, though it is generally ſuppoſed that they anſwer to the mountains of Tigré. The moſt noted cities were Axum, Napata, Premnis or Premnis, Melis, Mondus, Abalis, Meſylon, Caloe, Opone, &c.

Cuſtoms of the inhabitants.

The nations which inhabited ancient Ethiopia have already been enumerated; and it is not to be ſuppoſed that all, or indeed any two of them, would agree in many reſpects. The ancient hiſtorians, however, give the following information. They had many laws which were very different from thoſe of other nations; eſpecially their laws relating to the election of kings. The prieſts choſe the moſt reputable men of their body, and drew a large circle around them, which they were not to paſs. A prieſt entered the circle, running and jumping like an *Egipan* or a ſatyr. He of thoſe that were encloſed in the circle who firſt catched hold of the prieſt, was immediately declared king; and all the people paid him homage, as a perſon intruſted with the government of the nation by Divine Providence. The new-elected king immediately began to live in the manner which was preſcribed to him by the laws. In all things he exactly followed the cuſtoms of the country; he paid a moſt rigid attention to the rules eſtabliſhed from the origin of the nation, in diſpenſing rewards and puniſhments. The king could not order a ſubject to be put to death, though he had been capitally convicted in a court of juſtice; but he ſent an officer to him, who ſhowed him the ſignal of death. The criminal then ſhut himſelf up in his houſe, and was his own executioner. It was not permitted him to fly to a neighbouring country, and ſubſtitute baniſhment for death; a relaxation of the rigour of the law, with which criminals were indulged in Greece. *Diod. Sic.* p. 131, 132.

We have the following extraordinary information with regard to the death of many of their kings: The prieſts of Meroè, who had acquired great power there, when they thought proper diſpatched a courier to the king to order him to die. The courier was commiſſioned to tell him, that it was the will of the gods, and that it would be the moſt heinous of crimes to oppoſe an order which came from *them*. Their firſt kings obeyed theſe groundleſs deſpotical ſentences, though they were only conſtrained to ſuch obedience by their own ſuperſtition. Ergamenes, who reigned in the time of Ptolemy the ſecond, and who was inſtructed in the philoſophy of the Greeks, was the firſt who had the courage to ſhake off this iniquitous and ſacerdotal yoke. He led an army againſt Meroè, where, in more ancient times, was the Ethiopian temple of gold; when he put all the prieſts to the ſword, and inſtituted a new worſhip.

The friends of the king had impoſed on themſelves a very ſingular law, which was in force in the time of Diodorus Siculus. When their ſovereign had loſt the uſe

Abyſſinia. uſe of any part of his body, by malady, or by any other accident, they inflicted the ſame infirmity on themſelves; deeming it, for inſtance, ſhameful to walk ſtraight after a lame king. They thought it abſurd not to ſhare with him corporeal inconveniences; ſince we are bound by the ties of mere friendſhip to participitate the misfortunes and proſperity of our friends. It was even cuſtomary among them to die with their kings, which they thought a glorious teſtimony of their conſtant loyalty. Hence the ſubjects of an Ethiopian king were very attentive to *his* and their common preſervation; and therefore it was extremely difficult and dangerous to form a conſpiracy againſt him.

The Ethiopians had very particular ceremonies in their funerals. According to Cteſias, after having ſalted the bodies, they put them into a hollow ſtatue of gold which reſembled the deceaſed; and that ſtatue was placed in a niche on a pillar which they ſet up for that purpoſe. But it was only the remains of the richeſt Ethiopians that were thus honoured. The bodies of the next claſs were contained in ſilver ſtatues; the poor were enſhrined in ſtatues of earthen ware.

* *Lib.* iii. *c.* 24. Herodotus * informs us, that the neareſt relations of the dead kept the body a year in their houſes, and offered ſacrifices and firſt fruits during that time to their deceaſed friend; and at the end of the year, they fixed the niche in a place ſet apart for the purpoſe near their town.

The Ethiopians made uſe of bows and arrows, darts, lances, and ſeveral other weapons, in their wars, which they managed with great ſtrength and dexterity. Circumciſion was a rite obſerved among them, as well as among the Egyptians, from very early antiquity; though which of theſe nations firſt received it, cannot certainly be known. The Ethiopian ſoldiers tied their arrows round their heads, the feathered part of which touched their foreheads, temples, &c. and the other projected out like ſo many rays, which formed a kind of crown. Theſe arrows were extremely ſhort, pointed with ſharp ſtones inſtead of iron, and dipped in the *virus* of ſerpents, or ſome other lethiferous poiſon, inſomuch that all the wounds given by them were attended with immediate death. The bows from which they ſhot theſe arrows were four cubits long; and required ſo much ſtrength to manage them, that no other nation could make uſe of them. The Ethiopians retreated fighting, in the ſame manner as the Parthians; diſcharging volleys of arrows with ſuch dexterity and addreſs, whilſt they were retiring full ſpeed, that they terribly galled the enemy. Their lances or darts were of an immenſe ſize, which may be deemed a farther proof of their vaſt bodily ſtrength.

Thus far chiefly with regard to the Ethiopians who lived in the capital, and who inhabited the iſland of Meroè, and that part of Ethiopia which was adjacent to Egypt.

There were many other Ethiopian nations, ſome of which cultivated the tracts on each ſide of the Nile, and the iſlands in the middle of it; others inhabited the provinces bordering on Arabia; and others lived more towards the centre of Africa. All theſe people, and among the reſt thoſe who were born on the banks of the river, had flat noſes, black ſkins, and woolly hair. They had a very ſavage and ferocious appearance; they were more brutal in their cuſtoms than in their nature. They were of a dry aduſt temperament; their nails in length reſembled claws: they were ignorant of the arts which poliſh the mind: their language was hardly articulate; their voices were ſhrill and piercing. As they did not endeavour to render life more commodious and agreeable, their manners and cuſtoms were very different from thoſe of other nations. When they went to battle, ſome were armed with bucklers of ox hides, with little javelins in their hands; others carried crooked darts; others uſed the bow; and others fought with clubs. They took their wives with them to war, whom they obliged to enter upon military ſervice at a certain age. The women wore rings of copper at their lips. Abyſſinia.

Some of theſe people went without clothing. Sometimes they threw about them what they happened to find, to ſhelter themſelves from the burning rays of the ſun. With regard to their food, ſome lived upon a certain fruit, which grew ſpontaneouſly in marſhy places; ſome ate the tendereſt ſhoots of trees, which were defended by the large branches from the heat of the ſun; and others ſowed Indian corn and lotos. Some of them lived only on the roots of reeds. Many ſpent a great part of their time in ſhooting birds; and as they were excellent archers, their bows ſupplied them with plenty. But the greater part of this people were ſuſtained by the fleſh of their flocks.

The people who inhabited the country above Meroè made remarkable diſtinctions among their gods. Some, they ſaid, were of an eternal and incorruptible nature, as the ſun, the moon, and the univerſe; others having been born among men, had acquired divine honours by their virtue, and by the good which they had done to mankind. They worſhipped Iſis, Pan, and particularly Jupiter and Hercules, from whom they ſuppoſed they had received moſt benefits. But ſome Ethiopians believed that there were no gods; and when the ſun roſe, they fled into their marſhes, execrating him as their cruelleſt enemy.

Theſe Ethiopians differed likewiſe from other nations in the honours which they paid to their dead. Some threw their bodies into the river, thinking that the moſt honourable ſepulchre. Others kept them in their houſes in niches: thinking that their children would be ſtimulated to virtuous deeds by the ſight of their anceſtors; and that grown people, by the ſame objects, would retain their parents in their memory. Others put their dead bodies into coffins of earthen ware, and buried them near their temples. To ſwear with the hand laid upon a corpſe, was their moſt ſacred and inviolable oath.

The ſavage Ethiopians of ſome diſtricts gave their crown to him who of all their nation was beſt made. Their reaſon for that preference was, that the two firſt gifts of heaven were monarchy and a fine perſon. In other territories, they conferred the ſovereignty on the moſt vigilant ſhepherd; for he, they alleged, would be the moſt careful guardian of his ſubjects. Others choſe the richeſt man for their king; for he, they thought, would have it moſt in his power to do good to his ſubjects. Others, again, choſe the ſtrongeſt; eſteeming thoſe moſt worthy of the firſt dignity who were ableſt to defend them in battle.

Diod. Sic. p. 102. The Jeſuit miſſionaries were the firſt who gave any information to the Europeans concerning this country; Account of the miſſionaries.

Abyſſinia. and indeed, excepting them and the late accounts by Mr Bruce, we have no other ſource of information concerning it. Louis XIV. of France appointed ſix Jeſuits to this miſſion, and furniſhed them with ſuitable preſents for the emperor and the principal nobility. The admiſſion of theſe miſſionaries was facilitated by a dangerous ſcorbutic diſorder, which had attacked Yaſous and his ſon, and for which they wiſhed to have the advice of an European phyſician. Maillet, the French conſul at Cairo, wiſhing the Jeſuits to have the honour of the miſſion, diſappointed the views of Friars Paſchal and Anthony, two Franciſcans, who were firſt thought of, and recommended Charles Poncet, a Frenchman, who had been bred a chemiſt and apothecary, and Father Brevedent as his ſervant, to Hagi Ali, a Mahometan factor at Cairo, for the deſired purpoſe. The Franciſcans attempted the deſtruction of Poncet and his attendants; but Poncet arrived ſafe at Gondar on the 21ſt of July, 1699, and having perfectly cured his royal patient, ſet out on the 2d of May, 1700, on his return for Europe, and arrived in ſafety at Maſuah. Brevedent died at Gondar ſoon after their arrival. An embaſſy on the part of the Abyſſinian monarch was defeated by the interference of Maillet; but the Jeſuits concerted another miſſion from France, and the perſon appointed as ambaſſador was M. de Roule, vice-conſul at Damietta. This miſſion was very improperly conducted; the merchants at Cairo oppoſed it; the Franciſcans obſtructed it, and it terminated in the murder of the ambaſſador in the province of Sennaar.

The miſſionaries confirm what is ſaid by the ancients, that Abyſſinia is a very mountainous country. The provinces of Begemder, Gojam, Waleka, Shoa, &c. according to them, are only one continued chain of mountains. Many of them were ſaid to be of ſuch enormous height, that the Alps and Pyrenees are but mole-hills in compariſon of them. Thoſe called *Aorni* were ſaid to be of this kind; but Mr Bruce informs us, that theſe accounts are greatly exaggerated. Amongſt thoſe mountains, and even frequently in the plains, there are many ſteep and craggy rocks to be met with of various and whimſical ſhapes; ſome of them ſo ſmooth, that men and oxen are raiſed to the top by means of engines. The tops of theſe rocks are covered with woods and meadows, full of ſprings and ſtreams of water; of which Mr Bruce has given us an account in his deſcription of Lamalmon. The moſt remarkable of theſe, according to the authors we are now ſpeaking of, is that called *Amba Geſhen*, mentioned in the courſe of this article as one of the mountains uſed for a priſon to the princes of the blood. Its top is deſcribed as only half a league in breadth, though it is ſaid that it would require near half a day to go round it.

Mr Bruce's account of its diviſions. Modern Ethiopia, or *Abyſſinia*, as it is now called, is divided, according to Mr Bruce, into two parts, named *Tigré* and *Amhara;* though this rather denotes a difference in the language than the territory of the people. The moſt eaſterly province properly ſo called is Maſuah. It is of conſiderable length, but no great breadth; running parallel to the Indian ocean and Red ſea, in a zone of about 40 miles broad, as far as the iſland MASUAH. The territories of the Baharnagaſh include this province as well as the diſtricts of Azab and Habab. In the former are mines of foſſil ſalt, which ſubſtance in Abyſſinia paſſes current inſtead of money. For this purpoſe the mineral is cut into ſquare ſolid pieces about a foot in length. Here alſo is a kind of mint from which great profits are derived. The Habab is likewiſe called the land of the *Agaazi* or Shepherds; who ſpeak the language called *Geez*, and have had the uſe of letters from the moſt early ages. This province was formerly taken by the Turks, when the rebellious Baharnagaſh Iſaac called them to his aſſiſtance againſt the emperor Menas. From that time the office fell into diſrepute, and the Baharnagaſh at preſent has much leſs power than formerly. The province of Maſuah is now governed by a Mahometan prince or officer called a *naybe*. Abyſſinia

Tigré is bounded on the eaſt by the territories of the Baharnagaſh, of which the river Mareb is the boundary on the eaſt, and the Tacazze on the weſt. It is about 200 miles long from north to ſouth, and 120 broad from weſt to eaſt. All the merchandiſe ſent acroſs the Red ſea to Abyſſinia, or from Abyſſinia acroſs the Red ſea, muſt paſs through this province, ſo that the governor has his choice of it as it goes along. Thus the province itſelf is very wealthy; and as the Abyſſinian fire-arms are brought from Arabia, the governors of Tigré, by purchaſing quantities of them, may eaſily render themſelves very powerful. No arms of this kind can be ſent to any perſon without his permiſſion; nor can any one buy till the governor has firſt had an offer.

Sirè was ſome time ago united to Tigré, on account of the miſconduct of its governor; but was diſjoined from it at the time Mr Bruce was in Abyſſinia, with the conſent of Ras Michael, who beſtowed the government of it upon his ſon. It is about 25 miles long, and as much in breadth. Its weſtern boundary is the Tacazze.

Samen is a very mountainous province lying to the weſtward of the river Tacazze, about 80 miles long, and in ſome places 30 broad, though in moſt it is much narrower. It is moſtly inhabited by Jews.

Begemder lies to the north-eaſt of Tigré. It is about 180 miles long and 60 broad; bounded by the river Nile on the weſt. It comprehends the mountainous country of Laſta; and there are now ſeveral ſmall governments diſmembered from it. The inhabitants are fierce and barbarous, but reckoned the beſt ſoldiers in Abyſſinia; and it is ſaid that this province with Laſta can furniſh 45,000 horſemen. It abounds with iron mines, which in Abyſſinia would be very valuable if properly managed. It is alſo well ſtored with beautiful cattle. Near the ſouth end it is cut into vaſt gullies, ſeemingly by floods, of which we have no account. This province is reckoned the great barrier againſt the incurſions of the Galla; and though they have often endeavoured to make a ſettlement in it, they have never yet found it practicable. Several of their tribes have been cut off in the attempt.

Next to Begemder is the province of Amhara, in length about 120 miles, and ſomewhat more than 40 in breadth. It is very mountainous; and the men are reckoned the handſomeſt in all Abyſſinia. In this province is the mountain or rock Geſhen, formerly the reſidence of the royal family. This province is parallel to Begemder on the ſouth; being ſeparated from it by the river Baſhilo. On the weſt it is bounded by the Nile. The river Geſhen is another boundary.

Walaka.

Abyſſinia. Walaka lies between the rivers Geſhen and Samba. It is a low unwholeſome province, having Upper Shoa to the ſouthward. It was in this province that the only ſurviving prince of the family of Solomon was preſerved after the maſſacre by Judith, formerly mentioned; and on this account great privileges were conferred upon the inhabitants, which in ſome degree continue to this day. The governor is conſidered as an ally, rather than a ſubject, of the emperor of Abyſſinia; and to preſerve his independency, he has allowed the Galla to ſurround his province entirely, yielding up to them the territory of Walaka above mentioned. Truſting to the valour of his own people, he is under no apprehenſion of his barbarous neighbours the Galla. This province is alſo remarkable for the monaſtery of Debra Libanos, where the famous ſaint Tecla Haimanout, the founder of the power of the clergy, was bred.

Gojam is remarkable for having in it ſome of the ſources of the Nile. It is bounded on the north by the high mountains of Amid Amid, on the ſouth by the river Nile, on the weſt by another river named *Gult*, and on the eaſt by the river Temci; on the north-eaſt it has the kingdom of Damot. It is about 40 miles long from north to ſouth, and ſomewhat more than 20 in breadth from eaſt to weſt. It is very populous, but the men are accounted the worſt ſoldiers in Abyſſinia. There is great plenty of very beautiful cattle.

Beyond the mountains of Amid Amid on the eaſt lies the country of the Agows; on the weſt it has Buré, Umbarma, and the country of the Gongas; on the ſouth, thoſe of Damot and Gafat: and Dingleber on the ſouth.

Dembea occupies all the ſpace along the lake of the ſame name from Dingleber below the mountains bounding Gueſque and Kuara. Mr Bruce is of opinion, that the lake has formerly overflowed the whole of it; and the decreaſe of this lake he brings as an inſtance of the decreaſe of large pools throughout the world.

To the ſouth of Dembea is the country of Kuara bordering on that of the Shangalla, the Macrobii of the ancients. The neighbouring countries, inhabited by Pagan ſavages, produce gold, which is introduced in plenty into this province. None is produced in the province itſelf, nor indeed does Mr Bruce mention any part of Abyſſinia where gold is naturally found. In the lower part of this country is a colony of Pagan blacks named *Ganjar;* derived, according to our author, from the black ſlaves who came into the country with the Arabs after the invaſion of Mahomet. Theſe deſerting their maſters, formed the colony we ſpeak of; but it is now more increaſed by vagabonds from other parts than by the multiplication of the inhabitants themſelves. The governor of this country is one of the great officers of ſtate: he has kettle-drums of ſilver, which he is allowed to beat through the ſtreets of Gondar; a privilege allowed to none but himſelf. This privilege was conferred upon the firſt governor by David II. who conquered the country.

The frontier countries of Narea, Ras-el-Feel, Tchelga, &c. are wholly inhabited by Mahometans, and the government of them is uſually given to ſtrangers. The country is very hot, unwholeſome, and covered with thick woods. The people are fugitives from all nations, but excellent horſemen; making uſe of no other weapon but the broadſword, with which, however inadequate we might ſuppoſe the weapon to be, they will attack the elephant or rhinoceros. Abyſſinia.

According to Mr Bruce the empire of Abyſſinia is bounded on the ſouth by a vaſt chain of mountains, extending with very little interruption from 34° to 44° E. Long. and between 8° and 9° N. Lat. In more proſperous times it extended beyond theſe ſouthward, particularly into the kingdom of Adel; but the mountains juſt mentioned are undoubtedly to be reckoned its natural boundaries on this ſide. On the eaſt and north-eaſt it has the Red ſea, and on the ſouth-eaſt the kingdom of Adel. On the weſt and north its boundaries are leſs diſtinctly marked; having on both theſe quarters the barbarous kingdom of Sennaar, whoſe limits will no doubt frequently vary according to the fortune of war betwixt the two princes. From Arkeeko, ſituated near the foot of the baſaltes mountains, in about 15° 30′ N. Lat. it extends to near 7° N. Lat. where the mountains of Caffa, the moſt ſoutherly province of Abyſſinia, terminate. Along the coaſt of the Red ſea lie the territories inhabited by the Hazorta Shiho, the diſtrict of Engana. Shiho, and the kingdom of Dancali, including the territory of Azab and the ſalt pits already mentioned. To the weſtward of theſe is the province or kingdom of Tigré, including the country of the Dobas, part of the kingdom of Bali, and that of Dawaro. Still farther weſt are thoſe of Sirè, Laſta, Amhara, the greateſt part of Bali, and part of Fatigar, which laſt reaches beyond the mountains. Proceeding ſtill in the ſame direction, we come to Tcherkin, Tchelga, Abargale, Salao, Begemder, Shoa, and Ifat; reckoning always from north to ſouth; Tcherkin, for inſtance, being to the northward of Tchelga, &c. Shoa extends a conſiderable way to the weſtward; ſo that, beſides Ifat, it has to the ſouth of it alſo the kingdoms of Hade and Cambut; the latter extending beyond the ſouthern ridge of mountains. To the weſtward are Ras-el-Feel, Dembea, Gojam, and Damot; and beyond theſe are the kingdoms of Bembea, Bizamo, Gooderoo, and Guraque; thoſe of Narea or Enarea and Caffa occupying the ſouth-weſt corner of the empire.

The climate of Abyſſinia, though, like other parts of the torrid zone, it was formerly thought to be uninhabitable, is not only tolerable, but in general temperate and healthy. In this reſpect, however, the uneven ſurface of the country expoſes different ſituations to the effects of heat and cold, of dryneſs and moiſture, and of a free circulation or a ſtagnation of the atmoſphere, in very various degrees. On the mountains, and in the higher parts of the country, the ſky is clear and ſerene, the air is cool and refreſhing, and the people are healthy and ſprightly; whilſt thoſe who live in ſome of the valleys, in the vicinity of marſhes, and in ſandy deſerts, experience the pernicious influence of exceſſive heat, and of a moiſt, ſtagnant, and ſuffocating air; ſo that the climate depends upon ſoil and ſituation as much almoſt as upon the latitude. Mr Bruce obſerves, that on the higheſt mountain of the ridge called Lamalmon, the thermometer ſtood at 32° in the depth of winter, the wind being north-weſt; clear and cold, but attended only with hoar froſt. This, he adds, vaniſhed into dew Climate.

after

Abyſſinia. after a quarter of an hour's ſun; nor did he ever ſee any ſign of congelation of water upon the top of the higheſt mountains. The barometer ſtood at 19° 9′ at noon of the ſame day, and the thermometer was at 78°. He obſerved hail to lie for three hours in the forenoon on the mountains of Amid Amid. The range of the barometer and thermometer, according to Mr Bruce's regiſter kept at Gondar from February 19. 1770, to May 31. 1771, will appear from the following table.

	Barom.	Thermom.	Wind.
April 29. 6½ A. M.	22.11	69°	S.
Mar. 29 2¾ P. M.	20.11	75°	E.
April 19. 12 Noon.		91°	W. N. W.
July 7. 12 Noon.	21.6	54¼°	W.

The rainy ſeaſon commences in April or the beginning of May, when the ſun becomes vertical, and ends in September. The rains generally ceaſe about the 8th of September; a ſickly ſeaſon follows till they begin again, about the 20th of October; they then continue conſtant, but moderate, till the 8th of November. All epidemic diſeaſes ceaſe with the end of theſe rains. In order to avoid the inconveniences that attend the overflowing of their rivers during this ſeaſon, as well as on account of the greater ſalubrity of elevated ſituations, the Abyſſinians have built many of their towns and villages on the mountains. Their houſes are generally very mean, conſiſting only of one ſtory, and conſtructed with ſtraw and laths, earth and lime; though there are ſome of ſtone and better materials. It is a miſtaken notion, however, that they live in tents, and not in houſes. In a climate like that of Abyſſinia, ſubject to ſcorching weather for ſix months, and to deluges of rain, ſtorms of wind, thunder and lightning, and hurricanes, ſuch as are unknown in Europe, for the other ſix, it is not probable that they ſhould chooſe to live in tents, after having known how to build ſuch cities as Axum. In many of the towns and villages, the houſes are ſeparated by hedges, which being always green, and intermixed with flowers and fruit trees at certain diſtances, afford an agreeable proſpect, and contribute alſo to their ſalubrity.

Diſeaſes. The inhabitants of Abyſſinia are ſubject to violent fevers, which commonly prove fatal on the third day. Thoſe who ſurvive to the fifth day often recover, merely by drinking cold water, and by repeatedly throwing cold water upon them in their beds. The bark is the moſt effectual remedy; which in critical caſes, ſays Bruce, ſhould be frequently repeated in ſmall doſes, and perfect abſtinence obſerved, unleſs from copious draughts of cold water. Another common diſeaſe in Abyſſinia, is the tertian fever, which is in no reſpect different from our tertian, and is ſucceſsfully treated in the ſame manner. All fevers terminate in intermittents, and if they continue long, in dyſenteries, which are always tedious, and very frequently mortal. Bark and ipecacuanha, in ſmall quantities, water, and fruit not over ripe, have been found the moſt effectual remedies. The dyſentery, commencing with a conſtant diarrhœa, is ſeldom cured, if it begins with the rainy ſeaſon; otherwiſe, ſmall doſes of ipecacuanha either remove it, or change it into an intermittent fever, which yields to the bark. Another endemial diſeaſe is called *hanzeer*, the hogs or the ſwine, and is a ſwelling of the glands of the throat, and under the arms, which by ineffectual attempts for producing ſuppuration, and opening the tumours, becomes a running ſore, and reſembles the evil. In connection with this diſorder, we may mention thoſe ſwellings, to which the whole body is ſubject, but more particularly the arms, thighs, and legs, ſometimes accompanied with ulcers in the noſe and mouth, which deface the ſmoothneſs of the ſkin, and which on this account are much dreaded by the Abyſſinians. The two laſt diſeaſes ſometimes yield to mercurials; but the laſt is ſpeedily and completely cured by antimonials. Another complaint afflicts thoſe who are in the habit of drinking ſtagnant water. It is called *farenteit*, or the worm of Pharaoh, and appears in all parts of the body, but moſt frequently in the legs and arms. It is a worm with a ſmall black head and a hooked beak, of a whitiſh colour, and a white body of a ſilky texture, reſembling a ſmall tendon. The natives ſeize it by the head and wind it gently round a piece of ſilk, or a bird's feather, and thus by degrees they extract it without any inconvenience or permanent ſcar. Mr Bruce ſuffered much from this complaint, and the breaking of the worm in the operation of extracting it. The moſt terrible of all the diſeaſes of this climate is the elephantiaſis. The cicuta, mercury, and tar-water, were unſucceſsfully tried in this complaint: the greateſt benefit was derived from whey made of cows milk. To the alternation of ſcorching heat and chilling cold, thin clothing, the uſe of ſtagnant putrid water for four months, and other ſuch cauſes, theſe diſeaſes may be partly, if not wholly, aſcribed. The ſmallpox was introduced into Abyſſinia at the time of the ſiege of Mecca, about the year 356, and the Abyſſinian army was the firſt victim to it. Abyſſinia.

Soil and vegetable productions. The great difference of climate, owing to the vaſt extent and variety of elevation in different parts of this empire, is very perceptible in its ſoil and productions. The mountains in many places are not only barren, but altogether inacceſſible, except by thoſe who make it their conſtant practice to climb amongſt them: and even by them they cannot be aſcended without great difficulty and danger. The ſhapes of theſe mountains, as we have already had occaſion to obſerve, are very ſtrange and fantaſtical: exceedingly different from thoſe of Europe; ſome reſembling towers and ſteeples, while others are like a board or ſlate ſet up on end; the baſe being ſo narrow, and the whole mountain ſo high and thin, that it ſeems wonderful how it can ſtand. In the valleys, however, and flat parts of the country, the ſoil is exceſſively fruitful, though in the warmeſt places grain cannot be brought to perfection. Wine is alſo made only in one or two places; but the greateſt profuſion of fruits of all kinds is to be met with everywhere, as well as many vegetables not to be found in other countries. There is a vaſt variety of flowers, which adorn the banks of the rivers in ſuch a manner as to make them reſemble fine gardens. Among theſe a ſpecies of roſe is met with, which grows upon trees, and is much ſuperior in fragrance to thoſe which grow on buſhes. Sena, cardamom, ginger, and cotton,

Abyſſinia. cotton, are likewiſe produced here in great quantities. Among the variety of rare plants to be met with in Abyſſinia, Mr Bruce particularly deſcribes the following.

Plants described by Mr Bruce.

1. The papyrus, the ancient material for paper: which our author ſuppoſes to have been a native of Ethiopia, and not of Egypt as has been ſuppoſed. 2. Baleſſan, balm, or balſam plant; a tree growing to the height of 14 or 15 feet, and uſed for fuel along with other trees in the country. It grows on the coaſt of the Red ſea, among the myrrh trees behind Azab, all the way to Babelmandel. This is the tree producing the balm of Gilead mentioned in Scripture. 3. The laſſa, myrrh, and opocalpaſum trees. Theſe grow likewiſe along the coaſt of the Red ſea. The laſſa or opocalpaſum is uſed in manufactures; and, according to our author, reſembles gum *adragant*, probably tragacanth. The tree which produces it grows to a great ſize, and has a beautiful flower, ſcarce admitting of deſcription without a drawing. 4. The ergett, a ſpecies of the mimoſa, is of two kinds; one called *ergett y'dimmo*, or the bloody ergett, from the pink colour of its filaments; the other *ergett el krone*, or the horned ergett, with a flower reſembling the acacia vera or Egyptian thorn. Theſe were both found on the banks of a river named *Amo*, near the great lake Dembea. 5. Enſete, an herbaceous plant, growing in Narea, in ſwampy places; but it is ſuppoſed to grow equally well in any other part of the empire where there is heat and moiſture ſufficient. It forms a great part of the vegetable food of the Abyſſinians. It produces a kind of figs, but theſe are not eatable. When uſed for food, it is to be cut immediately above the ſmall detached roots, or perhaps a foot or two higher, according to the age of the plant. The green is to be ſtripped from the upper part till it becomes white; and when ſoft, is affords an excellent food when eaten with milk or butter. 6. Kolquail, a kind of tree, only the lower part of which is woody, the upper part being herbaceous and ſucculent. The flowers are of a beautiful golden colour, and the fruit turns to a deep crimſon; ſo that the trees make a very beautiful appearance. The whole plant is full of a very acrid and cauſtic milk. 7. Rack is a large tree, growing not only in Abyſſinia but in many places of Arabia Felix. Its wood is ſo hard and bitter, that no worm will touch it; for which reaſon it is uſed by the Arabs for conſtructing their boats. It grows, like the mangrove, among the ſalt water of the ſea, or about ſalt ſprings. 8. Gir-gir, or Geſhe-el-aube a kind of graſs found about Ras-el-Feel, growing to the height of about three feet four inches. 6. The kantuffa, a very noxious ſpecies of thorn, much more troubleſome than any with which we are acquainted, and growing to the height of eight or more feet. The flowers have a ſtrong ſmell like the flower mignionet. 10. The gaguedi, is a ſhort tree only about nine feet high, a native of Lamalmon. The flowers, which are yellow and very beautiful, turn towards the ſun like thoſe of the helianthus. 11. The wanſey, a tree common throughout all Abyſſinia, flowers exactly on the firſt day the rains ceaſe. It grows to the height of 18 or 20 feet; having a thick bark and cloſe heavy wood; the firſt part of which is white, but the reſt of a dark colour. The flowers are of a beautiful white colour; but it does not appear to poſſeſs any other remarkable property, though it is held in great eſtimation by the Abyſſinians, and is even worſhipped by the Galla. 12. The ſarek, or *Bauhinia acuminata*, grows in the country immediately adjacent to the ſources of the Nile; being found by Mr Bruce ſcarce 400 yards diſtant from the fountain. 13. Kuara, is a beautiful tree, growing in the ſouth and ſouth-weſt parts of Abyſſinia. It has a fruit like a bean, of a red colour, which in the early ages was made uſe of as a weight for gold and diamonds; and hence Mr Bruce is of opinion that the name of the imaginary weight *carat* is derived. 14. The walkuffa, grows in the hotteſt parts of Ethiopia. It is a flowering tree, with beautiful white bloſſoms, which do not appear till towards the middle of January. The flowers have no ſmell, and are accounted pernicious to bees. The wood is very heavy. 15. The wooginoos, or *Brucea antidyſenterica*, is common throughout the whole empire, but principally on the ſides of the valleys. It is a ſovereign remedy againſt the dyſentery, a very common and fatal diſeaſe in hot countries. Mr Bruce had experimental proof of its antidyſenteric virtue. 16. Cuſſo or *Baukſia anthelmintica*, is a very beautiful and uſeful tree, being a ſtrong anthelmintic, and uſed as ſuch by the Abyſſinians. Every perſon there, whether male or female, is troubled with that kind of worm called *aſcarides*; a great number of which are evacuated every month, and the evacuation is promoted by an infuſion of this plant. While taking this medicine, the patients ſequeſtrate themſelves from all their acquaintance, and keep cloſe at home. It is ſaid that the want of this medicine in other countries is the reaſon why the Abyſſinians do not go out of their own country; or, if they do, that they are ſhort-lived. Teff, is a kind of grain ſown generally throughout Abyſſinia; and conſtituting the bread commonly made uſe of by the inhabitants. They have indeed plenty of wheat, and are as ſkilful in forming it into bread as the Europeans; but this is only made uſe of by people of the firſt rank: however, the teff is ſometimes of ſuch an excellent quality, that the bread made from it is held in equal eſtimation with the fineſt wheat. From the bread made of this grain a ſouriſh liquor called *bouza* is prepared, which is uſed for common drink like our ſmall beer. A liquor of the ſame kind, but of inferior quality, is made from barley cakes. Some have been of opinion, that the uſe of teff occaſions the worms above mentioned; but this is controverted by Mr Bruce. Nook, a plant not to be diſtinguiſhed from our marigold, either in ſhape, ſize, or foliage, is alſo ſown very generally over the country, and furniſhes all Abyſſinia with oil for the kitchen and other uſes.

Abyſſinia. Abyſſinia abounds with a vaſt variety of quadrupeds both wild and tame. Immenſe numbers of cattle everywhere preſent themſelves, ſome of them the moſt beautiful in the world. Some have monſtrous horns, ſaid to be capable of holding 10 quarts each; but this, as our author informs us, is a diſeaſe which proves fatal to them. Buffaloes are here met with in great numbers, and are very fierce and untractable; but there are no ſuch animals as carnivorous bulls, which have been ſaid to exiſt in this and other internal parts of Africa. Antelopes and other wild animals are met with in great numbers in the uncultivated parts; feeding chiefly on the leaves of trees. They abound moſt of all, however, in thoſe parts which have been one

Quadrupeds.

cultivated

Abyſſinia. cultivated, but ſince deſolated by the calamities of war; and where wild oats abound in ſuch quantities as to hide them from purſuit. Hyænas, lions, foxes, jackals, wild boars, &c. are alſo found, as well as the elephant, rhinoceros, camelopard, and others of the larger and more uncommon kinds. Great havock is made in the cultivated fields by multitudes of baboons, apes, rats, and mice. There is plenty of hares; but theſe being reckoned unclean, as well as wild boars, are not uſed as food. The rivers abound with crocodiles and hippopotami, at leaſt the Nile, and thoſe large ſtreams which flow into it; but a great number have water in them only during the rainy ſeaſon, and theſe have neither fiſh nor any animal that feeds upon them.

Birds. The number of birds in this country is immenſe; nor are thoſe of the carnivorous kind at all deficient. Great numbers of eagles, vultures, hawks, and others of that kind are met with, and come punctually every year after the tropical rains have ceaſed. They feed at firſt upon the ſhell-fiſh which are met with in great quantities on the edges of the deſerts, where they had lived in the ſalt ſprings; but, being forced from their natural habitations when theſe ſprings were ſwelled by the rains, are afterwards left to periſh on dry land. When theſe fail, their next reſource is from the carcaſes of the large animals, ſuch as the elephant and rhinoceros, which are killed in the flat country by the hunters. Their next ſupply is the multitude of rats and field-mice which infeſt the country after harveſt. The vaſt ſlaughter of cattle made by the Abyſſinian armies, the multitude of perſons killed whoſe bodies are allowed to rot on the field of battle, &c. furniſh them alſo with another reſource. Theſe ſupplies, however, all fail at the beginning of the rainy ſeaſon, when the hunters and armies return home, and the vaſt quantity of water which continually overflows the ground renders it impoſſible for them to find any other food.

There are other birds which feed upon inſects, and multitudes which live on grain or ſeeds of various kinds; all of which are amply ſupplied by the immenſe quantity of fruits and berries which grow in Abyſſinia, and are ripe at all ſeaſons of the year. A very remarkable particular concerning this is, that the trees which bear fruit all the year round do not carry it always in the ſame place. The weſt ſide is that which bloſſoms firſt, and where of conſequence the fruit firſt comes to perfection; the ſouth ſide ſucceeds, and goes though the ſame proceſs: after which, the north bloſſoms in like manner; and laſt of all is the eaſt ſide, which produces flowers and fruit towards the beginning of the rainy ſeaſon. All the trees of Abyſſinia are ever-green; and their leaves are of a thick leathery conſiſtence, and highly varniſhed to enable them to reſiſt the violent rains which fall during a certain ſeaſon. The granivorous birds have likewiſe this advantage, that the rains do not fall at the ſame time all over the country. It is interſected by a chain of mountains that divide the ſeaſons alſo; ſo that they have but a ſhort way to fly in order to become birds of paſſage, and ſupply themſelves with ſuch food as is neceſſary for them beyond the mountains. All the pigeons, of which there are many ſpecies, are birds of paſſage, excepting one kind. The owls are extremely large and beautiful, but few in number. There Abyſſinia. is a great variety of ſwallows, ſeveral kinds of which are unknown in Europe; but ſays our author, "thoſe that are common in Europe appear in paſſage at the very ſeaſon when they take their flight from thence. We ſaw the greateſt part of them in the iſland of Maſuah, where they lighted and tarried two days, and then proceeded with moon-light nights to the ſouth-weſt." The large birds which reſide conſtantly among the mountains of Samen and Taranta have all their feathers tubular, the hollow part being filled with a kind of yellow duſt which iſſues out in great abundance on hunting them. This was particularly obſerved by Mr Bruce in a ſpecies of eagle which he calls the *golden eagle*; and the duſt being viewed through a microſcope with a very ſtrong magnifying power, appeared like fine feathers. The crows are ſpotted white and black, almoſt in equal proportions. The raven has his feathers intermixed with brown, the tip of his beak white, and a figure like a cup or chalice of white feathers upon his head. Our author ſaw no ſparrows, magpies, nor bats; neither are there many water-fowl, eſpecially of the web-footed kind: but there are vaſt numbers of ſtorks, which cover the plains in May, when the rains become conſtant. There are no geeſe, excepting one ſpecies called the *golden gooſe* or *gooſe of the Nile*, which is common all over Africa; but there are ſnipes in all the marſhes.

Our author deſcribes very few fiſhes; though he Fiſhes. ſays that an account of theſe, and other marine productions of the Red ſea, which he has painted and collected, would occupy many large volumes, and the engraving coſt a ſum which he could not by any means afford. Among others, he mentions the *torpedo* and the *binny*, which latter is good food, and grows to a large ſize; that from which he took the drawing was about 32 pounds weight. Its whole body is covered with beautiful ſcales reſembling ſilver ſpangles.

Locuſts and a ſpecies of ants are extremely troubleſome and pernicious in Abyſſinia, but the fly by the natives called *tſaltſalya* is moſt deſtructive to cattle. Mr Bruce gives a particular deſcription of a kind of Few ſerpents in Abyſſinia. lizard, and of the ceraſtes or horned ſerpent; but denies that ſerpents are numerous in Abyſſinia, as almoſt all authors have ſuppoſed, and as we ſhould be led naturally to ſuſpect. He vouches alſo for the power that ſome perſons have of enchanting ſerpents and ſcorpions, which in ſome is natural, in others communicated artificially by certain medicines. He prevailed upon thoſe who knew the ſecret to prepare him by theſe means as they had done others; but, notwithſtanding this aſſiſtance, he acknowledges, that when it came to the trial his heart always failed him.

The crown is hereditary in the line of Solomon, but Method of ſettling the ſucceſſion to the crown. it depends on the miniſter to chooſe the particular perſon who is to enjoy it; and as it is always his inclination to have the government in his own hands, he never fails to chooſe an infant, who is ſeldom ſuffered to live after he comes to the years of maturity. Thus perpe- The cauſe of civil wars. tual wars and commotions take place, inſomuch that the ravenous birds, as has been obſerved, find one great ſupply of food in the ſlaughters made by the Abyſſinians of one another. All authors indeed agree that the de- Exceſſive deſtruction by their armies. vaſtations committed by the armies of this country are exceſſive; inſomuch, that after a long encampment is removed,

Abyſſinia. removed, nothing is to be ſeen all around the place where it was but bare earth. When an army marches through the country, ſays Mr Bruce, "an inconceivable number of birds and beaſts of prey, eſpecially the former, follow it from the firſt day of its march to its return; increaſing always in proportion the more it advances into the country. An army there leaves nothing living behind, not even the veſtige of a habitation; but fire and the ſword reduce every thing to a wilderneſs and ſolitude. The beaſts and birds unmoleſted have the country to themſelves, and increaſe beyond all poſſible conception. The ſlovenly manners of this ſavage people, who, after a battle, bury neither friends nor enemies; the quantity of beaſts of burthen that die perpetually under the load of baggage, and variety of miſmanagement; the quantity of offal, and half-eaten carcaſes of cows, goats, and ſheep, which they conſume in their march for ſuſtenance; all furniſh a ſtock of carrion ſufficient to occaſion contagious diſtempers, were there not ſuch a prodigious number of voracious attendants who conſume them almoſt before putrefaction. There is no giving the reader any idea of their number, unleſs by comparing them to the ſand of the ſea. While the army is in motion, they are a black canopy which extends over it for leagues. When encamped, the ground is diſcoloured with them beyond the ſight of the eye; and all the trees are loaded with them."

nmenſe umber of irds which ollow iem.

The prodigious number of criminals executed for high treaſon, whoſe bodies are cut in pieces and thrown about the ſtreets, invite the hyænas to the capital, in the ſame manner that the carrion of the camp invites the birds of prey to follow it. The method of keeping off theſe voracious animals is certainly very curious. "An officer (ſays Mr Bruce) called *Serach Maſſery*, with a long whip, begins cracking and making a noiſe worſe than 20 French poſtilions at the door of the palace before the dawn of day. This chaſes away the hyænas and other wild beaſts: this too is the ſignal for the king's riſing, who ſits in judgement every morning faſting; and after that, about 8 o'clock, he goes to breakfaſt."

urious ıethod of eeping off ıe hyænas om the ing's pa- ıce.

From theſe and other circumſtances we ſhould be apt to imagine that the Abyſſinians, inſtead of becoming more civilized, were daily improving in barbarity. The king is anointed at his election with plain oil of olives; "which (ſays Mr Bruce) being poured upon the crown of his head, he rubs into his long hair indecently enough with both his hands, pretty much as his ſoldiers do with theirs when they get acceſs to plenty of butter." In former times, however, matters ſeem to have been conducted with more decency. Socinios, the greateſt monarch that ever ſat on the Abyſſinian throne, was crowned, after having gained a great victory over the Galla, in a very different manner, and with the ceremonies which we are told were in uſe among the ancient kings of Tigré. At that time he had with him an army of about 30,000 men; and was beſides attended by all the great officers dreſſed in the gayeſt manner, as well as by the ladies of the firſt quality in the empire. The king himſelf, dreſſed in crimſon damaſk, with a great chain of gold about his neck, his head bare, and mounted on a horſe richly capariſoned, advanced at the head of his nobility, paſſed the outer court, and came to the paved way before the church. Here he was met by a number of young girls, daughters of the *ambares* or ſupreme judges, together with many noble virgins ſtanding on the right and left of the court. Two of the nobleſt of theſe held in their hands a crimſon cord of ſilk, ſomewhat thicker than common whip-cord, ſtretched acroſs from one company to another, as if to ſhut up the road by which the king was approaching the church. When this cord was prepared and drawn tight about breaſt-high by the girls, the king entered; advancing moderately quick, and ſhowing his ſkill in horſemanſhip as he went along. Being ſtopped by the tenſion of the ſtring, the damſels aſked, Who he was? To this he anſwered, "I am your king, the king of Ethiopia." But they replied, "You ſhall not paſs; you are not our king." He then retired ſome paces, and again preſented himſelf. The queſtion was again put, "Who he was?" To which he anſwered, "I am your king, the king of Iſrael." But the ſame reply was ſtill given by the girls. The third time, on being aſked, "Who he was?" he anſwered, "I am your king, the king of Sion:" and drawing his ſword, he cut the cord aſunder. The damſels then cried out, "It is a truth, you are our king; truly you are the king of Sion." On this they began to ſing Hallelujah, and were joined by the whole army and the reſt of the king's attendants. Amidſt theſe acclamations the king advanced to the foot of the ſtair of the church, diſmounted, and ſat down upon a ſtone; which, in Mr Bruce's opinion, was plainly an altar of Anubis or the Dog-ſtar. After the king, came a number of prieſts in proper order. The king was firſt anointed, then crowned, and accompanied half up the ſteps by the ſinging prieſts. He ſtopped at a hole made on purpoſe in one of the ſteps, where he was fumigated with myrrh, aloes, and caſſia: after which divine ſervice was celebrated; and he returned to the camp, where 14 days were ſpent in feaſting and rejoicing.

Abyſſinia.

Ceremonies of this kind are now given over on account of the expence. Our author was informed by Tecla Haimanout, that when he was obliged to retire into Tigré from his enemies, Ras Michael had ſome thoughts of having him crowned in contempt of his enemies; but by the moſt moderate calculations that could be made, it would have coſt 20,000 ounces of gold, about 80,000l. ſterling; on which all thoughts of it were laid aſide.

Iethod of nointing nd crown- ng the ing.

The Abyſſinians compute time by the ſolar year. Thirty days conſtitute their month, to which they add five days and a quarter, and thus they complete the year. The five days are added to the month of Auguſt, and to every fourth year they add a ſixth day. They begin their year with the 29th or 30th of Auguſt, i. e. the kalends of September; the 29th of Auguſt being the firſt of their month Maſcaram. The common epoch which the Abyſſinians uſe is from the creation of the world, and they reckon 5500 years from the creation to the birth of Chriſt, rejecting the odd eight years of the Greeks, who make this period 5508 years. They have alſo many other epochs, ſuch as from the council of Nice and Epheſus. In their eccleſiaſtical computations they make uſe of the golden number and epact. The firſt uſe of epacts amongſt them was not earlier, according to Scaliger, than the time of Diocleſian; but Mr Bruce obſerves, that this is contrary to the poſitive evidence of Abyſſinian hiſtory, which ſays expreſsly, that the epact was invented by

Mode of computing time.

Abyſſinia. Demetrius of Alexandria. This Demetrius was the 12th patriarch of Alexandria, and elected about the 190th year of Chriſt, or in the reign of Severus, and conſequently long before the time of Dioclesian. The Abyſſinians have another mode of computing time, that is peculiar to themſelves. They read the whole of the evangeliſts, in order, every year in their churches; and when they ſpeak of an event, they write or ſay, it happened in the days of Matthew; that is, in the firſt quarter of the year, whilſt they were reading the goſpel of St Matthew in their churches. They compute the time of the day in a very arbitrary manner. The twilight being very ſhort, is ſelected for the beginning of their day; this they call Naggé, which comprehends the duration of twilight. Méſet expreſſes the moment when the evening twilight begins. Mid-day is called Kater, which ſignifies culmination. All the other parts of time they deſcribe, in converſation, by pointing at the place in the heavens where the ſun was, when the event, which they are deſcribing, happened.

With regard to the manners of the Abyſſinians, they are repreſented by Mr Bruce as highly barbarous. Their continual warfare inures them to blood from their infancy; ſo that even children would not have the leaſt ſcruple at killing one another or grown up perſons if they were able. Many ſhocking inſtances of hardneſs of heart are related by our author in Teela Haimanout himſelf, though otherwiſe an accompliſhed prince. Their cruelty diſplays itſelf abundantly in the puniſhments inflicted upon criminals, one of which is flaying alive, as has been already related of Wooſheka. Cutting in pieces with a ſabre is another; and this is performed, not by executioners, whoſe employment is reckoned diſgraceful as in this country, but by officers and people of quality. So little is this thought of indeed in Gondar, the capital of the empire, that Mr Bruce happening to paſs by an officer employed in this work, who had three men to diſpatch, the officer called to him to ſtop till he had killed them all, as he wanted to ſpeak to him upon a matter of conſequence. Stoning to death is a capital puniſhment likewiſe common in this country; and uſually inflicted on Roman Catholics if they happen to be found, or upon other heretics in religion.

Manners of the Abyſſinians. Their horrid manner of feeding.

It is not to be ſuppoſed that people who regard the lives of one another ſo little, will ſhow much compaſſion to the brute creation. In this reſpect, however, the Abyſſinians are cruel and ſavage beyond all people on the face of the earth. There are many inſtances of people eating raw fiſh or fleſh, and we call them barbarous that do ſo; but what name ſhall we give to thoſe who cut off pieces of fleſh from animals while ſtill living, and eat it not only raw but ſtill quivering with life! Mr Bruce labours much to prove, that the way of eating not raw, but *living* fleſh, was cuſtomary among the nations of antiquity: but whatever be in this, he is the only author who mentions it directly; and it is on his ſingle teſtimony that the fact is eſtabliſhed. The Jeſuits mention in their books, that the Abyſſinians eat raw fleſh, but not a word of eating it in this manner; and indeed there are ſome circumſtances which he himſelf relates ſeemingly very difficult to be reconciled with known and indubitable facts. He informs us, for inſtance, that when at no great diſtance from Axum, the capital of Tigré, he fell in with three ſoldiers "driving a cow. They halted at a brook, threw down the beaſt, and one of them cut a pretty large collop of fleſh from its buttock; after which they drove the cow gently on as before." In another place he tells us, that the fleſh was taken from the upper part of the buttock; that the ſkin was flapped over the wound, faſtened with a ſkewer, and a cataplaſm of clay put over all. Now it is known to anatomiſts, that no piece of fleſh can be cut off without deſtroying a muſcle; and that the muſcles of the buttocks are ſubſervient to the motion of the legs. The Abyſſinians therefore muſt have been expert anatomiſts to know how to cut off ſuch muſcles as would allow the creature ſtill to go on; and if their repaſt had been two or three times repeated, it is plainly impoſſible that the cow could at any rate have ſtirred a ſtep. In his deſcription of their feaſts there is more conſiſtency; for there the animal is tied ſo that it cannot move: after ſtripping off the ſkin, the fleſh of the buttocks is cut off in ſolid ſquare pieces, without bones or much effuſion of blood; and the prodigious noiſe the animal makes is a ſignal for the company to ſit down to table. Every man ſits between two women, having a long knife in his hand. With this he cuts the fleſh, while the motion of its fibres is yet viſible, into pieces like dice. Theſe are laid upon pieces of bread made of the grain called *teff*, already mentioned, after being ſtrongly powdered with Cayenne pepper and foſſil ſalt. They are then rolled up like as many cartridges; the men open their mouths, ſtooping and gaping like idiots, while the women cram them ſo full of theſe cartridges, that they ſeem every moment in danger of being choked; and in proportion to the quantity their mouths can hold, and the noiſe they make in chewing, they are held in eſtimation by the company. All this time the animal bleeds but little: but when the large arteries are cut and it expires, the fleſh becomes tough; and the wretches who have the reſt to eat, gnaw it from the bones like dogs!

Abyſſinia. Abyſſinia.

ABYSSINIAN, in *Eccleſiaſtical Hiſtory*, is the name of a ſect, in the Chriſtian church, eſtabliſhed in the empire of Abyſſinia. The Abyſſinians are a branch of the Copts or Jacobites; with whom they agree in admitting but one nature in Jeſus Chriſt, and rejecting the council of Chalcedon: whence they are alſo called *Eutychians* or *Monophyſites*, and ſtand oppoſed to the Melchites. They are only diſtinguiſhed from the Copts, and other ſects of Jacobites, by ſome peculiar national uſages.—The Abyſſinian ſect or church is governed by a biſhop or metropolitan ſtyled *Abuna*, ſent them by the Coptic patriarch of Alexandria reſiding at Cairo, who is the only perſon that ordains prieſts. The next dignity is that of Komos, or Hegumenos, who is a kind of arch-preſbyter. They have canons alſo, and monks: the former of whom marry; the latter, at their admiſſion, vow celibacy, but with a reſervation: theſe, it is ſaid, make a promiſe aloud, before their ſuperior, to keep chaſtity; but add in a low voice, *as you keep it*. The emperor has a kind of ſupremacy in eccleſiaſtical matters. He alone takes cognizance of all eccleſiaſtical cauſes, except ſome ſmaller ones reſerved to the judges; and confers all benefices, except that of Abuna.

There are two claſſes of monks among the Abyſſinians; thoſe of Debra Libanos, and thoſe of St Euſtathius.

The

Abyſſinian. The latter are groſsly ignorant. Their head is the ſuperior of the convent of Mahebar Selaſſé, in the north-weſt part of Abyſſinia, near Kuara and the Shangalla, towards Sennaar and the river Dender. The chief of the former is the Itchegué, who is ordained in the following manner. Two chief prieſts hold a white cloth or veil, over his head, a third repeats a prayer, and then they all lay their hands on his head, and join together in ſinging pſalms. In turbulent times this Itchegué has more extenſive influence than even the Abuna.—The monks do not live in convents, but in ſeparate houſes round their church; and each cultivates for himſelf a portion of the land which is aſſigned them as their property.—The churches are built on eminences, in the vicinity of running water, for the advantage of purifications and ablutions, according to the Levitical law, and are ſurrounded with rows of Virginia cedar. They are circular buildings with conical ſummits and thatched roofs, and encompaſſed on the outſide with pillars of cedar, to which the roof projecting eight feet beyond the wall is fixed, and forms an agreeable walk in the hot or rainy ſeaſon. The internal partition and arrangement of the church, is that preſcribed by the Moſaic law; and many of the ceremonies and obſervances in their mode of worſhip, are obviouſly derived from the ceremonial rites of the Jewiſh religion.

The Abyſſinians have at different times expreſſed an inclination to be reconciled to the ſee of Rome; but rather out of intereſt of ſtate than any other motive. The emperor David, or the queen regent on his behalf, wrote a letter on this head to Pope Clement VII. full of ſubmiſſion, and demanding a patriarch from Rome to be inſtructed by: which being complied with, he publicly abjured the doctrine of Eutychius and Dioſcorus in 1626, and allowed the ſupremacy of the pope. Under the emperor Sultan Seghed all was undone again; the Romiſh miſſionaries ſettled there had their churches taken from them, and their new converts baniſhed or put to death. The congregation *de propaganda* have made ſeveral attempts to revive the miſſion, but to little purpoſe.—The doctrines and ritual of this ſectary form a ſtrange compound of Judaiſm, Chriſtianity, and ſuperſtition. They practiſe circumciſion; and are ſaid to extend the practice to the females as well as males: They obſerve both Saturday and Sunday as Sabbaths: they eat no meats prohibited by the law of Moſes: women are obliged to the legal purifications; and brothers marry their brothers wives, &c. On the other hand, they celebrate the epiphany with peculiar feſtivity, in memory of Chriſt's baptiſm; when they plunge and ſport in ponds and rivers; which has occaſioned ſome to affirm that they were baptized anew every year. Among the ſaints days is one conſecrated to Pilate and his wife; becauſe Pilate waſhed his hands before he pronounced ſentence on Chriſt, and his wife deſired him to have nothing to do with the blood of that juſt perſon. They have four lents: the great one commences ten days earlier then ours, and is obſerved with much ſeverity, many abſtaining therein even from fiſh, becauſe St Paul ſays there is one kind of fleſh of men, and another of fiſhes. They allow of divorce, which is eaſily granted among them, and by the civil judge; nor do their civil laws prohibit polygamy itſelf. They have at leaſt as many miracles and legends of ſaints as the Romiſh church; which proved no ſmall embarraſſment to the Jeſuit miſſionaries, to whom they produced ſo many miracles, wrought by their ſaints, in proof of their religion, and thoſe ſo well circumſtantiated and atteſted, that the Jeſuits were obliged to deny miracles to be any evidence of a true religion; and in proof hereof, to allege the ſame arguments againſt the Abyſſinians which Proteſtants in Europe allege againſt Papiſts. They pray for the dead, and invoke ſaints and angels; have ſo great a veneration for the virgin, that they charged the Jeſuits with not rendering her honour enough. They venerate images in painting; but abhor all thoſe in relievo, except the croſs. They hold that the ſoul of man is not created; becauſe, ſay they, God finiſhed all his works on the ſixth day. They admit the apocryphal books, and the canons of the apoſtles as well as the apoſtolical conſtitutions, for genuine. Their liturgy is given by Alvarez, and in Engliſh by Pagit; and their calendar by Ludolph.

Aca
||
Acacia.

ACA, Ace, or Acon, in *Ancient Geography*, a town of Phœnicia, on the Mediterranean; afterwards called *Ptolemais*; now *Acre*. See Acre.

ACACALOTL, the Braſilian name of a bird called by ſome *corvus aquaticus*, or the water raven: properly, the pelicanus carbo, or corvorant. See Ornithology *Index*.

ACACIA, Egyptian Thorn, or Binding Beantree, in *Botany*, a ſpecies of mimoſa, according to Linnæus; though other botaniſts make it a diſtinct genus. See Mimosa, Botany *Index*.

The flowers of a ſpecies of the acacia are uſed by the Chineſe in making that yellow which we ſee hears waſhing in their ſilks and ſtuffs, and appears with ſo much elegance in their painting on paper. The method is this:

They gather the flowers before they are fully open; theſe they put into a clean earthen veſſel over a gentle heat, and ſtir them continually about as they do the tea leaves, till they become dryiſh and of a yellow colour; then to half a pound of the flowers they add three ſpoonfuls of fair water, and after that a little more, till there is juſt enough to hold the flowers incorporated together; they boil this for ſome time, and the juice of the flowers mixing with the water, it becomes thick and yellow; they then take it from the fire, and ſtrain it through a piece of coarſe ſilk. To the liquor they add half an ounce of common alum, and an ounce of calcined oyſter ſhells reduced to a fine powder. All is then well mixed together; and this is the fine laſting yellow they have ſo long uſed.

The dyers of large pieces uſe the flowers and ſeeds of the acacia for dying three different ſorts of yellow. They roaſt the flowers, as before obſerved; and then mix the ſeeds with them, which muſt be gathered for this purpoſe when full ripe: by different admixture of theſe, they give the different ſhades of colour, only for the deepeſt of all they add a ſmall quantity of Brazil wood.

Mr Geoffroy attributes the origin of bezoar to the ſeeds of this plant; which being bruiſed by certain animals, and vellicating the ſtomach by their great ſourneſs and aſtringency, cauſe a condenſation of the juices, till at length they become coated over with a ſtony matter, which we call Bezoar.

Acacia || Acacius.

False Acacia. See Robinia, Botany *Index.*

Three-thorned Acacia, or *Honey-locuſt.* See Gleditsia, Botany *Index.*

Acacia, in the *Materia Medica*, the inſpiſſated juice of the unripe fruit of the *Mimosa Nilotica.*

The juice is brought to us from Egypt, in roundiſh maſſes, wrapt up in thin bladders. It is outwardly of a deep brown colour, inclining to black; inwardly of a reddiſh or yellowiſh brown; of a firm conſiſtence, but not very dry. It ſoon ſoftens in the mouth, and diſcovers a rough, not diſagreeable taſte, which is followed by a ſweetiſh reliſh. This inſpiſſated juice entirely diſſolves in watery liquors; but is ſcarce ſenſibly acted on by rectified ſpirit.

Acacia is a mild aſtringent medicine. The Egyptians give it in ſpitting of blood, in the quantity of a drachm, diſſolved in any convenient liquor; and repeat this doſe occaſionally: they likewiſe employ it in collyria for ſtrengthening the eyes, and in gargariſms for quinſeys. Among us, it is little otherwiſe uſed than as an ingredient in mithridate and theriaca, and is rarely met with in the ſhops. What is uſually ſold for the Egyptian acacia, is the inſpiſſated juice of unripe ſloes; this is harder, heavier, of a darker colour, and ſomewhat ſharper taſte, than the true ſort. See the next article.

German Acacia, the juice of unripe ſloes inſpiſſated nearly to dryneſs over a gentle fire, care being taken to prevent its burning. It is moderately aſtringent, ſimilar to the Egyptian acacia, for which it has been commonly ſubſtituted in the ſhops. It is given in fluxes, and other diſorders where ſtyptic medicines are indicated, from a ſcruple to a drachm.

Acacia, among antiquaries, ſomething reſembling a roll or bag, ſeen on medals, as in the hands of ſeveral conſuls and emperors. Some take it to repreſent a handkerchief rolled up, wherewith they made ſignals at the games; others a roll of petitions or memorials; and ſome, a purple bag full of earth, to remind them of their mortality.

ACACIANS, in eccleſiaſtical hiſtory, the name of ſeveral ſects of heretics; ſome of which maintained, that the Son was only a ſimilar, not the ſame, ſubſtance with the Father; and others, that he was not only a diſtinct but a diſſimilar ſubſtance. Two of theſe ſects had their denominations from Acacius biſhop of Cæſarea, who lived in the fourth century, and changed his opinions, ſo as, at different times, to be head of both. Another was named from Acacius patriarch of Conſtantinople, who lived in the cloſe of the fifth century.

ACACIUS, ſurnamed Luscus, becauſe he was blind of one eye, was biſhop of Cæſarea in Paleſtine, and ſucceeded the famous Euſebius: he had a great ſhare in the baniſhment of Pope Liberius, and bringing Felix to the ſee of Rome. He gave name to a ſect, and died about the year 365. He wrote the life of Euſebius, which is loſt, and ſeveral other works.

Acacius, *Saint*, biſhop of Amida in Meſopotamia, in 420, was diſtinguiſhed by his piety and charity. He ſold the plate belonging to his church, to redeem ſeven thouſand Perſian ſlaves who were periſhing with hunger. He gave each of them ſome money and ſent them home. Veranius their king was ſo affected with this noble inſtance of benevolence, that he deſired to ſee the biſhop; and this interview procured a peace between that prince and Theodoſius I.

Acad || Academic

There have been ſeveral other eminent perſons of the ſame name; particularly, a martyr under the emperor Decius: a patriarch of Antioch, who ſucceeded Baſil in 458, and died in 459: a biſhop of Miletum in the fifth century: a famous rhetorician in the reign of the emperor Julian: and, a patriarch of Conſtantinople in the fifth century; who was ambitious to draw the whole power and authority of Rome by degrees to Conſtantinople, for which he was excommunicated by Pope Felix II. He in his turn paſſed ſentence of excommunication againſt the pope. Still, however, he held his patriarchate till his death in 488.

ACAD, or Achad, in *Ancient Geography*, the town in which Nimrod reigned, called *Archad* by the Seventy; ſituated in Babylonia, to the eaſtward of the Tigris.

ACADEMICIAN, or Academist, a member of an academy. See Academy in the modern ſenſe.

ACADEMICS, or Academists, a denomination given to the cultivators of a ſpecies of philoſophy originally derived from Socrates, and afterwards illuſtrated and enforced by Plato, who taught in a grove near Athens, conſecrated to the memory of Academus, an Athenian hero; from which circumſtance this philoſophy received the name of *Academical.* Before the days of Plato, philoſophy had in a great meaſure fallen into contempt. The contradictory ſyſtems and hypotheſes which had ſucceſſively been urged upon the world were become ſo numerous, that, from a view of this inconſtancy and uncertainty of human opinions, many were led to conclude, that truth lay beyond the reach of our comprehenſion. Abſolute and univerſal ſcepticiſm was the natural conſequence of this concluſion. In order to remedy this abuſe of philoſophy and of the human faculties, Plato laid hold of the principles of the academical philoſophy; and, in his Phædo, reaſons in the following manner: "If we are "unable to diſcover truth (ſays he), it muſt be owing "to two circumſtances: either there is no truth in "the nature of things; or the mind, from a defect "in its powers, is not able to apprehend it. Upon the "latter ſuppoſition, all the uncertainty and fluctuation "in the opinions and judgements of mankind admit of "an eaſy ſolution: Let us therefore be modeſt, and "aſcribe our errors to the real weakneſs of our own "minds, and not to the nature of things themſelves. "Truth is often difficult of acceſs: in order to come "at it, we muſt proceed with caution and diffidence, "carefully examining every ſtep; and, after all our "labour, we will frequently find our greateſt efforts "diſappointed, and be obliged to confeſs our ignorance and weakneſs."

Labour and caution in their reſearches, in oppoſition to raſh and haſty deciſions, were the diſtinguiſhing characteriſtics of the diſciples of the ancient academy A philoſopher, poſſeſſed of theſe principles, will be ſlow in his progreſs; but will ſeldom fall into errors, or have occaſion to alter his opinion after it is once formed. Vanity and precipitance are the great ſources of ſcepticiſm: hurried on by theſe, inſtead of attending to the cool and deliberate principles recommended by the academy, ſeveral of our modern philoſophers have plunged themſelves into an abſurd and ridiculous kind of ſcepticiſm. They pretend to diſcredit ſubjects that

are.

Academy. are plain, ſimple, and eaſily comprehended: but give peremptory and deciſive judgements upon things that evidently exceed the limits of our capacity. Of theſe, Berkeley and Hume are the moſt conſiderable. Berkeley denied the exiſtence of every thing, excepting his own ideas. Mr Hume has gone a ſtep further, and queſtioned even the exiſtence of ideas; but at the ſame time has not heſitated to give determined opinions with regard to eternity, providence, and a future ſtate, miraculous interpoſitions of the Deity, &c. ſubjects far above the reach of our faculties. In his eſſay on the academical or ſceptical philoſophy, he has confounded two very oppoſite ſpecies of philoſophy. After the days of Plato, indeed, the principles of the firſt academy were groſsly corrupted by Arceſilas, Carneades, &c. This might lead Mr Hume into the notion that the *academical* and *ſceptical* philoſophy were ſynonymous terms. But no principles can be of a more oppoſite nature than thoſe which were inculcated by the old academy of Socrates and Plato, and the ſceptical notions which were propagated by Arceſilas, Carneades, and the other diſciples of the ſucceeding academies.

ACADEMY, in antiquity, a garden, villa, or grove, ſituated within a mile of Athens, where Plato and his followers held their philoſophical conferences. It took its name from one Academus, or Ecademus, who was the original owner of it, and made it a kind of gymnaſium. He lived in the time of Theſeus; and, after his death, it retained his name, and was conſecrated to his memory. Cimon embelliſhed it with fountains, trees, and walks; but Sylla, during the ſiege of Athens, employed theſe very trees in making battering engines againſt the city. Cicero too had his villa, or place of retirement, near Puzzuoli, which he alſo named an *academy*, where he compoſed his *Academical Queſtions*, and his book *De Natura Deorum*.

ACADEMY, among the moderns, is moſt commonly uſed to ſignify a SOCIETY of learned men, eſtabliſhed for the improvement of any art or ſcience, and generally under the protection of a prince. Ptolemy Soter, for the encouragement and improvement of the liberal arts in his dominions, founded an academy at Alexandria, and provided it with a collection of books which was the foundation of the Alexandrian library.

Theodoſius the younger eſtabliſhed an academy at Conſtantinople, and appointed profeſſors of every ſcience, with the view of making it a rival inſtitution to that at Rome; which, with the other literary ſeminaries, had been deſtroyed by the Goths about the end of the fourth and the beginning of the fifth centuries.

The firſt academy we read of was eſtabliſhed by Charlemagne, at the inſtigation of ALCUIN. It was compoſed of the chief wits of the court, the emperor himſelf being a member. In their academical conferences, every perſon was to give an account of what ancient authors he had read; and each even aſſumed the name of ſome ancient author who pleaſed him moſt, or ſome celebrated perſon of antiquity. Alcuin, from whoſe letters we learn theſe particulars, took that of Flaccus, the ſurname of Horace: a young lord, named Augilbert took that of Homer: Adelard, biſhop of Corbie, was called Auguſtine: Ricul'e, biſhop of Mentz, was Dametas; and the king himſelf, David. This ſhows the miſtake of ſome modern writers, who relate, that it was in conformity with the genius of the learned men of thoſe times, who were great admirers of Roman names, that Alcuin took the name of Flaccus Albinus. Academy.

Moſt nations have now their academies; but Italy has the greateſt number. Many flouriſhing academies exiſted in France before the revolution. Moſt of them were eſtabliſhed by Louis XIV. We have but few in Britain; and thoſe of chiefeſt note go by a different name, viz. SOCIETY.

In giving an account of the principal academies, it ſeems moſt proper to arrange them according to their ſubjects.

I. *MEDICAL Academies*, as that of the Naturæ Curioſi in Germany; that founded at Palermo in 1645; another at Venice in 1701, which meets weekly in a hall near the grand hoſpital; another at Geneva in 1715, in the houſe of M. le Clerc. The colleges of phyſicians at London and Edinburgh, are alſo, by ſome, ranked in the number of *academies*.

The *Academy of Naturæ Curioſi*, called alſo the *Leopoldine Academy*, was founded in 1652 by Jo. Laur. Bauſchius, a phyſician; who, in imitation of the Engliſh, publiſhed an invitation to all phyſicians to communicate their extraordinary caſes; and, meeting with ſucceſs, was elected preſident. Their works were at firſt publiſhed ſeparately; but in 1670 a new ſchēme was laid for publiſhing a volume of obſervations every year. The firſt volume appeared in 1684, under the title of *Ephemerides*, and the work has been continued with ſome interruptions and variations of the title, &c. In 1687, the emperor Leopold took the ſociety under his protection, granting the members ſeveral privileges, particularly that their preſidents ſhould be counts palatine of the holy Roman empire. This academy has no fixed reſidence, or regular aſſemblies: inſtead of theſe, there is a kind of bureau, or office, firſt eſtabliſhed at Breſlau, and afterwards removed to Nuremberg, where letters, obſervations, &c. from correſpondents or members are taken in. The academy conſiſts of a preſident, two adjuncts or ſecretaries, and colleagues or members without reſtriction. The colleagues, at their admiſſion, oblige themſelves to two things; firſt, to chuſe ſome ſubject out of the animal, vegetable, or mineral kingdom, for diſcuſſion, provided it had not been treated of by any colleague before; the ſecond, to apply themſelves to furniſh materials for the Annual Ephemerides. Each member to bear a ſymbol of the academy; viz. a gold ring; whereon, inſtead of a ſtone, is a book open, and, on the face thereof, an eye; on the other ſide the motto of the academy, *Nunquam otioſus*.

II. *CHIRURGICAL Academies*; as that inſtituted ſome years ago, by public authority, at Paris: the members of which were not only to publiſh their own and correſpondents obſervations and improvements; but to give an account of all that is publiſhed on ſurgery, and to compoſe a complete hiſtory of the art, by their extracts from all the authors ancient and modern who have wrote on it. A queſtion in ſurgery was annually propoſed by the academy, and a gold medal of 200 livres value was given to the ſucceſsful competitor.

Academy of Surgery at Vienna, was inſtituted ſome years ago by the preſent emperor, under the direction

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Academies of the celebrated Brambilla. In this there were at first only two profeſſors; and to their charge the inſtruction of 130 young men was committed, 30 of whom had formerly been ſurgeons in the army. But of late the number both of the teachers and pupils has been conſiderably increaſed. Gabrieli has been appointed to teach pathology and practice; Boecking, anatomy, phyſiology, and phyſics; Streit, medical and pharmaceutical ſurgery; Hunczowſky, ſurgical operations, midwifery, and the chirurgia forenſis; and Plenk, chemiſtry and botany. To theſe alſo has been added, Beindl as profector and extraordinary profeſſor of ſurgery and anatomy. Beſides this, the emperor, with his uſual liberality, has provided a large and ſplendid edifice in Vienna, which affords habitation both for the teachers, the ſtudents, pregnant women, patients for clinical lectures, and ſervants. He has alſo purchaſed for the uſe of this academy a medical library, which is open every day; a complete ſet of chirurgical inſtruments; an apparatus for experiments in natural philoſophy; a collection of natural hiſtory; a number of anatomical and pathological preparations; a collection of preparations in wax brought from Florence; and a variety of other uſeful articles. Adjoining to the building alſo there is a good botanical garden.

Among other parts of this inſtitution, three prize medals, each of the value of 40 florins, are to be annually beſtowed on thoſe ſtudents who return the beſt anſwer to queſtions propoſed the year before. Theſe prizes are not entirely founded by the emperor, but are in part owing to the liberality of Brendellius, the protochirurgus at Vienna.

III. *Ecclesiastical Academies*; as that at Bologna in Italy, inſtituted in 1687, employed in the examination of the doctrine, diſcipline, and hiſtory, of each age of the church.

IV. *Cosmographical Academies*; as that at Venice, called the *Argonauts*. This was inſtituted at the ſolicitation of F. Coronelli, for the improvement of geographical knowledge. Its deſign was to publiſh exact maps, both celeſtial and terreſtrial, as well particular as general, together with geographical, hiſtorical, and aſtronomical deſcriptions. Each member, in order to defray the expence of ſuch a publication, was to ſubſcribe a proportional ſum, for which they were to receive one or more copies of each piece publiſhed. For this end three ſocieties are ſettled; one under F. Moro, provincial of the Minorites in Hungary; another under the Abbot Laurence au Ruy Payenne au Marais; the third under F. Baldigiani, Jeſuit profeſſor of mathematics in the Roman college. The device of this academy is the terraqueous globe, with the motto *Plus ultra*; and at its expence all the globes, maps and geographical writings, of F. Coronelli have been publiſhed.

V. *Academies of Sciences*—Theſe comprehend ſuch as are erected for improving natural and mathematical knowledge. They are otherwiſe called *Philoſophical* and *Phyſical* academies.

The firſt of theſe was inſtituted at Naples, about the year 1560, in the houſe of Baptiſta Porta. It was called the Academy *Secretorum Naturæ*; and was ſucceeded by the Academy of *Lyncei*, founded at Rome by Prince Frederic Ceſi, towards the end of that century. Several of the members of this academy rendered it famous by their diſcoveries; among theſe was the celebrated Galileo. Several other academies were inſtituted about that time, which contributed greatly to the advancement of the ſciences; but none of them comparable to that of the *Lyncei*. Academies.

Some years after the death of Torricelli, the *Academy del Cemento* made its appearance, under the protection of Prince Leopold, afterwards Cardinal de Medicis. Redi was one of its chief members: and the ſtudies purſued by the reſt may be collected from thoſe curious experiments publiſhed in 1667, by their ſecretary Count Laurence Magulotti, under the title of *Saggi di Naturali Eſperienze*; a copy of which was preſented to the Royal Society, tranſlated into Engliſh by Mr Waller, and publiſhed at London in 4to.

The *Academy degl'Inquieti*, afterwards incorporated into that of Della Tracia in the ſame city, followed the example of that of Del Cimento. Some excellent diſcourſes on phyſical and mathematical ſubjects, by Geminiano Montenari, one of the chief members, were publiſhed in 1667, under the title of *Penſieri Fiſico-Matematici*.

The *Academy of Roſſano*, in the kingdom of Naples, was originally an academy of belles lettres, founded in 1540, and transformed into an academy of ſciences in 1695 at the ſolicitation of the learned abbot Don Giacinto Gimma; who being made preſident, under the title of Promoter General thereof, gave them a new ſet of regulations. He divided the academiſts into the following claſſes: Grammarians, Rhetoricians, Poets, Hiſtorians, Philoſophers, Phyſicians, Mathematicians, Lawyers, and Divines, with a claſs apart for cardinals and perſons of quality. To be admitted a member, a man muſt have ſome degrees in the faculty. The members are not allowed to take the title of *Academiſts* in the beginning of their books, without a written permiſſion from their preſident, which is not granted till the work has been examined by the cenſors of the academy; and the permiſſion is the greateſt honour the academy can confer, as they thereby adopt the work, and are anſwerable for it againſt all criticiſms that may be made upon it. To this law the preſident or promoter himſelf is ſubject; and no academiſt is allowed to publiſh any thing againſt the writings of another without leave from the ſociety.

Several other academies of *Sciences* have been founded in Italy; but, for want of being ſupported by princes, did not continue long. The loſs of them, however, was abundantly repaired by the inſtitution of others ſtill ſubſiſting: ſuch as, the *Academy of Filarmonici* at Verona; of *Ricovatri* at Padua, where a learned diſcourſe on the origin of ſprings was delivered by Sig. Vallifnieri, firſt profeſſor of phyſic in the univerſity of that city, and which was afterwards printed. To the Academy of the *Muti de Reggio*, at Modena, the ſame Sig. Vallifnieri preſented an excellent diſcourſe on the ſcale of created beings, ſince inſerted in his hiſtory of the generation of man and animals, printed at Venice in the year 1721.

F. Merſenne is ſaid to have given the firſt idea of a philoſophical academy in France, towards the beginning of the 17th century, by the conferences of naturaliſts and mathematicians occaſionally held at his lodgings; at which Gaſſendi, Des Cartes, Hobbes, Roberval, Paſcal, Blondel, and others aſſiſted. F. Merſenne

Academies. ſenne propoſed to each certain problems to examine, or certain experiments to be made. Theſe private aſſemblies were ſucceeded by more public ones, formed by Mr Montmort, and Mr Thevenot the celebrated traveller. The French example animated ſeveral Engliſhmen of diſtinction and learning to erect a kind of philoſophical academy at Oxford, towards the cloſe of Oliver Cromwell's adminiſtration; which, after the Reſtoration, was erected into a Royal Society. See SOCIETY. The Engliſh example, in its turn, animated the French. Louis XIV. in 1666, aſſiſted by the counſels of M. Colbert, founded an academy of ſciences at Paris, with a ſufficient revenue to defray the charge of experiments, and ſalaries to the members.

Royal Academy of Sciences. After the peace of the Pyrenees, Louis XIV. being deſirous of eſtabliſhing the arts, ſciences, and literature, upon a ſolid foundation, directed M. Colbert to form a ſociety of men of known abilities and experience in the different branches, who ſhould meet together under the king's protection, and communicate their reſpective diſcoveries. Accordingly M. Colbert, having conferred with thoſe who were at that time moſt celebrated for their learning, reſolved to form a ſociety of ſuch perſons as were converſant in natural philoſophy and mathematics, to join to them other perſons ſkilled in hiſtory and other branches of erudition, along with thoſe who were entirely engaged in what are called the *Belles Lettres*, grammar, eloquence, and poetry. The geometricians and natural philoſophers were ordered to meet on Tueſdays and Saturdays, in a great hall of the king's library, where the books of mathematics and natural philoſophy were contained; the learned in hiſtory to aſſemble on Mondays and Thurſdays, in the hall where the books of hiſtory were contained; and the claſs of belles lettres to aſſemble on Wedneſdays and Fridays. All the different claſſes were likewiſe ordered to meet together upon the firſt Thurſday of every month; and, by their reſpective ſecretaries, make a report of the proceedings of the foregoing month.

In a ſhort time, however, the claſſes of hiſtory, belles lettres, &c. were united to the *French* Academy, which was originally inſtituted for the improvement and refining the French language: ſo that the Royal Academy contained only two claſſes, viz. that of natural philoſophy and mathematics.

In the 1696, the king, by a proclamation dated the 26th of January, gave this academy a new form, and put it upon a more reſpectable footing. It was now to be compoſed of four kinds of members, viz. *honorary*, *penſionary*, *aſſociates*, and *eleves*. Theſe laſt were a kind of pupils, or ſcholars, one of whom was attached to each of the penſionaries. The firſt claſs to contain ten perſons, and each of the reſt twenty. The honorary academiſts to be all inhabitants of France; the penſionaries all to reſide at Paris: eight of the aſſociates allowed to be foreigners; and the eleves all to live at Paris. The officers to be, a preſident named by the king, out of the claſs of honorary academiſts; and a ſecretary and treaſurer to be perpetual. Of the penſionaries, three to be geometricians, three aſtronomers, three mechanics, three anatomiſts, three chemiſts, three botaniſts, and the remaining two to be ſecretary and treaſurer. Of the twelve aſſociates, two to apply themſelves to geometry, two to botany, and two to chemiſtry. The eleves to apply themſelves to the ſame kind of ſcience with the penſionaries they were attached to; and not to ſpeak, except when called by the preſident. No regular or religious to be admitted, except into the claſs of honorary academiſts; nor any perſon to be admitted either for aſſociate or penſionary, unleſs known by ſome conſiderable printed work, ſome machine, or other diſcovery. The aſſemblies were held on Wedneſdays and Saturdays, unleſs either of them happened to be a holiday, and then the aſſembly was held on the preceding day. To encourage the members to purſue their labours, the king engaged not only to pay the ordinary penſions, but even to give extraordinary gratifications according to the merit of their reſpective performances; furniſhing withal the expence of the experiments and other inquiries neceſſary to be made. If any member gave in a bill of charges of experiments he had made, or deſired the printing of any book, and brought in the charges of graving, the money was immediately paid by the king, upon the preſident's allowing and ſigning the bill. So if an anatomiſt required live tortoiſes, for inſtance, for making experiments about the heart, &c. as many as he pleaſed were brought him at the king's charge. Their motto was *Invenit et perfecit.* Academies.

In the year 1716, the duke of Orleans, then regent, made an alteration in their conſtitution; augmenting the number of honoraries, and of aſſociates capable of being foreigners, to 12; admitting regulars among ſuch aſſociates; and ſuppreſſing the claſs of eleves, as it appeared to be attended with ſome inconveniences, particularly that of making too great an inequality among the academiſts, and being productive of ſome miſunderſtandings and animoſities among the members. At the ſame time he created other two claſſes; one conſiſting of 12 adjuncts, who, as well as the aſſociates, were allowed a deliberative voice in matters relative to ſcience; and the other ſix free aſſociates, who were not attached to any particular ſcience, nor obliged to purſue any particular work.

Since its re-eſtabliſhment in 1699, this academy has been very exact in publiſhing, every year, a volume containing either the works of its own members, or ſuch memoirs as have been compoſed and read to the academy during the courſe of that year. To each volume is prefixed the hiſtory of the academy, or an extract of the memoirs, and, in general, of whatever has been read or ſaid in the academy; at the end of the hiſtory, are the eulogiums on ſuch academiſts as have died that year. M. Rouille de Meſlay, counſellor to the parliament of Paris, founded two prizes, one of 2500, and the other of 2000 livres, which were alternately diſtributed by the parliament every year: the ſubject for the firſt muſt relate to phyſical aſtronomy, and thoſe for the latter to navigation and commerce.

Notwithſtanding the advantages which the members of this academy enjoyed over others, in having their expences defrayed, and even being paid for their time and attendance, they had fallen under ſome imputations, particularly that of plagiariſm, or borrowing their neighbours inventions; but with what juſtice we do not ſay. This academy was ſuppreſſed and aboliſhed by the convention in 1793; and other inſtitutions have been eſtabliſhed. See INSTITUTE.

The French had alſo conſiderable academies in moſt of

Academies. of their great cities: as, at Montpelier, a royal academy of ſciences on the like footing as that at Paris, being as it were a counterpart thereof; at Thouloufe, an academy under the denomination of Lanterniſts; others at Niſmes, Arles, Lyons, Dijon, Bourdeaux, &c. Academie

The Royal Academy of Sciences at Berlin was founded in 1700, by Frederic II. king of Pruſſia, on the model of that of England; excepting that, beſides natural knowledge, it likewiſe comprehends the belles lettres. In 1710, it was ordained that the preſident ſhall be one of the counſellors of ſtate, and nominated by the king. The members were divided into four claſſes; the firſt for proſecuting phyſics, medicine, and chemiſtry; the ſecond for mathematics, aſtronomy, and mechanics; the third for the German language and the hiſtory of the country; the fourth for oriental learning, particularly as it may concern the propagation of the goſpel among infidels. Each claſs to elect a director for themſelves, who ſhall hold his poſt for life. The members of any of the claſſes have free admiſſion into the aſſemblies of any of the reſt.

The great promoter of this inſtitution was the celebrated Mr Leibnitz, who accordingly was made the firſt director. The firſt volume of their tranſactions was publiſhed in 1710, under the title of *Miſcellanea Berolinenſia;* and though they received but few marks of the royal favour for ſome time, they continued to publiſh new volumes in 1723, 1727, 1734, and 1740. At laſt, however, Frederic III. the late king of Pruſſia, gave new vigour to this academy, by inviting to Berlin ſuch foreigners as were moſt diſtinguiſhed for their merit and literature, and encouraged his ſubjects to proſecute the ſtudy and cultivation of the ſciences by giving ample rewards; and thinking that the academy, which till that time had had ſome miniſter or opulent nobleman for its preſident, would find an advantage in having a man of letters at its head, he conferred that honour on M. Maupertuis. At the ſame time, he gave a new regulation to the academy, and took upon himſelf the title of its protector.

The academiſts hold two public aſſemblies annually; one in January, on the late king's birth day; and the other on May, on the day of his acceſſion to the throne. At the latter of theſe is given, as a prize, a gold medal of 50 ducats value: the ſubject for this prize is ſucceſſively natural philoſophy, mathematics, metaphyſics, and erudition.

The Imperial Academy of Sciences at Peterſburgh was projected by Czar Peter the Great. That great monarch having, during his travels, obſerved the advantage of public ſocieties for the encouragement and promotion of literature, formed the deſign of founding an academy of ſciences at St Peterſburgh. By the advice of Wolf and Leibnitz, whom he conſulted on this occaſion, the ſociety was regulated, and ſeveral learned foreigners were invited to become members. Peter himſelf drew the plan, and ſigned it on the 10th of February 1724; but was prevented, by the ſuddenneſs of his death, from carrying it into execution. His deceaſe, however, did not prevent its completion: for on the 21ſt of December 1725, Catharine I. eſtabliſhed it according to Peter's plan; and on the 27th of the ſame month the ſociety was firſt aſſembled. On the 1ſt of Auguſt 1726, Catharine honoured the meeting with her preſence, when Profeſſor Bulfinger, a German naturaliſt of great eminence, pronounced an oration upon the advances made by the loadſtone and needle for the diſcovery of the longitude.

The empreſs ſettled a fund of 4982l. *per annum* for the ſupport of the academy; and fifteen members, all eminent for their learning and talents, were admitted and penſioned, under the title of Profeſſors in the various branches of literature and ſcience. The moſt diſtinguiſhed of theſe profeſſors were Nicholas and Daniel Bernoulli, the two De Liſles, Bulfinger, and Wolf.

During the ſhort reign of Peter II. the ſalaries of the members were diſcontinued, and the academy was utterly neglected by the court; but it was again patroniſed by the empreſs Anne, who even added a ſeminary for the education of youth, under the ſuperintendence of the profeſſors. Both inſtitutions flouriſhed for ſome time under the direction of Baron Korf; but upon his death, towards the latter end of Anne's reign, an ignorant perſon being appointed preſident, many of the moſt able members quitted Ruſſia. At the acceſſion of Elizabeth, new life and vigour were again reſtored to the academy: the original plan was enlarged and improved; ſome of the moſt learned foreigners were again drawn to Peterſburgh; and, what was conſidered as a good omen for the literature of Ruſſia, two natives, Lomonoſof and Rumovſky, men of genius and abilities, who had proſecuted their ſtudies in foreign univerſities, were enrolled among its members. The annual income was increaſed to 10,659l. and ſoon afterwards the new inſtitution took place.

The late empreſs Catharine II. with her uſual zeal for promoting the diffuſion of knowledge, took this uſeful ſociety under her more immediate protection. She altered the court of directors greatly to the advantage of the whole body; corrected many of its abuſes, and infuſed a new vigour and ſpirit into their reſearches. By her majeſty's particular recommendation the moſt ingenious profeſſors viſited the various provinces of her vaſt dominions; and as the fund of the academy was not ſufficient to ſupply the whole expence of theſe ſeveral expeditions, the empreſs beſtowed a largeſs of 2000l. which ſhe renewed as occaſion required.

The purpoſe and intent of theſe travels will appear from the inſtructions given by the academy to the ſeveral perſons who were engaged in them. They were ordered to purſue their inquiries upon the different ſorts of earths and waters; upon the beſt methods of cultivating the barren and deſert ſpots; upon the local diſorders incident to men and animals, and the moſt efficacious means of relieving them; upon the breeding of cattle, and particularly of ſheep; on the rearing of bees and ſilk worms; on the different places and objects for fiſhing and hunting; on minerals; on the arts and trades, and on forming a *Flora Ruſſica*, or collection of indigenous plants; they were particularly inſtructed to rectify the longitude and latitude of the principal towns; to make aſtronomical, geographical, and meteorological obſervations; to trace the courſe of the rivers; to take the moſt exact charts; and to be very diſtinct and accurate in remarking and deſcribing the manners and cuſtoms of the different people, their dreſſes, languages, antiquities, traditions, hiſtory, religion;

Academies. gion; and, in a word, to gain every information which might tend to illuſtrate the real ſtate of the whole Ruſſian empire.

In conſequence of theſe expeditions, perhaps no country can boaſt, within the ſpace of ſo few years, ſuch a number of excellent publications on its internal ſtate, on its natural productions, on its topography, geography, and hiſtory, on the manners, cuſtoms, and languages of the different people, as have iſſued from the preſs of this academy.

The firſt tranſactions of this ſociety were publiſhed in 1728, and entitled *Commentarii Academiæ Scientiarum Imperialis Petropolitanæ ad ann.* 1726, with a dedication to Peter II. The publication was continued under this form until the year 1747, when its tranſactions were called *Novi Commentarii Academiæ*, &c. In 1777 the academy again changed the title into *Acta Academiæ Scientiarum Imperialis Petropolitanæ*, and likewiſe made ſome alteration in the arrangement and plan of the work. The papers, which had been hitherto publiſhed in the Latin tongue, are now written either in that language or French; and a preface is added, ſtyled *Partie Hiſtorique*, which contains an account of its proceedings, meetings, admiſſion of new members, and other remarkable occurrences. Of the Commentaries, 14 volumes were publiſhed: the firſt of the New Commentaries made its appearance in 1750, and the twentieth in 1776. Under the new title of *Acta Academiæ*, ſeveral volumes have been given to the public, and two are printed every year. Theſe tranſactions abound with ingenious and elaborate diſquiſitions upon various parts of ſcience and natural hiſtory, and which reflect the greateſt honour upon their authors; and it may not be an exaggeration to aſſert, that no ſociety in Europe has more diſtinguiſhed itſelf for the excellence of its publications, and particularly in the more abſtruſe parts of the pure and mixed mathematics.

The academy is ſtill compoſed, as at firſt, of fifteen profeſſors, beſides the preſident and director. Each of theſe profeſſors has a houſe and an annual ſtipend from 200l. to 600l. Beſide the profeſſors, there are four adjuncts, who are penſioned, and who are preſent at the ſittings of the ſociety, and ſucceed to the firſt vacancies. The direction of the academy is at preſent conſigned to the princeſs Daſhkof.

The building and apparatus of this academy are extraordinary. There is a fine library, conſiſting of 36,000 curious books and manuſcripts. There is an extenſive muſeum, in which the various branches of natural hiſtory, &c. are diſtributed in different apartments: it is extremely rich in native productions, having been conſiderably augmented with a variety of ſpecimens collected by Pallas, Gmelin, Guldenſtaedt, and other learned profeſſors, during their late expeditions through the Ruſſian empire. The ſtuffed animals and birds occupy one apartment. The chamber of rarities, the cabinet of coins, &c. contain innumerable articles of the higheſt curioſity and value. The ſociety has this modeſt motto, *Paulatim*.

The Academy of Sciences at Bologna, called the *Inſtitute of Bologna*, was founded by Count Marſigli in 1712, for the cultivating of phyſics, mathematics, medicine, chemiſtry, and natural hiſtory. Its hiſtory is written by M. de Limiers, from memoirs furniſhed by the founder himſelf. Academies.

The Academy of Sciences at Stockholm, or *Royal Swediſh Academy*, owes its inſtitution to ſix perſons of diſtinguiſhed learning, amongſt whom was the celebrated Linnæus: they originally met on the 2d of June 1739; formed a private ſociety, in which ſome diſſertations were read; and in the latter end of the ſame year their firſt publication made its appearance. As the meetings continued and the members increaſed, the ſociety attracted the notice of the king, and was, on the 31ſt of March 1741, incorporated under the name of the Royal Swediſh Academy. Not receiving any penſion from the crown, it is only under the protection of the king, being directed, like our Royal Society, by its own members. It has now a large fund, which has chiefly ariſen from legacies and other donations; but a profeſſor of experimental philoſophy, and two ſecretaries, are ſtill the only perſons who receive any ſalaries. Each of the members reſident at Stockholm becomes preſident by rotation, and continues in office during three months. There are two ſpecies of members, native and foreign: the election of the former is held in April, and of the latter in July: no money is paid at the time of admiſſion. The diſſertations read at each meeting are collected and publiſhed four times in the year; they are written in the Swediſh language, and printed in octavo; and the annual publications make a volume. The firſt 40 volumes, which were finiſhed in 1779, are called the Old Tranſactions; for in the following year the title was changed into that of New Tranſactions. The king is ſometimes preſent at the ordinary meetings, and particularly at the annual aſſembly in April for the election of members. Any perſon who ſends a treatiſe which is thought worthy of being printed, receives the Tranſactions for that quarter *gratis*, and a ſilver medal, which is not eſteemed for its value, being worth only three ſhillings, but for its rarity and the honour conveyed by it. All the papers relating to agriculture are publiſhed ſeparately under the title of *Oeconomica Acta*. Annual premiums, in money and gold medals, principally for the encouragement of agriculture and inland trade, are alſo diſtributed by the academy. The fund for theſe prizes is ſupplied from private donations.

The Royal Academy of Sciences at Copenhagen owes its inſtitution to the zeal of ſix literati, whom Chriſtian VI. in 1742, ordered to arrange his cabinet of medals. The count of Holſtein was the firſt preſident; and the ſix perſons who firſt formed the deſign, were John Gram, Joachim Frederic Ramus, Chriſtian Louis Scheid, Mark Woldickey, Eric Pontopidan, and Bernard Moelman. Theſe perſons occaſionally meeting for that purpoſe, extended their deſigns; aſſociated with them others who were eminent in ſeveral branches of ſcience; and forming a kind of literary ſociety, employed themſelves in ſearching into, and explaining the hiſtory and antiquities of their country. The count of Holſtein warmly patronized this ſociety, and recommended it ſo ſtrongly to Chriſtian VI. that, in 1743, his Daniſh majeſty took it under his protection, called it the Royal Academy of Sciences, endowed it with a fund, and ordered the members to join to their former purſuits, natural hiſtory, phyſics, and mathe-

Academies. matics. In consequence of the royal favour, the members engaged with fresh zeal in their pursuits; and the academy has published 15 volumes in the Danish language, some of which have been translated into Latin.

The *American Academy of Sciences*, was established in 1780 by the council and house of representatives in the province of Massachuset's Bay, for promoting the knowledge of the antiquities of America, and of the natural history of the country; for determining the uses to which its various natural productions might be applied; for encouraging medicinal discoveries, mathematical disquisitions, philosophical inquiries and experiments, astronomical, meteorological, and geographical observations, and improvements in agriculture, manufactures, and commerce; and, in short, for cultivating every art and science which may tend to advance the interest, honour, dignity, and happiness of a free, independent, and virtuous people. The members of this academy are never to be more than 200, nor less than 40.

Royal Irish Academy arose out of a society established at Dublin, about the year 1782, and consisting of a number of gentlemen, most of whom belonged to the university. They held weekly meetings, and alternately read essays on various subjects. The members of this society afterwards formed a more extensive plan, and admitting only such names as might add dignity to their new institution, became the founders of the *Royal Irish Academy*, which professes to unite the advancement of science with the history of mankind and polite literature. The first volume of their transactions for 1787 appeared in 1788, and seven volumes have been since published. A society was formed in Dublin, similar to the Royal Society in London, as early as the year 1683; but the distracted state of the country was unpropitious to the cultivation of philosophy and literature. The plan was resumed about the beginning of the present century, and the earl of Pembroke, then lord lieutenant, was president of a philosophical society established in Dublin college. In the year 1740, there was instituted a Physico-historical Society; of which two volumes of minutes are extant: but this society soon declined.

VI. *Academies or Schools of Arts*; as that at Peterfburgh, which was established by the empress Elizabeth, at the suggestion of Count Shuvalof, and annexed to the Academy of Sciences: the fund was 4000l. per annum, and the foundation for 40 scholars. The late empress formed it into a separate institution, enlarged the annual revenue to 12,000l. and augmented the number of scholars to 300; she also constructed, for the use and accommodation of the members, a large circular building, which fronts the Neva. The scholars are admitted at the age of six, and continue until they have attained that of 18: they are clothed, fed, and lodged, at the expence of the crown. They are all instructed in reading and writing, arithmetic, the French and German languages, and drawing. At the age of 14 they are at liberty to choose any of the following arts, divided into four classes: 1. Painting in all its branches, of history, portraits, battles, and landscapes; architecture; mosaic; enamelling, &c. 2. Engraving on copperplates, seal-cutting, &c. 3. Carving on wood, ivory, and amber. 4. Watch making, turning, instrument-making, casting statues in bronze and other metals, imitating gems and medals in paste and other compositions, gilding, and varnishing. Prizes are annually distributed to those who excel in any particular art; and from those who have obtained four prizes, twelve are selected, who are sent abroad at the charge of the empress. A certain sum is paid to defray their travelling expences; and when they are settled in any town, they receive an annual salary of 60l. which is continued during four years. There is a small assortment of paintings for the use of the scholars; and those who have made great progress are permitted to copy the pictures in the empress's collection. For the purpose of design, there are models in plaster of the best antique statues in Italy, all done at Rome, of the same size with the originals, which the artists of the academy were employed to cast in bronze. Academ

The *Royal Academy of Arts in London*, was instituted for the encouragement of *Designing*, *Painting*, *Sculpture*, &c. &c. in the year 1768. This academy is under the immediate patronage of the king, and under the direction of 40 artists of the first rank in their several professions. It furnishes, in winter, living models of different characters to draw after; and in summer, models of the same kind to paint after. Nine of the ablest academicians are annually elected out of the 40, whose business is to attend by rotation, to set the figures, to examine the performance of the students, and to give them necessary instructions. There are likewise four professors, of *Painting*, of *Architecture*, of *Anatomy*, and of *Perspective*, who annually read public lectures on the subjects of their several departments; beside a president, a council, and other officers. The admission to this academy is free to all students properly qualified to reap advantage from the studies cultivated in it; and there is an annual exhibition of paintings, sculptures, and designs, open to all artists of distinguished merit.

The Academy of Painting and Sculpture at Paris. This took its rise from the disputes that happened between the master painters and sculptors in that capital; in consequence of which, M. le Brun, Sarazin, Corneille, and others of the king's painters, formed a design of instituting a particular academy; and, having presented a petition to the king, obtained an arrêt dated January 20. 1648. In the beginning of 1655, they obtained from Cardinal Mazarine a brevet, and letters patent, which were registered in parliament; in gratitude for which favour, they chose the cardinal for their protector, and the chancellor for their vice-protector. In 1663, by means of M. Colbert, they obtained a pension of 4000 livres. The academy consisted of a protector; a vice protector; a director; a chancellor; four rectors; adjuncts to the rectors; a treasurer; four professors, one of which was professor of anatomy, and another of geometry; several adjuncts and counsellors, a historiographer, a secretary, and two ushers.

The Academy of Painting held a public assembly every day for two hours in the afternoon, to which the painters resorted either to design or to paint, and where the sculptors modelled after a naked person. There were 12 professors, each of whom kept the school for a month: and there were 12 adjuncts to supply them in case of need. The professor upon duty placed the naked man

as

Academies. as he thought proper, and ſet him in two different attitudes every week. This was what they called *ſetting the model.* In one week of the month he ſet two models together, which was called *ſetting the group.* The paintings, and models made after this model, were called *academics*, or *academy figures.* They had likewiſe a woman who ſtood for a model in the public ſchool. Every three months, three prizes for deſign were diſtributed among the *eleves* or diſciples; two others for painting, and two for ſculpture, every year.

There was alſo an Academy of Painting, Sculpture, &c. at Rome, eſtabliſhed by Lewis XIV. wherein thoſe who had gained the annual prize at Paris were entitled to be three years entertained at the king's expence, for their further improvement.

Muſical Academy, conſiſts of the managers and directors of the opera.

The *Academy of Ancient Muſic* was eſtabliſhed in London in 1710, by ſeveral perſons of diſtinction, and other gentlemen, in conjunction with the moſt eminent maſters of the time, with a view to the ſtudy and practice of vocal and inſtrumental harmony. This inſtitution, which had the advantage of a library, conſiſting of the moſt celebrated compoſitions both foreign and domeſtic, in manuſcript and in print, and which was aided by the performances of the gentlemen of the chapel royal, and the choir of St Paul's, with the boys belonging to each, continued to flouriſh for many years. In 1731, a charge of plagiariſm brought againſt Bononcini, a member of the academy, for claiming a madrigal of Lotti of Venice as his own, threatened the exiſtence of the inſtitution. Dr Greene, who had introduced the madrigal into the academy, took part with Bononcini, and withdrew from the ſociety, taking with him the boys of St Paul's. In 1734 Mr Gates, another member of the ſociety, and maſter of the children of the royal chapel, retired in diſguſt; and it was thus deprived of the aſſiſtance which the boys afforded it in ſinging the ſoprano parts. From this time the academy became a ſeminary for the inſtruction of youth in the principles of muſic, and the laws of harmony. Dr Pepuſch, who was one of its founders, was active in accompliſhing this meaſure; and by the expedients of educating boys for their purpoſe, and admitting auditor members, the ſubſiſtence of the academy was continued. The *Royal Academy of Muſic* was formed by the principal nobility and gentry of the kingdom for the performance of operas, compoſed by Mr Handel, and conducted by him at the theatre in the Haymarket. The ſubſcription amounted to 50,000l. and the king, beſides ſubſcribing 1000l. allowed the ſociety to aſſume the title of *Royal Academy.* It conſiſted of a governor, deputy governor, and twenty directors. A conteſt between Handel and Seneſino, one of the performers, in which the directors took the part of the latter, occaſioned the diſſolution of the academy, after it had ſubſiſted with reputation for more than nine years.

The Academy of Architecture, eſtabliſhed by M. Colbert in 1671, conſiſted of a company of ſkilful architects, under the direction of the ſuperintendant of the buildings.

The Academy of Dancing, erected by Lewis XIV. with privileges above all the reſt.

VII. *Academies of Law*; as that famous one at Academies. Beryta, and that of the Sitientes at Bologna.

VIII. *Academies of History*; as the *Royal Academy of Portugueſe Hiſtory at Liſbon.* This academy was inſtituted by King John V. in 1720. It conſiſts of a director, four cenſors, a ſecretary, and 50 members; to each of whom is aſſigned ſome part of the eccleſiaſtical or civil hiſtory of the nation, which he is to treat either in Latin or Portugueſe. In the church-hiſtory of each diocese, the prelates, ſynods, councils, churches, monaſteries, academies, perſons illuſtrious for ſanctity or learning, places famous for miracles or relics, muſt be diſtinctly related in twelve chapters. The civil hiſtory compriſes the tranſactions of the kingdom from the government of the Romans down to the preſent time. The members who reſide in the country are obliged to make collections and extracts out of all the regiſters, &c. where they live. Their meetings to be once in 15 days

A medal was ſtruck by this academy in honour of their prince: the front of which was his effigy, with the inſcription *Johannes* V. *Luſitanorum Rex*; and, on the reverſe, the ſame prince is repreſented ſtanding, and raiſing Hiſtory almoſt proſtrate before him, with the legend *Hiſtoria Reſurges.* Underneath are the following words in abbreviature: REGia ACADemia HISToriæ LUSITanæ, INSTITuta VI. Idus Decembris MDCCXX.

Academy of Suabian Hiſtory at Tubingen was lately eſtabliſhed by ſome learned men, for publiſhing the beſt hiſtorical writings, the lives of the chief hiſtorians, and compiling new memoirs on the ſeveral points and periods thereof.

IX. *Academies of Antiquities*; as that at Cortona in Italy, and at Upſal in Sweden. The firſt is deſigned for the ſtudy of Hetrurian antiquities; the other for illuſtrating the northern languages, and the antiquities of Sweden, in which notable diſcoveries have been made by it. The head of the Hetrurian academy is called *Lucomon*, by which the ancient governors of the country were diſtinguiſhed. One of their laws is to give audience to poets only one day in the year; another is to fix their ſeſſions, and impoſe a tax of a diſſertation on each member in his turn.

The Academy of Medals and Inſcriptions at Paris was ſet on foot by M. Colbert, under the patronage of Lewis XIV. in 1663, for the ſtudy and explanation of ancient monuments, and perpetuating great and memorable events, eſpecially thoſe of the French monarchy, by coins, relievos, inſcriptions, &c. The number of members at firſt was confined to four or five, choſen out of thoſe of the French academy; who met in the library of M. Colbert, from whom they received his majeſty's orders. The days of their meetings were not determined; but generally they met on Wedneſdays, eſpecially in the winter ſeaſon; but, in 1691, the king having given the inſpection of this academy to M. de Pontchartrain comptroller general, &c. he fixed their meetings on Tueſdays and Saturdays.

By a new regulation, dated the 16th of July 1701, the academy was compoſed of ten *honorary* members; ten *aſſociates*; each of whom had two declarative voices; ten *penſionaries*; and ten *eleves*, or pupils. They then

Academies. met every Tuesday and Wednesday, in one of the halls of the Louvre; and had two public meetings yearly, one the day after Martinmas, and the other the 16th after Easter. The class of *elèves* was suppressed, and united to the associates. The king nominated their president and vice-president yearly; but their secretary and treasurer were perpetual. The rest were chosen by the members themselves, agreeably to the constitutions on that behalf given them.

One of the first undertakings of this academy, was to compose, by means of medals, a connected history of the principal events of Louis XIV's reign: but in this design they met with great difficulties, and of consequence it was interrupted for many years; but at length it was completed down to the advancement of the duke of Anjou to the crown of Spain.

In this celebrated work, the establishment of the academy itself was not forgotten. The medal on this subject represents Mercury sitting, and writing with an antique stylus on a table of brass; he leans with his left hand upon an urn full of medals, and at his feet are several others placed upon a card: the legend, *Rerum gestarum fides;* and on the exergue, *Academia regia inscriptionum et numismatum, instituta* M.DC.LXIII. signifying that the Royal Academy of Medals and Inscriptions, founded in 1663, ought to give to future ages a faithful testimony of all great actions. Besides this work, we have several volumes of their memoirs; and their history, written and continued by their secretaries.

X. *Academies of* Belles Lettres, are those wherein eloquence and poetry are chiefly cultivated. These are very numerous in Italy, and were not uncommon in France.

The Academy of Umidi at Florence has contributed greatly to the progress of the sciences by the excellent Italian translations given, by some of its members, of the ancient Greek and Latin historians. Their chief attention is to the Italian poetry, at the same time that they have applied themselves to the polishing of their language, which produced the *Academy della Crusca.*

The Academy of Humorists, Umoristi, had its origin at Rome from the marriage of Lorenzo Marcini, a Roman gentleman, at which several persons of rank were guests; and, it being carnival time, to give the ladies some diversion, they took themselves to the reciting of verses, sonnets, speeches, first *extempore*, and afterwards premeditately; which gave them the denomination of *Belli Humori.* After some experience, coming more and more into the taste of these exercises, they resolved to form an academy of belles lettres; and changed the title of *Belli Humori* for that of *Humoristi:* choosing for their device a cloud, which, after being formed of exhalations from the salt waters of the ocean, returns in a gentle sweet shower; with this motto from Lucretius, *Redit agmine dulci.*

In 1690, the *Academy of Arcadi* was established at Rome, for reviving the study of poetry and of the belles lettres. Besides most of the politer wits of both sexes in Italy, this academy comprehends many princes, cardinals, and other ecclesiastics; and, to avoid disputes about pre-eminence, all appear masked after the manner of Arcadian shepherds. Within ten years from its first establishment, the number of *Academists* amounted to six hundred. They hold assem- Academies.
blies seven times a-year in a mead or grove, or in the gardens of some nobleman of distinction. Six of these meetings are employed in the recitation of poems and verses of the Arcadi residing at Rome; who read their own compositions; except ladies and cardinals, who are allowed to employ others. The seventh meeting is set apart for the compositions of foreign or absent members.

This academy is governed by a custos, who represents the whole society, and is chosen every four years, with a power of electing 12 others yearly for his assistance. Under these are two sub-custodes, one vicar or pro-custos, and four deputies or superintendants, annually chosen. The laws of the society are immutable, and bear a near resemblance to the ancient model.

There are five modes of electing members. The first is by *acclamation.* This is used when sovereign princes, cardinals, and ambassadors of kings, desire to be admitted; and the votes are then given *viva voce:* The second is called *annumeration.* This was introduced in favour of ladies and academical colonies, where the votes are taken privately. The third, *representation*, was established in favour of colonies and universities, where the young gentry are bred; who have each a privilege of recommending one or two members privately to be ballotted for. The fourth, *surrogation;* whereby new members are substituted in the room of those dead or expelled. The last, *destination;* whereby, when there is no vacancy of members, persons of poetical merit have the title of Arcadi conferred upon them till such time as a vacancy shall happen. All the members of this body, at their admission, assume new pastoral names, in imitation of the shepherds of Arcadia. The academy has several colonies of Arcadi in different cities of Italy, who are all regulated after the same manner.

XI. *Academies of* Languages; called, by some, *Grammatical Academies:* as,

The Academy della Crusca at Florence, famous for its vocabulary of the Italian tongue, was formed in 1582, but scarce heard of before the year 1584, when it became noted for a dispute between Tasso and several of its members. Many authors confound this with the Florentine academy. The discourses which Torricelli, the celebrated disciple of Galileo, delivered in the assemblies, concerning levity, the wind, the power of percussion, mathematics, and military architecture, are a proof that these academies applied themselves to things as well as words.

The Academy of Fructiferi had its rise in 1617 at an assembly of several princes and nobility of the country, who met with a design to refine and perfect the German tongue. It flourished long under the direction of princes of the empire, who were always chosen presidents. In 1668, the number of members arose to upwards of 900. It was prior in time to the French academy, which only appeared in 1629, and was not established into an academy before the year 1635. Its history is written in the German tongue by George Neumarck.

The French Academy, which had its rise from a meeting of men of letters in the house of M. Conrart, in 1629. In 1635, it was erected into an academy, by Cardinal Richlieu,

Academies. Richlieu, for refining and aſcertaining the French language and ſtyle.—The number of its members was limited to 40; out of whom a director, chancellor, and ſecretary, were to be choſen: the two former held their poſts for two months, the latter was perpetual. The members of this academy enjoyed ſeveral privileges and immunities, among which was that of not being obliged to anſwer before any court but that of the king's houſehold. They met three times a-week in the Louvre; at breaking up, 40 ſilver medals were diſtributed among them, having on one ſide the king of France's head, and on the reverſe, *Protecteur de l'Academie*, with laurel, and this motto, *A l'Immortalité*. By this diſtribution, the attendance of the *Academiſts* was ſecured: thoſe who were preſent received the ſurplus otherwiſe intended for the abſent. To elect or expel a member, at leaſt 18 were required; nor could any be choſen unleſs he petitioned for it: by this expedient, the affront of refuſals from perſons elected was avoided. Religious were not admitted; nor could any nobleman, or perſon of diſtinction, be admitted on another footing than as a man of letters. None were to be expelled, except for baſe and diſhoneſt practices; and there were but two inſtances of ſuch expulſions, the firſt of M. Granier for refuſing to return a depoſite, the other of the Abbè Furetiere for plagiariſm. The deſign of this academy was to give not only rules, but examples, of good writing. They began with making ſpeeches on ſubjects taken at pleaſure, about 20 of which were printed. They met with great oppoſition from the parliament at their firſt inſtitution; it being two years before the patents granted by the king could be regiſtered. They have been ſeverely ſatirized, and their ſtyle has been ridiculed as enervating inſtead of refining the French language. They are alſo charged with having ſurfeited the world by flattery, and having exhauſted all the topics of panegyric in praiſe of their founder; it being a duty incumbent on every member, at his admiſſion, to make a ſpeech in praiſe of the king, the cardinal, the chancellor Seguier, and the perſon in whoſe place he is elected. The moſt remarkable work of this academy is a dictionary of the French tongue; which, after 50 years ſpent in ſettling the words and phraſes to be uſed in writing, was at laſt publiſhed in 1694.

The foundation of an *Academy* ſimilar to the above has been propoſed at Peterſburg by the learned Princeſs Daſhkof: it is to conſiſt of 60 members. The plan was approved by the late empreſs, who gave a fund for its ſupport and eſtabliſhment.

The Royal Spaniſh Academy at Madrid held its firſt meeting in July 1713, in the palace of its founder, the Duke d'Eſcalona. It conſiſted at firſt of eight academiſts, including the duke; to which number 14 others were afterwards added, the founder being choſen preſident or director. In 1714, the king granted them his confirmation and protection. Their device is a crucible in the middle of the fire, with this motto, *Limpia, Fya, y da Eſplendor;* "It purifies, fixes, and gives brightneſs." The number of members is limited to 24; the Duke d'Eſcalona to be director for life, but his ſucceſſors choſen yearly, and the ſecretary to be perpetual. Their object, as marked out by the royal declaration, was to cultivate and improve the national language: they were to begin with chooſing carefully ſuch words and phraſes as have been uſed by the beſt Spaniſh writers; noting the low, barbarous, or obſolete ones; and compoſing a dictionary wherein theſe may be diſtinguiſhed from the former. Academy || Acalzike.

XII *Academies of Politics;* as that at Paris, which conſiſted of ſix perſons, who met at the Louvre, in the chamber where the papers relating to foreign affairs were lodged. But this academy proved of little ſervice, as the kings of France were unwilling to truſt any but their miniſters with the inſpection of foreign affairs.

For a further account of ſimilar eſtabliſhments, ſee the article SOCIETY.

ACADEMY is alſo a term for ſchools and other ſeminaries of learning among the Jews, where their rabbins and doctors inſtructed their youth in the Hebrew language, and explained to them the Talmud and the ſecrets of the Cabbala: Thoſe of Tiberias and Babylon have been the moſt noted.

The Romans had a kind of military academies, eſtabliſhed in all the cities of Italy, under the name of *Campi Martis*. Here the youth were admitted to be trained for war at the public expence. The Greeks, beſide academies of this kind, had military profeſſors called *Tactici*, who taught all the higher offices of war, &c. &c.

ACADEMY is often uſed with us to denote a kind of collegiate ſeminary, where youth are inſtructed in arts and ſciences. There is one at Portſmouth for teaching navigation, drawing, &c. which was founded by George I. in 1722; another at Woolwich, for fortification, gunnery, &c.; eſtabliſhed by George II. in 1741.—Beſides theſe, there are numerous academies, eſpecially in London, for teaching mathematics, languages, writing, accounts, drawing, and other branches of learning.

The nonconformiſt miniſters, &c. are bred up in private academies; as not approving the common univerſity education. There are ſeveral academies of this deſcription in different parts of England.

ACADEMY is likewiſe a name given to a riding-ſchool, where young gentlemen are taught to ride the great horſe, &c. and the ground allotted is uſually called the *Manege*.

ACADEMY Figure, a drawing of a naked man or woman, taken from the life; which is uſually done on paper with red or black chalk, and ſometimes with paſtils or CRAYONS.

ACADIE, or ACADY, in *Geography*, a name formerly given to Nova Scotia, or New Scotland, in America. See *NOVA-Scotia*.

ACÆNA, in *Antiquity*, a Grecian meaſure of length, being a ten-feet rod, uſed in meaſuring their lands.

ACENÆ, in *Botany*. See BOTANY *Index*.

ACAJOU, or CASHEW-NUT TREE. See ANACARDIUM, BOTANY *Index*.

ACALANDRUS, a river falling into the bay of Tarentum, not far from the Metapontum (Pliny, Strabo); now called *Fiume de Roſeto*.

ACALEPTIC, in ancient proſody, a complete verſe.

ACALYPHA, the THREE-SEEDED MERCURY. See BOTANY *Index*.

ACALZIKE, a town and fortreſs of Aſiatic Tartary, ſituated in N. Lat. 41. 30. E. Long. 44. 14.

ACAMANTIS,

Acamantis || Acapulco.

ACAMANTIS, the ancient name of the iſland of Cyprus, taken from one of its promontories ſituated to the weſt, and called *Acamas*. Teos in Ionia was alſo called thus from Acamas the founder.

ACAMAS, Acamantis, in *Ancient Geography*, the weſt promontory of the iſland of Cyprus, from whence it took its ancient name; now Cape *Piſano*, or *Epiſanio*, where formerly was a town of the ſame name, now a village called *Cruſocco*.

Acamas, ſon of Theſeus, followed the reſt of the Grecian princes to the ſiege of Troy; and was deputed, with Diomedes, to the Trojans, in order to get Helen reſtored. Laodice, Priam's daughter, fell in love with him, ſtole a night with him, and had a ſon by him called *Munitus*. He was one of the heroes who concealed themſelves in the wooden horſe. One of the tribes of Athens was called *Acamantides* from him, by the appointment of the oracle; and he founded a city in Phrygia Major, called *Acamantium*. Homer mentions two other heroes of this name; one a Thracian prince who came to ſuccour Priam, another a ſon of Antenor.

ACANGIS, that is, *Ravagers* or *Adventurers*; a name which the Turks give their huſſars or light troops, who are generally ſent out in detachments to procure intelligence, haraſs the enemy, or ravage the country.

ACANTHA, in *Botany*, the prickle of any plant; in *Zoology*, a term for the ſpine or prickly fins of fiſhes.

ACANTHABOLUS, in *Surgery*, an inſtrument for pulling thorns, or the like, out of the ſkin.

ACANTHINE, any thing reſembling or belonging to the herb acanthus. Acanthine garments, among the ancients, are ſaid to be made of the down of thiſtles; others think they were garments embroidered in imitation of the acanthus.

ACANTHOPTERYGIOUS fishes, a term uſed by Linnæus and others for thoſe fiſhes whoſe back fins are hard, oſſeous, and prickly.

ACANTHOS, Acanthus, a town of Egypt, near Memphis, (Pliny); now *Biſalta*. Alſo a maritime town of Macedonia, to the weſt of Mount Athos; a colony of Andrians (Thucydides, Ptolemy); now *Eriſſo*; near which was ſhown Xerxes's ditch, of ſeven ſtadia, in order to ſeparate Mount Athos from the continent, and convey his ſhips, without doubling Athos, into the Singitic bay. *Acanthos* is alſo a town of Epirus.

ACANTHUS, bear's breech, in *Botany*. See Botany *Index*.

Acanthus, in *Architecture*, an ornament repreſenting the leaves of the acanthus, uſed in the capitals of the Corinthian and Compoſite orders.

ACAPALA, or Acapula, a town in the province of Chiapa, in New Spain, which is ſituated on Tabaſco river, about five leagues north-weſt from Chiapa.

ACAPAM, a town of Aſia on the Euxine ſea.

ACAPULCO, a conſiderable town and port in Mexico, on a bay of the South ſea, diſtant from the city of Mexico ſouth-eaſt 210 miles. It has a fine harbour, from whence a ſhip annually ſails to Manilla in the Philippine iſlands, near the coaſt of China in Aſia; and another returns annually from thence with all the treaſures of the Eaſt Indies, ſuch as diamonds, rubies, ſapphires, and other precious ſtones; the rich carpets of Perſia; the camphire of Borneo; the benjamin and ivory of Pegu and Cambodia; the ſilks, muſlins, and calicoes, of the Mogul's country; the gold duſt, tea, china ware, ſilk, and cabinets, of China and Japan; beſides cinnamon, cloves, mace, nutmegs, and pepper; inſomuch that this ſingle ſhip contains more riches than many whole fleets. The goods brought to Acapulco are carried to the city of Mexico by mules and pack horſes; and from thence to Vera Cruz on the North ſea, in order to be ſhipped for Europe. Acapulco itſelf is a ſmall place, conſiſting of about 200 or 300 thatched houſes. Ships arrive at the port by two inlets, ſeparated from each other by a ſmall iſland; the entrance into them in the day time is by means of a ſea breeze, as the ſailing out in the night time is effected by a land breeze. A wretched fort, 42 pieces of cannon, and a garriſon of 60 men, defend it. It is equally extenſive, ſafe, and commodious. The baſon which conſtitutes this harbour is ſurrounded by lofty mountains, which are ſo dry, that they are even deſtitute of water. The air here is hot, heavy, and unwholeſome; to which none can habituate themſelves, except certain negroes that are born under a ſimilar climate, or ſome mulattoes. This feeble and miſerable colony is crowded with a vaſt acceſſion to its numbers upon the arrival of the galleons; traders flocking here from all the provinces of Mexico, who come to exchange European toys, their own cochineal, and about ten millions of ſilver (437,500l. Sterling) for ſpices, muſlins, printed linens, ſilk, perfumes, and the gold works of Aſia. W. Long. 102. 20. N. Lat. 17. 22.

Acarai || Acaſtus.

ACARAI, a town of Paraguay in South America, built by the Jeſuits in 1624. W. Long. 51. 5. S. Lat. 26.

ACARAUNA, a ſmall American fiſh, called by our ſailors *the old wife*. See Labrus, Ichthyology *Index*.

ACARI, Port, in *Geography*, lies on the coaſt of Peru, in S. Lat. 15. 50. W. Long. 54. 40.

ACARNANIA, the firſt country of Free Greece, or Greece Proper, bounded on the weſt by the Sinus Ambracius, and ſeparated from Ætolia by the river Achelous on the eaſt, and by the Sinus Ambracius from Epirus. The people were called *Acarnanes*, denoting perſons unſhorn; other Etolians, to the eaſt of the Achelous, being called *Curetes* (Homer) from being ſhorn. According to Lucian, they were noted for effeminacy and incontinence; hence the proverb *Porcellus Acarnanius*. This country was famous for an excellent breed of horſes; ſo that Ακαρνικος ιππος, is a proverbial ſaying for a thing excellent in its kind. It is now called *il Carnia* and *il Deſpotato*.

ACARON, or Accaron, a town of Paleſtine, called *Ekron* in Scripture. It was the boundary of the Philiſtines to the north; ſtood at ſome diſtance from the ſea, near Bethſhemeſh; and was famous for the idol of Baalzebub.

ACARUS, the Tick or Mite. See Entomology *Index*.

ACASTUS, in *Claſſic Hiſtory*, the ſon of Pelias, king of Theſſaly, and one of the moſt famous hunters of his time, married Hippolita, who falling deſperately

in

Acatalectic in love with Peleus her ſon-in-law, and he refuſing to gratify her wiſhes, ſhe accuſed him to her huſband of a rape: on which he ſlew them both.

Accedas.

ACATALECTIC, a term in ancient poetry for ſuch verſes as have all their feet or ſyllables, in contradiſtinction to thoſe that have a ſyllable too few. The firſt verſe of the two following from Horace is *acatalectic* or complete, the laſt is *catalectic* or deficient.

Solvitur acris hyems, grata vice veris et Favoni:
Trahuntque ſiccas machinæ carinas——

ACATALEPSY, ſignifies the impoſſibility of comprehending ſomething. The diſtinguiſhing tenet of the Pyrrhoniſts was their aſſerting an abſolute acatalepſy in regard to every thing.

ACATERY, or ACCATRY, anciently an officer of the king's houſehold, deſigned for a check betwixt the clerks of the kitchen and the purveyors.

ACATHARSIA, in *Medicine*, an impurity of the blood or humours.

ACATHISTUS, the name of a ſolemn hymn or vigil, anciently ſung in the Greek church on the Saturday of the fifth week of Lent, in honour of the Virgin, for having thrice delivered Conſtantinople from the invaſions of the barbarous nations. It was denominated ἀκαθίστος, i. e. *without ſitting*, becauſe, in the celebration of the praiſes of the virgin, the people ſtood all night ſinging.

ACATIUM, in *Ancient Navigation*, a kind of boat or pinnace uſed for military purpoſes. The *acatium* was a ſpecies of thoſe veſſels called *naves actuariæ*, i. e. ſuch as were wrought with oars. It was ſometimes made uſe of in battle. Strabo deſcribes it as a privateer or pirate ſloop, and Suidas, as a fiſhing veſſel.

ACAULIS, in *Botany*, a term applied to certain plants, the flowers of which have no pedicle or ſtalk to ſupport them, but reſt immediately on the ground, ſuch as the carline thiſtle, &c.

ACCA, SAINT, biſhop of Hagunſtaldt, or Hexham, in Northumberland, ſucceeded Wilfrid in that ſee in 709. He ornamented his cathedral in a moſt magnificent manner; furniſhed it with plate and holy veſtments; and erected a noble library, conſiſting chiefly of eccleſiaſtical learning, and a large collection of the lives of the ſaints, which he was at great pains to procure. He was accounted a very able divine, and was famous for his ſkill in church muſic. He wrote ſeveral books: particularly, *Paſſiones Sanctorum*, The Sufferings of the Saints: *Pro illuſtrandis Scripturis, ad Bedam*, For explaining the Scriptures, addreſſed to Bede. He died in 740, having enjoyed the ſee of Hexham 31 years, under Egbert king of the Northumbrians.

ACCALIA, in Roman antiquity, ſolemn feſtivals held in honour of Acca Laurentia, Romulus's nurſe: they were otherwiſe called LAURENTALIA.

ACCAPITARE, in *Law*, the act of becoming vaſſal of a lord, or of yielding him homage and obedience. Hence,

ACCAPITUM ſignifies the money paid by a vaſſal upon his admiſſion to a feu.

ACCAPITUM, in our *Ancient Law*, was uſed alſo to expreſs the relief due to the chief lord. See RELIEF.

ACCEDAS AD CURIAM, in *Engliſh Law*, a writ lying where a man has received, or fears, falſe judgement in an inferior court. It lies alſo for juſtice delayed, and is a ſpecies of the writ RECORDARE.

Acceleration.

ACCELERATION, in *Mechanics*, the increaſe of velocity in a moving body. Accelerated motion is that which continually receives freſh acceſſions of velocity. Acceleration ſtands directly oppoſed to *retardation*, which denotes a diminution of velocity.

ACCELERATION is chiefly uſed, in *Phyſics*, in reſpect of falling bodies, i. e. of heavy bodies tending towards the centre of the earth by the force of gravity. That natural bodies are accelerated in their deſcent, is evident from various conſiderations, both *à priori* and *poſteriori*.—Thus, we actually find, that the greater height a body falls from, the greater impreſſion it makes, and the more vehemently does it ſtrike the ſubject plane, or other obſtacle.

Various were the ſyſtems and opinions which philoſophers produced to account for this acceleration. But the immediate cauſe of acceleration is now ſufficiently obvious; the principle of gravitation, which determines the body to deſcend, determining it to be accelerated by a neceſſary conſequence.

Suppoſe a body let fall from on high: the primary cauſe of its beginning to deſcend is doubtleſs the power of gravity; but when once the deſcent is commenced, that ſtate becomes in ſome meaſure natural to the body; ſo that if left to itſelf, it would perſevere in it for ever, even though the firſt cauſe ſhould ceaſe: as we ſee in a ſtone caſt with the hand, which continues to move after it is left by the cauſe that gave it motion. But, beſide the propenſity to deſcend impreſſed by the firſt cauſe, and which of itſelf were ſufficient to continue the ſame degree of motion, once begun, *in infinitum*; there is a conſtant acceſſion of ſubſequent efforts of the ſame principle, gravity, which continues to act on the body already in motion, in the ſame manner as if it were at reſt. Here, then, being a double cauſe of motion; and both acting in the ſame direction, viz. directly towards the centre of the earth; the motion they jointly produce muſt neceſſarily be greater than that of any one of them.—And the velocity thus increaſed having the ſame cauſe of increaſe ſtill perſiſting, the deſcent muſt neceſſarily be continually accelerated.

The motion of a body aſcending, or impelled upwards, is diminiſhed or retarded from the ſame principle of gravity acting in a contrary direction, in the ſame manner as a falling body is accelerated: See RETARDATION. A body thus projected upwards, riſes till it has loſt all its motion: which it does in the ſame time that a body falling would have acquired a velocity equal to that wherewith the body was thrown up. Hence the ſame body thrown up, will riſe to the ſame height from which falling it would have acquired the velocity wherewith it was thrown up: and hence the heights which bodies thrown up with different velocities do aſcend to, are to one another as the ſquares of theſe velocities.

ACCELERATION of Bodies on inclined Planes. The ſame general law obtains here as in bodies falling perpendicularly: the effect of the plane is to make the motion ſlower; but the inclination being everywhere equal, the retardation ariſing therefrom will proceed equally in all parts, at the beginning and the ending of the motion. See MECHANICS.

Acceleration.

Acceleration of the Motion of Pendulums—The motion of pendulous bodies is accelerated in their deſcent; but in a leſs ratio than that of bodies falling perpendicularly. See MECHANICS and PENDULUM.

Acceleration of the Motion of Projectiles. See PROJECTILES.

ACCELERATION is alſo applied in the ancient aſtronomy, in reſpect of the fixed ſtars. This acceleration was the difference between the revolution of the *primum mobile* and the ſolar revolution; which was computed at 3 minutes and 56 ſeconds.

Acceleration of the Moon, a term uſed to expreſs the increaſe of the moon's mean motion from the ſun, compared with the diurnal motion of the earth; ſo that it is now a little ſwifter than it was formerly. Dr Halley was the firſt who made this diſcovery; and he was led to it by comparing the ancient eclipſes obſerved at Babylon with thoſe obſerved by Albatennius in the ninth century, and ſome of his own time. He was not able to aſcertain the quantity of this acceleration, becauſe the longitudes of Bagdad, Alexandria, and Aleppo, where the obſervations were made, had not been accurately determined. But ſince his time, the longitude of Alexandria has been aſcertained by Chazelles; and Babylon, according to Ptolemy's account, lies 30′ eaſt from Alexandria. From theſe *data*, Mr Dunthorn compared ſeveral ancient and modern eclipſes, with the calculations of them, by his own tables, and hereby verified Dr Halley's opinion; for he found that the ſame tables repreſent the moon's place more backward than her true place in ancient eclipſes, and more forward than her true place in later eclipſes; and thence juſtly inferred, that her motion in ancient times was ſlower, in later times quicker, than the tables give it. But he did not content himſelf with merely aſcertaining the fact; he proceeded to determine the quantity of the acceleration; and by means of the moſt ancient eclipſe of which any authentic account remains, obſerved at Babylon in the year before Chriſt 721, he concluded, that the obſerved beginning of this eclipſe was not above an hour and three quarters before the beginning by the tables; and therefore the moon's true place could precede her place by computation but little more than 50′ of a degree at that time. Admitting the acceleration to be uniform, and the aggregate of it as the ſquare of the time, it will be at the rate of about 10′ in 100 years.

Dr Long attributes the acceleration above deſcribed to one or more of theſe cauſes: either, 1. The annual and diurnal motion of the earth continuing the ſame, the moon is really carried round the earth with a greater velocity than heretofore: or, 2. The diurnal motion of the earth, and the periodical revolution of the moon, continuing the ſame, the annual motion of the earth round the ſun is a little retarded; which makes the ſun's apparent motion in the ecliptic a little ſlower than formerly; and, conſequently, the moon in paſſing from any conjunction with the ſun, ſpends leſs time before ſhe again overtakes the ſun, and forms a ſubſequent conjunction: in both theſe caſes, the motion of the moon from the ſun is really accelerated, and the ſynodical month actually ſhortened. Or, 3. The annual motion of the earth, and the periodical revolution of the moon continuing the ſame, the rotation of the earth round its axis is a little retarded: in this caſe, days, hours, minutes, ſeconds, &c. by which all periods of time muſt be meaſured, are of a longer duration; and conſequently the ſynodical month will appear to be ſhortened, though it really contains the ſame quantity of abſolute time as it always did. If the quantity of matter in the body of the ſun be leſſened by the particles of light continually ſtreaming from it, the motion of the earth round the ſun may become ſlower: if the earth increaſes in bulk, the motion of the moon round the earth may be quickened thereby. See ASTRONOMY.

Acceleration of Accenſi.

Acceleration of a Planet. A planet is ſaid to be accelerated in its motion when the real diurnal motion exceeds the mean diurnal motion. On the other hand, a planet is ſaid to be retarded in its motion when the mean motion exceeds the real diurnal motion. This inequality ariſes from the change in the diſtance of the planet from the ſun, which is continually varying; the planet moving always quicker in its orbit when nearer the ſun, and ſlower when farther off.

ACCELERATOR, in *Anatomy*, the name of two muſcles of the penis, which ſerve for ejecting the urine or ſemen. See ANATOMY, *Table of the Muſcles.*

ACCENDENTES, a lower order of miniſters in the Romiſh church, whoſe office is to light and trim the candles.

ACCENDONES, in Roman antiquity, a kind of gladiators, whoſe office was to excite and animate the combatants during the engagement. The orthography of the word is conteſted: the firſt edition of Tertullian, by Rhenanus, has it *accedones;* an ancient manuſcript, *accendones.* Aquinas adheres to the former, Pitiſcus to the latter. The origin of the word, ſuppoſing it *accendones*, is from *accendo*, I kindle; ſuppoſing it *accedones*, from *accedo*, I accede, am added to. The former places their diſtinguiſhing character in enlivening the combat by their exhortations and ſuggeſtions: the latter ſuppoſes them to be much the ſame with what among us are called *ſeconds*, among the Italians *patroni;* excepting that theſe latter only ſtand by to ſee the laws of the ſword duly obſerved, without intermeddling to give advice or inſtruction.

ACCENSI, in the Roman armies, certain ſupernumerary ſoldiers, deſigned to ſupply the places of thoſe who ſhould be killed or anywiſe diſabled. They were thus denominated, *quia accenſebantur*, or *ad cenſum adjiciebantur.* Vegetius calls them *ſupernumerarii legionum.* Cato calls them *ferentarii*, in regard they furniſhed thoſe engaged in battle with weapons, drink, &c. Though Nonnius ſuggeſts another reaſon of that appellation, viz. becauſe they fought with ſtones, ſlings, and weapons *quæ feruntur*, ſuch as are thrown, not carried in the hand. They were ſometimes alſo called *velites*, and *velati*, becauſe they fought clothed, but not in armour; ſometimes *adſcriptitii*, and *adſcriptivi;* ſometimes *rorarii.* The *accenſi*, Livy obſerves, were placed at the rear of the army, becauſe no great matter was expected from them; they were taken out of the fifth claſs of citizens.

ACCENSI, in antiquity, denotes an inferior order of officers, appointed to attend the Roman magiſtrates, ſomewhat in the manner of uſhers, ſerjeants, or tipſtaves among us. They were thus called from *accire*, to ſend for; one part of their office being to call aſſemblies of

Accenſi || Accent.

of the people, ſummon parties to appear and anſwer before the judges, &c.

ACCENSI was alſo an appellation given to a kind of adjutants, appointed by the tribune to aſſiſt each centurion and decurion. In which ſenſe *accenſus* is ſynonymous with *optio*. In an ancient inſcription, given by Torre, we meet with ACCENSUS EQUITUM ROMANORUM; an office nowhere elſe heard of. That author ſuſpects it for a corruption; and inſtead thereof reads, A CENSIBUS.

ACCENSION, the action of ſetting a body on fire: thus the accenſion of tinder is effected by ſtriking fire with flint and ſteel.

ACCENT, in *reading* or *ſpeaking*, an inflection of the voice, which gives to each ſyllable of a word its due pitch in reſpect of height or lowneſs. See READING. The word is originally Latin, *accentus*; a compound of *ad*, to; and *cano*, to ſing. *Accentus, quaſi ad-cantus*, or *juxta cantum*. In this ſenſe, accent is ſynonymous with the Greek τονος; the Latin *tenor*, or *tonor*; and the Hebrew טעם, *guſtus*, taſte.—For the doctrine of *Accents* in *Compoſition*, ſee POETRY, Part III.

ACCENT, among *Grammarians*, is a certain mark or character placed over a ſyllable to direct the ſtreſs of its pronunciation. We generally reckon three grammatical accents in ordinary uſe, all borrowed from the Greeks, viz. the *acute accent*, ('), which ſhows when the tone of the voice is to be raiſed. The *grave accent* (`). when the note or tone of the voice is to be depreſſed. The *circumflex accent*, (^), is compoſed of both the acute and the grave, and points out a kind of undulation of the voice. The Latins have made the ſame uſe of theſe three accents.

The Hebrews have a grammatical, a rhetorical, and muſical accent: though the firſt and laſt ſeem, in effect, to be the ſame; both being compriſed under the general name of *tonic accents*, becauſe they give the proper tone to ſyllables; as the rhetorical accents are ſaid to be euphonic, becauſe they tend to make the pronunciation more ſweet and agreeable. There are four euphonic accents, and 25 tonic; of which ſome are placed above, and others below the ſyllables; the Hebrew accents ſerving not only to regulate the riſings and fallings of the voice, but alſo to diſtinguiſh the ſections, periods, and members of periods, in a diſcourſe; and to anſwer the ſame purpoſes with the points in other languages. Their accents are divided into *emperors*, *kings*, *dukes*, &c. each bearing a title anſwerable to the importance of the diſtinction it makes. Their emperor rules over a whole phraſe, and terminates the ſenſe completely; anſwering to our point. Their king anſwers to our colon; and their duke to our comma. The king, however, occaſionally becomes a duke, and the duke a king, as the phraſes are more or leſs ſhort. It muſt be noted, by the way, that the management and combination of theſe accents differ in Hebrew poetry from what they are in proſe. The uſe of the tonic or grammatical accents has been much controverted; ſome holding that they diſtinguiſh the ſenſe; while others maintain that they are only intended to regulate the muſic, or ſinging; alleging that the Jews ſing, rather than read, the Scriptures in their ſynagogues*. Be this, however, as it will, it is certain the ancient Hebrews were not acquainted with theſe accents. The opinion which prevails amongſt the learned is, that they were invented about the fifth century, by the Jewiſh doctors of the ſchool of Tiberias, called the *Maſſorets*. Accent.

As to the Greek accents, now ſeen both in manuſcripts and printed books, there has been no leſs diſpute about their antiquity and uſe than about thoſe of the Hebrews. Iſaac Voſſius endeavours to prove them of modern invention; aſſerting, that anciently they had nothing of this kind, but only a few notes in their poetry, which were invented by Ariſtophanes the grammarian, about the time of Ptolemy Philopater; and that theſe were of muſical, rather than grammatical uſe, ſerving as aids in the ſinging of their poems, and very different from thoſe introduced afterwards. He alſo ſhows from ſeveral ancient grammarians, that the manner of writing the Greek accents in theſe days was quite different from that which appears in our books. The author of *La Methode Greque*, p. 546, obſerves, that the right pronunciation of the Greek language being natural to the Greeks, it was needleſs for them to mark it by accents in their writings: ſo that, according to all appearance, they only began to make uſe of them about the time when the Romans, willing to learn the Greek tongue, ſent their children to ſtudy at Athens, thinking thereby to fix the pronunciation, and to facilitate it to ſtrangers; which happened, as the ſame author obſerves, a little before Cicero's time. Wetſtein, Greek profeſſor at Baſil, in a learned diſſertation, endeavours to prove the Greek accents of an older ſtanding. He owns that they were not always formed in the ſame manner by the ancients; but thinks that difference owing to the different pronunciation which obtained in the different parts of Greece. He brings ſeveral reaſons, *à priori*, for the uſe of accents, even in the earlieſt days: as that they then wrote all in capital letters equidiſtant from each other, without any diſtinction either of words or phraſes, which without accents could ſcarce be intelligible; and that accents were neceſſary to diſtinguiſh ambiguous words, and to point out their proper meaning: which he confirms from a diſpute on a paſſage in Homer, mentioned by Ariſtotle in his *Poëtics*, chap. v. Accordingly, he obſerves, that the Syrians, who have tonic, but no diſtinctive accents, have yet invented certain points, placed either below or above the words, to ſhow their mood, tenſe, perſon, or ſenſe.

Mr Browne of Trinity College, Dublin, has entered more deeply into this inveſtigation; and as he had an opportunity of converſing with the crew of a Greek ſhip from Patraſs, a town ſituated not far diſtant from the ancient Corinth, which had been driven by ſtreſs of weather into the port of Dingle in Ireland, the reſult of his inquiries was, that the practice of the modern Greeks is different from any of the theories that have been delivered in books. "It is true, he obſerves, they have not two pronunciations for proſe and for verſe, and in both they read by accent, but they make accent the cauſe of quantity; they make it govern and controul quantity; they make the ſyllable long on which the acute accent falls, and they allow the acute accent to change the real quality. They always read poetry as well as proſe by accent. Whether any inference can hence be drawn as to the pronunciation of the ancients, I muſt leave, after what I have premiſed above, to men of more learning, but I think it at leaſt ſo probable as to make it worth while to mention the inſtance:

* Cooper on Muſic. Claz. § 1.

Accent. inſtances which occurred in proof of this aſſertion more particularly. Of the two firſt perſons whom I met, one, the ſteward of the ſhip, an inhabitant of the iſland of Cephalonia, had had a ſchool education: he read Euripides, and tranſlated ſome eaſier paſſages without much difficulty. By a ſtay in this country of near two years, he was able to ſpeak Engliſh very tolerably, as could the captain and ſeveral of the crew; and almoſt all of them ſpoke Italian fluently. The companion however of the ſteward could ſpeak only modern Greek, in which I could diſcover that he was giving a deſcription of the diſtreſs in which the ſhip had been, and though not able to underſtand the context, I could plainly diſtinguiſh many words, ſuch as δενδρα—ξυλον, and amongſt the reſt the ſound of Ανθρωπος, pronounced ſhort; this awoke my curioſity, which was ſtill more heightened when I obſerved that he ſaid Ανθωπων long, with the ſame attention to the alteration of the accent with the variety of caſe, which a boy would be taught to pay at a ſchool in England. Watching therefore more cloſely, and aſking the other to read ſome ancient Greek, I found that they both uniformly pronounced according to accent, without any attention to long or ſhort ſyllables where accent came in the way; and on their departure, one of them having bade me good day, by ſaying Καωημερα, to which I anſwered Καλημεωα, he with ſtrong marks of reprobation ſet me right, and repeated Καλημερα; and with like cenſure did the captain upon another occaſion obſerve upon my ſaying Socrātes inſtead of Socrātes.

"I now had a ſtrong wiſh to know whether they obſerved the diſtinction in this reſpect uſually between verſe and proſe, but from the little ſcholarſhip of the two men with whom I had converſed, from the ignorance of a third whom I afterwards met, (who however read Lucian with eaſe, though he did not ſeem ever to have heard of the book), and on account of my imperfect mode of converſing with them all, I had little hopes of ſatisfaction on the point, nor was I clear that they perfectly knew the difference between and verſe proſe. At length having met with the commander of the ſhip, and his clerk Athanaſius Κονομος, and finding that the latter had been a ſchoolmaſter in the Morea, and had here learnt to ſpeak Engliſh fluently, I put the queſtion to them in the preſence of a very learned college friend, and at another time, to avoid any error, with the aid of a gentleman who is perfectly maſter of the Italian language. Both the Greeks repeatedly aſſured us that verſe as well as proſe was read by accent, and not by quantity, and exemplified it by reading ſeveral lines of Homer, with whoſe name they ſeemed perfectly well acquainted.

"I ſhall give an inſtance or two of their mode of reading:

Βῆ δ' ἀκέων παρὰ θῖνα πολυφλοίσβοιο θαλάσσης,
Τὸν δ' ἀπαμειβόμενος προσέφη πόδας ὠκὺς Ἀχιλλεύς,
Ἐς δ' ἑξῆς ἐπίηδες ἀγειρόμεν, ἐς δ' ἑκατόμβην.

They made the ε in ακέων, προσέφη, and εξῆς long.

But when they read.

Κλῦθί μεν, Ἀργυρότοξ', ὃς Χρύσην ἀμφιβέβηκας,

they made the ſecond ſyllable of the firſt word Κλυθι ſhort, notwithſtanding the acute accent: on my aſking why, they deſired me to look back on the circumflex on the firſt ſyllable, and ſaid it thence neceſſarily followed; for it is impoſſible to pronounce the firſt ſyllable with the great length which the circumflex denotes and not to ſhorten the ſecond. The teſtimony of the ſchoolmaſter might be vitiated, but what could be ſtronger, than that of theſe ignorant mariners as to the vulgar common practice of modern Greece; and it is remarkable that this confirms the opinion of Biſhop Horſley, that the tones of words in connexion are not always the ſame with the tones of ſolitary words, though in thoſe of more than one ſyllable the accentual marks do not change their poſition. I muſt here add that theſe men confirmed an obſervation which I have heard made, that we are much miſtaken in our idea of the ſuppoſed lofty ſound of πολυφλοισβοιο θαλασσης; that the borderers on the coaſt of the Archipelago take their ideas from the gentle laving of the ſhore by a ſummer wave, and not from the roaring of a winter ocean, and they accordingly pronounced it *Polyphliſvoo thalaſſes*.

"I own that the obſervations made by me on the pronunciation of theſe modern Greeks brought a perfectly new train of ideas into my mind. I propoſe them, with humility, for the conſideration of the learned; but they have made a ſtrong impreſſion upon me, and approached, when compared with other admitted facts, nearly to conviction. In ſhort, I am ſtrongly inclined to believe, that what the famous treatiſe ſo often mentioned on the proſodies of the Greek and Latin languages mentions as the peculiarity of the Engliſh, that we always prolong the ſound of the ſyllable on which the acute accent falls, is true, and has been true of every nation upon earth. We know it is true of the modern Italians—they read Latin in that reſpect juſt as we do, and ſay, *Arma virūmqŭe cānŏ*, and, *In nōvă fert animus*, as much as we. And when we find the modern Greeks following the ſame practice, ſurely we have ſome cauſe to ſuppoſe that the ancients did the ſame. In the Engliſh language, indeed, quantity is not affected, becauſe accent and quantity always agree. Biſhop Horſley endeavoured to prove that they did ſo in Greek, but this is on the bold ſuppoſition that the accent doth not fall where the mark is placed. The objection to this hypotheſis, which ſeems to have been admitted by all writers, and conſidered as deciſive by ſome as to proſe, by all as to verſe, is that ſuch a mode of pronunciation or reading muſt deſtroy metre, or *rhythmos*. From this poſition, however, univerſal, or however it may have been taken for granted, I totally diſſent. That it will oppoſe the metre or quantity I readily agree, but that it will deſtroy the rhythmos, by which, whatever learned deſcriptions there may have been of its meaning, I underſtand nothing more than the melody or ſmooth flowing of the verſes, or their harmony if you pleaſe, if harmony be properly applied to ſucceſſive and not ſynchronal ſounds. On the contrary, nothing can be more diſagreeable or unmelodious than the reading verſe by quantity, or ſcanning of it, as it is vulgarly called. Let us try the line ſo often quoted—

Armă vĭrūmqŭe cănō, Trōjæ qui prīmŭs ăb ōris.

inſtead of

Armă vĭrūmqŭe cānŏ, Trōjæ qŭi prīmŭs ăb ōris.

"No

Accent. " No man ever defined rhythmos better than Plato, *ordinem quendam qui in motibus cernitur*; the motion or meaſure of the verſe may be exact, and yet the order, arrangement, and diſpoſition of the letters and ſyllables, ſuch as to be grating and unmelodious to the ear. In like manner the feet of the verſe may be exact, but the ſtreſs laid upon particular ſyllables of it which follows the quantity may totally deſtroy the melody: in ſhort, the radical error ſeems to be the confuſion of quantity with melody, and the ſuppoſition that whatever is at war with quantity and metre muſt be at war with melody.

" It will be aſked then what is the uſe of metre or meaſure in verſe, if we are not to read by it; and here is the grand difficulty, and I own with candour I cannot anſwer it with perfect ſatisfaction to my own mind: to thoſe indeed who ſay we are to read by accent in proſe, it may be equally aſked what is the uſe of long or ſhort ſyllables in proſe, if we are not to attend to them when accent comes in the way: but to thoſe who think otherwiſe, I can only anſwer, that in the firſt place accent doth not always interfere, and then quantity is our guide, and accent often accords with quantity. Secondly, Metre determines the number of feet or meaſures in each verſe, and thereby produces a general analogy and harmony through the whole; and it is to be obſerved, that, as I apprehend, accent doth not change the number of feet, though it doth the nature or ſpecies of them. Thus when we read

Arma virumque cāno, Trōjæ qui primus ab oris,

we do not make more feet than when we ſcan the line, nor employ more time than in pronouncing the next line in which the accent happens to accord with the quantity, viz.

Italiam fato profugus, Lavinaque venit.

Thirdly, The poet in meaſuring his verſe certainly muſt be confined to ſome certain number and order of long and ſhort ſyllables, in order to produce a concordance through the whole, and even to regulate the poſition of accent, which though not ſubdued by quantity will certainly have ſome relation to it, *euphoniæ gratia*; but ſurely the length or ſhortneſs of a ſyllable cannot determine where emphaſis ſhall be placed—that muſt depend on the meaning and the thought; and it would be moſt abſurd for the poet to ſay to the reader, you ſhall not reſt upon this emphatic and ſignificative word becauſe its ſyllables are ſhort, and wherever there is a reſt, there muſt be length and intonation." (*Iriſh Tranſ.* vol. vii.)

The uſe of accents, to prevent ambiguities, is moſt remarkably perceived in ſome eaſtern languages, particularly the Siameſe and Chineſe. Among the people of China, every word, or (which is the ſame thing) ſyllable, admits of five accents, as ſpoken more acutely or remiſsly; and thus ſtands for many different things. The ſame ſound *ya*, according to the accent affixed to it, ſignifies *God*, *a wall*, *excellent*, *ſtupidity*, and a *gooſe*. The Chineſe have but 330 ſpoken words in their language; but theſe being multiplied by the different accents or tones, which affect the vowel, furniſh a language tolerably copious. By means hereof, their 330 ſimple ſounds come to denote 1650 things; but this being hardly ſufficient, they are increaſed further by aſpirates added to each word to double the number. The Chineſe only reckon four *accents*: for which the miſſionaries uſe the following marks, *aá*, *á*, *à*, *ā*; to which they have added a fifth, thus *ă*. They make a kind of modulation; wherein, prolonging the duration of the ſound of the vowel, they vary the tone, raiſing and ſinking it by a certain pitch of voice: ſo that their talking is a ſort of muſic or ſinging. Attempts have been made to determine the quantity of the riſe or fall in each accent by means of muſical notes; but this is hard to effect, as being different in different perſons. Hence the great difficulty of the language to foreigners, they are forced to ſing moſt ſcrupulouſly: if they deviate ever ſo little from the accent, they ſay quite a different thing from what was intended. Thus, meaning to compliment the perſon you are talking to with the title *Sir*, you call him a beaſt with the ſame word, only a little varied in the tone. Magalhon makes the language the eaſier to learn on this account. The Siameſe are alſo obſerved to ſing rather than talk. Their alphabet begins with ſix characters, all only equivalent to a K, but differently accented. For though in the pronunciation the accents are naturally on the vowels, yet they have ſome to diverſify ſuch of their conſonants as are in other reſpects the ſame.

Accent, in *Muſic*, is a certain enforcement of particular ſounds, whether by the voice or inſtruments, generally uſed at the beginning of bars.

ACCEPTANCE, in *Law*, a perſon's agreeing to offers made in bargaining, by which the bargain is concluded.

Acceptance, in the church of Rome, is put for receiving the pope's conſtitutions.

Acceptance, in *Commerce*, is the ſubſcribing, ſigning, and making one's ſelf debtor for the ſum contained in a bill of exchange or other obligation.

ACCEPTATION, in *Grammar*, the ſenſe or meaning in which any word is taken.

ACCEPTER, or Acceptor, the perſon who accepts a BILL of exchange, &c.

ACCEPTILATION, among civilians, an acquittance or diſcharge given by the creditor to the debtor without the payment of any value.

ACCESSIBLE, ſomething that may be approached, or that acceſs may be had to. Thus we ſay, Such a place is acceſſible on one ſide, &c.

ACCESSION, in *Law*, is a method of acquiring property, by which, in things that have a cloſe connection or dependence upon one another, the property of the principal thing draws after it the property of the acceſſory: Thus, the owner of a cow becomes likewiſe the owner of the calf. It ſometimes likewiſe ſignifies conſent or acquieſcence.

Accession, among phyſicians, is uſed for a paroxyſm of a diſeaſe; among politicians, is ſignifies a prince's ſucceeding to the government upon the death of his predeceſſor.

ACCESSORY, or Accessary, ſomething that accedes, or is added to another more conſiderable thing; in which ſenſe the word ſtands oppoſed to PRINCIPAL.

Accessory, or *Acceſſary*, in *Common Law*, is chiefly uſed for a perſon guilty of a felonious offence, not principally, but by participation: as by advice, command, or concealment.

There are two kinds of *acceſſories: before* the fact,

Acceſſory and Acciaioli.

and *after* it. The *firſt* is he who commands, or procures another to commit felony, and is not preſent himſelf; for if he be preſent, he is a principal. The *ſecond* is he who receives, aſſiſts, or comforts any man that has done murder or felony, whereof he has knowledge. A man may alſo be acceſſory to an acceſſory, by aiding, receiving, &c. an acceſſory in felony.

An acceſſory in felony ſhall have judgement of life and member, as well as the principal who did the felony; but not till the principal be firſt attainted, and convict, or outlawed thereon. Where the principal is pardoned without attainder, the acceſſory cannot be arraigned; it being a maxim in law, *Ubi non eſt principalis, non poteſt eſſe acceſſorius:* but if the principal be pardoned, or have his clergy after attainder, the acceſſory ſhall be arraigned; 4 and 5 W. et M. cap. 4. And by ſtat. 1 Anne, cap. 9. it is enacted, that where the principal is convicted of felony or ſtands mute, or challenges above 20 of the jury, it ſhall be lawful to proceed againſt the acceſſory in the ſame manner as if the principal had been attainted; and notwithſtanding ſuch principal ſhall be admitted to his clergy, pardoned, or delivered before attainder. In ſome caſes alſo, if the principal cannot be taken, then the acceſſory may be proſecuted for a miſdemeanour, and puniſhed by fine, impriſonment, &c. In the loweſt and higheſt offences there are no acceſſories, but all are principals: as in riots, routs, forcible entries, and other treſpaſſes, which are the loweſt offences. So alſo in the higheſt offence, which is, according to the Engliſh law, high treaſon, there are no acceſſories.

Acceſſories, in petty treaſon, murder, and in felonies of ſeveral kinds, are not to have their clergy. There can be no acceſſory before the fact in manſlaughter; becauſe that is ſudden and unprepenſed.

Accessory Nerves, in *Anatomy*, a pair of nerves, which, ariſing from the medulla in the vertebræ of the neck, aſcend, and enter the ſkull, and paſs out of it again with the par vagum, wrapped up in the ſame common integument, and after quitting them, are diſtributed into the muſcles of the neck and ſhoulders. See Anatomy.

Accessory, among painters, an epithet given to ſuch parts of a hiſtory-piece as ſerve chiefly for ornament, and might have been wholly left out: ſuch as vaſes, armour, &c.

ACCI, in *Ancient Geography*, a town of Tarraconenſis, formerly called *Aeti;* ſuppoſed to be *Guadix*, to the eaſt of the city of Granada in Spain, at the foot of a mountain, near the ſource of the rivulet Guadalantin; now greatly decayed. It is the Colonia Accitana Gemella, and was of ſome repute among the Roman colonies. The people were called Gemellenſes, becauſe the colony conſiſted of coloniſts from the third and ſixth legions.

ACCIAIOLI, Donato, a native of Florence, was born in 1428, and was famous for his learning and the honourable employments which he held. He wrote, a Latin tranſlation of ſome of Plutarch's Lives; Commentaries on Ariſtotle's Ethics and Politics; and the Lives of Hannibal, of Scipio, and of Charlemagne. He was ſent to France by the Florentines, to ſolicit aid from Louis XI. againſt Pope Sixtus IV. but on his journey died at Milan in 1478; his body was carried to Florence, and buried in the church of the Carthuſians at the public expence. The ſmall fortune he left his children is a proof of his probity and diſintereſtedneſs. His daughters, like thoſe of Ariſtides, were portioned by his fellow-citizens, as an acknowledgement of his ſervices. His funeral eulogium was ſpoken by Chriſtopher Landini; and an elegant epitaph, by Politian, was inſcribed on his tomb.

Accident || Accidental

ACCIDENT, in a general ſenſe, denotes any caſual event.

Accident, among *Logicians*, is uſed in a threefold ſenſe. 1. Whatever does not eſſentially belong to a thing; as the clothes a man wears, or the money in his pocket. 2. Such properties in any ſubject as are not eſſential to it; thus whiteneſs in paper is an accidental quality. 3. In oppoſition to ſubſtance, all qualities whatever are called accidents; as ſweetneſs, ſoftneſs, &c.

Accident, in *Grammar*, implies a property attached to a word, without entering into its eſſential definition; for every word, notwithſtanding its ſignification, will be either primitive, derivative, ſimple, or compound, which are the accidents of words. A word is ſaid to be primitive, when it is taken from no other word in the language in which it is uſed: thus *heaven*, *king*, *good*, are primitive words. It is ſaid to be derivative, when it is taken from ſome other word: thus *heavenly*, *kingdom*, *goodneſs*, &c. are derivatives. A ſimple word is eaſily diſtinguiſhed from a compound: thus *juſt*, *juſtice*, are ſimple words; *unjuſt*, *injuſtice*, are compound: *res* is a ſimple word, as well as *publica;* but *reſpublica* is a compound. Beſides theſe accidents which are common to all ſorts of words, each particular ſpecies has its accidents: thus the accidents of the noun ſubſtantive are the gender, declenſion, and number; and the adjective has another accident, namely, the compariſon. See the articles Grammar and Language.

Accident, in *Heraldry*, an additional point or mark in a coat of arms, which may be either omitted or retained without altering the eſſence of the armour; ſuch as abatement, difference, and tincture.

ACCIDENTAL, in a general ſenſe, implies ſomething that happens by accident, or that is not eſſential to its ſubject

Accidental, in *Philoſophy*, is applied to that effect which flows from ſome cauſe intervening by accident, without being ſubject, or at leaſt without any appearance of being ſubject, to general laws or regular returns. In this ſenſe, *accident* is oppoſed to *conſtant* and *principal*. Thus the ſun's place is, with reſpect to the earth, the conſtant and principal cauſe of the heat in ſummer, and the cold in winter; whereas winds, ſnows, and rains, are the accidental cauſes which often alter and modify the action of the principal cauſe.

Accidental Colours, are thoſe which depend upon the affections of the eye, in contradiſtinction to thoſe which belong to the light itſelf. The impreſſions made upon the eye by looking ſtedfaſtly on objects of a particular colour are various, according to the ſingle colour or combination of colours in the object; and they continue for ſome time after the eye is withdrawn, and give a falſe colouring to other objects. M. Buffon has endeavoured to trace the connections which theſe accidental colours have with ſuch as are natural, in a variety of inſtances. The ſubject has alſo been conſidered

Acciſmus || Accius.

Accius, Acclamation.

conſidered by De la Hire and M. Æpinus; and M. d'Arcy has contrived a machine for determining the duration of thoſe impreſſions on the eye; and from the reſult of ſeveral experiments, he inferred, that the effect of the action of light on the eye continued about eight thirds of a minute.

Accidental Point, in *Perſpective*, is that point in the horizontal line where the projections of two lines parallel to each other meet the perſpective plane.

ACCIPENSER. See Ichthyology *Index*.

ACCIPITER, among the Romans, ſignified a hawk, which, from its being very carnivorous, they conſidered as a bird of bad omen:

Odimus accipitrem, quia ſemper vivit in armis. Ovid.

Pliny, however, tells us, that in ſome caſes, particularly in marriage, it was eſteemed a bird of good omen, becauſe it never eats the hearts of other birds; intimating thereby, that no differences in a married ſtate ought to reach the heart. The accipiter was worſhipped as a divinity by the inhabitants of Tentyra, an iſland in the Nile, being conſidered by them as the image of the ſun; and hence we find that luminary repreſented, in hieroglyphics, under the figure of a hawk.

ACCIPITRES, the name of Linnæus's firſt order of birds. See Ornithology.

ACCISMUS denotes a feigned refuſal of ſomething which a perſon earneſtly deſires. The word is Latin; or rather Greek, Ακκισμος; ſuppoſed to be formed from *Acco*, the name of a fooliſh old woman noted in antiquity for an affectation of this kind.

Acciſmus is ſometimes conſidered as a virtue; ſometimes as a vice, which Auguſtus and Tiberius practiſed with great ſucceſs. Cromwell's refuſal of the crown of England may be brought as an inſtance of an acciſmus.

Accismus is more particularly uſed, in *Rhetoric*, as a ſpecies of irony.

ACCITUM, in *Ancient Geography*, a town of Hiſpania Bætica, now *Finiana*, as appears from an ancient inſcription; ſituated on an eminence of the mountains Alpuxaras, in the province of Granada in Spain.

ACCIUS, Lucius, a Latin tragic poet, the ſon of a freedman, and, according to St Jerome, born in the conſulſhip of Hoſtilius Mancinus and Attilius Serranus, in the year of Rome 583; but there appears ſomewhat of confuſion and perplexity in this chronology. He made himſelf known before the death of Pacuvius, by a dramatic piece which was exhibited the ſame year that Pacuvius brought one upon the ſtage, the latter being then eighty years of age, and Accius only thirty. We do not know the name of this piece of Accius's, but the titles of ſeveral of his tragedies are mentioned by various authors. He wrote on the moſt celebrated ſtories which had been repreſented on the Athenian ſtage; as Andromache, Andromeda, Atreus, Clytemneſtra, Medea, Meleager, Philoctetes, the civil wars of Thebes, Tereus, the Troades, &c. He did not always, however, take his ſubjects from the Grecian ſtory; for he compoſed one dramatic piece wholly Roman: it was entitled *Brutus*, and related to the expulſion of the Tarquins. It is affirmed by ſome that he wrote alſo comedies; which is not unlikely, if he was the author of two pieces, the Wedding and the Merchant, which have been aſcribed to him. He did not confine himſelf to dramatic writing; for he left other productions, particularly his annals, mentioned by Macrobius, Priſcian, Feſtus, and Nonnius Marcellus. He has been cenſured for writing in too harſh a ſtyle, but in all other reſpects has been eſteemed a very great poet. He was ſo much eſteemed by the public, that a comedian was puniſhed, for only mentioning his name on the ſtage. Cicero ſpeaks with great deriſion of one Accius who had written a hiſtory; and, as our author had wrote annals, ſome inſiſt that he is the perſon cenſured: but as Cicero himſelf, Horace, Quintilian, Ovid, and Paterculus, have ſpoken of our author with ſo much applauſe, we cannot think it is the ſame perſon whom the Roman orator cenſures with ſo much ſeverity.

There was alſo in this age a pretty good orator of the ſame name, againſt whom Cicero defended Cluentius. He was born in Piſaurum, and perhaps was a relation of our poet.

Accius, a poet of the 16th century, to whom is attributed A Paraphraſe of Æſop's Fables, on which Julius Scaliger beſtows great encomiums.

ACCLAMATION, a confuſed noiſe or ſhout of joy, by which the public expreſs their applauſe, eſteem, or approbation.

Acclamation, in a more proper ſenſe, denotes a certain form of words, uttered with extraordinary vehemence, and in a peculiar tone ſomewhat reſembling a ſong, frequent in the ancient aſſemblies. Acclamations were uſually accompanied with applauſes, with which they are ſometimes confounded: though they ought to be diſtinguiſhed; as acclamation was given by the voice, applauſe by the hands: add, that acclamation was alſo beſtowed on perſons abſent, applauſe only on thoſe preſent. Acclamation was alſo given by women, whereas applauſe ſeems to have been confined to men.

Acclamations are of various kinds; eccleſiaſtical, military, nuptial, ſenatorial, ſynodical, ſcholaſtical, theatrical, &c. We meet with loud acclamations, muſical and rhythmical acclamations; acclamations of joy and reſpect, and even of reproach and contumely. The former, wherein words of happy omen were uſed, were alſo called *Laudationes*, *et bona vota*, or good wiſhes; the latter, *Execrationes et convicia*. Suetonius furniſhes an inſtance of this laſt kind in the Roman ſenate, on occaſion of the decree for demoliſhing the ſtatues of Domitian, when the fathers, as the hiſtorian repreſents it, could not refrain from contumelious acclamations of the deceaſed. The like were ſhown after the death of Commodus, where the acclamations run in the following ſtrain: *Hoſti patria honores detrahantur, parricidæ honores detrahantur: hoſtis ſtatuas undique, parricidæ ſtatuas undique, gladiatoris ſtatuas undique*, &c.—The formula, in acclamations, was repeated ſometimes a greater, ſometimes a leſſer, number of times. Hence we find in Roman writers, *acclamatum eſt quinquies, et vicies;* five times, and twenty times: ſometimes alſo *ſexagies*, and even *octuagies;* ſixty and eighty times.

Acclamations were not unknown on the theatres in the earlieſt ages of the Roman commonwealth; but they were artleſs then, and little other than confuſed ſhouts. Afterwards they became a ſort of regular concerts. That mentioned by Phædrus, *lætare incolumis Roma ſalvo principe*, which was made for Auguſtus, and proved the occaſion of a pleaſant miſtake of a flute-

player.

Acclamation

player called *Princeps*, shows that musical acclamations were in use in that emperor's reign. *Reverentem ex Provincia modulatis carminibus prosequebantur*, says Suetonius, who gives another instance in the time of Tiberius: a false report of Germanicus's recovery being spread through Rome, the people ran in crowds to the capitol with torches and victims, singing, *Salva Roma, Salva Patria, Salvus es! Germanicus*.—Nero, passionately fond of music, took special care to improve and perfect the music of acclamations. Charmed with the harmony with which the Alexandrians, who came to the games celebrated at Naples, had sung his praises, he brought several over to instruct a number of youth, chosen from among the knights and people, in the different kinds of acclamations practised at Alexandria. These continued in use as long as the reign of Theodoric. But the people did not always make a single chorus; sometimes there were two, who answered each other alternately: thus, when Nero played on the theatre, Burrhus and Seneca, who were on either hand, giving the signal by clapping, 5000 soldiers called *Augustals*, began to chant his praise, which the spectators were obliged to repeat. The whole was conducted by a music-master called *mesochorus* or *pausarius*.—The honour of acclamations was chiefly rendered to emperors, their children, and favourites; and to the magistrates who presided at the games. Persons of distinguished merit also sometimes received them, of which Quintilian gives us instances in Cato and Virgil. The most usual forms were, *Feliciter*, *Longiorem vitam*, *Annos felices*. The actors themselves, and they who gained the prizes in the games of the circus, were not excluded the honour of acclamations.

To theatrical acclamations may be added those of the soldiery and the people in time of triumph. The victorious army accompanied their general to the capitol; and, among the verses they sung in his praises, frequently repeated Io Triumphe, which the people answered in the same strain. It was also in the way of acclamation, that the soldiers gave their general the title of *Imperator*, after some notable victory: a title which he only kept till the time of his triumph.

The acclamations of the senate were somewhat more serious than the popular ones; but arose from the same principle, viz. a desire of pleasing the prince or his favourites; and aimed likewise at the same end, either to express the general approbation and zeal of the company, or to congratulate him on his victories, or to make him new protestations of fidelity. These acclamations were usually given after a report made by some senator, to which the rest all expressed their consent by crying Omnes, Omnes; or else, Æquum est, Justum est. Sometimes they began with acclamations, and sometimes ended with them without other debates. It was after this manner that all the elections and proclamations of emperors, made by the senate, were conducted; something of which practice is still retained at modern elections of kings and emperors, where *Vivat Rex*, and *Long live the King*, are customary forms of acclamation.

The Greeks borrowed the custom of receiving their emperors in the public places from the Romans. Luitprand relates, that at a procession where he was present, they sung to the emperor Nicephorus, πολλα ετης; that is, Many years: which Cuddon expresses thus, by το ψαλλειν το πολυχρονιον, or by το πολυχρονιζειν, and the wish or salutation by πολυχρονισμα. And at dinner, the Greeks then present wished with a loud voice to the emperor and Bardas, *Ut Deus annos multiplicet*; as he translates the Greek. Plutarch mentions an acclamation so loud, upon occasion of Flaminius's restoring liberty to Greece, that the very birds fell from heaven with the shout. The Turks practise something like this on the sight of their emperors and grand viziers to this day. Acclamation

For the acclamations with which authors, poets, &c. were received, who recited their works in public; it is to be observed, the assemblies for this purpose were held with great parade in the most solemn places, as the capitol, temples, the Athenæum, and the houses of great men. Invitations were sent everywhere, in order to get the greater appearance. The chief care was, that the acclamations might be given with all the order and pomp possible. Men of fortune who pretended to wit, kept able applauders in their service, and lent them to their friends. Others endeavoured to gain them by presents and treats. Philostratus mentions a young man named Vavus, who lent money to the men of letters, and forgave the interest to such as applauded his exercises. These acclamations were conducted much after the same manner as those in the theatre, both as to the music and the accompaniments: they were to be suited both to the subject and to the person. There were particular ones for the philosophers, for orators, for historians, and for poets. It would be difficult to rehearse all the forms of them; one of the most usual was *Sophos*, which was to be repeated three times. Martial comprehends several other usual forms in this verse:

Graviter, Citò, Nequiter, Euge, Beatè.

Neither the Greeks nor Romans were barren on this head. The names of gods and heroes were given those whom they would extol. It was not enough to do it after each head of discourse, chiefly after the exordium; but the acclamations were renewed at every fine passage, frequently at every period.

The acclamations with which the spectators honoured the victories of the athletæ, were a natural consequence of the impetuous motions which attended the gymnastic games. The cries and acclamations of the people, sometimes expressing their compassion and joy, sometimes their horror and disgust, are strongly painted by different poets and orators.

Acclamations made also a part of the ceremony of marriage. They were used for the omen's sake; being the *Læta Omina*, sometimes spoken of before marriage in Roman writers.

Acclamations, at first practised in the theatre, and passing thence to the senate, &c. were in process of time received into the acts of councils, and the ordinary assemblies of the church. The people expressed their approbation of the preacher variously; the more usual forms were, *Orthodox! Third Apostle*, &c. These acclamations being sometimes carried to excess, and often misplaced, were frequently prohibited by the ancient doctors, and at length abrogated; though they appear to have been in some use about the time of St Bernard.

Declivity || Accolti.

Acclamation Medals, among *Antiquaries*, such as represent the people expressing their joy in the posture of acclamation.

ACCLIVITY, the rise or ascent of a hill, in opposition to the declivity or descent of it. Some writers on fortification use it for the talus of a rampart.

ACCOLA, among the Romans, signified a person who lived *near* some place; in which sense, it differed from *incola*, the *inhabitant* of such a place.

ACCOLADE, a ceremony anciently used in the conferring of knighthood.

Antiquaries are not agreed wherein the accolade properly consisted. The generality suppose it to be the embrace, or kiss, which princes anciently gave the new knight, as a token of their affection: whence the word *accolade*; q. d. a clasping, or taking round the neck. Others will rather have it to be a blow on the chine of the neck, given on the same occasion. The Accolade is of some antiquity, in whichsoever of the two senses it be taken. Greg. de Tours writes, that the kings of France, even of the first race, in conferring the gilt shoulder-belt, kissed the knights on the left cheek. For the *accolée*, or blow, John of Salisbury assures us, it was in use among the ancient Normans: by this it was that William the Conqueror conferred the honour of knighthood on his son Henry. At first it was given with the naked fist; but was afterwards changed into a blow with the flat of the sword on the shoulder of the knight.

ACCOLE'E, sometimes synonymous with Accolade, which see.—It is also used in various senses in heraldry; sometimes it is applied to two things joined; at other times, to animals with crowns or collars about their necks, as the lion in the Ogilvy's arms; and, lastly, to kews, battons, maces, swords, &c. placed saltierwise behind the shield.

ACCOLTI, Benedict, the younger, grandson of Benedict Accolti the elder, who flourished about the year 1376, was born at Arezzo in 1415. About the year 1450, he was appointed secretary to the republic of Florence, when he was greatly distinguished. He wrote "Four Books concerning the War which the Christians carried on against the Infidels to recover Judæa and the Holy Sepulchre." This work was printed at Venice in 1532, and it is the ground-plot of Tasso's Jerusalem Delivered. He wrote also an account of the "Excellent Personages of his Time," in the form of dialogue. He died in 1466.

Accolti, *Benedict*, was nephew, or according to some, grandson of Peter Accolti, and was born at Florence in 1497. He was much distinguished for his knowledge of law, and a most retentive memory; and was such a master of the Latin language, that he obtained the flattering appellation of *the Cicero of the age*. He enjoyed very high ecclesiastical honours: Leo X. bestowed on him the bishopric of Cadiz; Adrian the VI. gave him that of Cremona, and the archbishopric of Ravenna; and Clement VII. raised him to the rank of cardinal. At the request of Clement, he wrote a treatise in vindication of the pope's right to the kingdom of Naples. He left several other works, and particularly some pieces of poetry. He died at Florence in 1549.

Accolti, *Francis*, brother of the former, was born about the year 1418. He was professor of jurisprudence in several universities, and was styled the *prince of lawyers*. His understanding was vigorous, his knowledge was extensive, and his eloquence powerful; but he was so sordidly parsimonious that he amassed immense treasures. He died about the year 1470; and left behind him several works on law, and some translations of the works of Chrysostom. Accommodation || Accompaniment.

Accolti, *Peter*, the son of Benedict the younger, was born at Arezzo about the year 1455. He was a professor of law, and taught with great reputation. He was successively raised to several bishoprics, and at last to the rank of cardinal in 1511. He was created by Pope Leo X. prince of the state of Nepi. He wrote a comedy entitled "Virginia," and some other poems which were much applauded by his contemporaries. He died at Rome in 1532.

ACCOMMODATION, the application of one thing, by analogy, to another; or the making two or more things agree with one another.

To know a thing by *accommodation*, is to know it by the idea of a similar thing referred thereto.

A prophecy of scripture is said to be fulfilled various ways; properly, as when a thing foretold comes to pass; and improperly, or by way of *accommodation*, when an event happens to any place or people, like to what fell out some time before to another.—Thus, the words of Isaiah, spoken to those of his own time, are said to be fulfilled in those who lived in our Saviour's; and are *accommodated* to them: "Ye hypocrites, well did Esaias prophecy of you," &c. which same words St Paul afterwards *accommodates* to the Jews of his time.

The primitive church *accommodated* multitudes of Jewish, and even heathen ceremonies and practices, to Christian purposes; but the Jews had before done the same by the Gentiles: some will even have circumcision, the tabernacle, brazen serpent, &c. to have been originally of Egyptian use, and only *accommodated* by Moses to the purposes of Judaism *. Spencer maintains, that most of the rites of the old law were in imitation of those of the Gentiles, and particularly of the Egyptians; that God, in order to divert the children of Israel from the worship they paid to their false deities, consecrated the greatest part of the ceremonies performed by those idolaters, and had formed out of them a body of the ceremonial law; that he had indeed made some alterations therein, as barriers against idolatry; and that he thus *accommodated* his worship to the genius and occasions of his ancient people. To this condescension of God, according to Spencer †, is owing the origin of the tabernacle, and particularly that of the ark. These opinions, however, have been controverted by later writers.

* *Saurin, Diss. O. Tom.* i.

† *De legib. Hebr.* diss. i. l. 3. p. 32.

ACCOMPANIMENT, something attending or added as a circumstance to another, either by way of ornament, or for the sake of symmetry.

Accompaniment, Accompagnamento, Accompagnatura, in *Music*, denotes the instruments which accompany a voice, in order to sustain it, as well as to make the music more full. The accompaniment is used in recitative, as well as in song; on the stage, as well as in the choir, &c. The ancients had likewise their accompaniments in the theatre; they had even different kinds of instruments to accompany the chorus, from those which accompanied the actors in the recitation.

The

Accompaniment || Accords.

The accompaniment, among the moderns, is frequently a different part or melody from the ſong it accompanies. It is diſputed whether it was ſo among the ancients. It is generally alleged, that their accompaniments went no farther than the playing in octave, or in antiphony to the voice. The Abbé Fraguier, from a paſſage in Plato, pretends to prove, that they had actual ſymphony, or muſic in parts: but his arguments ſeem far from being concluſive.

ACCOMPANIMENT, in *Painting*, denotes ſuch objects as are added, either by way of ornament or fitneſs to the principal figures; as dogs, guns, game, &c. in a hunting piece.

ACCOMPANIMENT, in *Heraldry*, any thing added to a ſhield by way of ornament; as the belt, mantling, ſupporters, &c. It is alſo applied to ſeveral bearings about a principal one; as a ſaltier, bend, feſs, chevron, &c.

ACCOMPLICE, one that has a hand in a buſineſs; or is privy in the ſame deſign or crime with another. See ACCESSORY.

By the law of Scotland, the *accomplice* can only be proſecuted after the conviction of the *principal* offender, unleſs the acceſſion of the *accomplice* is immediate, in *ipſo actu*, ſo as in effect to render them *co-principal*. By the general rule, the *accomplice* ſuffers the ſame puniſhment with the *principal* offender; yet if he be remarkably leſs guilty, juſtice will not permit equal puniſhment.

The council of Sens, and ſeveral other ſynodical ſtatutes, expreſsly prohibit the revealing of *accomplices*.

ACCOMPLISHMENT, the entire execution or fulfilling of any thing.

ACCOMPLISHMENT is principally uſed in ſpeaking of events foretold by the Jewiſh prophets in the Old Teſtament, and fulfilled under the New. We ſay a literal accompliſhment, a myſtical or ſpiritual accompliſhment, a ſingle accompliſhment, a double accompliſhment, a Jewiſh accompliſhment, a Chriſtian, a heathen accompliſhment. The ſame prophecy is ſometimes accompliſhed in all, or in ſeveral of thoſe different ways. Thus, of ſome of the prophecies of the Old Teſtament, the Jews find a literal accompliſhment in their own hiſtory, about the time when the prophecy was given: the Chriſtians find another in Chriſt, or the earlieſt days of the church; the heathens another, in ſome of their emperors; the Mahometans another, in their legiſlator, &c. There are two principal ways of accompliſhing a prophecy, *directly*, and by *accommodation*. See ACCOMMODATION, and PROPHECY.

ACCOMPLISHMENT, is alſo uſed for any mental or perſonal endowment.

ACCORD, in *Painting*, is the harmony that reigns among the lights and ſhades of a picture.

ACCORDS, STEPHEN TABOUROT, SEIGNEUR DES, advocate in the parliament of Dijon in France, and king's advocate in the bailiwick and chancery of that city, was born in 1549. He was a man of genius and learning; but too much addicted to trifles, as appears from his piece, entitled, "Les Bigarrures," printed at Paris in 1582. This was not his firſt production, for he had before printed ſome ſonnets. His work, entitled *Les Touches*, was publiſhed at Paris in 1585; which is indeed a collection of witty poems, but worked up in a looſe manner, according to the licentious taſte of that age. His Bigarrures are written in the ſame ſtrain. He was cenſured for this way of writing, which obliged him to publiſh an apology. The lordſhip of Accords is an imaginary fief or title from the device of his anceſtors, which was a drum, with the motto *à tous accords*, "chiming with all." He had ſent a ſonnet to a daughter of M. Begat, the great and learned preſident of Burgundy, "who (ſays he) did me the honour to love me: And inaſmuch (continues he), I had ſubſcribed my ſonnet with only my device *à tous accords*, this lady firſt nicknamed me, in her anſwer, *Seigneur des Accords*; by which title her father alſo called me ſeveral times. For this reaſon I choſe this ſurname, not only in all my writings compoſed at that time, but even in theſe books." He died in 1595, in the 46th year of his age.

Accorſo.

ACCORSO (in Latin *Accurſius*), FRANCIS, the elder, an eminent lawyer, was born at Bagnolo, near Florence, in 1182. He began the ſtudy of law at a late period of life; but ſuch were his aſſiduity and proficiency, that he ſoon diſtinguiſhed himſelf. He was appointed profeſſor at Bologna, and became a very eminent teacher. He undertook the great work of uniting and arranging into one body the almoſt endleſs comments and remarks upon the Code, the Inſtitutes, and Digeſts, which, he obſerved, only tended to involve the ſubjects in obſcurity and contradiction. When he was employed in this work, it is ſaid, that hearing of a ſimilar one propoſed and begun by Odofred, another lawyer of Bologna, he feigned indiſpoſition, interrupted his public lectures, and ſhut himſelf up, till he had, with the utmoſt expedition, accompliſhed his deſign. His work, entitled "A Perpetual Commentary," was much eſteemed. It was printed with the "Body of Law," publiſhed at Lyons in 1627. He died in 1260, and left very great riches. His ſon, the younger Francis Accorſo, ſucceeded him in his profeſſorſhip, and accompanied Edward I. to England, on his return from the cruſade in 1237. (*Gen. Biog*).

ACCORSO, *Mariangelo*, a learned and ingenious critic, was a native of Aquila, in the kingdom of Naples, and lived about the beginning of the ſixteenth century. To a perfect knowledge of Greek and Latin, he added an intimate acquaintance with ſeveral modern languages. Claſſical literature was much improved and promoted by his labours. In diſcovering and collating ancient manuſcripts he diſplayed uncommon aſſiduity and diligence. His work, entitled "*Diatribæ*," printed at Rome, in folio, in 1524, is a ſingular monument of erudition and critical ſkill. He beſtowed, it is ſaid, unuſual pains on Claudian, and made above ſeven hundred corrections in the works of that poet, from different manuſcripts. Unfortunately the world has been deprived of the advantage of theſe criticiſms; for they were never publiſhed. Theſe corrections were made while he travelled on horſeback during a tour through Germany, a circumſtance which is ſtrongly characteriſtic of his induſtry and aſſiduity. An edition of *Ammianus Marcellinus*, which he publiſhed at Augſburg in 1533, contains five books more than any former one. He was the firſt editor of the "Letters of Caſſiodorus," with his "Treatiſe on the Soul." The affected

uſe

Account || Accretion.

uſe of antiquated terms introduced by ſome of the Latin writers of that age, is humouroufly ridiculed in a dialogue publiſhed in 1531, entitled, "*Oſco, Volſco, Romanoque, Eloquentia, Interlocutoribus, Dialogus Ludis Romanis actus.* He compoſed a book on the invention of printing. On the firſt leaf of a grammar of Donatus, printed on vellum, there is written with his own hand: "This Donatus, with another book entitled "*Confeſſionalia*," were the firſt books printed; and John Fauſtus, citizen of Mentz, inventor of the art, had put them to the preſs in the year 1450." He had been accuſed of plagiariſm in his notes on Auſonius; and the ſolemn and determined manner in which he repelled this charge of literary theft, preſents us with a ſingular inſtance of his anxiety and care to preſerve his literary reputation unſtained and pure. It is in the following oath: "In the name of gods and men, of truth and ſincerity, I ſolemnly ſwear, and if any declaration be more binding than an oath, I in that form declare, and I deſire that my declaration may be received as ſtrictly true, that I have never read or ſeen any author, from which my own lucubrations have received the ſmalleſt aſſiſtance or improvement; nay, that I have even laboured, as far as poſſible, whenever any writer has publiſhed any obſervations which I myſelf had before made, immediately to blot them out of my own works. If in this declaration I am forſworn, may the pope puniſh my perjury; and may an evil genius attend my writings, ſo that whatever in them is good, or at leaſt tolerable, may appear to the unſkilful multitude exceedingly bad, and even to the learned trivial and contemptible; and may the ſmall reputation I now poſſeſs be given to the winds, and regarded as the worthleſs boon of vulgar levity." (*Gen. Biog.*)

ACCOUNT, or ACCOMPT, in a general ſenſe, a computation or reckoning of any thing by numbers.—Collectively it is uſed to expreſs the books which merchants, traders, bankers, &c. uſe for recording their tranſactions in buſineſs. See BOOK-KEEPING.

Chamber of Accounts, in the French polity, a ſovereign court of great antiquity, which took cognizance of and regiſtered the accounts of the king's revenue; nearly the ſame with the Engliſh *Court of Exchequer*.

ACCOUNT is taken ſometimes, in a particular ſenſe, for the computation of time: thus we ſay, the Julian Account, the Gregorian Account, &c. in which ſenſe it is equivalent to *ſtyle*.

ACCOUNTANT, or ACCOMPTANT, in the moſt general ſenſe, is a perſon ſkilled in accounts. In a more reſtricted ſenſe, it is applied to a perſon, or officer, appointed to keep the accounts of a public company or office: as the South Sea, the India Company, the Bank, the Exciſe, &c.

ACCOUNTANTSHIP, the art of keeping and balancing accounts. See BOOK-KEEPING.

ACCOUNTANT-GENERAL, a new officer in the court of chancery, appointed by act of parliament to receive all monies lodged in court inſtead of the maſters, and convey the ſame to the bank of England for ſecurity.

ACCOUTREMENT, an old term applied to the furniture of a ſoldier, knight, or gentleman.

ACCRETION, in *Phyſics*, the increaſe or growth of an organical body, by the acceſſion of new parts. See NUTRITION, PLANTS, and VEGETABLES.

ACCRETION, among civilians, the property acquired in a vague or unoccupied thing, by its adhering to or following another already occupied: thus, if a legacy be left to two perſons, one of whom dies before the teſtator, the legacy devolves to the ſurvivor by right of accretion.

Accroche || Accurſed.

ACCROCHE, in *Heraldry*, denotes a thing's being hooked with another.

ACCUBATION, a poſture of the body, between ſitting and lying. The word comes from the Latin *accubare*, compounded of *ad*, to, and *cubo*, I lie down. *Accubation*, or *Accubitus*, was the table poſture of the Greeks and Romans; whence we find the words particularly uſed for the lying, or rather (as we call it) ſitting down to meat. The Greeks introduced this poſture. The Romans, during the frugal ages of the republic, were ſtrangers to it; but as luxury got footing, this poſture came to be adopted, at leaſt by the men; for as to women, it was reputed an indecency in them to lie down among the men: though, afterwards, this too was got over. Children did not lie down, nor ſervants, nor ſoldiers, nor perſons of meaner condition. They took their meals ſitting, as a poſture leſs indulgent. The Roman manner of diſpoſing themſelves at table was this: A low round table was placed in the *cœnaculum*, or dining room, and, about this, uſually three, ſometimes only two, beds or couches; and according to their number, it was called *biclinium* or *triclinium*. Theſe were covered with a ſort of bedclothes, richer or plainer according to the quality of the perſon, and furniſhed with quilts and pillows, that the gueſts might lie the more commodiouſly. There were uſually three perſons on each bed; to crowd more, was eſteemed ſordid. In eating, they lay down on their left ſides, with their heads reſting on the pillows, or rather on their elbows. The firſt lay at the head of the bed, with his feet extended behind the back of the ſecond; the ſecond lay with the back of his head towards the navel of the firſt, only ſeparated by a pillow, his feet behind the back of the third; and ſo of the third or fourth. The middle place was eſteemed the moſt honourable. Before they came to table, they changed their clothes, putting on what they called *cœnatoria veſtis*, the dining garment; and pulled off their ſhoes, to prevent ſoiling the couch.

ACCUBITOR, an ancient officer of the emperors of Conſtantinople, whoſe buſineſs was to lie near the emperor. He was the head of the youth of the bedchamber, and had the *cubicularius* and *procubitor* under him.

ACCUMULATION, in a general ſenſe, the act of heaping or amaſſing things together. Among lawyers, it is uſed in ſpeaking of the concurrence of ſeveral titles to the ſame thing, or of ſeveral circumſtances to the ſame proof.

Accumulation of Degrees, in a univerſity, is the taking ſeveral of them together, or at ſhorter intervals than uſual or than is allowed by the rules of the univerſity.

ACCURSED, ſomething that lies under a curſe, or ſentence of excommunication.

In the Jewiſh idiom, *accurſed* and *crucified* were ſynonymous. Among them, every one was accounted *accurſed* who died on a tree. This ſerves to explain the difficult paſſage in Rom. ix. 3. where the apoſtle

Accuſation ‖ Accuſative.

Paul wiſhed himſelf *accurſed after the manner of Chriſt*, i. e. crucified, if happily he might by ſuch a death ſave his countrymen. The prepoſition απο here made uſe of, is uſed in the ſame ſenſe, 2. Tim. i. 3. where it obviouſly ſignifies *after the manner of*.

ACCUSATION, the charging any perſon with a criminal action, either in one's own name, or in that of the public. The word is compounded of *ad*, to; and *cauſari* to plead.

Writers on politics treat of the benefit and the inconveniencies of public accuſations. Various arguments are alleged, both for the encouragement and diſcouragement of accuſations againſt great men. Nothing, according to Machiavel, tends more to the preſervation of a ſtate, than frequent accuſations of perſons truſted with the adminiſtration of public affairs. This, accordingly, was ſtrictly obſerved by the Romans, in the inſtances of Camillus, accuſed of corruption by Manlius Capitolinus, &c. Accuſations, however, in the judgement of the ſame author, are not more beneficial than calumnies are pernicious; which is alſo confirmed by the practice of the Romans. Manlius not being able to make good his charge againſt Camillus, was caſt into priſon.

By the Roman law, there was no public accuſer for public crimes; every private perſon, whether intereſted in the crime or not, might accuſe, and proſecute the accuſed to puniſhment or abſolution. Cato, the moſt innocent perſon of his age, had been accuſed 42 times, and as often abſolved. But the accuſation of *private* crimes was never received but from the mouths of thoſe who were immediately intereſted in them: None (*e. g.*) but the huſband could accuſe his wife of adultery.

The ancient Roman lawyers diſtinguiſhed between *poſtulatio*, *delatio*, and *accuſatio*. For, firſt, leave was deſired to bring a charge againſt one, which was called *poſtulare*: then he againſt whom the charge was laid was brought before the judge; which was called *deferre*, or *nominis delatio*: laſtly, the charge was drawn up and preſented; which was properly the *accuſatio*. The accuſation properly commenced, according to Pœdianus, when the *reus* or party charged, being interrogated, denied he was guilty of the crime, and ſubſcribed his name to the *delatio* made by his opponent.

In the French law, none but the procureur general, or his deputies, can form an accuſation, except for high treaſon and coining, where accuſation is open to every body. In other crimes, private perſons can only act the part of denouncers, and demand reparation for the offence, with damages.

In Britain, by Magna Charta, no man ſhall be impriſoned or condemned on any accuſation, without trial by his peers, or the law; none ſhall be vexed with any accuſation, but according to the law of the land; and no man may be moleſted by petition to the king, &c. unleſs it be by indictment or preſentment of lawful men, or by proceſs at common law. Promoters of ſuggeſtions, are to find ſurety to purſue them; and if they do not make them good, ſhall pay damages to the party accuſed, and alſo a fine to the king. No perſon is obliged to anſwer upon oath to a queſtion whereby he may accuſe himſelf of any crime.

ACCUSATIVE, in *Latin Grammar*, is the fourth caſe of nouns, and ſignifies the relation of the noun on which the action implied in the verb terminates; and hence, in ſuch languages as have caſes, theſe nouns have a particular termination, called *accuſative*, as, *Auguſtus vicit Antonium*, Auguſtus vanquiſhed Antony. Here *Antonium* is the noun on which the action implied in the word *vicit* terminates; and, therefore, muſt have the accuſative termination. Ovid, ſpeaking of the palace of the ſun, ſays, *Materiem ſuperabat opus*, The work ſurpaſſed the materials. Here *materiem* has the accuſative termination; becauſe it determines the action of the verb *ſuperabat*.—In the Engliſh language there are no caſes, except the genitive; the relation of the noun being ſhown by the aſſiſtance of prepoſitions, as *of*, *to*, *from*, &c.

Accuſiorum Colonia ‖ Acephalous.

ACCUSIORUM COLONIA, in *Ancient Geography*, an inland town in the Cavares, in Gallia Narbonenſis; now *Grenoble*, in Dauphiné. See GRENOBLE.

ACE, among gameſters, a card or die marked only with one point.

ACELDAMA, in Scripture hiſtory, a place without the ſouth wall of Jeruſalem, beyond the brook of Siloam, was called the Potters field, becauſe clay of which pots were made was dug out of it. It was afterwards bought with the money with which the high prieſts and rulers of the Jews purchaſed the blood of Jeſus Chriſt, and hence it was called *Aceldama*, the field of blood.

ACELUM, or ACELIUM, in *Ancient Geography*, a town of the Venetian territory, now called *Azolo*, ſituated to the weſt of Trevigi, at the ſource of the rivulet Muſone. E. Long. 13°. N. Lat. 45°.

ACENTETUM, or ACANTETA, in *Natural Hiſtory*, a name given by the ancients to the pureſt and fineſt kind of rock cryſtal: They uſed the cryſtal in many ways; ſometimes engraving on it, and ſometimes forming it into vaſes and cups, which were held next in value to the *vaſa murrhina* of thoſe times. The cryſtal they obtained from the iſland of Cyprus was much eſteemed; but often faulty in particular parts, having hairs, cracks, and foulneſſes, which they called *falts*, in the middle of the large pieces. Pliny tells us, that when it was uſed for engraving on, the artiſt could conceal all theſe blemiſhes among the ſtrokes of his work; but when it was to be formed into cups or precious vaſes, they always choſe the acentetum which had no flaws or blemiſhes.

ACEPHALI, or ACEPHALITÆ, a term applied to ſeveral ſects who refuſed to follow ſome noted leader. Thus the perſons who refuſed to follow either John of Antioch, or St Cyril, in a diſpute that happened in the council of Epheſus, were termed *Acephali*, without a head or leader. Such biſhops, alſo, as were exempt from the juriſdiction and diſcipline of their patriarch, were ſtyled *Acephali*.

ACEPHALI, the levellers in the reign of King Henry I. who acknowledged no head or ſuperior. They were reckoned ſo poor, that they had not a tenement by which they might acknowledge a ſuperior lord.

ACEPHALOUS, or ACEPHALUS, in a general ſenſe; without a head.

The term is more particularly uſed in ſpeaking of certain nations, or people, repreſented by ancient naturaliſts and coſmographers, as well as by ſome modern travellers,

Acephalous travellers, as formed without heads; their eyes, mouth, &c. being placed in other parts.

Acerra.

Such are the Blemmyes, a nation of Africa near the head of the Niger, represented to be by Pliny and Solinus; *Blemmyes traduntur capita abesse, ore et oculis pectore affixis.* Ctesias and Solinus mention others in India near the Ganges, *sine cervice, oculos in humeris habentes.* Mela also speaks of people, *quibus capita et vultus in pectore sunt.* And Suidas, Stephanus Byzantinus, Vopiscus, and others after them, relate the like. Some modern travellers still pretend to find acephalous people in America.

Several opinions have been framed as to the origin of the fable of the Acephali. The first is that of Thomas Bartholin, who turns the whole into a metaphor; being convinced, that the name Acephali was anciently given to such as had less brain, or conducted themselves less by the rules of prudence than others. Olearius rather apprehends, that the ancient voyagers, viewing certain barbarous people from the coasts, had been imposed on by their uncouth dress; for that the Samogitians, being short of stature, and going in the severity of winter with their heads covered in hoods, seem at a distance as if they were headless. F. Lafitau says, that by Acephali are only meant people whose heads are sunk below their shoulders. In effect, Hulsius, in his epitome of Sir Walter Raleigh's voyage to Guiana, also speaks of a people which that traveller found in the province of Irvipanama, between the lakes of Panama and Cassipa, who had no head or neck; and Hondius, in his map, marks the place with the figures of these monsters. Yet De Laet * rejects the story; being informed by others, that the inhabitants of the banks of the Caora, a river that flows out of the lake of Cassipa, have their heads so far sunk between their shoulders, that many believed they had their eyes in their shoulders, and their mouths in their breasts.

Descript. Amer. l. 17. c. 22.

But though the existence of a nation of Acephali be ill warranted, naturalists furnish several instances of individuals born without heads, by some lusus or deviation of nature. Wepfer gives † a catalogue of such acephalous births, from Shenckius, Licetus, Paræus, Wolfius, Mauriceau, &c.

† *In Eph. Ger.* dec. 1. an. 3. obs. 129. p. 184. Dec. 2. an. 9. obser. 148. p. 258.

Acephalus, an obsolete term for the tænia or tape-worm, which was long supposed to be acephalous. The first who gave it a head was Tulpius; and after him, Fehr: The former even makes it *biceps*, or two-headed.

Acephalus, is also used to express a verse defective in the beginning.

ACER, the Maple or Sycamore tree. See Botany *Index.*

ACERB, a sour rough astringency of taste, such as that of unripe fruit.

ACERINA, in *Ichthyology*, a name given by Pliny and other of the old naturalists, to the fish we at this time call the *ruffe*. See Perca, Ichthyology *Index.*

ACERNO, in *Geography*, a town of Italy, in the citerior principality of Naples, with a bishop's see. It is situated 12 miles north-east of Saluno, in E. Long. 15. 46. N. Lat. 40. 45.

ACERRA, in antiquity, an altar erected, among the Romans, near the bed of a person deceased, on which his friends daily offered incense till his burial.—The real intention probably was to overcome any offensive smell that might arise about the corpse. The Chinese have still a custom like this: they erect an altar to the deceased in a room hung with mourning; and place an image of the dead person on the altar, to which every one that approaches it bows four times, and offers oblations and perfumes.

Acerra ‖ Acetabulum

The *acerra* also signified a little pot wherein were put the incense and perfumes to be burnt on the altars of the gods and before the dead. It appears to have been the same with what was otherwise called *thuribulum*, and *pyxis*.

We find mention of *acerræ* in the ancient church. The Jews had also their *acerræ*, in our version rendered *censers*; and the Romanists still retain them under the name of *incense pots*. In Roman writers, we frequently meet with *plena acerra*, a full acerra: to understand which, it is to be observed, that people were obliged to offer incense in proportion to their estate and condition; the rich in larger quantities, the poor only a few grains; the former poured out full *acerræ* on the altar, the latter took out two or three bits with their fingers.

Acerra, a town of Italy, in the kingdom of Naples, and in the Terra di Lavoro; seated on the river Agno, seven miles north-east of Naples. E. Long. 14. 30. N. Lat. 40. 55.

ACERRÆ, in *Ancient Geography*, the name of a town on the Clanius, in Campania, not far from Naples; now Acerra.—The name also of another town, now called *la Girola*, in the territory and to the south-east of Lodi, where the rivulet Serio falls into the Adda, to the west of Cremona and north of Placentia.

ACESINES, in *Ancient Geography*, a large and rapid river of India which Alexander passed in his expedition into that country. The kingdom of Porus, which was conquered by Alexander, lay between the Hydaspes and this river, which, uniting with the former and other considerable rivers, pours its waters into the Indus. According to Major Rennell, the modern Jenaub is the Acesines of the ancients.

ACESIUS, a bishop of Constantinople in the reign of Constantine, was a rigid adherent to the Novatian doctrines, according to which those whom persecutions had shaken from the faith, or who were guilty of any mortal sin after baptism, could not be admitted to the communion of the church, even after exhibiting the most convincing proofs of sincere repentance. Constantine, who was extremely displeased with the severity of this rigid sect, in discouraging and rejecting repentance, is said to have thus expressed himself: "Then, Acesius, make a ladder for yourself, and go up to heaven alone." (*Gen. Biog.*)

ACESCENT, a word used to denote any thing which is turning sour, or which is slightly acid. It is only applied properly to the former of these two meanings. The second may be expressed by either of the two words, *acidulous*, or *sub-acid.*

ACETABULUM, in antiquity, a measure used by the ancients, equal to one-eighth of our pint. It seems to have acquired its name from a vessel in which acetum or vinegar was brought to their tables, and which probably contained about this quantity.

Acetabulum, in *Anatomy*, a cavity in any bone

Acetabulum || Achæans.

for receiving the protuberant head of another, and thereby forming that ſpecies of articulation called ENARTHROSIS.

ACETABULUM, in *Botany*, the trivial name of a ſpecies of the peziza, or cup peziza, a genus belonging to the cryptogamia fungi of Linnæus. It has got the name of *acetabulum*, from the reſemblance its leaves bear to a cup. See PEZIZA, Botany *Index*.

ACETARY. Grew, in his anatomy of plants, applies this term to a pulpy ſubſtance, in certain fruits, e. g. the pear, which is encloſed in a congeries of ſmall calculous bodies towards the baſe of the fruit, and is always of an acid taſte.

ACETOSA, SORREL; by Linnæus joined to the genus *Rumex*. See BOTANY *Index*.

ACETOSELLA, in *Botany*, a ſpecies of OXALIS. See BOTANY *Index*.

ACETOUS, an epithet applied to ſuch ſubſtances as are ſour, or partake of the nature of vinegar.

ACETUM, VINEGAR, the vegetable ACID of the chemiſts. See AGETOUS ACID, CHEMISTRY *Index*.

ACHABYTUS, in *Ancient Geography*, a high mountain in Rhodes, on the top of which ſtood a temple of Jupiter.

ACHÆA, in *Ancient Geography*, a town of the iſland of Rhodes, in the diſtrict of Jalyſus, and the firſt and moſt ancient of all, ſaid to be built by the Heliades, or grandſons of the ſun.

ACHÆA, a hamlet of Aſiatic Sarmatia, on the Euxine. The inhabitants were called *Achæi*, a colony of the Orchomenians.

ACHÆANS, the inhabitants of ACHAIA Propria, a Peloponneſian ſtate. This republic was not conſiderable in early times, for the number of its troops, nor for its wealth, nor for the extent of its territories; but it was famed for its probity, its juſtice, and its love of liberty. Its high reputation for theſe virtues was very ancient. The Crotonians and Sybarites, to re-eſtabliſh order in their towns, adopted the laws and cuſtoms of the Achæans. After the famous battle of Leuctra, a difference aroſe betwixt the Lacedemonians and Thebans, who held the virtue of this people in ſuch veneration, that they terminated the diſpute by their deciſion. The government of the Achæans was democratical. They preſerved their liberty till the time of Philip and Alexander: But in the reign of theſe princes, and afterwards, they were either ſubject to the Macedonians, who had made themſelves maſters of Greece, or oppreſſed by cruel tyrants. The Achæan commonwealth conſiſted of twelve inconſiderable towns in Peloponneſus. Its firſt annals are not marked by any great action, for they are not graced with one eminent character. After the death of Alexander, this little republic was a prey to all the evils which flow from political diſcord. Zeal for the good of the community was now extinguiſhed. Each town was only attentive to its private intereſt. There was no longer any ſtability in the ſtate; for it changed its maſters with every revolution in Macedonia. Towards the 124th Olympiad, about the time when Ptolemy Soter died, and when Pyrrhus invaded Italy, the republic of the Achæans recovered its old inſtitutions and unanimity. The inhabitants of Patræ and of Dymæ were the firſt aſſertors of ancient liberty. The tyrants were baniſhed, and the towns again made one commonwealth. A public council was then held, in which affairs of importance were diſcuſſed and determined. A regiſter was appointed to record the tranſactions of the council. This aſſembly had two preſidents, who were nominated alternately by the different towns. But inſtead of two preſidents, they ſoon elected but one. Many neighbouring towns which admired the conſtitution of this republic, founded on equality, liberty, the love of juſtice, and of the public good, were incorporated with the Achæans, and admitted to the full enjoyment of their laws and privileges.—The arms which the Achæans chiefly uſed were ſlings. They were trained to the art from their infancy, by ſlinging from a great diſtance, at a circular mark of a moderate circumference. By long practice they took ſo nice an aim, that they were ſure, not only to hit their enemies on the head, but on any part of the face they choſe. Their ſlings were of a different kind from thoſe of the Balearians, whom they far ſurpaſſed in dexterity.

Achæi || Achaia.

ACHÆI, ACHÆANS, the inhabitants of Achaia Propria. In Livy, the people of Greece; for the moſt part called *Achivi*, by the Roman poets. In Homer, the general name for Grecians. See ACHÆANS.

ACHÆORUM PORTUS, (Pliny); now *Portu Buon*, a harbour of the Cherſoneſus Taurica, on the Euxine: Another near Sigæum, into which the Xanthus, after being joined by the Simois, falls.

ACHÆMENES, according to Herodotus, was grandfather of Cambyſes, and great-grandfather of Cyrus the firſt, king of Perſia. Moſt of the commentators of Horace are of opinion, that the Achæmenes whom that poet mentions, ode xii. of his 2d book, was one of the Perſian monarchs; but, if that were true, he muſt have reigned before the Medes ſubdued the Perſians; for we do not hear of any king of that name from the time that the Perſians founded that great monarchy, which is looked upon as the ſecond univerſal one. However this be, the epithet *Achæmenians* is frequently given to the Perſians, in the old Latin poets.

ACHÆMENES, ſon of Darius I. king of Perſia, and brother of Xerxes, had the government of Egypt beſtowed on him, after Xerxes had forced the Egyptians to return to their allegiance. He ſome time after commanded the Egyptian fleet in the celebrated expedition which proved ſo fatal to all Greece. The Egyptians having again taken up arms after the death of Xerxes, Achæmenes was ſent into Egypt to ſuppreſs the rebellion; but was vanquiſhed by Inarus, chief of the rebels, ſuccoured by the Athenians.

ACHÆUS, couſin-german to Seleucus Ceraunus and Antiochus the Great, kings of Syria, became a very powerful monarch, and enjoyed the dominions he had uſurped for many years; but at laſt he was puniſhed for his uſurpations in a dreadful manner, in the 140th year of Rome, as related by Polybius*.

* Lib. vii. cap. 56.

ACHAIA, a name taken for that part of Greece which Ptolemy calls *Hellas;* the younger Pliny, *Græcia;* now called *Livadia:* bounded on the north by Theſſaly, the river Sperchius, the Sinus Maliacus, and Mount Oëta; on the weſt by the river Achelous; on the eaſt, turning a little to the north, it is waſhed by the Archipelago, down to the promontory of Sunium; on the ſouth, joined to Peloponneſus, or the Morea, by the iſthmus of Corinth, five miles broad.

ACHAIA

Achaia ‖ Acheen.

Achaia Propria, anciently a ſmall diſtrict in the north of Peloponneſus, running weſtward along the bay of Corinth, and bounded on the weſt by the Ionian ſea, on the ſouth by Elis and Arcadia, and on the eaſt by Sicyonia: inhabitants, the *Achæans*, properly ſo called; its metropolis, *Patræ*. It is now called *Romania Alta*, in the Morea.

Achaia was alſo taken for all thoſe countries that joined in the Achæan league, reduced by the Romans to a province. Likewiſe for Peloponneſus.

Achaiæ Preſbyteri, or the Preſbyters of Achaia, were thoſe who were preſent at the martyrdom of St Andrew the apoſtle, A. D. 59; and are ſaid to have written an epiſtle in relation to it. Bellarmin, and ſeveral other eminent writers in the church of Rome, allow it to be genuine; while Du Pin, and ſome others, expreſsly reject it.

ACHAIUS, ſon of Ethwin, was raiſed to the crown of Scotland, A. D. 788. The emperor Charlemagne ſent an embaſſy to this prince to requeſt an alliance with him againſt the Engliſh, whoſe pirates ſo infeſted the ſeas, that the merchants could not carry on their trade. This alliance was concluded in France upon conditions ſo advantageous to the Scots, that Achaius, to perpetuate the memory of it, added to the arms of Scotland a double field fowed with lilies. He died in 819.

ACHALALACTLI, a ſpecies of king's-fiſher. See Alcedo, Ornithology *Index*.

ACHAN, the ſon of Carmi, of the tribe of Judah, at the taking of Jericho concealed two hundred ſhekels of ſilver, a Babyloniſh garment, and a wedge of gold, cuntrary to the expreſs command of God. This ſin proved fatal to the Iſraelites, who were repulſed at the ſiege of Ai. In this dreadful exigence, Joſhua proſtrated himſelf before the Lord, and begged that he would have mercy upon his people. Achan was diſcovered by caſting lots, and he and his children were ſtoned to death. This expiation being made, Ai was taken by ſtratagem. Joſh. vii. 8, 9.

ACHANE, an ancient Perſian corn meaſure, containing 45 Attic medimni.

ACHARACA, anciently a town of Lydia, ſituated between Tralles and Nyſa; in which were the temple of Pluto, and the cave Charonium, where patients ſlept in order to obtain a cure.

ACHAT, in *Law*, implies a purchaſe or bargain. And hence probably purveyors were called *Achators*, from their making bargains.

ACHATES, the companion of Æneas, and his moſt faithful friend, celebrated in Virgil.

Achates, in *Natural Hiſtory*, the ſame as Agate.

Achates, in *Ancient Geography*, a river of Sicily, now the *Drillo*; which runs from north to ſouth, almoſt parallel with, and at no great diſtance from, the Gela; and riſes in the north of the territory of Noto. It gave name to the achates, or agate, ſaid to be firſt found there.

ACHAZIB, or Aczib, in *Ancient Geography*, a town of Galilee, in the tribe of Aſher, nine miles from Ptolemais.—Alſo a town in the more ſouthern parts of the tribe of Judah.

ACHEEN, Ache', or Achen, a kingdom of Sumatra in the Eaſt Indies, ſituated on the north-weſtern part of the iſland.

Acheen.

The capital is ſituated on a river which empties itſelf near the north-weſt point, or Acheen head, about two miles from the mouth. It lies in a wide valley, formed like an amphitheatre by two lofty ranges of hills. The river is not large, and by emptying itſelf in ſeveral channels is rendered very ſhallow at the bar. In the dry monſoon, it will not admit boats of any burthen, much leſs large veſſels, which lie without, in the road formed by the iſlands off the point. Though no longer the great mart of eaſtern commodities, it ſtill carries on a conſiderable trade with the natives of that part of the coaſt of Indoſtan called *Tellinga*, who ſupply it with the cotton goods of their country, and receive in return, gold duſt, ſapan wood, betel-nut, patch-leaf, a little pepper, ſulphur, camphire, and benzoin. The country is ſupplied with Bengal opium, and alſo with iron, and many other articles of merchandiſe, by the European traders.

Acheen is eſteemed comparatively healthy, being more free from woods and ſwamps than moſt other portions of the iſland; and the fevers and dyſenteries to which theſe are ſuppoſed to give occaſion, are there ſaid to be uncommon. The ſoil is light and fertile; and the products, beſide thoſe already enumerated as articles of export trade, and a variety of fine fruits, are chiefly rice and cotton. There is likewiſe ſome raw ſilk procured in the country, of very inferior quality. Gold duſt is collected in the mountains near Acheen, but the greateſt part is brought from the ſouthern ports of Nalaboo and Sooſoo. The ſulphur is gathered from a volcanic mountain in the neighbourhood, which ſupplies their own conſumption for the manufacture of gunpowder, and admits of a large exportation.

In their perſons, the Acheneſe differ from the reſt of the Sumatrans, being taller, ſtouter, and darker complexioned. They appear not to be a genuine people; but are thought, with great appearance of reaſon, to be a mixture of Battas, Malays, and Moors, from the weſt of India. In their diſpoſitions they are more active and induſtrious than their neighbours: they poſſeſs more penetration and ſagacity; have more general knowledge; and, as merchants, they deal upon a more extenſive and liberal footing. Their religion is Mahometaniſm; and having a great number of moſques and prieſts, its forms and ceremonies are ſtrictly obſerved.

The appearance of the town, and the nature of the buildings, are much the ſame as are found in the generality of Malay bazars, excepting that the ſuperior wealth of this place has occaſioned a great number of public edifices, but without the ſmalleſt pretenſions to magnificence. The king's palace, if it deſerves the appellation, is a very rude and uncouth piece of architecture, deſigned to reſiſt the force of an enemy, and ſurrounded for that purpoſe by ſtrong walls, but without any regular plan, or view to the modern ſyſtem of military attack. The houſes in common are built of bamboos and rough timber, and raiſed ſome feet from the ground on account of the place being overflowed in the rainy ſeaſon.

A conſiderable fabric of a thick ſpecies of cotton cloth, and of ſtuff for the ſhort drawers worn both by Malays and Acheneſe, is eſtabliſhed here, and ſupplies an extenſive demand. They weave alſo very handſome ſilk pieces, of a particular form, for that part of the dreſs which is called by the Malays *cayen ſerrong*.

The

Acheen. The Acheneſe are expert and bold navigators, and employ a variety of veſſels, according to the voyages they undertake, and the purpoſes for which they deſign them. The river is covered with a multitude of fiſhing ſampans or canoes, which go to ſea with the morning breeze, and return in the afternoon, with the ſea wind, full laden.

Having no convenient coins, though moſt ſpecies of money will be taken here at a valuation, they commonly make their payments in gold duſt, and for that purpoſe are all provided with ſcales or ſmall ſteelyards. They carry their gold about them, wrapped up in pieces of bladder, and often purchaſe to ſo ſmall an amount, as to make uſe of grain or ſeeds for weights.

The monarchy is hereditary; and the king uſually maintains a guard of 100 ſepoys about his palace.

According to Mr Marſden, "the grand council of the nation conſiſts of the king or *ſultan*, four *ooloobballangs*, and eight of a lower degree, who ſit on his right hand, and ſixteen *cajoorangs*, who ſit on his left. At the king's feet ſits a woman, to whom he makes known his pleaſure: by her it is communicated to an eunuch, who ſits next to her; and by him to an officer named *cajoorang gondong*, who then proclaims it aloud to the aſſembly. There are alſo preſent two other officers, one of whom has the government of the *bazar* or market, and the other the ſuperintending and carrying into execution the puniſhment of criminals. All matters relative to commerce and the cuſtoms of the port come under the juriſdiction of the *ſhabandar*, who performs the ceremony of giving the *chap* or licenſe for trade; which is done by lifting a golden-hafted creeſe over the head of the merchant who arrives, and without which he dares not to land his goods. Preſents, the value of which are become pretty regularly aſcertained, are then ſent to the king and his officers. If the ſtranger be in the ſtyle of an ambaſſador, the royal elephants are ſent down to carry him and his letters to the monarch's preſence; theſe being firſt delivered into the hands of an eunuch, who places them in a ſilver diſh, covered with rich ſilk, on the back of the largeſt elephant, which is provided with a machine (*houder*) for that purpoſe. Within about an hundred yards of an open hall where the king ſits, the cavalcade ſtops, and the ambaſſador diſmounts, and makes his obeiſance by bending his body, and lifting his joined hands to his head. When he enters the palace, if an European, he is obliged to take off his ſhoes; and having made a ſecond obeiſance, is ſeated upon a carpet on the floor, where *betel* is brought to him. The throne was ſome years ago of ivory and tortoiſeſhell; and when the place was governed by queens, a curtain of gauze was hung before it, which did not obſtruct the audience, but prevented any perfect view. The ſtranger, after ſome general diſcourſe, is then conducted to a ſeparate building, where he is entertained with the delicacies of the country by the officers of ſtate, and in the evening returns in the manner he came, ſurrounded by a prodigious number of lights. On high days (*aree ryah*) the king goes in great ſtate, mounted on an elephant richly capariſoned, to the great moſque, preceded by his *ooloo-ballangs*, who are armed nearly in the European manner."

The country under the immediate juriſdiction of Acheen, is divided into three diſtricts, named *Duo-pooloo duo*, *Duo pooloo leemo*, and *Duo-pooloo anam*. Each diſtrict is governed by a *pangleemo*, and under him an *imaum* and four *pangeeches* to each moſque. Acheen, Achelous

"Acheen has ever been remarkable for the ſeverity with which crimes are puniſhed by their laws: the ſame rigour ſtill ſubſiſts, and there is no commutation admitted, as is regularly eſtabliſhed in the ſouthern countries. There is great reaſon, however, to conclude, that the poor alone experience the rod of juſtice; the nobles being ſecure from retribution in the number of their dependants. Petty theft is puniſhed by ſuſpending the criminal from a tree, with a gun or heavy weight tied to his feet; or by cutting off a finger, a hand, or leg, according to the nature of the theft. Many of theſe mutilated and wretched objects are daily to be ſeen in the ſtreets. Robbery on the highway and houſe-breaking are puniſhed by drowning, and afterwards expoſing the body on a ſtake for a few days. If the robbery is committed upon an imaum or prieſt, the ſacrilege is expiated by burning the criminal alive. A man who is convicted of adultery is ſeldom attempted to be ſcreened by his friends, but is delivered up to the friends and relations of the injured huſband. Theſe take him to ſome large plain, and forming themſelves in a circle, place him in the middle. A large weapon called a *gadoobong*, is then delivered to him by one of his family; and if he can force his way through thoſe who ſurround him, and make his eſcape, he is not liable to further proſecution; but it commonly happens that he is inſtantly cut to pieces. In this caſe his relations bury him as they would a dead buffalo, refuſing to admit the corpſe into their houſe, or to perform any funeral rites." Theſe diſcouragements to vice might ſeem to beſpeak a moral and virtuous people: yet all travellers agree in repreſenting the Acheneſe as one of the moſt diſhoneſt and flagitious nations of the Eaſt.

Acheen was viſited by the Portugueſe in 1509, only 12 years after they had diſcovered the paſſage to the Eaſt Indies by the Cape of Good Hope. They made various attempts to eſtabliſh themſelves in the country, but were expelled with diſgrace. See SUMATRA.

ACHELOUS, in fabulous hiſtory, wreſtled with Hercules, for no leſs a prize than Deianira, daughter of King Œneus: but as Achelous had the power of aſſuming all ſhapes, the conteſt was long dubious: at laſt, as he took that of a bull, Hercules tore off one of his horns; ſo that he was forced to ſubmit, and to redeem it by giving the conqueror the horn of Amalthea, the ſame with the cornucopiæ or horn of plenty; which Hercules having filled with a variety of fruits, conſecrated to Jupiter. Some explain this fable, by ſaying, That Achelous is a winding river of Greece, whoſe ſtream was ſo rapid, that it roared like a bull, and overflowed its banks; but Hercules, by bringing it into two channels, broke off one of the horns, and ſo reſtored plenty to the country. See the next article.

ACHELOUS, a river of Acarnania; which riſes in Mount Pindus, and, dividing Ætolia from Acarnania, falls from north to ſouth into the Sinus Corinthiacus. It was formerly called *Thoas* from its impetuoſity, and *king of rivers*, (Homer). The epithet *Acheloius* is uſed for *Aqueus*, (Virgil); the ancients calling all water *Achelous*, eſpecially in oaths, vows, and ſacrifices, according to Ephorus: Now called *Aſpro Potamo*. Rivers are by the ancient poets called *Taurifor.nes*,

either

Acheri || Achiar.

either from the bellowing of their waters, or from their ploughing the earth in their courſe: Hercules, reſtraining by dikes and mounds the inundations of the *Achelous*, is ſaid to have broken off one of his horns, and to have brought back plenty to the country. See the preceding article.

ACHERI, Luke d', a learned Benedictine of the congregation of St Maur, was born at St Quintin, in Picardy, in 1609; and made himſelf famous by printing ſeveral works, which till then were only in manuſcript: particularly, the epiſtle attributed to St Barnabas; the works of Lanfranc, archbiſhop of Canterbury; a collection of ſcarce and curious pieces, under the title of *Spicilegium*, i. e. Gleanings, in thirteen volumes, quarto. The prefaces and notes, which he annexed to many of theſe pieces, ſhow him to have been a man of genius and abilities. He had alſo ſome ſhare in the pieces inſerted in the firſt volumes of The acts of the Saints of the order of St Benedict; the title whereof acquaints us that they were collected and publiſhed by him and Father Mabillon. After a very retired life, till the age of 73, he died at Paris the 29th of April 1685, in the abbey of St Germain in the Fields, where he had been librarian.

ACHERNER, or Acharner, a ſtar of the firſt magnitude in the ſouthern extremity of the conſtellation Eridanus, but inviſible in our latitude.

ACHERON, in mythology, a river of Epirus. The poets feigned it to have been the ſon of Ceres, whom ſhe hid in hell for fear of the Titans, and turned into a river, over which ſouls departed were ferried in their way to Elyſium.

Acheron, in *Ancient Geography*, a river of Theſprotia, in Epirus; which, after forming the lake Acheruſia, at no great diſtance from the promontory of Chimerium, falls into the ſea to the weſt of the Sinus Ambracius, in a courſe from north to ſouth.

Acheron, or Acheros, a river of the Bruttii in Italy, running from eaſt to weſt; where Alexander king of Epirus was ſlain by the Lucani, being deceived by the oracle of Dodona, which bade him beware of Acheron.

ACHARSET, an ancient meaſure of corn, conjectured to be the ſame with our quarter, or eight buſhels.

ACHERUSIA palus, a lake between Cumæ and the promontory Miſenum, now *il Lago della Collucia*. (Cluverius). Some confound it with the *Lacus Lucrinus*, and others with the *Lacus Averni*. But Strabo and Pliny diſtinguiſh them. The former takes it to be an effuſion, exundation, or waſhes of the ſea, and therefore called by Lycophron, Αχηρουσια χυσις.—Alſo a lake of Epirus, through which the Acheron runs.—There is alſo an *Acheruſia*, a peninſula of Bithynia on the Euxine, near Heraclea; and a cave there of the ſame name, through which Hercules is fabled to have deſcended to hell to drag forth Cerberus.

ACHIAR, is a Malayan word, which ſignifies all ſorts of fruits and roots pickled with vinegar and ſpice. The Dutch import from Batavia all ſorts of achiar, but particularly that of Bamboo, a kind of cane, extremely thick, which grows in the Eaſt Indies. It is preſerved there, whilſt it is ſtill green, with very ſtrong vinegar and ſpice; and is called *bamboo achiar*. The name changes according to the fruit with which the achiar is made.

ACHICOLUM, is uſed to expreſs the *fornix*, *tholus*, or *ſudatorium* of the ancient baths; which was a hot room where they uſed to ſweat. It is alſo called *architholus*. Achicolum || Achiluni.

ACHILLÆA, Yarrow, Milfoil, Nosebleed, or Sneezewort. See Botany *Index*.

ACHILLEID, Achilleis, a celebrated poem of Statius, in which that author propoſed to deliver the whole life and exploits of Achilles; but being prevented by death, he has only treated of the infancy and education of his hero. See Statius.

ACHILLES, one of the greateſt heroes of ancient Greece, was the ſon of Peleus and Thetis. He was a native of Phthia, in Theſſaly. His mother, it is ſaid, in order to conſume every mortal part of his body, uſed to lay him every night under live coals, anointing him with ambroſia, which preſerved every part from burning but one of his lips, owing to his having licked it. She dipped him alſo in the waters of the river Styx; by which his whole body became invulnerable, except that part of his heel by which ſhe held him. But this opinion is not univerſal, nor is it a part of his character as drawn by Homer; for in the Iliad (B. xxi. 161.) he is actually wounded in the right arm, by the lance of Aſteropeus, in the battle near the river Scamander. Thetis afterwards intruſted him to the care of the centaur Chiron, who, to give him the ſtrength neceſſary for martial toil, fed him with honey and the marrow of lions and wild boars. To prevent his going to the ſiege of Troy, ſhe diſguiſed him in female apparel, and hid him among the maidens at the court of King Lycomedes: but Ulyſſes diſcovering him, perſuaded him to follow the Greeks. Achilles diſtinguiſhed himſelf by a number of heroic actions at the ſiege. Being diſguſted, however, with Agamemnon for the loſs of Briſeïs, he retired from the camp. But returning to avenge the death of his friend Patroclus, he ſlew Hector, faſtened his corpſe to his chariot, and dragged it round the walls of Troy. At laſt Paris, the brother of Hector, wounded him in the heel with an arrow, while he was in the temple treating about his marriage with Philoxena, daughter of King Priam. Of this wound he died, and was interred on the promontory of Sigæum; and after Troy was taken, the Greeks ſacrificed Philoxena on his tomb, in obedience to his deſire, that he might enjoy her company in the Elyſian fields. It is ſaid, that Alexander, ſeeing this tomb, honoured it by placing a crown upon it; at the ſame time crying out, that "Achilles was happy in having, during his life, ſuch a friend as Patroclus; and, after his death, a poet like Homer." Achilles is ſuppoſed to have died 1183 years before the Chriſtian era.

Achilles *Tatius*. See Tatius.

Tendo Achillis, in *Anatomy*, is a ſtrong tendinous cord formed by the tendons of ſeveral muſcles, and inſerted into the os calcis. It has its name from the fatal wound Achilles is ſaid to have received in that part from Paris the ſon of Priam.

ACHILLINI, Alexander, born at Bologna, and doctor of philoſophy in that univerſity. He flouriſhed in the 15th and 16th centuries, and by way of eminence was ſtyled the Great Philoſopher. He was a ſtedfaſt follower and accurate interpreter of Averroes upon Ariſtotle, but moſt admired for his acuteneſs and ſtrength of arguing in private and public diſputations.

He,

Achillini | Achmet.

He made a ſurpriſing quick progreſs in his ſtudies, and was very early promoted to a profeſſorſhip in the univerſity; in which he acquitted himſelf with ſo much applauſe that his name became famous throughout all Italy. He continued at Bologna till the year 1506; when the univerſity of Padua made choice of him to ſucceed Antonio Francatiano in the firſt chair of philoſophy, and his fame brought vaſt numbers of ſtudents to his lectures at Padua: but the war, wherein the republic of Venice was engaged againſt the league of Cambray, putting a ſtop to the lectures of that univerſity, he withdrew to his native country, where he was received with the ſame marks of honour and diſtinction as before, and again appointed profeſſor of philoſophy in Bologna. He ſpent the remainder of his life in this city, where he died, and was interred with great pomp in the church of St Martin the Great, which belongs to the Carmelite friars. Jovius, who knew Achillini, and heard his lectures, ſays, that he was a man of ſuch exceeding ſimplicity, and ſo unacquainted with addreſs and flattery, that he was a laughing ſtock to the pert and ſaucy young ſcholars, although eſteemed on account of his learning. He wrote ſeveral pieces on philoſophical ſubjects, which he publiſhed, and dedicated to John Bentivogli.

Achillini, *Claudius*, grandſon of the former, read lectures at Bologna, Ferrara, and Parma; where he was reputed a great philoſopher, a learned divine, an excellent lawyer, an eloquent orator, a good mathematician, and an elegant poet. He accompanied Cardinal Ludovino, who went as legate into Piedmont; but being afterward neglected by this cardinal, when he became pope under the name of Gregory XV. he left Rome in diſguſt, and retired to Parma; where the duke appointed him profeſſor of law, with a good ſalary. A canzone which he addreſſed to Louis XIII. on the birth of the dauphin, is ſaid to have been rewarded by Cardinal Richlieu, with a gold chain of the value of 1000 crowns. He publiſhed a volume of Latin letters, and another of Italian poems, which gained him great reputation. He died in 1640, aged 66.

ACHIOTTE, or Achiotl, a foreign drug, uſed in dying, and in the preparation of chocolate. It is the ſame with the ſubſtance more uſually known by the name of Arnotto. See Bixa, Botany *Index*.

ACHIROPŒTOS, a name given by ancient writers to certain miraculous pictures of Chriſt and the Virgin, ſuppoſed to have been made without hands.—The moſt celebrated of theſe is the picture of Chriſt, preſerved in the church of St John Lateran at Rome; ſaid to have been begun by St Luke, but finiſhed by the miniſtry of angels.

ACHMET, ſon of Seerim, an Arabian author, has left a book concerning the interpretation of dreams according to the doctrine of the Indians, Perſians, and Egyptians, which was tranſlated into Greek and Latin. The original is now loſt. He lived about the 4th century.

Achmet I. emperor of the Turks, the third ſon and ſucceſſor of Mahomet III. aſcended the throne before he reached the age of fifteen. During the period of his reign, the Turkiſh empire enjoyed at one time great proſperity, and at another was depreſſed by adverſity. The Aſiatic rebels, who took refuge in Perſia, involved the two empires in a war, during which the Turks loſt Bagdad, to recover which every effort proved unſucceſsful. In his reign Tranſylvania and Hungary were the ſcenes of war between the Turks and Germans. In addition to the calamities and diſtreſſes of war abroad, and internal tumults and broils, a pretender to his throne diſturbed his repoſe, and made attempts on his life. He was much devoted to amuſements; and ſpent his time chiefly in the haram and in the ſports of the field. His ſeraglio conſiſted of 3000 women; and his hunting eſtabliſhment was compoſed of 40,000 falconers, and an equal number of huntſmen, in different parts of his dominions. He expended great ſums of money in building, and particularly on a magnificent moſque which he erected in the Hippodrome. Achmet was leſs cruel than ſome of his predeceſſors; but he was haughty and ambitious. He died in 1617 at the age of 29. His three ſons ſucceſſively aſcended the throne after him. (*Gen. Biog.*) Achmet

Achmet II. emperor of the Turks, ſon of Sultan Ibrahim, ſucceeded his brother Solyman in 1691. The adminiſtration of affairs during his reign was feeble and unſettled. The Ottoman territory was overrun by the imperialiſts; the Venetians ſeized the Morea, took the iſle of Chios, and ſeveral places in Dalmatia; and the Arabs attacked and plundered a caravan of pilgrims, and even laid ſiege to Mecca. Though he never diſcovered the vigour and ſagacity that are eſſentially requiſite in the character of a ſovereign, in private life he was mild, devout, and inoffenſive. He was fond of poetry and muſic; and to thoſe about his perſon, he was chearful and amiable. He died in 1695 at the age of 50.

Achmet III. emperor of the Turks, ſon of Mahomet IV. ſucceeded his brother Muſtapha II. who was depoſed in 1703. After he had ſettled the diſcontents of the empire, his great object was to amaſs wealth. With this view he debaſed the coin, and impoſed new taxes. He received Charles XII. of Sweden, who took refuge in his dominions, after the battle of Pultowa in 1709, with great hoſpitality; and, influenced by the ſultana mother, he declared war againſt the Czar Peter, Charles's formidable rival. Achmet recovered the Morea from the Venetians; but his expedition into Hungary was leſs fortunate, for his army was defeated by Prince Eugene at the battle of Peterwaradin in 1716. As the public meaſures of Achmet were influenced by miniſters and favourites, the empire during his reign was frequently diſtracted by political ſtruggles and revolutions. The diſcontent and ſedition of his ſoldiers at laſt drove him from the throne. He was depoſed in 1730, and ſucceeded by his nephew Mahomet V. He was confined in the ſame apartment which had been occupied by his ſucceſſor previous to his elevation to the throne, and died of an apoplexy in 1736, at the age of 74. The intentions of this prince, it is ſaid, were upright; but his talents were moderate, never diſcovering that vigour of mind and ſteadineſs of action which are ſo neceſſary in the character of a ſovereign. Exceſſive confidence in his vizier diminiſhed the ſplendour of his reign, and probably tended to ſhorten the period of it. (*Gen. Biog.*)

Achmet Geduc, a famous general under Mahomet II. and Bajazet II. in the 15th century. When Mahomet II. died, Bajazet and Zezan both claimed the throne: Achmet ſided with the former, and by his bravery

Achmetschet, Achmim.

bravery and conduct fixed the crown on his head. But Bajazet took away his life; shining virtue being always an unpardonable crime in the eyes of a tyrant.

ACHMETSCHET, a town of the peninsula of the Crimea, the residence of the sultan Galga, who is eldest son of the khan of Tartary. E. Long. 52. 20. N. Lat. 45. 35.

ACHMIM, a large town of Upper Egypt, situated on the eastern bank of the Nile. 'One admires there (says Abulfeda, as quoted by M. Savary) a temple which is comparable to the most celebrated monuments of antiquity. It is constructed with stones of a surprising size, on which are sculptured innumerable figures.' Though this town be fallen from its ancient splendour, it is still one of the most beautiful of Upper Egypt. According to M. Savary, an Arab prince commands there, and the police is well attended to. The streets are wide and clean, and commerce and agriculture flourish. It has a manufacture of cotton stuffs, and pottery, which are conveyed over all Egypt. It is the same that Herodotus calls *Chemmis*, and Strabo *Panopolis*, or the city of Pan, who was worshipped there. Herodotus says, that Perseus was a native of this city, and that his descendants had established festivals there in his honour. It has lost its ancient edifices, and much of its extent; the ruins of the temple, described by Abulfeda, being without its limits to the north. Nothing remains of it but some stones, of such magnitude that the Turks have not been able to move them. They are covered with hieroglyphics. On one of them are traced four concentric circles, in a square. The innermost of these contains a sun. The two succeeding ones, divided into 12 parts, contain, one, 12 birds, the other, 12 animals, almost effaced, which appear to be the signs of the zodiac. The fourth has no divisions, and presents 12 human figures: which Mr Savary imagines to represent the 12 gods, the 12 months of the year, and the 12 signs of the zodiac. The Egyptians, says Herodotus, were the first who divided the year into 12 months, and employed the names of the 12 gods. The four seasons occupy the angles of the square, on the side of which may be distinguished a globe with wings. M. Savary thinks it probable that this stone belonged to a temple dedicated to the sun, that the whole of these hieroglyphics mark his passage into the signs of the zodiac, and his course, whose revolution forms the year. The columns of this temple have been partly broken to make lime and millstones. Some of them have been transported into one of the mosques of Achmim, where they are placed without taste; others are heaped up in the squares of the town.

M. Savary tells us of a serpent which is worshipped here, and is the wonder of the country. "Upwards of a century ago (says he), a religious Turk called *Scheik Haridi* died here. He passed for a saint among the Mahometans; who raised a monument to him, covered with a cupola, at the foot of the mountain. The people flocked from all parts to offer up their prayers to him. One of their priests, profiting by their credulity, persuaded them that God had made the soul of Scheik Haridi puts into the body of a serpent. Many of these are found in the Thebais, which are harmless; and he had taught one to obey his voice. He appeared with his serpent, dazzled the vulgar by his surprising tricks, and pretended to cure all disorders. Some lucky instances of success, due to nature alone, and sometimes to the imagination of the patients, gave him great celebrity. He soon consigned his serpent Haridi to the tomb, producing him only to oblige princes and persons capable of giving him a handsome recompense. The successors of this priest, brought up in the same principles, found no difficulty in giving sanction to so advantageous an error. They added to the general persuasion of his virtue that of his immortality. They had the boldness even to make a public proof of it. The serpent was cut in pieces in presence of the emir, and placed for two hours under a vase. At the instant of lifting up the vase, the priests, no doubt, had the address to substitute one exactly resembling it. A miracle was proclaimed, and the immortal Haridi acquired a fresh degree of consideration. This knavery procures them great advantages. The people flock from all quarters to pray at this tomb; and if the serpent crawls out from under the stone, and approaches the suppliant, it is a sign that his malady will be cured. It may be imagined, that he does not appear till an offering has been made proportioned to the quality and riches of the different persons. In extraordinary cases, where the sick persons cannot be cured without the presence of the serpent, a *pure virgin* must come to solicit him. To avoid inconveniences on this head, they take care to choose a *very young girl indeed*. She is decked out in her best clothes, and crowned with flowers. She puts herself in a praying attitude; and as the priests are inclined, the serpent comes out, makes circles round the young suppliant, and goes and reposes on her. The virgin, accompanied by a vast multitude, carries him in triumph amidst the general acclamation. No human reasoning would persuade these ignorant and credulous Egyptions that they are the dupes of a few impostors; they believe in the serpent Haridi as firmly as in the prophet."

Achomy || Achromatic.

ACHONRY, a small town of Ireland, in the province of Connaught and county of Sligo, seated on the river Shannon.

ACHOR, a valley of Jericho, lying along the river Jordan, not far from Gilgal; so called from Achan, the troubler of Israel, being there stoned to death.

ACHOR, in *Medicine*, a species of HERPES.

ACHOR, in *Mythology*, the god of flies; to whom, according to Pliny, the inhabitants of Cyrene sacrificed, in order to obtain deliverance from the insects and the disorders occasioned by them.

ACHRADINA, in *Ancient Geography*, one of the four cities or divisions of Syracuse, and the strongest, largest, and most beautiful part of it; separated by a very strong wall from the outer town, *Tycha* and *Neapolis*. It was adorned with a very large forum, with beautiful porticoes, a most elegant prytaneum, a spacious senate-house, and a superb temple of Jupiter Olympius.

ACHRAS, or SAPOTA PLUM. See BOTANY *Index*.

ACHOMATIC, an epithet expressing want of colour. The word is Greek, being compounded of α privative, and $\chi\rho\omega\mu\alpha$, *colour*. This term was first introduced into astronomy by De la Lande.

ACHROMATIC Telescopes, are telescopes contrived to remedy the aberrations in colours. They were invent-

Achteling || Acidalus.

ed by Mr John Dollond, optician, and have been ſince improved by his ſon and others. See ABERRATION. —A more particular account of the invention and conſtruction of theſe inſtruments will be found under OPTICS.

ACHTELING, a meaſure for liquids uſed in Germany. Thirty-two *achtelings* make a *heemer;* four *ſciltins* or *ſciltins* make an *achteling*.

ACHYR, a ſtrong town and caſtle of the Ukrain, ſubject to the Ruſſians ſince 1667. It ſtands on the river Uorſkla, near the frontiers of Ruſſia, 127 miles weſt of Kiow. E. Long. 36. 0. N. Lat. 49. 32.

ACHYRANTHES, in *Botany*. See BOTANY *Index*.

ACICANTHERA, in *Botany*, the trivial name of a ſpecies of RHEXIA.

ACICULÆ, the ſmall pikes or prickles of the hedgehog, echinus marinus, &c.

ACIDALIUS, VALENS, would, in all probability, have been one of the greateſt critics in theſe latter ages, had he lived longer to perfect thoſe talents which nature had given him. He was born at Witſtock, in Brandenburg; and having viſited ſeveral academies in Germany, Italy, and other countries, where he was greatly eſteemed, he afterwards took up his reſidence at Breſlaw, the metropolis of Sileſia. Here he remained a conſiderable time, in expectation of ſome employment; but nothing offering, he turned Roman Catholic, and was choſen rector of a ſchool at Nieſſa. It is related, that about four months after, as he was following a proceſſion of the hoſt, he was ſeized with a ſudden phrenſy; and being carried home, expired in a very ſhort time. But Thuanus tells us, that his exceſſive application to ſtudy was the occaſion of his untimely death; and that his ſitting up in the night compoſing his Conjectures on Plautus, brought upon him a diſtemper which carried him off in three days, on the 25th of May 1595, being juſt turned of 28. He wrote a Commentary on Quintus Curtius; alſo, Notes on Tacitus, on the twelve Panegyrics; beſides ſpeeches, letters, and poems. His poetical pieces are inſerted in the *Deliciæ* of the German poets, and conſiſt of epic verſes, odes, and epigrams. A little work printed in 1595, under the title of *Mulieres non eſſe homines*, "That women were not of the human ſpecies," was falſely aſcribed to him. But the fact was, that Acidalius happening to meet with the manuſcript, and thinking it very whimſical, tranſcribed it, and gave it to the bookſeller, who printed it. The performance was highly cenſured, ſo that the bookſeller being ſeized, he diſcovered the perſon who gave him the manuſcript, and a terrible outcry was made againſt Acidalius. A ſtory goes, that being one day to dine at a friend's houſe, there happened to be ſeveral ladies at table; who ſuppoſing him to be the author, were moved with ſo much indignation, that they threatened to throw their plates at his head. Acidalius, however, ingeniouſly diverted their wrath. In his opinion, he ſaid the author was a judicious perſon, the ladies being certainly more of the ſpecies of *angels* than of *men*.—Mr Baillet has given him a place among his *Enfans Celebres;* and ſays, that he wrote a comment upon Plautus when he was but 17 or 18 years old, and that he compoſed ſeveral Latin poems at the ſame age.

ACIDALUS, a fountain in Orchomenus, a city of Bœotia, in which the Graces, who are ſacred to Venus, bathed. Hence the epithet *Acidalia*, given to Venus. (Virgil.)

Acidity || Acids.

ACIDITY, that quality which renders bodies acid.

ACIDOTON, in *Botany*, the trivial name of a ſpecies of ADELIA.

ACIDS, in *Chemiſtry*, a claſs of ſubſtances which are diſtinguiſhed by the following properties:

1. When applied to the tongue, they excite that ſenſation which is called *ſour* or *acid*.

2. They change the blue colours of vegetables to a red. The vegetable blues employed for this purpoſe are generally tincture of litmus and ſyrup of violets or of radiſhes, which have obtained the name of *reagents* or *teſts*. If theſe colours have been previouſly converted to a *green* by alkalies, the acids reſtore them again.

3. They unite with water in almoſt any proportion.

4. They combine with all the alkalies, and moſt of the metallic oxides and earths, and form with them thoſe compounds which are called *ſalts*.

It muſt be remarked, however, that every acid does not poſſeſs all theſe properties; but all of them poſſeſs a ſufficient number of them to diſtinguiſh them from other ſubſtances. And this is the only purpoſe which artificial definition is meant to anſwer.

The acids are by far the moſt important claſs of bodies in chemiſtry. It was by their means indeed, by ſtudying their properties, and by employing them as inſtruments in the examination of other bodies, that men of ſcience laid the foundation of chemiſtry, and brought it to that ſtate in which we find it at preſent. The nature and compoſition of acids, therefore, became a very important point of diſcuſſion, and occupied the attention of the moſt eminent cultivators of the ſcience.

Paracelſus believed that there was only one acid principle in nature which communicated taſte and ſolubility to the bodies in which it was combined. Beccher embraced the ſame opinion; and added to it, that this acid principle was a compound of earth and water, which he conſidered as two elements. Stahl adopted the theory of Beccher, and endeavoured to prove that his acid principle is ſulphuric acid; of which, according to him, all the other acids are mere compounds. But his proofs were only conjectures or vague experiments, from which nothing could be deduced. Nevertheleſs, his opinion, like every other which he advanced in chemiſtry, continued to have ſupporters for a long time, and was even countenanced by Macquer. At laſt its defects began to be perceived; Bergman and Scheele declared openly againſt it; and their diſcoveries, together with thoſe of Lavoiſier, demonſtrated the falſehood of both parts of the theory, by ſhewing that ſulphuric acid does not exiſt in the other acids, and that it is not compoſed of water and earth, but of ſulphur and oxygen.

The opinion, however, that acidity is owing to ſome principle common to all the ſalts, was not abandoned. Wallerius, Meyer, and Sage, had advanced different theories in ſucceſſion about the nature of this principle; but as they were founded rather on conjecture and analogy than direct proof, they obtained but few advocates. At laſt M. Lavoiſier, by a number of ingenious and accurate experiments, proved that ſeveral combuſtible

Acids. combuſtible ſubſtances, when united with oxygen, form acids; that a great number of acids contain oxygen; and that when this principle is ſeparated from them, they loſe their acid properties. He concluded, therefore, that the acidifying principle is oxygen, and that acids are nothing elſe but combuſtible ſubſtances combined with oxygen, and differing from one another according to the nature of the combuſtible baſe.

This concluſion, as far as regards the greater number of acids, is certainly true. All the ſimple combuſtibles, except hydrogen, are convertible into acids; and theſe acids are compoſed of oxygen and the combuſtible body combined: this is the caſe alſo with four of the metals. It muſt not, however, be admitted without ſome limitation.

1. When it is ſaid that oxygen is the acidifying principle, it is not meant ſurely to affirm that oxygen poſſeſſes the properties of an acid, which would be contrary to truth; all that can be meant is, that it enters as a component part into acids, or that acids contain it as an eſſential ingredient.

2. But, even in this ſenſe, the aſſertion cannot be admitted: for it is not true that oxygen is an eſſential ingredient in all acids, or that no body poſſeſſes the property of an acid unleſs it contains oxygen. Sulphurated hydrogen, for inſtance, poſſeſſes all the characters of an acid, yet it contains no oxygen.

3. When it is ſaid that oxygen is the acidifying principle, it cannot be meant ſurely to affirm that the combination of oxygen with bodies produces in all caſes an acid, or that whenever a body is combined with oxygen, the product is an acid; for the contrary is known to every chemiſt. Hydrogen, for inſtance, when combined with oxygen, forms not an acid, but water, and the greater number of metallic bodies form only oxides.

All that can be meant, then, when it is ſaid that oxygen is the acidifying principle, is merely that it exiſts as a component part in the greater number of acids; and that many acids are formed by combuſtion, or by ſome equivalent proceſs. The truth is, that the claſs of acids is altogether arbitrary; formed when the greater number of the bodies arranged under it were unknown, and before any preciſe notion of what ought to conſtitute the characteriſtic marks of an acid had been thought of. New bodies, when they were diſcovered, if they poſſeſſed any properties analogous to the known acids, were referred without ſcruple to the ſame claſs, how much ſoever they differed from them in other particulars. Hence we find, under the head of acids, bodies which have ſcarcely a ſingle property in common except that of combining with alkalies and earths. What ſubſtances, for inſtance, can be more diſſimilar than ſulphuric, pruſſic and uric acids? Hence the difficulty of aſſigning the general characters of the claſs of acids, and the diſputes which have ariſen about the propriety of claſſing certain bodies among acids. If we lay it down as an axiom that oxygen is the acidifying principle, we muſt either include among acids a great number of bodies which have not the ſmalleſt reſemblance to thoſe ſubſtances which are at preſent reckoned acids, or exclude from the claſs ſeveral bodies which have the properties of acids in perfection. The claſs of acids being perfectly arbitrary, there cannot be ſuch a thing as an acidifying principle in the moſt extenſive ſenſe of the word. Acidulous

The acids at preſent known amount to about 30; and all of them, eight excepted, have been diſcovered within theſe laſt 40 years. They may be arranged under two general heads: 1. Acids compoſed of two ingredients. 2. Acids compoſed of more than two component parts. (*Thomſon's Chemiſtry*). See CHEMISTRY. Acis.

ACIDULOUS, denotes a thing that is ſlightly *acid*: it is ſynonymous with the word *ſub-acid*.

ACIDULÆ. Mineral waters that are briſk and ſparkling without the action of heat are thus named; but if they are hot alſo, they are called THERMÆ.

ACIDULATED, a name given to medicines that have an acid in their compoſition.

ACIDUM AEREUM, the ſame with *fixed air*; or, in modern chemiſtry, *carbonic acid*.

Acidum pingue, an imaginary acid, which ſome German chemiſts ſuppoſed to be contained in fire, and by combining with alkalies, lime, &c. to give them their cauſtic properties; an effect which is found certainly to depend on the loſs of their carbonic acid.

ACILA, in *Ancient Geography*, a ſtaple or mart town in Arabia Felix, on the Arabian gulf, from which, according to Pliny, the Scenitæ Sabæi ſet ſail for India. Now *Ziden*.

ACILISENE, in *Ancient Geography*, a diſtrict of the leſſer Armenia towards the head of the Euphrates, having that river on the weſt, and on the ſouth a river to which Xenophon and Pliny ſeem to have given the ſame name.

ACILIUS GLABRIO, MARCUS, conſul in the year of Rome 562, and 211 years before the Chriſtian era, diſtinguiſhed himſelf by his bravery and conduct in gaining a complete victory over Antiochus the Great, king of Syria, at the ſtraits of Thermopylæ in Theſſaly, and on ſeveral other occaſions. He built the temple of Piety at Rome, in conſequence of a vow which he made before this battle. He is mentioned by Pliny, Valerius Maximus, and others.

ACINASIS, in *Ancient Geography*, a river of Aſia, at the ſouthern extremity of Colchis, which diſcharges itſelf into the Euxine ſea, between the Bathys and the Iſis. It is mentioned by Arrian in his Periplus.

ACINIPPO, in *Ancient Geography*, a town of Bætica: its ruins, called *Ronda la Viega*, are to be ſeen near Arunda, in the kingdom of Granada.

ACINODENDRUM, in *Botany*, the trivial name of a ſpecies of MELASTOMA.

ACINOS, in *Botany*, the trivial name of a ſpecies of THYMUS. See BOTANY *Index*.

ACINUS, or ACINI, the ſmall protuberances of mulberries, ſtrawberries, &c. and by ſome applied to grapes. Generally it is uſed for thoſe ſmall grains growing in branches, after the manner of grapes, as *liguſtrum*, &c.

ACIS, in *Mythology*, the ſon of Faunus and the nymph Simaethis, was a beautiful ſhepherd of Sicily, who being beloved by Galatea, Polyphemus the giant was ſo enraged, that he daſhed out his brains againſt a rock; after which Galatea turned him into a river, which was called by his name.

The Sicilian authors ſay, that Acis was a king of

Acknowledgment || Acœmetæ.

this part of the iſland, who was ſlain by Polyphemus, one of the giants of Ætna, in a fit of jealouſy.

ACIS, a river of Sicily, celebrated by the poets, running from a very cold ſpring, in the woody and ſhady foot of Mount Ætna, for the ſpace of a mile eaſtward into the ſea, along green and pleaſant banks, with the ſpeed of an arrow, from which it takes its name. Its waters are now impregnated with ſulphureous vapours, though formerly they were celebrated for their ſweetneſs and ſalubrity, and were held ſacred by the Sicilian ſhepherds:

Quique per Ætnæos Acis petit æquora fines,
Et dulci gratam Nereïda perluit unda. SIL. ITAL.

It is now called *Il Fiume Fredda*, *Aci*, *Iaci*, or *Chiaci*, according to the different Sicilian dialects: Antonine calls it *Acius*. It is alſo the name of a hamlet at the mouth of the *Acis*.

ACKNOWLEDGMENT, in a general ſenſe, is a perſon's owning or confeſſing a thing; but, more particularly, is the expreſſion of gratitude for a favour.

ACKNOWLEDGMENT-Money, a certain ſum paid by tenants, in ſeveral parts of England, on the death of their landlords, as an acknowledgment of their new lords.

ACLIDES, in *Roman Antiquity*, a kind of miſſile weapon, with a thong affixed to it, by which it was drawn back. Moſt authors deſcribe it as a ſort of dart or javelin; but Scaliger makes it roundiſh or globular, and full of ſpikes, with a ſlender wooden ſtem to poiſe it by. Each warrior was furniſhed with two.

ACLOWA, in *Botany*, a barbarous name of a ſpecies of COLUTEA. It is uſed by the natives of Guinea, to cure the itch: They rub it on the body as we do unguents. See COLUTEA, BOTANY *Index*.

ACME, the top or height of any thing. It is uſually applied to the maturity of an animal juſt before it begins to decline; and phyſicians have uſed it to expreſs the utmoſt violence or criſis of a diſeaſe.

ACMELLA, in *Botany*, the trivial name of a ſpecies of SPILANTHUS. See BOTANY *Index*.

ACMODÆ, in *Ancient Geography*, ſeven iſlands in the Britiſh ſea, ſuppoſed by ſome to be the Scilly iſlands, but by others thoſe of Shetland near the Orkneys, on the northern coaſt of Scotland.

ACMONIA, and AGMONIA, in Peutinger's map, a town of Phrygia Major, now in ruins. The inhabitants are called *Acmonenſes* by Cicero, and the city *Civitas Acmonenſis*. Alſo a city of Dacia (Ptolemy), on the Danube, near the ruins of Trajan's bridge, built by Severus, and called *Severicum*; diſtant 12 German miles from Temeſwar, to the ſouth-eaſt.

ACNIDA, VIRGINIAN HEMP. See BOTANY *Index*.

ACNUA, in *Roman Antiquity*, ſignified a certain meaſure of land, about an Engliſh rood, or fourth part of an acre.

ACO, in *Geography*, a town of Peru in South America. It is alſo the name of a river in Africa, which riſes in the Abyſſinian mountains, runs in a ſouth eaſt courſe, and diſcharges itſelf into the Indian ocean.

ACOEMETÆ, or ACOEMETI, in *Church Hiſtory*, or, Men who lived without ſleep; a ſet of monks who chanted the divine ſervice night and day in their places of worſhip. They divided themſelves into three bodies, who alternately ſucceeded one another, ſo that the ſervice in their churches was never interrupted. This practice they founded upon the precept, *Pray without ceaſing*. They flouriſhed in the eaſt about the middle of the 5th century. There are a kind of acoemeti ſtill ſubſiſting in the Romiſh church, viz. the religious of the holy ſacrament, who keep up a perpetual adoration, ſome one or other of them praying before the holy ſacrament day and night.

Acola || Aconiti.

ACOLA, in *Ancient Geography*, a town in Media, on the borders of the Hyrcanian ſea.

ACOLUTHI, or ACOLUTHISTS, in antiquity, was an appellation given to thoſe perſons who were ſteady and immoveable in their reſolutions; and hence the Stoics, becauſe they would not forſake their principles, nor alter their reſolutions, acquired the title of *acoluthi*. The word is Greek, and compounded of α privative, and κολευθος, way; as never turning from the original courſe.

ACOLUTHI, among the ancient Chriſtians, implied a peculiar order of the inferior clergy in the Latin church, for they were unknown to the Greeks for above 400 years. They were next to the ſubdeacon; and we learn from the fourth council of Carthage, that the archdeacon, at their ordination, put into their hands a candleſtick with a taper, giving them thereby to underſtand that they were appointed to light the candles of the church; as alſo an empty pitcher, to imply that they were to furniſh wine for the euchariſt. Some think they had another office, that of attending the biſhop wherever he went. The word is Greek, and compounded of α privative, and κωλυω, to hinder or diſturb.

ACOLYTHIA, in the Greek church, denotes the office or order of divine ſervice; or the prayers, ceremonies, hymns, &c. whereof the Greek ſervice is compoſed.

ACOMA, a town of New Mexico, ſeated on a hill with a ſtrong caſtle. To reach the town, you walk up 50 ſteps cut out of the rock. It is the capital of that province, and was taken by the Spaniards in 1599. W. Long. 104. 15. Lat. 35. 0.

ACOMAC, the name of a county in Virginia. It is on the eaſtern ſide of Cheſapeak bay, on a ſlip of land, by the Virginians called the *eaſtern ſhore*. It contains 13,959 inhabitants.

ACOMINATUS, NICETAS, was ſecretary to Alexius Comnenus and to Iſaacus Angelus ſucceſſively: he wrote a hiſtory from the death of Alexius Comnenus in 1118, where Zonaras ended his, to the year 1203, which has gone through many editions, and has been much applauded by the beſt critics.

ACONCROBA, in *Botany*, the indigenous name of a plant which grows wild in Guinea, and is in great eſteem among the natives for its virtues in the ſmall-pox. They give an infuſion of it in wine. The leaves of this plant are opaque, and as ſtiff as thoſe of the philyrea: they grow in pairs, and ſtand on ſhort foot-ſtalks; they are ſmall at each end, and broad in the middle; and the largeſt of them are about three inches in length, and an inch and a quarter in breadth in the middle. Like thoſe of our bay, they are of a duſky colour on the upper ſide, and of a pale green underneath.

ACONITE. See ACONITUM, BOTANY *Index*.

Winter ACONITE. See HELLEBORUS, BOTANY *Index*.

ACONITI, in antiquity, an appellation given to ſome

Aconitum || Acoſta.

ſome of the ATHLETÆ, but differently interpreted. Mercurialis underſtands it of thoſe who only anointed their bodies with oil, but did not ſmear themſelves over with duſt, as was the uſual practice.

ACONITUM, ACONITE, WOLFSBANE, or MONKSHOOD. See BOTANY *Index*.

ACONTIAS, in *Zoology*, an obſolete name of the anguis jaculus, or dart-ſnake, belonging to the order of amphibia ſerpentes. See ANGUIS.

ACONTIUM, ἀκόντιον, in Grecian antiquity, a kind of dart or javelin, reſembling the Roman pilum.

ACONTIUS, a young man of the iſland Cea, who having gone to Delos, to ſee the ſacred rites which were performed there by a crowd of virgins in the temple of Diana, fell deſperately in love with Cydippe; but not daring to aſk her in marriage, on account of the meanneſs of his birth, inſidiouſly threw down at her feet an apple, on which were inſcribed theſe words, *Me tibi nupturam, (ſelix eat omen,) Aconti, Juro, quam colimus, numina magna Deae.* Or according to others, *Juro tibi ſacrae per myſtica ſacra Dianae, Me tibi venturam comitem, ſponſamque futuram.* The virgin having taken up the apple, inadvertently read the words, and thus apparently bound herſelf by a promiſe; for by law, every thing uttered in that temple was held to be ratified. When her father, a little after, ignorant of what had happened, betrothed her to another man, ſhe was ſuddenly ſeized with a fever. Whereupon Acontius ſent her a letter, (expreſſed by Ovid, Ep. 20.) to perſuade her that her fever was cauſed by Diana for not having fulfilled the promiſe which ſhe had made to him in the temple of that goddeſs. Cydippe therefore reſolved to comply with the wiſhes of Acontius, even againſt the inclination of her father. Her anſwer is the ſubject of Ovid's 21ſt epiſtle. (*Adam's Claſ. Biog.*)

ACONTIUS, *James*, a philoſopher, civilian, and divine, born at Trent in the 16th century. He embraced the reformed religion; and coming into England in the reign of Queen Elizabeth, he was favourably received and much honoured by that princeſs, which he acknowledges in a book dedicated to her. This work is his celebrated Collection of the Stratagems of Satan, which has been ſo often tranſlated, and paſſed through ſo many editions.

ACORN, the fruit of the oak tree. See QUERCUS, BOTANY *Index*.

ACORN, in ſea language, a little ornamental piece of wood, faſhioned like a cone, and fixed on the uppermoſt point of the ſpindle, above the vane, on the maſthead. It is uſed to keep the vane from being blown off from the ſpindle in a whirlwind, or when the ſhip leans much to one ſide under ſail.

ACORUS, CALAMUS AROMATICUS, SWEET FLAG, or SWEET RUSH. See BOTANY *Index*.

ACORUS, in the *Materia Medica*, a name ſometimes given to the great galangal. See KEMPFERIA.

ACORUS, in *Natural Hiſtory*, blue coral. The true ſort is very ſcarce; ſome, however, is fiſhed on the coaſts of Africa, particularly from Rio del Re to the river of the Camarones. This coral is part of the merchandiſe which the Dutch trade for with the Camarones: that of the kingdom of Benin is alſo very much eſteemed. It grows in form of a tree on a rocky bottom.

ACOSTA, URIEL, a Portugueſe, born at Oporto towards the cloſe of the 16th century. He was educated in the Romiſh religion, which his father alſo profeſſed, though deſcended from one of thoſe Jewiſh families who had been in a manner forced to receive baptiſm. Uriel had a liberal education. He was inſtructed in ſeveral ſciences; and at laſt he ſtudied law. He had by nature a good temper and mild diſpoſition; and religion had made ſo deep an impreſſion on his mind, that he ardently deſired to conform to all the precepts of the church, to avoid eternal death, which he dreaded. He applied with great aſſiduity to reading the Scriptures and other religious books, carefully conſulting alſo the creed of the confeſſors; but the more he ſtudied, the more difficulties occurred, which perplexed him at length to ſuch a degree, that, being unable to ſolve them, he fell into the moſt terrible agonies of mind. He thought it impoſſible to fulfil his duty with regard to the conditions required for abſolution; ſo that he deſpaired of ſalvation, if he could find no other means of attaining it; and it proved difficult to abandon a religion in which he had been bred up from his infancy, and which had been deeply rooted in his mind. However he began to inquire, whether ſeveral particulars mentioned about the other life were agreeable to reaſon; and, upon inquiry and deliberation, he imagined that reaſon ſuggeſted many arguments againſt them. Acoſta was about two and twenty, when he was thus perplexed with doubts; and the reſult of his reflections was, that he could not be ſaved by the religion which he had imbibed in his infancy. Nevertheleſs he proſecuted his ſtudies in the law; and at the age of five and twenty, was made treaſurer in a collegiate church. Being naturally of a religious diſpoſition, and now made uneaſy by the popiſh doctrines, he began to ſtudy Moſes and the prophets; where he thought he found more ſatisfaction than in the goſpel, and at length became convinced that Judaiſm was the true religion: and, as he could not profeſs it in Portugal, he reſolved to leave the country. He accordingly reſigned his place, and embarked for Amſterdam with his mother and brothers; whom he had ventured to inſtruct in the principles of the Jewiſh religion, even when in Portugal. Soon after their arrival in Amſterdam, they became members of the ſynagogue; were circumciſed according to cuſtom; and he changed his name of Gabriel for that of Uriel. A little time was ſufficient to ſhew him, that the Jews did neither in their rites nor morals conform to the law of Moſes, of which he could not but declare his diſapprobation: but the chiefs of the ſynagogue gave him to underſtand, that he muſt exactly obſerve their tenets and cuſtoms; and that he would be excommunicated, if he deviated in the leaſt from them. This threat, however, had no effect; for he thought it would be a moſt mean behaviour in him, who had left the ſweets of his native country purely for liberty of conſcience, to ſubmit to a ſet of Rabbis without any proper juriſdiction; and that it would ſhew both want of courage and piety, if he ſhould ſtifle his ſentiments on this occaſion. He therefore perſiſted in his invectives, and in conſequence was excommunicated: the effect of which was ſuch, that his own brothers durſt not ſpeak to him, nor ſalute him when they met him in the ſtreets. Finding himſelf thus ſituated, he wrote a book in his juſtification; wherein he endeavours to ſhew, that the rites and traditions

Acoſta.

Acoſta, Acouſtics.

ditions of the Phariſees are contrary to the writings of Moſes, and ſoon after adopted the opinion of the Sadducees: for he had worked himſelf up to a belief, that the rewards and puniſhments of the old law relate only to this life; and this, becauſe Moſes nowhere mentions the joys of heaven, or the torments of hell. His adverſaries were overjoyed at his embracing this tenet; foreſeeing, that it would tend greatly to juſtify, in the ſight of Chriſtians, the proceedings of the ſynagogues againſt him. Before his book was printed, there appeared a piece upon the immortality of the ſoul, written by a phyſician, who omitted nothing he could ſuggeſt to make Acoſta paſs for an Atheiſt. The very children were encouraged to inſult him in the ſtreets, and to batter his houſe with ſtones; all which however did not prevent him from writing a treatiſe againſt the phyſician, wherein he endeavoured to confute the doctrine of the ſoul's immortality. The Jews now made application to the magiſtrates of Amſterdam; and informed againſt him, as one who wanted to undermine the foundation of both Jewiſh and Chriſtian religions. He was thrown into priſon, but bailed out within a week or ten days after; however all the copies of his works were ſeized, and he himſelf fined in 300 florins. Nevertheleſs, he proceeded ſtill farther in his ſcepticiſm. He now began to examine, whether the law of Moſes came from God; and he ſuppoſed he had at length found reaſons to convince him, that it was only a political invention. Yet, inſtead of drawing this inference from thence, "I ought not to return to the Jewiſh communion," he thus argued with himſelf, Why ſhould I continue all my life cut off from the communion, expoſed to ſo many inconveniencies, eſpecially as I am in a country where I am a ſtranger, and unacquainted with the language? Had I not better play the ape amongſt apes?" He accordingly returned to the Jewiſh church, after he had been excommunicated 15 years; and, after having made a recantation of what he had written, ſubſcribed every thing as they directed. A few days after, he was accuſed by a nephew, who lived in his houſe, that he did not, as to his eating and many other points, conform to the laws of the ſynagogue. This accuſation was attended with very bad conſequences; for a relation of Acoſta, who had got him reconciled to the ſynagogue, thought he was in honour bound to perſecute him with the utmoſt violence. The Rabbis and the reſt of the Jews were animated with the ſame ſpirit; eſpecially, when they found that Acoſta had diſſuaded two Chriſtians, who had come from London to Amſterdam, from turning Jews. He was ſummoned before the grand council of the ſynagogue; when it was declared to him, that he muſt again be excommunicated, if he did not give ſuch ſatisfaction as ſhould be required. He found the terms ſo hard, that he could not comply. The Jews thereupon again expelled him from their communion; and he afterwards ſuffered various hardſhips and great perſecutions, even from his own relations. After remaining ſeven years in a moſt wretched ſituation, he at length declared he was willing to ſubmit to the ſentence of the ſynagogue, having been told that he might eaſily accommodate matters; for, that the judges, being ſatisfied with his ſubmiſſion, would ſoften the ſeverity of the diſcipline. Acoſta, however, was caught in a ſnare; for they made him undergo the moſt rigorous penance. Theſe particulars relating to the life of Acoſta, are taken from his work, entitled, "*Exemplar humanæ Vitæ*," publiſhed and refuted by Limborch. It is ſuppoſed that he compoſed it a few days before his death, after having determined to lay violent hands on himſelf. He executed this horrid reſolution, a little after he had failed in his attempt to kill his principal enemy; for the piſtol, with which he intended to have ſhot him as he paſſed his houſe, having miſſed fire, he immediately ſhut the door, and ſhot himſelf with another piſtol. This happened at Amſterdam, but in what year is not exactly known.

Acoſta Acouſtics.

ACOSTAN, a mountainous iſland in the north ſeas between Aſia and America, obſerved by Captain Cook.

ACOUSMATICI, ſometimes alſo called *Acouſtici*, in Grecian antiquity, ſuch of the diſciples of Pythagoras as had not completed their five years probation.

ACOUSTIC, in general, denotes any thing that relates to the ear, the ſenſe of hearing, or the doctrine of ſounds.

Acouſtic Duct, in *Anatomy*, the ſame with *meatus auditorius*, or the external paſſage of the ear. See ANATOMY.

Acouſtic Inſtrument, or auricular tube. See ACOUSTICS.

Acouſtic Veſſels, in the ancient theatres, were a kind of veſſels, made of braſs, ſhaped in the bell faſhion, which being of all tones within the pitch of the voice or even of inſtruments, rendered the ſounds more audible, ſo that the actors could be heard through all parts of theatres which were even 400 feet in diameter.

Acouſtic Diſciples, among the ancient Pythagoreans, thoſe more commonly called ACOUSMATICI.

A C O U S T I C S,

Preliminary Obſervations.

IN *Phyſics*, is that ſcience which inſtructs us in the nature of ſound. It is divided by ſome writers into *Diacouſtics*, which explains the properties of thoſe ſounds that come directly from the ſonorous body to the ear; and *Catacouſtics*, which treats of reflected ſounds: but ſuch diſtinctions do not appear to be of any real utility.

Sound is a term of which it would be prepoſterous to offer any definition, as it may almoſt be ſaid to expreſs a ſimple idea: But when we conſider it as a SENSATION, and ſtill more when we conſider it as a PERCEPTION, it may not be improper to give a deſcription of it; becauſe this muſt involve certain relations of external things, and certain trains of events in the material world, which make it a proper object of philoſophical diſcuſſion. Sound is that primary information which we get of external things by means of the ſenſe of hearing. This, however, does not explain it; for were we in like manner to deſcribe our ſenſe of hearing, we ſhould find ourſelves obliged to ſay, that it is the faculty by which we perceive ſound. Languages are not the invention of philoſophers; and we muſt not expect

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expect precision, even in the simplest cases. Our methods of expressing the information given us by our different senses are not similar, as a philosopher, cautiously contriving language, would make them. We have no word to express the primary or generic object of our sense of seeing; for we believe, that even the vulgar consider light as the medium, but not the object. This is certainly the case (how justly we do not say) with the philosopher. On the other hand, the words smell, sound, and perhaps taste, are conceived by most persons as expressing the immediate objects of the senses of smelling, hearing, and tasting. Smell and sound are hastily conceived as separate existences, and as mediums of information and of intercourse with the odoriferous and sounding bodies; and it is only the very cautious philosopher who distinguishes between the smell which he feels and the perfume which fills the room. Those of the ancients, therefore, who taught that sounds were beings wafted through the air, and felt by our ears, should not, even at this day, be considered as awkward observers of nature. It has required the long, patient, and sagacious consideration of the most penetrating geniuses, from Zeno the Stoic to Sir Isaac Newton, to discover that what we call sound, the *immediate* external object of the sense of hearing, is nothing but a particular agitation of the parts of surrounding bodies, acting by mechanical impulse on our organs; and that it is not any separate being, nor even a specific quality inherent in any particular thing, by which it can affect the organ, as we suppose with respect to a perfume, but merely a mode of existence competent to every atom of matter. And thus the description which we proposed to give of sound must be a description of that state of external contiguous matter which is the *cause* of sound. It is not therefore prefatory to any theory or set of doctrines on this subject; but, on the contrary, is the sum or result of them all.

To discover this state of external body by which, without any farther intermedium of substance or of operation, it affects our sensitive faculties, must be considered as a great step in science. It will show us at least one way by which mind and body may be connected. It is supposed that we have attained this knowledge with respect to sound. Our success, therefore, is a very pleasing gratification to the philosophic mind. It is still more important in another view: it has encouraged us to make similar attempts in other cases, and has supplied us with a fact to which an ingenious mind can easily fancy something analogous in many abstruse operations of nature, and thus it enables us to give some sort of explanation of them. Accordingly this use has been most liberally made of the mechanical theory of sound; and there is now scarcely any phenomenon, either of matter or mind, that has not been explained in a manner somewhat similar. But we are sorry to say that these explanations have done no credit to philosophy. They are, for the most part, strongly marked with that precipitate and self-conceited impatience which has always characterized the investigations conducted solely by ingenious fancy. The consequences of this procedure have been no less fatal to the progress of true knowledge in modern times than in the schools of ancient Greece; and the ethereal philosophers of this age, like the followers of Aristotle of old, have filled ponderous volumes with nonsense and error. It is strange, however, that this should be the effect of a great and a successful step in philosophy: But the fault is in the philosophers, not in the science. Nothing can be more certain than the account which Newton has given of the propagation of a certain class of undulations in an elastic fluid. But this procedure of nature cannot be seen with distinctness and precision by any but well-informed mathematicians. They alone can rest with unshaken confidence on the conclusions legitimately deduced from the Newtonian theorems; and even they can insure success only by treading with the most scrupulous caution the steps of this patient philosopher. But few have done this; and we may venture to say, that not one in ten of those who employ the Newtonian doctrines of elastic undulations for the explanation of other phenomena have taken the trouble, or indeed were able, to go through the steps of the fundamental proposition (Prin. II. 50, &c.) But the *general* results are so plain, and admit of such impressive illustration, that they draw the assent of the most careless reader; and all imagine that they understand the explanation, and perceive the whole procedure of nature. Emboldened therefore by this successful step in philosophy, they, without hesitation, *fancy* similar intermediums in other cases; and as air has been found to be a vehicle for sound, they have supposed that something which they call ether, somehow resembling air, is the vehicle of vision. Others have proceeded farther, and have held that ether, or another something like air, is the vehicle of sensation in general, from the organ to the brain: nay, we have got a great volume called A THEORY OF MAN, where all our sensations, emotions, affections, thoughts, and purposes or volitions, are said to be so many vibrations of another something equally unseen, gratuitous, and incompetent; and, to crown all, this exalted doctrine, when logically prosecuted, must terminate in the discovery of those vibrations which pervade all others, and which constitute what we have been accustomed to venerate by the name DEITY. Such *must* be the termination of this philosophy; and a truly philosophical dissertation on the attributes of the Divine Being *can be nothing else* than an accurate description of these vibrations!

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This is not a needless and declamatory rhapsody. If the explanation of sound can be legitimately transferred to those other classes of phenomena, these are certain results; and if so, all the discoveries made by Newton are but the glimmerings of the morning, when compared with this meridian splendour. But if, on the other hand, sound logic forbids us to make this transference of explanation, we must continue to believe, for a little while longer, that mind is something different from vibrating matter, and that no kind of oscillations will constitute infinite wisdom.

It is of immense importance therefore to understand thoroughly this doctrine of sound, that we may see clearly and precisely in what it consists, what are the phenomena of sound that are fully explained, what are the data and the assumptions on which the explanations proceed, and what is the *precise mechanical fact* in which it terminates. For this, or a fact perfectly similar, must terminate every explanation which we derive from this by analogy, however perfect the analogy may be. This *previous* knowledge must be completely possessed;

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ſeſſed by every perſon who pretends to explain other phenomena in a ſimilar manner. Then, and not till then, he is able to ſay what claſſes of phenomena will admit of the explanation: and, when all this is done, his explanation is ſtill an *hypotheſis*, till he is able to prove, from other indiſputable ſources, the exiſtence and agency of the ſame thing analogous to the elaſtic fluid, from which all is borrowed.

At preſent therefore we ſhall content ourſelves with giving a ſhort hiſtory of the ſpeculations of philoſophers on the nature of ſound, tracing out the ſteps by which we have arrived at the knowledge which we have of it. We apprehend this to be of great importance; becauſe it ſhows us what kind of evidence we have for its truth, and the paths which we muſt ſhun if we wiſh to proceed farther: and we truſt that the progreſs which we have made will appear to be ſo real, and the object to be attained ſo alluring to a truly philoſophical mind, that men of genius will be incited to exert their utmoſt efforts to paſs the preſent boundaries of our real progreſs.

First notions of ſound.

In the infancy of philoſophy, ſound was held to be a ſeparate exiſtence, ſomething which would be, although no hearing animal exiſted. This was conceived as waſted through the air to our organ of hearing, which it was ſuppoſed to affect in a manner reſembling that in which our noſtrils are affected when they give us the ſenſation of ſmell. It was one of the Platonic SPECIES, fitted for exciting the intellectual ſpecies, which is the immediate object of the ſoul's contemplation.

Yet, even in thoſe early years of ſcience, there were ſome, and, in particular, the celebrated founder of the Stoic ſchool, who held that ſound, that is, the cauſe of ſound, was only the particular motion of external groſs matter, propagated to the ear, and there producing that agitation of the organ by which the ſoul is immediately affected with the ſenſation of ſound. Zeno, as quoted by Diogenes Laertius *, ſays, "Hearing is produced by the air which intervenes between the thing ſounding and the ear. The air is agitated in a ſpherical form, and moves off in waves; and falls on the ear, in the ſame manner as the water in a ciſtern undulates in circles when a ſtone has been thrown into it." The ancients were not remarkable for preciſion, either of conception or argument, in their diſcuſſions, and they were contented with a general and vague view of things. Some followed the Platonic notions, and many the opinion of Zeno, but without any further attempts to give a diſtinct conception of the explanation, or to compare it with experiment.

* B. vii. § 158. Zeno's opinion.

But in later times, during the ardent reſearches in the laſt century into the phenomena of nature, this became an intereſting ſubject of inquiry. The invention of the air-pump gave the firſt opportunity of deciding by experiment whether the elaſtic undulations of air were the cauſes of ſound: and the trial fully eſtabliſhed this point; for a bell rung *in vacuo* gave no ſound, and one rung in condenſed air gave a very loud one. It was therefore received as a doctrine in general phyſics that air was the vehicle of ſound.

Air the vehicle of ſound proved by the air-pump.

Galileo's diſcovery of the nature of muſical chords.

The celebrated Galileo, the parent of mathematical philoſophy, diſcovered the nature of that connection between the lengths of muſical chords and the notes which they produced, which had been obſerved by Pythagoras, or learned by him in his travels in the eaſt, and which he made the foundation of a refined and beautiful ſcience, the theory of muſic. Galileo ſhowed, that the real connection ſubſiſted between the tones and the vibrations of theſe chords, and that their different degrees of acuteneſs correſponded to the different frequency of their vibrations. The very elementary and familiar demonſtration which he gave of this connection did not ſatisfy the curious mathematicans of that inquiſitive age; and the mechanical theory of muſical chords was proſecuted to a great degree of refinement. In the courſe of this inveſtigation, it appeared that the chord vibrated in a manner preciſely ſimilar to a pendulum vibrating in a cycloid. It muſt therefore agitate the air contiguous to it in the ſame manner; and thus there is a particular kind of agitation which the air *can* receive and maintain, which is very intereſting.

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Sir Iſaac Newton took up this queſtion as worthy of his notice; and endeavoured to aſcertain with mathematical preciſion the mechaniſm of this particular claſs of undulations, and gave us the fundamental theorems concerning the undulations of elaſtic fluids, which make the 47th, &c. propoſitions of Book II. of the Principles of Natural Philoſophy. They have been (perhaps haſtily) conſidered as giving the fundamental doctrines concerning the propagation of ſound. A variety of facts are narrated in the article PNEUMATICS, to ſhow that ſuch undulations *actually obtain* in the air of our atmoſphere, and are accompanied by a ſet of phenomena of ſound which preciſely correſpond to all the mechanical circumſtances of theſe undulations.

Newton's theory of undulation correſpond with the phenomena of ſound.

In the mean time, the anatomiſts and phyſiologiſts were buſily employed in examining the ſtructure of our organs of hearing. Impreſſed with the validity of this doctrine of aerial undulations being the cauſe of ſound, their reſearches were always directed with a view to diſcover thoſe circumſtances in the ſtructure of the ear which rendered it an organ ſuſceptible of agitations from this cauſe; and they diſcovered many which appeared as contrivances for making it a drum, on which the aerial undulations from without muſt make very forcible impulſes, ſo as to produce very ſonorous undulations in the air contained in it. Theſe therefore they conſidered as the *immediate* objects of ſenſation, or the immediate cauſes of ſound.

Reſearches of anatomiſts.

But ſome anatomiſts ſaw that this would not be a full account of the matter: for after a drum is agitated, it has done all that it can do; it has produced a noiſe. But a farther proceſs goes on in our ear: There is behind the membrane, which is the head of this drum, a curious mechaniſm, which communicates the agitations of the membrane (the only thing acted on by the undulating air) to another chamber of moſt ſingular conſtruction, where the auditory nerve is greatly expanded. They conceive, therefore, that the organ called the *drum* does not act as a drum, but in ſome other way. Indeed it ſeems bad logic to ſuppoſe that it acts as a drum merely by producing a noiſe. This is in no reſpect different from the noiſe produced out of the ear; and if it is to be heard as a noiſe, we muſt have another ear by which it may be heard, and this ear muſt be another *ſuch* drum; and this muſt have another, and ſo on for ever. It is like the inaccurate notion that viſion is the contemplation of the picture on the retina. Theſe anatomiſts attended therefore to the ſtructure. Here they obſerved

Structure of the ear

Preliminary Observations.

observed a prodigious unfolding of the auditory nerve of the ear, which is curiously distributed through every part of this cavity, lining its sides, hung across it like a curtain, and sending off fibres in every direction, so as to leave hardly a point of it unoccupied. They thought the machinery contained in the drum peculiarly fitted for producing undulations of the air contained in this labyrinth, and that by these agitations of the air the contiguous fibres of the auditory nerve are impelled, and that thus we get the sensation of sound.

Of the human.

The cavity intervening between the external ear and this inner chamber appeared to these anatomists to have no other use than to allow a very free motion to the *stapes* or little piston that is employed to agitate the air in the labyrinth. This piston condenses on a very small surface the impulse which it receives from a much larger surface, strained by the malleus on the entry of the tympanum, on purpose to receive the gentle agitations of the external air in the outer canal. This membranous surface could not be agitated, unless completely detached from every thing round it; therefore all animals which have this mechanism have it in a cavity containing only air. But they held, that nature had even taken precautions to prevent this cavity from acting as a drum, by making it of such an irregular rambling form; for it is by no means a cavity of a symmetrical shape, like a vessel, but rather resembles the rambling holes and blebs which are often seen in a piece of bread, scattered through the substance of the cranium, and communicating with each other by small passages. The whole of these cavernulæ are lined with a softish membrane, which still farther unfits this cavity for producing sound. This reasoning is specious, but not very conclusive. We might even assert, that this anfractuous form, with narrow passages, is well fitted for producing noise. If we place the ear close to the small hole in the side of a military drum, we shall hear the smallest tap of the drumstick like a violent blow. The lining of the cavernulæ is nervous, and may therefore be strongly affected in the numerous narrow passages between the cells.

Of other animals.

While these speculations were going on with respect to the ear of the breathing animals, observations were occasionally made on other animals, such as reptiles, serpents, and fishes, which give undoubted indications of hearing; and many very familiar facts were observed or recollected, where sounds are communicated through or by means of solid bodies, or by water: therefore, without inquiring how or by what kind of mechanism it is brought about, it became a very general belief among physiologists, that all fishes, and perhaps all animals, hear, and that water in particular is a vehicle of sound. Many experiments are mentioned by Kircher and others on the communication of sound through solid bodies, such as masts, yards, and other long beams of dry fir, with similar results. Dr Monro has published a particular account of very curious experiments on the propagation of sound through water in his Dissertation on the Physiology of Fishes; so that it now appears that air is by no means the only vehicle of sound.

Water discovered in the internal ear

In 1762 Cotunni published his important discovery, that the labyrinth or inmost cavity of the ear in animals is completely filled with water. This, after some contest, has been completely demonstrated (see in particular Meckel Junior *de Labyrinthi Auris Contentis*, Argentor. 1777), and it seems now to be admitted by all.

Preliminary Observations.

This being the case, our notions of the immediate cause of sound must undergo a great revolution, and a new research must be made into the way in which the nerve is affected: for it is not enough that we substitute the undulations of water for those of air in the labyrinth. The well-informed mechanician will see at once, that the vivacity of the agitations of the nerve will be greatly increased by this substitution; for if water be perfectly elastic through the whole extent of the undulatory agitation which it receives, its effect will be greater in proportion to its specific gravity: and this is confirmed by an experiment very easily made. Immerse a table-bell in water contained in a large thin glass vessel. Strike it with a hammer. The sound will be heard as if the bell had been immediately struck on the sides of the vessel. The filling of the labyrinth of the ear with water is therefore an additional mark of the wisdom of the Great Artist. But this is not enough for informing us concerning the ultimate mechanical event in the process of hearing. The manner in which the nerve is exposed to these undulations must be totally different from what was formerly imagined. The filaments and membranes, which have been described by former anatomists, must have been found by them in a state quite unlike to their situation and condition in the living animal. Accordingly the most eminent anatomists of Europe seem at present in great uncertainty as to the state of the nerve, and are keenly occupied in observations to this purpose. The descriptions given by Monro, Scarpa, Camper, Comparetti, and others, are full of most curious discoveries, which make almost a total change in our notions of this subject, and will, we hope, be productive of most valuable information.

Increases the force of the undulations.

Scarpa has discovered that the solid cavity called the *labyrinth* contains a threefold expansion of the auditory nerve. One part of it, the cochlea, contains it in a fibrillous state, ramified in a most symmetrical manner through the whole of the *zona mollis* of the *lamina spiralis*, where it anastomoses with another production of it diffused over the general lining of that cavity. Another department of the nerve, also in a fibrous state, is spread over the external surface of a membranaceous bag, which nearly fills that part of the vestibule into which the semicircular canals open, and also that orifice which receives the impressions of the stapes. This bag sends off tubular membranaceous ducts, which, in like manner, nearly fill these semicircular canals. A third department of the nerve is spread over the external surface of another membranaceous bag, which lies between the one just now mentioned and the cochlea, but having no communication with either, almost completely filling the remainder of the vestibule. Thus the vestibule and canals seem only a case for protecting this sensitive membranaceous vessel, which is almost, but not altogether, in contact with the osseous case, being separated by a delicate and almost fluid cellular substance. The fibrillous expansion of the nerve is not indiscriminately diffused over the surface of these sacculi, but evidently directed to certain foci, where the fibres are constipated. And this is the last appearance of the fibrous state of the nerve; for when the inside of these sacculi is inspected, no fibres appear, but a pulp (judged to be nervous

Scarpa's discovery of the expansion of the nerve in the labyrinth.

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from its ſimilarity to other pulpy productions of the brain) adhering to the membranaceous coat, and not ſeparable from it by gently waſhing it. It is more abundant, that is, of greater thickneſs, oppoſite to the external fibrous foci. No organical ſtructure could be diſcovered in this pulp, but it probably is organized; for, beſides this adhering pulp, the water in the ſacculi was obſerved to be clammy or mucous; ſo that in all probability the vaſcular or fibrous ſtate of the nerve is ſucceeded by an uninterrupted production (perhaps columnar like baſalt, though not cohering); and this at laſt ends in ſimple diſſemination, ſymmetrical however, where water and nerve are alternate in every direction.

Comparetti's, of a tympanum in the foramen rotundum.

To theſe obſervations of Scarpa, Comparetti adds the curious circumſtance of another and regular tympanum in the foramen rotundum, the cylindric cavity of which is encloſed at both ends by a fine membrane. The membrane which ſeparates it from the cochlea appears to be in a ſtate of variable tenſion, being drawn up to an umbo by a cartilaginous ſpeck in its middle, which he thinks adheres to the lamina ſpiralis, and thus ſerves to ſtrain the drumhead, as the malleus ſtrains the great membrane known to all.

Theſe are moſt important obſervations, and muſt greatly excite the curioſity of a truly philoſophical mind, and deſerve the moſt careful inquiry into their juſtneſs. If theſe are accurate deſcriptions of the organ, they ſeem to conduct us farther into the ſecrets of nature than any thing yet known.

We think that they promiſe to give us the greateſt ſtep yet made in phyſiology, viz. to ſhow us the laſt mechanical fact which occurs in the long train interpoſed between the external body and the incitement of our ſenſitive ſyſtem. But there is, as yet, great and eſſential differences in the deſcriptions given by thoſe celebrated naturaliſts. It cannot be otherwiſe. The containing labyrinth can be laid open to our view in no other way than by deſtroying it; and its moſt delicate contents are the firſt ſufferers in the ſearch. They are found in very different ſituations and conditions by different anatomiſts, according to their addreſs or their good fortune. Add to this, that the natural varieties are very conſiderable. Faithful deſcriptions muſt therefore give very different notions of the ultimate action and reaction between the unorganized matter in the labyrinth and the ultimate expanſion of the auditory nerve.

Deſcriptions of naturaliſts different.

The progreſs which has been made in many parts of natural ſcience has been great and wonderful; and perhaps we are not too ſanguine, when we expreſs our hopes that the obſervations and experiments of anatomiſts and mechanicians will ſoon furniſh us with ſuch a collection of facts reſpecting the ſtructure and the contents of the organ of hearing, as might enable us to give a juſter theory of ſound than is yet to be found in the writings of philoſophers. There ſeems to be no abatement of ardour in the reſearches of the phyſiologiſts: and they will not remain long ignorant of the truth or miſtake in the accounts given by Scarpa and Comparetti. A collection of accurate obſervations on the ſtructure of the ear would give us principles on which to proceed in explaining the various methods of producing external ſounds. The nature of *continued ſounds* might then be treated of, and would appear, we believe, very different from what it is commonly ſuppoſed. Under this head animal voices might be particularly conſidered, and the elements of human ſpeech properly aſcertained. When the production of continued ſounds is once ſhown to be a thing regulated by principle, it may be ſyſtematically treated, and this principle may be conſidered as combined with every mechanical ſtate of body that may be pointed out. This will ſuggeſt to us methods of producing ſound which have not yet been thought of, and may therefore give us ſounds with which we are unacquainted.. Such an acquiſition is not to be deſpiſed nor rejected. The bountiful Author of our being and of all our faculties has made it an object of moſt enchanting relish to the human mind. The Greeks, the moſt cultivated people who have ever figured on the ſtage of life, enjoyed the pleaſures of muſic with rapture. Even the poor negro, after toiling a whole day beneath a tropical ſun, will go ten miles in the dark to dance all night to the ſimple muſic of the balafoe, and return without ſleep to his next day's toil. The penetrating eye of the anatomiſt has diſcovered in the human larynx an apparatus evidently contrived for tempering the great movements of the glottis, ſo as to enable us to produce the intended note with the utmoſt preciſion. There is no doubt therefore that the conſummate Artiſt has not thought it unworthy of his attention. We ought therefore to receive with thankfulneſs this preſent from our Maker—this *laborum dulce lenimen;* and it is ſurely worthy the attention of the philoſopher to add to this innocent elegance of life.

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Chap. I. *Different Theories of Sound.*

Of the vehicles of ſound.

Moſt ſounds, we all know, are conveyed to us on the boſom of the air. In whatever manner they either float upon it, or are propelled forward in it, certain it is, that, without the vehicle of this or ſome other fluid, we ſhould have no ſounds at all. Let the air be exhauſted from a receiver, and a bell ſhall emit no ſound when rung in the void; for, as the air continues to grow leſs denſe, the ſound dies away in proportion, ſo that at laſt its ſtrongeſt vibrations are almoſt totally ſilent.

Air not the only one.

Thus air is a vehicle for ſound. However, we muſt not, with ſome philoſophers, aſſert, that it is the only vehicle; that, if there were no air, we ſhould have no ſounds whatſoever: for it is found by experiment, that ſounds are conveyed through water with the ſame facility with which they move through air. A bell rung in water returns a tone as diſtinct as if rung in air. This was obſerved by Derham, who alſo remarked that the tone came a quarter deeper. It appears from the experiments of naturaliſts, that fiſhes have a ſtrong perception of ſounds, even at the bottom of deep rivers. From hence, it would ſeem not to be very material in the propagation of ſounds, whether the fluid which conveys them be elaſtic or otherwiſe. Water, which, of all ſubſtances that we know, has the leaſt elaſticity, yet ſerves to carry them forward; and if we make allowance for the difference of its denſity, perhaps the ſounds move in it with a proportional rapidity to what they are found to do in the elaſtic fluid of air. But though air and water are both vehicles of ſound, yet neither of them according to ſome philoſophers ſeems

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to be ſo by itſelf, but only as it contains an exceedingly ſubtle fluid capable of penetrating the moſt ſolid bodies. Hence, by the medium of that fluid, ſounds can be propagated through wood, or metals, even more readily than through the open air. By the ſame means, deaf people may be made ſenſible of ſounds if they hold a piece of metal in the mouth, one end of which is applied to the ſounding body. And as it is certain, that air cannot penetrate metals, the medium of ſound, ſay they, muſt be of a more ſubtle nature; and thus the electrical fluid will naturally occur as the proper one. But why then is ſound no longer heard in an exhauſted receiver, if the air is not the fluid by which it is conveyed, ſeeing the electrical matter cannot be excluded? The reply to this is obvious: The electrical fluid is ſo exceedingly ſubtle, and pervades ſolid bodies with ſo much eaſe, that any motion of a ſolid body in a quantity of electric matter by itſelf, can never excite a degree of agitation in it ſufficient for producing a ſound; but if the electric fluid is entangled among the particles of air, water, wood, metal, &c. whatever affects their particles will alſo affect this fluid, and produce an audible noiſe. In the experiment of the air pump, it is alleged there may be an ambiguity, as the gradual exhauſting of the air creates an increaſing difference of preſſure on the outſide, and may occaſion in the glaſs a difficulty of vibrating, ſo as to render it leſs fit to communicate to the air without the vibrations that ſtrike it from within. From this cauſe the diminution of ſound in an exhauſted receiver may be ſuppoſed to proceed, as well as from the diminution of the air. But if any internal agitation of its parts ſhould happen to the electrical fluid, exceeding loud noiſes might be propagated through it, as has been the caſe when large meteors have kindled at a great diſtance from the earth. It is alſo difficult, they ſuppoſe, to account for the amazing velocity of ſound, upon the ſuppoſition that it is propagated by means of air alone; for nothing is more certain, than that the ſtrongeſt and moſt violent gale is, in its courſe, inert and ſluggiſh, compared with the motion of ſound.

One thing however is certain, that whether the fluid which conveys the note be elaſtic, or nonelaſtic, whatever ſound we hear is produced by a ſtroke, which the ſounding body makes againſt the fluid, whether air or water. The fluid being ſtruck upon, carries the impreſſion forward to the ear, and there produces its ſenſation. Philoſophers are ſo far agreed, that they all allow that ſound is nothing more than the impreſſion made by an elaſtic body upon the air or water, and this impreſſion carried along by either fluid to the organ of hearing. But the manner in which this conveyance is made, is ſtill diſputed: Whether the ſound is diffuſed into the air, in circle beyond circle, like the waves of water when we diſturb the ſmoothneſs of its ſurface by dropping in a ſtone; or whether it travels along, like rays diffuſed from a centre, ſomewhat in the ſwift manner that electricity runs along a rod of iron; theſe are the queſtions which have divided the learned.

What ſound is, and how propagated.

Newton was of the firſt opinion. He has explained the progreſſion of ſound by an undulatory, or rather a vermicular, motion in the parts of the air. If we have an exact idea of the crawling of ſome inſects, we ſhall have a tolerable notion of the progreſſion of ſound upon this hypotheſis. This inſect, for inſtance, in its motion, firſt carries its contractions from the hinder part, in order to throw its fore part to the proper diſtance, then it carries its contractions from the fore part to the hinder to bring that forward. Something ſimilar to this is the motion of the air when ſtruck upon by a ſounding body. To be a little more preciſe, ſuppoſe ABC, Plate I. fig. 1. the ſtriking of a harpſichord ſcrewed to a proper pitch, and drawn out of the right line by the finger at B. We ſhall have occaſion elſewhere to obſerve, that ſuch a ſtring would, if let go, vibrate to E; and from E to D, and back again; that it would continue thus to vibrate like a pendulum, for ever, if not externally reſiſted, and, like a pendulum, all its little vibrations would be performed in equal times, the laſt and the firſt being equally long in performing; alſo that, like a pendulum, its greateſt ſwiftneſs would always be when it arrived at E, the middle part of its motion. Now then, if this ſtring be ſuppoſed to fly from the finger at B, it is obvious, that whatever be its own motion, ſuch alſo will be the motion of the parts of air that fly before it. Its motion, as is obvious, is firſt uniformly accelerated forward from B to E, then retarded as it goes from E to D, accelerated back again as it returns from D to E, and retarded from E to B. This motion being therefore ſucceſſively produced through a range of elaſtic air, it muſt happen, that the parts of one range of air will be ſent forward with accelerated motion, and then with a retarded motion. This accelerated motion reaching the remoteſt end of the firſt range will be communicated to a ſecond range, whilſt the neareſt parts of the firſt range being retarded in their motion, and falling back with the receſſion of the ſtring, retire firſt with an accelerated, then with a retarded motion, and the remoteſt parts will ſoon follow. In the mean time, while the parts of the firſt range are thus falling back, the parts of the ſecond range are going forward with an accelerated motion. Thus there will be an alternate condenſation and relaxation of the air, during the time of one vibration; and as the air going forward ſtrikes any oppoſing body with greater force than upon retiring, ſo each of theſe accelerated progreſſions have been called by Newton a *pulſe* of ſound.

Thus will the air be driven forward in the direction of the ſtring. But now we muſt obſerve, that theſe pulſes will move every way; for all motion impreſſed upon fluids in any direction whatſoever, operates all around in a ſphere: ſo that ſounds will be driven in all directions, backwards, forwards, upwards, downwards, and on every ſide. They will go on ſucceeding each other, one on the outſide of the other, like circles in diſturbed water; or rather, they will lie one without the other, in concentric ſhells, ſhell above ſhell, as we ſee in the coats of an onion.

Newton's theory.

All who have remarked the tone of a bell, while its ſounds are decaying away, muſt have an idea of the pulſes of ſound, which, according to Newton, are formed by the air's alternate progreſſion and receſſion. And it muſt be obſerved, that as each of theſe pulſes is formed by a ſingle vibration of the ſtring, they muſt be equal to each other; for the vibrations of the ſtring are known to be ſo.

Again, As to the velocity with which ſounds travel, this Newton determines, by the moſt difficult calcula-

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tion that can be imagined, to be in proportion to the thickneſs of the parts of the air, and the diſtance of theſe parts from each other. From hence he goes on to prove, that each little part moves backward and forward like a pendulum; and from thence he proceeds to demonſtrate, that if the atmoſphere were of the ſame denſity everywhere as at the ſurface of the earth, in ſuch a caſe, a pendulum, that reached from its higheſt ſurface down to the ſurface of the earth, would by its vibrations diſcover to us the proportion of the velocity with which ſounds travel. The velocity with which each pulſe would move, he ſhows, would be as much greater than the velocity of ſuch a pendulum ſwinging with one complete vibration, as the circumference of a circle is greater than the diameter. From hence he calculates, that the motion of ſound will be 979 feet in one ſecond. But this not being conſonant to experience, he takes in another conſideration, which deſtroys entirely the rigour of his former demonſtration, namely, vapours in the air; and then finds the motion of ſound to be 1142 feet in one ſecond, or near 13 miles in a minute; a proportion which experience had eſtabliſhed nearly before.

Preceding theory oppoſed.

This much will ſerve to give an obſcure idea of a theory which has met with numerous oppoſers. Even John Bernouilli, Newton's greateſt diſciple, modeſtly owns that he did not pretend to underſtand this part of the *Principia*. He attempted therefore to give a more perſpicuous demonſtration of his own, that might confirm and illuſtrate the Newtonian theory. The ſubject ſeemed to reject elucidation; his theory is obviouſly wrong, as D'Alembert has proved in his Theory of Fluids.

The objections.

Various have been the objections that have been made to the Newtonian ſyſtem of ſounds. It is urged, that this theory can only agree with the motion of ſound in an elaſtic fluid, whereas ſounds are known to move forward through water that is not elaſtic. To explain their progreſs therefore through water, a ſecond theory muſt be formed: ſo that two theories muſt be made to explain a ſimilar effect; which is contrary to the ſimplicity of true philoſophy, for it is contrary to the ſimplicity of nature. It is further urged, that this ſlow vermicular motion but ill repreſents the velocity with which ſounds travel, as we know by experience that it is almoſt 13 miles in a minute. In ſhort, it is urged, that ſuch undulations as have been deſcribed, when coming from ſeveral ſonorous bodies at once, would croſs, obſtruct, and confound each other; ſo that, if they were conveyed to the ear by this means we ſhould hear nothing but a medley of diſcord and broken articulations. But this is equally with the reſt contradictory to experience, ſince we hear the fulleſt concert, not only without confuſion, but with the higheſt pleaſure. Theſe objections, whether well founded or not, have given riſe to another theory: which we ſhall likewiſe lay before the reader; though it too appears liable to objections, which ſhall be afterwards mentioned.

Another theory.

Every ſound may be conſidered as driven off from the ſounding body in ſtraight lines, and impreſſed upon the air in one direction only: but whatever impreſſion is made upon a fluid in one direction, is diffuſed upon its ſurface into all directions: ſo that the ſound firſt driven directly forward ſoon fills up a wide ſphere, and is heard on every ſide. Thus, as it is impreſſed, it inſtantaneouſly travels forward with a very ſwift motion, reſembling the velocity with which we know electricity flies from one end of a line to another.

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Now, as to the pulſes, or cloſe ſhakes as the muſicians expreſs it, which a ſounding body is known to make, each pulſe (ſay the ſupporters of this theory) is itſelf a diſtinct and perfect ſound, and the interval between every two pulſes is profoundly ſilent. Continuity of ſound from the ſame body is only a deception of the hearing; for as each diſtinct ſound ſucceeds at very ſmall intervals, the organ has no time to tranſmit its images with equal ſwiftneſs to the mind, and the interval is thus loſt to ſenſe: juſt as in ſeeing a flaming torch, whirled rapidly round, it appears as a ring of fire. In this manner a beaten drum, at ſome ſmall diſtance, preſents us with the idea of continuing ſound. When children run with their ſticks along a rail, a continuing ſound is thus repreſented, though it need ſcarce be obſerved that the ſtroke againſt each rail is perfectly diſtinct and inſulated.

According to this theory, therefore, the pulſes are nothing more than diſtinct ſounds repeated by the ſame body, the firſt ſtroke or vibration being ever the loudeſt, and travelling farther than thoſe that follow; while each ſucceeding vibration gives a new ſound, but with diminiſhed force, till at laſt the pulſes decay away totally, as the force decays that gives them exiſtence.

All bodies whatſoever that are ſtruck return more or leſs a ſound: but ſome, wanting elaſticity, give back no repetition of the ſound; the noiſe is at once produced and dies: while other bodies, however, there are, which being more elaſtic and capable of vibration, give back a ſound, and repeat the ſame ſeveral times ſucceſſively. Theſe laſt are ſaid to have a tone; the others are not allowed to have any.

This tone of the elaſtic ſtring, or bell, is notwithſtanding nothing more than a ſimilar ſound of what the former bodies produced, but with the difference of being many times repeated, while their note is but ſingle. So that, if we would give the former bodies a tone, it will be neceſſary to make them repeat their ſound, by repeating our blows ſwiftly upon them. This will effectually give them a tone; and even an unmuſical inſtrument has often had a fine effect by its tone in our concerts.

Let us now go on then to ſuppoſe, that by ſwift and equably continued ſtrokes we give any nonelaſtic body its tone: it is very obvious, that no alterations will be made in this tone by the quickneſs of the ſtrokes, though repeated ever ſo faſt. Theſe will only render the tone more equal and continuous, but make no alteration in the tone it gives. On the contrary, if we make an alteration in the force of each blow, a different tone will then undoubtedly be excited. The difference will be ſmall, it muſt be confeſſed; for the tones of theſe inflexible bodies are capable but of ſmall variation; however, there will certainly be a difference. The table on which we write, for inſtance, will return a different ſound when ſtruck with a club, from what it did when ſtruck only with a ſwitch. Thus nonelaſtic bodies return a difference of tone, not in proportion to the ſwiftneſs with which their ſound is repeated, but in proportion to the greatneſs of the blow which produced it; for in two equal nonelaſtic bodies, that body produced

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produced the deepeſt tone which was ſtruck by the greateſt blow.

We now then come to a critical queſtion, What is it that produces the difference of tone in two elaſtic ſounding bells or ſtrings? or, what makes one deep and the other ſhrill? This queſtion has always been hitherto anſwered by ſaying, that the depth or height of the note proceeded from the ſlowneſs or ſwiftneſs of the times of the vibrations. The ſloweſt vibrations, it has been ſaid, are qualified for producing the deepeſt tones, while the ſwifteſt vibrations produce the higheſt tones. In this caſe, an effect has been given for a cauſe. It is in fact the force with which the ſounding ſtring ſtrikes the air when ſtruck upon, that makes the true diſtinction in the tones of ſounds. It is this force, with greater or leſs impreſſions, reſembling the greater or leſs force of the blows upon a nonelaſtic body, which produces correſpondent affections of ſound. The greateſt forces produce the deepeſt ſounds; the high notes are the effect of ſmall efforts. In the ſame manner a bell, wide at the mouth, gives a grave ſound; but if it be very maſſy withal, that will render it ſtill graver; but if maſſy, wide, and long or high, that will make the tone deepeſt of all.

Thus, then, will elaſtic bodies give the deepeſt ſound, in proportion to the force with which they ſtrike the air: but if we ſhould attempt to increaſe their force by giving them a ſtronger blow, this will be in vain; they will ſtill return the ſame tone; for ſuch is their formation, that they are ſonorous only becauſe they are elaſtic, and the force of this elaſticity is not increaſed by our ſtrength, as the greatneſs of a pendulum's vibrations will not be increaſed by falling from a greater height.

Now as to the frequency with which elaſtic ſtrings vibrate the deepeſt tones, it has been found, that the longeſt ſtrings have the wideſt vibrations, and conſequently go backward and forward ſloweſt; while, on the contrary, the ſhorteſt ſtrings vibrate the quickeſt, or come and go in the ſhorteſt intervals. From hence thoſe who have treated of ſounds, have aſſerted, as was ſaid before, that the tone of the ſtring depended upon the length or the ſhortneſs of the vibrations. This, however, is not the caſe. One and the ſame ſtring, when ſtruck, muſt always, like the ſame pendulum, return preciſely ſimilar vibrations: but it is well known, that one and the ſame ſtring, when ſtruck upon, does not always return preciſely the ſame tone: ſo that in this caſe the vibrations follow one rule, and the tone another. The vibrations muſt be invariably the ſame in the ſame ſtring, which does not return the ſame tone invariably, as is well known to muſicians in general. In the violin, for inſtance, they can eaſily alter the tone of the ſtring an octave or eight notes higher, by a ſofter method of drawing the bow; and ſome are known thus to bring out the moſt charming airs imaginable. Theſe peculiar tones are by the Engliſh fiddlers called *flute-notes*. The only reaſon, it has been alleged, that can be aſſigned for the ſame ſtring thus returning different tones, muſt certainly be the different force of its ſtrokes upon the air. In one caſe, it has double the tone of the other; becauſe upon the ſoft touches of the bow, only half its elaſticity is put into vibration.

Different Theories of Sound.

This being underſtood (continue the authors of this theory), we ſhall be able clearly to account for many things relating to ſounds that have hitherto been inexplicable. Thus, for inſtance, if it be aſked, When two ſtrings are ſtretched together of equal lengths, tenſions, and thickneſs, how does it happen, that one of them being ſtruck, and made to vibrate throughout, the other ſhall vibrate throughout alſo? the anſwer is obvious: The force that the ſtring ſtruck receives is communicated to the air, and the air communicates the ſame to the ſimilar ſtring; which therefore receives all the force of the former; and the force being equal, the vibrations muſt be ſo too. Again: Put the queſtion, If one ſtring be but half the length of the other, and be ſtruck, how will the vibrations be? The anſwer is, The longeſt ſtring will receive all the force of the ſtring half as long as itſelf, and therefore it will vibrate in proportion, that is, through half its length. In the ſame manner, if the longeſt ſtring were three times as long as the other, it would only vibrate in a third of its length; or if four times, in a fourth of its length. In ſhort, whatever force the ſmaller ſtring impreſſes upon the air, the air will impreſs a ſimilar force upon the longer ſtring, and partially excite its vibrations.

Eolian Lyre.

From hence alſo we may account for the cauſe of thoſe charming melancholy gradations of ſound in the Eolian lyre, Plate I. fig. 2.; an inſtrument (ſays Sir John Hawkins) lately obtruded upon the public as a new invention, though deſcribed above a century ago by Kircher *. This inſtrument is eaſily made, being nothing more than a long narrow box of thin deal, about 30 inches long, 5 inches broad, and 1¼ inches deep, with a circle in the middle of the upper ſide or belly about 1¼ inch diameter pierced with ſmall holes. On this ſide are ſeven, ten, or (according to Kircher) fifteen or more ſtrings of very fine gut, ſtretched over bridges at each end, like the bridge of a fiddle, and ſcrewed up or relaxed with ſcrew-pins (B). The ſtrings are all tuned to one and the ſame note; and the inſtrument is placed in ſome current of air, where the wind can bruſh over its ſtrings with freedom. A window with the ſaſh juſt raiſed to give the air admiſſion, will anſwer this purpoſe exactly. Now when the entering air blows upon theſe ſtrings with different degrees of force, there will be excited different tones of ſound; ſometimes the blaſt brings out all the tones in full concert; ſometimes it ſinks them to the ſofteſt murmurs; it feels for every tone, and by its gradations of ſtrength ſolicits thoſe gradations of ſound which art has taken different methods to produce.

* Vide *Kircher's Muſurgia*, lib. ix.

It remains, in the laſt place, to conſider (by this theory) the loudneſs and lowneſs, or, as the muſicians ſpeak, the ſtrength and ſoftneſs of ſound. In vibrating elaſtic ſtrings, the loudneſs of the tone is in proportion to the deepneſs of the note; that is, in two ſtrings, all things in other circumſtances alike, the deepeſt tone will be loudeſt. In muſical inſtruments upon a different principle, as in the violin, it is otherwiſe;

(B) The figure repreſents the inſtrument with ten chords; of which ſome direct only eight to be tuned uniſons, and the two outermoſt octaves below them. But this ſeems to be not material.

Different Theories of Sounds.

wife; the tones are made in ſuch inſtruments, by a number of ſmall vibrations crowded into one ſtroke. The roſined bow, for inſtance, being drawn along a ſtring, its roughneſſes catch the ſtring at very ſmall intervals, and excite its vibrations. In this inſtrument, therefore, to excite loud tones, the bow muſt be drawn quick, and this will produce the greateſt number of vibrations. But it muſt be obſerved, that the more quick the bow paſſes over the ſtring, the leſs apt will the roughneſs of its ſurface be to touch the ſtring at every inſtant; to remedy this, therefore, the bow muſt be preſſed the harder as it is drawn quicker, and thus its fulleſt ſound will be brought from the inſtrument. If the ſwiftneſs of the vibrations in an inſtrument thus rubbed upon, exceed the force of the deeper ſound in another, then the ſwift vibrations will be heard at a greater diſtance, and as much farther off as the ſwiftneſs in them exceeds the force in the other.

The nature of muſical ſounds illuſtrated according to the ſame theory.

By the ſame theory (it is alleged) may all the phenomena of muſical ſounds be eaſily explained.—The fables of the ancients pretend, that muſic was firſt found out by the beating of different hammers upon the ſmith's anvil. Without purſuing the fable, let us endeavour to explain the nature of muſical ſounds by a ſimilar method. Let us ſuppoſe an anvil, or ſeveral ſimilar anvils, to be ſtruck upon by ſeveral hammers of different weights or forces. The hammer, which is double that of another, upon ſtriking the anvil will produce a ſound double that of the other: this double ſound muſicians have agreed to call an octave. The ear can judge of the difference or reſemblance of theſe ſounds with great eaſe, the numbers being as one and two, and therefore very readily compared. Suppoſe that a hammer, three times leſs than the firſt, ſtrikes the anvil, the ſound produced by this will be three times leſs than the firſt: ſo that the ear, in judging the ſimilitude of theſe ſounds, will find ſomewhat more difficulty; becauſe it is not ſo eaſy to tell how often one is contained in three, as it is to tell how often it is contained in two. Again, Suppoſe that a hammer four times leſs than the firſt ſtrikes the anvil, the ear will find greater difficulty ſtill in judging preciſely the difference of the ſounds; for the difference of the numbers four and one cannot ſo ſoon be determined with preciſion as three and one. If the hammer be five times leſs, the difficulty of judging will be ſtill greater. If the hammer be ſix times leſs, the difficulty ſtill increaſes, and ſo alſo of the ſeventh, ſo that the ear cannot always readily and at once determine the preciſe gradation. Now, of all compariſons, thoſe which the mind makes moſt eaſily, and with leaſt labour, are the moſt pleaſing. There is a certain regularity in the human ſoul, by which it finds happineſs in exact and ſtriking, and eaſily made compariſons. As the ear is but an inſtrument of the mind, it is therefore moſt pleaſed with the combination of any two ſounds, the difference of which it can moſt readily diſtinguiſh. It is more pleaſed with the concord of two ſounds which are to each other as one and two, than of two ſounds which are as one and three, or one and four, or one and five, or one and ſix or ſeven. Upon this pleaſure, which the mind takes in compariſon, all harmony depends. The variety of ſounds is infinite: but becauſe the ear cannot compare two ſounds ſo as readily to diſtinguiſh their diſcriminations when they exceed the proportion of one and ſeven, muſicians have been content to confine all harmony within that compaſs, and allowed but ſeven notes in muſical compoſition. Of Muſic: Sounds.

Let us now then ſuppoſe a ſtringed inſtrument fitted up in the order mentioned above. For inſtance: Let the firſt ſtring be twice as long as the ſecond; let the third ſtring be three times ſhorter than the firſt; let the fourth be four times, the fifth ſtring five times, and the ſixth ſix times as ſhort as the firſt. Such an inſtrument would probably give us a repreſentation of the lyre as it came firſt from the hand of the inventor. This inſtrument will give us all the ſeven notes following each other, in the order in which any two of them will accord together moſt pleaſingly; but yet it will be a very inconvenient and a very diſagreeable inſtrument: inconvenient, for in a compaſs of ſeven ſtrings only, the firſt muſt be ſeven times as long as the laſt; and diſagreeable, becauſe this firſt ſtring will be ſeven times as loud alſo; ſo that when the tones are to be played in a different order, loud and ſoft ſounds would be intermixed with moſt diſguſting alternations. In order to improve the firſt inſtrument, therefore, ſucceeding muſicians very judiciouſly threw in all the other ſtrings between the two firſt, or, in other words, between the two octaves, giving to each, however, the ſame proportion to what it would have had in the firſt natural inſtrument. This made the inſtrument more portable, and the ſounds more even and pleaſing. They therefore diſpoſed the ſounds between the octave in their natural order, and gave each its own proportional dimenſions. Of theſe ſounds, where the proportion between any two of them is moſt obvious, the concord between them will be moſt pleaſing. Thus octaves, which are as two to one, have a moſt harmonious effect; the fourth and fifth alſo ſound ſweetly together, and they will be found, upon calculation, to bear the ſame proportion to each other that octaves do. "Let it not be ſuppoſed (ſays M. Sauveur), that the muſical ſcale is merely an arbitrary combination of ſounds; it is made up from the conſonance and differences of the parts which compoſe it. Thoſe who have often heard a fourth and fifth accord together, will be naturally led to diſcover their difference at once; and the mind unites itſelf to their beauties." Let us then ceaſe to aſſign the coincidences of vibrations as the cauſe of harmony, ſince theſe coincidences in two ſtrings vibrating at different intervals, muſt at beſt be but fortuitous; whereas concord is always pleaſing. The true cauſe why concord is pleaſing, muſt ariſe from our power, in ſuch a caſe, of meaſuring more eaſily the differences of the tones. In proportion as the note can be meaſured with its fundamental tone by large and obvious diſtinctions, then the concord is moſt pleaſing; on the contrary, when the ear meaſures the diſcriminations of two tones by very ſmall parts, or cannot meaſure them at all, it loſes the beauty of their reſemblance: the whole is diſcord and pain (c).

But

(c) It is certain, that in proportion to the ſimplicity of relations in ſound, the ear is pleaſed with its combinations; but this is not to be admitted as the cauſe why muſicians have confined all harmony to an octave.

Diſcriminated

Of Musical Sounds.

But there is another property in the vibration of a musical ſtring not yet taken notice of, and which is alleged to confirm the foregoing theory. If we ſtrike the ſtring of a harpſichord, or any other elaſtic ſounding chord whatever, it returns a continuing ſound. This till of late was conſidered as one ſimple uniform tone; but all muſicians now confeſs, that inſtead of one tone it actually returns four tones, and that conſtantly. The notes are, beſide the fundamental tone, an octave above, a twelfth above, and a ſeventeenth. One of the baſs notes of a harpſichord has been diſſected in this manner by Rameau, and the actual exiſtence of theſe tones proved beyond a poſſibility of being controverted. In fact, the experiment is eaſily tried; for if we ſmartly ſtrike one of the lower keys of a harpſichord, and then take the finger briſkly away, a tolerable ear will be able to diſtinguiſh, that, after the fundamental tone has ceaſed, three other ſhriller tones will be diſtinctly heard; firſt the octave above, then the twelfth, and laſtly the ſeventeenth: the octave above is in general almoſt mixed with the fundamental tone, ſo as not to be eaſily perceived, except by an ear long habituated to the minute diſcriminations of ſounds. So that we may obſerve, that the ſmalleſt tone is heard laſt, and the deepeſt and largeſt one firſt: the two others in order.

In the whole theory of ſounds, nothing has given greater room for ſpeculation, conjecture, and diſappointment, than this amazing property in elaſtic ſtrings. The whole ſtring is univerſally acknowledged to be in vibration in all its parts, yet this ſingle vibration returns no leſs than four different ſounds. They who account for the tones of ſtrings by the number of their vibrations, are here at the greateſt loſs. Daniel Bernouilli ſuppoſes, that a vibrating ſtring divides itſelf into a number of curves, each of which has a peculiar vibration; and though they all ſwing together in the common vibration, yet each vibrates within itſelf. This opinion, which was ſupported, as moſt geometrical ſpeculations are, with the parade of demonſtration, was only born ſoon after to die. Others have aſcribed this to an elaſtic difference in the parts of the air, each of which, at different intervals, thus received different impreſſions from the ſtring, in proportion to their elaſticity. This is abſurd. If we allow the difference of tone to proceed from the force, and not the frequency, of the vibrations, this difficulty will admit of an eaſy ſolution. Theſe ſounds, though they ſeem to exiſt together in the ſtring, actually follow each other in ſucceſſion: while the vibration has greateſt force, the fundamental tone is brought forward: the force of the vibration decaying, the octave is produced, but almoſt only inſtantaneouſly; to this ſucceeds, with diminiſhed force, the twelfth; and, laſtly, the ſeventeenth is heard to vibrate with great diſtinctneſs, while the three other tones are always ſilent. Theſe ſounds, thus excited, are all of them the harmonic tones, whoſe differences from the fundamental tone are, as was ſaid, ſtrong and diſtinct. On the other hand, the diſcordant tones cannot be heard. Their differences being but very ſmall, they are overpowered, and in a manner drowned in the tones of ſuperior difference: yet not always neither; for Daniel Bernouilli has been able, from the ſame ſtroke, to make the ſame ſtring bring out its harmonic and its diſcordant tones alſo (D). So that from hence we may juſtly infer, that every note whatſoever is only a ſucceſſion of tones; and that thoſe are moſt diſtinctly heard, whoſe differences are moſt eaſily perceivable.

Of Muſical Sounds.

To this theory, however, though it has a plauſible appearance, there are ſtrong and indeed inſuperable objections. The very fundamental principle of it is falſe. No body whatever, whether elaſtic or nonelaſtic, yields a graver ſound by being ſtruck with a larger inſtrument, unleſs either the ſounding body, or that part of it which emits the ſound, is enlarged. In this caſe, the largeſt bodies always return the graveſt ſounds.

Objections to the preceding theory.

In ſpeaking of elaſtic and nonelaſtic bodies in a muſical ſenſe, we are not to puſh the diſtinction ſo far as when we ſpeak of them philoſophically. A body is *muſically* elaſtic, all of whoſe parts are thrown into vibrations ſo as to emit a ſound when only part of their ſurface is ſtruck. Of this kind are bells, muſical ſtrings, and all bodies whatever that are conſiderably hollow. Muſical nonelaſtics are ſuch bodies as emit a ſound only from that particular place which is ſtruck: thus, a table, a plate of iron nailed on wood, a bell ſunk in the earth, are all of them nonelaſtics in a muſical ſenſe, though not philoſophically ſo. When a ſolid body, ſuch as a log of wood, is ſtruck with a ſwitch, only that part of it emits a ſound which comes in contact with the ſwitch; the note is acute and loud, but would be no leſs ſo though the adjacent parts of the log were removed. If, inſtead of the ſwitch, a heavier or larger inſtrument is made uſe of, a larger portion of its ſurface then returns a ſound, and the note is conſequently more grave; but it would not be ſo if the large inſtrument was ſtruck with a ſharp edge, or a ſurface only equal to that of the ſmall one.

In ſounds of this kind, where there is only a ſingle thwack, without any repetition, the immediate cauſe of the gravity or acuteneſs ſeems to be the quantity of air diſplaced by the ſounding body; a large quantity of air diſplaced, produces a grave ſound, and a ſmaller quantity a more acute one, the force wherewith the air is diſplaced ſignifying very little. What we here advance is confirmed by ſome experiments made by Dr Prieſtley, concerning the *muſical tone* of electrical diſcharges. The paſſage being curious, and not very long, we ſhall here tranſcribe it.

"As the courſe of my experiments has required a great variety of electrical explo\ſions, I could not help obſerving a great variety in the muſical tone made by the reports. This excited my curioſity to attempt to reduce this variation to ſome meaſure. Accordingly, by

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Diſcriminated ſounds, whoſe vibrations either never coincide, or at leaſt very rarely, do not only ceaſe to pleaſe, but violently grate the ear. Harmony and diſcord, therefore, are neither diſcriminated by the judgement of hearers, nor the inſtitution of muſicians, but by their own eſſential and immutable nature.

(D) Vid. Memoires de l'Academie de Berlin, 1753, p. 153.

Of Muſical Sounds

by the help of a couple of ſpinets, and two perſons who had good ears for muſic, I endeavoured to aſcertain the tone of ſome electrical diſcharges; and obſerved, that every diſcharge made ſeveral ſtrings, particularly thoſe that were chords to one another, to vibrate; but one note was always predominant, and ſounded after the reſt. As every exploſion was repeated ſeveral times, and three of us ſeparately took the ſame note, there remained no doubt but that the tone we fixed upon was at leaſt very near the true one. The reſult was as follows:

"A jar containing half a ſquare foot of coated glaſs ſounded F ſharp, concert pitch. Another jar of a different form, but equal ſurface, ſounded the ſame.

"A jar of three ſquare feet ſounded C below F ſharp. A battery conſiſting of ſixty-four jars, each containing half a ſquare foot, ſounded F below the C.

"The ſame battery in conjunction with another of thirty-one jars, ſounded C ſharp. So that a greater quantity of coated glaſs always gave a deeper note.

"Differences in the degree of a charge in the ſame jar made little or no difference in the tone of the exploſion; if any, a higher charge gave rather a deeper note."

Theſe experiments ſhow us how much the gravity or acuteneſs of ſounds depends on the quantity of air put in agitation by the ſounding body. We know that the noiſe of the electric exploſion, ariſes from the return of the air into the vacuum produced by the electric flaſh. The larger the vacuum, the deeper was the note: for the ſame reaſon, the diſcharge of a muſket produces a more acute note than that of a cannon; and thunder is deeper than either.

Beſides this, however, other circumſtances concur to produce different degrees of gravity or acuteneſs in ſounds. The ſound of a table ſtruck upon with a piece of wood, will not be the ſame with that produced from a plate of iron ſtruck by the ſame piece of wood, even if the blows ſhould be exactly equal, and the iron perfectly kept from vibrating. Here the ſounds are generally ſaid to differ in their degrees of acuteneſs, according to the ſpecific gravities or denſities of the ſubſtances which emit them. Thus gold, which is the moſt denſe of all metals, returns a much graver ſound than ſilver; and metalline wires, which are more denſe than therms, return a proportionably graver ſound. But neither does this appear to be a general rule in which we can put confidence. Bell metal is denſer than copper, but it by no means appears to yield a graver ſound: on the contrary, it ſeems very probable, that copper will give a graver ſound than bell metal, if both are ſtruck upon in their nonelaſtic ſtate; and we can by no means think that a bell of pure tin, the leaſt denſe of all the metals, will give a more acute ſound than one of bell metal, which is greatly more denſe. In ſome bodies hardneſs ſeems to have a conſiderable effect. Glaſs, which is conſiderably harder than any metal, gives a more acute ſound; bell metal is harder than gold, lead, or tin, and therefore ſounds much more acutely: though how far this holds with regard to other ſubſtances, there is not a ſufficient number of experiments for us to judge.

In bodies muſically elaſtic, the whole ſubſtance vibrates with the ſlighteſt ſtroke, and therefore they always give the ſame note whether they are ſtruck with a large or with a ſmall inſtrument; ſo that ſtriking a part of the ſurface of any body muſically elaſtic is equivalent, in it, to ſtriking the whole ſurface of a nonelaſtic one. If the whole ſurface of a table was ſtruck with another table, the note produced would be neither more nor leſs acute whatever force was employed; becauſe the whole ſurface would then yield a ſound, and no force could increaſe the ſurface: the ſound would indeed be louder in proportion to the force employed, but the gravity would remain the ſame. In like manner, when a bell, or muſical ſtring, is ſtruck, the whole ſubſtance vibrates, and a greater ſtroke cannot increaſe the ſubſtance. Hence we ſee the fallacy of what is ſaid concerning the Pythagorean anvils. An anvil is a body muſically elaſtic, and no difference in the tone can be perceived whether it is ſtruck with a large or with a ſmall hammer; becauſe either of them are ſufficient to make the whole ſubſtance vibrate, provided nothing but the anvil is ſtruck upon: ſmiths, however, do not ſtrike their anvils, but red hot iron laid upon their anvils; and thus the vibrations of the anvil are ſtopped, ſo that it becomes a nonelaſtic body, and the differences of tone in the ſtrokes of different hammers proceed only from the ſurface of the large hammers covering the whole ſurface of the iron, or at leaſt a greater part of it than the ſmall ones. If the ſmall hammer is ſufficient to cover the whole ſurface of the iron as well as the large one, the note produced will be the ſame, whether the large or the ſmall hammer is uſed.

Laſtly, The argument for the preceding theory, grounded on the production of what are called *flute-notes* on the violin, is built on a falſe foundation; for the bow being lightly drawn on an open ſtring, produces no *flute-notes*, but only the harmonies of the note to which the ſtring is tuned. The *flute-notes* are produced by a particular motion of the bow, quick and near the bridge, and by fingering very gently. By this management, the ſame ſounds are produced, though at certain intervals only, as if the vibrations were tranſferred to the ſpace between the end of the finger-board and the finger, inſtead of that between the finger and the bridge. Why this ſmall part of the ſtring ſhould vibrate in ſuch a caſe, and not that which is under the immediate action of the bow, we muſt own ourſelves ignorant: nor dare we affirm that the vibrations really are transferred in this manner, only the ſame ſounds are produced as if they were.

Though theſe objections ſeem ſufficiently to overturn the foregoing theory, with regard to acute ſounds being the effects of weak ſtrokes, and grave ones of ſtronger impulſes, we cannot admit that longer or ſhorter vibrations are the occaſions of gravity or acuteneſs in ſound. A muſical ſound, however lengthened, either by a ſtring or bell, is only a repetition of a ſingle one, whoſe duration by itſelf is but for a moment, and is therefore termed *inappretiable*, like the ſmack of a whip, or the exploſion of an electrical battery. The continuation of the ſound is nothing more than a repetition of this inſtantaneous inappretiable noiſe after the manner of an echo, and it is only this echo that makes the ſound agreeable. For this reaſon, muſic is much more agreeable when played in a large hall where the ſound is reverberated, than in a ſmall room where there is no ſuch reverberation. For the ſame reaſon, the ſound of a ſtring is more agreeable when put on a hollow

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low violin than when fastened to a plain board, &c.—In the sound of a bell we cannot avoid observing this echo very distinctly. The sound appears to be made up of distinct pulses, or repetitions of the same note produced by the stroke of the hammer. It can by no means be allowed, that the note would be more acute though these pulses were to succeed one another more rapidly; the sound would indeed become more simple, but would still preserve the same tone.—In musical strings the reverberations are vastly more quick than in bells; and therefore their sound is more uniform or simple, and consequently more agreeable than that of bells. In musical glasses*, the vibrations must be inconceivably quicker than in any bell or stringed instrument: and hence they are of all others the most simple and the most agreeable, though neither the most acute nor the loudest.—As far as we can judge, quickness of vibration contributes to the uniformity, or simplicity, but not to the acuteness, nor to the loudness, of a musical note.

See *Harmonica.*

It may here be objected, that each of the different pulses, of which we observe the sound of a bell to be composed, is of a very perceptible length, and far from being instantaneous; so that it is not fair to infer that the sound of a bell is only a repetition of a single instantaneous stroke, seeing it is evidently the repetition of a lengthened note.—To this it may be replied, that the inappretiable sound which is produced by striking a bell in a non-elastic state, is the very same which, being first propagated round the bell, forms one of these short pulses that is afterwards re-echoed as long as the vibrations of the metal continue, and it is impossible that the quickness of repetition of any sound can either increase or diminish its gravity.

Chap. II. *Of the Propagation of Sound. Newton's Doctrine explained and vindicated.*

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The writers on sound have been betrayed into these difficulties and obscurities, by rejecting the 47th proposition, B. II. of Newton, as inconclusive reasoning. Of this proposition, however, the late ingenious Dr Matthew Young bishop of Clonfert, formerly of Trinity college, Dublin, has given a clear, explanatory, and able defence. He candidly owns that the demonstration is obscurely stated, and takes the liberty of varying, in some degree, from the method pursued by Newton.

"1. The parts of all sounding bodies (he observes), vibrate according to the law of a cycloidal pendulum: for they may be considered as composed of an indefinite number of elastic fibres; but these fibres vibrate according to that law. *Vide Helsham*, p. 270.

"2. Sounding bodies propagate their motions on all sides *in directum*, by successive condensations and rarefactions, and successive goings forward and returnings backward of the particles. *Vide Prop.* 43. B. II. *Newton. Princip.*

"3. The pulses are those parts of the air which vibrate backwards and forwards; and which, by going forward, strike (*pulsant*) against obstacles. The latitude of a pulse is the rectilineal space through which the motion of the air is propagated during one vibration of the sounding body.

"4. All pulses move equally fast. This is proved by experiment; and it is found that they describe 1070 Paris feet, or 1142 London feet in a second, whether the sound be loud or low, grave or acute.

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"5. Prob. To determine the latitude of a pulse. Divide the space which the pulse describes in a given time (4) by the number of vibrations performed in the same time by the sounding body, (*Cor.* 1. *Prop.* 24. *Smith's Harmonics*), the quotient is the latitude.

"M. Sauveur, by some experiments on organ pipes, found that a body, which gives the gravest harmonic sound, vibrates 12 times and a half in a second, and that the shrillest sounding body vibrates 51.100 times in a second. At a medium, let us take the body which gives what Sauveur calls his *fixed sound*: it performs 100 vibrations in a second, and in the same time the pulses describe 1070 Parisian feet; therefore the space described by the pulses whilst the body vibrates once, that is, the latitude, or interval of the pulse, will be 10.7 feet.

"6. Prob. To find the proportion which the greatest space, through which the particles of the air vibrate, bears to the radius of a circle, whose perimeter is equal to the latitude of the pulse.

"During the first half of the progress of the elastic fibre, or sounding body, it is continually getting nearer to the next particle; and during the latter half of its progress, that particle is getting farther from the fibre, and these portions of time are equal (*Helsham*): therefore we may conclude, that at the end of the progress of the fibre, the first particle of air will be nearly as far distant from the fibre as when it began to move, and in the same manner we may infer, that all the particles vibrate through spaces nearly equal to that run over by the fibre.

"Now M. Sauveur (*Acad. Scienc. ann.* 1700, p. 141.) has found by experiment, that the middle point of a chord which produces his *fixed sound*, and whose diameter is $\frac{1}{6}$th of a line, runs over in its smallest sensible vibrations $\frac{1}{18}$th of a line, and in its greatest vibrations 72 times that space; that is, $72 \times \frac{1}{18}$ of a line, or 4 lines, that is $\frac{1}{3}$ of an inch.

"The latitude of the pulses of this fixed sound is 10.7 feet (5); and since the circumference of a circle is to its radius as 710 is to 113, the greatest space described by the particles will be to the radius of a circle, whose periphery is equal to the latitude of the pulse as $\frac{1}{3}$d of an inch is to 1.7029 feet, or 20.4348 inches, that is, as 1 to 61.3044.

"If the length of the string be increased or diminished in any proportion, *cæteris paribus*, the greatest space described by its middle point will vary in the same proportion. For the inflecting force is to the tending force as the distance of the string from the middle point of vibration to half the length of the string (see *Helsham* and *Martin*); and therefore the inflecting and tending forces being given, the string will vibrate through spaces proportioned to its length; but the latitude of the pulse is inversely as the number of vibrations performed by the string in a given time (5), that is, directly as the time of one vibration, or directly as the length of the string (*Prop.* 24. *Cor.* 7. *Smith's Harmonics*); therefore the greatest space through which the middle point of the string vibrates will vary in the direct ratio of the latitude of the pulse, or of the radius of a circle whose circumference is equal

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to the latitude, that is, it will be to that radius as 1 to 61.3044.

" 7. If the particles of the aerial pulſes, during any part of their vibration, be ſucceſſively agitated, according to the law of a cycloidal pendulum, the comparative elaſtic forces ariſing from their mutual action, by which they will afterwards be agitated, will be ſuch as will cauſe the particles to continue that motion, according to the ſame law, to the end of their vibration.

" Let AB, BC, CD, &c. fig. 3. denote the equal diſtances of the ſucceſſive pulſes; ABC the direction of the motion of the pulſes propagated from A towards B; E, F, G, three phyſical points of the quieſcent medium, ſituated in the right line AC at equal diſtances from each other; E*e*, F*f*, G*g*, the very ſmall equal ſpaces through which theſe particles vibrate; ε, φ, γ, any intermediate places of theſe points. Draw the right line PS, fig. 4. equal to E*e*, biſect it in O, and from the centre O with the radius OP deſcribe the circle SIP*h*. Let the whole time of the vibration of a particle and its parts be denoted by the circumference of this circle and its proportional parts. And ſince the particles are ſuppoſed to be at firſt agitated according to the law of a cycloidal pendulum, if at any time PH or PHS*h*, the perpendicular HL or *hl*, be let fall on PS, and if E*e* be taken equal to PL or P*l*, the particle E ſhall be found in ε. Thus will the particle E perform its vibrations according to the law of a cycloidal pendulum. *Prop.* 52. B. I. *Principia.*

" Let us ſuppoſe now, that the particles have been ſucceſſively agitated, according to this law, for a certain time, by any cauſe whatſoever, and let us examine what will be the comparative elaſtic forces ariſing from their mutual action, by which they will afterwards continue to be agitated.

" In the circumference PHS*h* take the equal arches HI, IK in the ſame ratio to the whole circumference which the equal right lines EF, FG, have to BC the whole interval of the pulſes; and let fall the perpendiculars IIL, IM, KN. Since the points E, F, G are ſucceſſively agitated in the ſame manner, and perform their entire vibrations of progreſs and regreſs while the pulſe is propagated from B to C, if PH be the time from the beginning of the motion of E, PI will be the time from the beginning of the motion of F, and PK the time from the beginning of the motion of G; and therefore Eε, Fφ, Gγ will be reſpectively equal to PL, PM, PN in the progreſs of the particles. Whence εφ or EF+Fφ—Eε is equal to EF—LM. But εφ is the expanſion of EF in the place εφ, and therefore this expanſion is to its mean expanſion as EF—LM to EF. But LM is to IH as IM is to OP; and IH is to EF, as the circumference PHS*h* is to BC; that, is as OP is to V, if V be the radius of a circle whoſe circumference is BC; therefore, *ex æquo*, LM is to EF as IM is to V; and therefore the expanſion of EF in the place εφ is to its mean expanſion as V—IM is to V; and the elaſtic force exiſting between the phyſical points E and F is to the mean elaſtic force as

$\frac{1}{V-IM}$ is to $\frac{1}{V}$ (*Cotes Pneum. Lect.* 9.) By the ſame argument, the elaſtic force exiſting between the phyſical points F and G is to the mean elaſtic force as $\frac{1}{V-KN}$ is to $\frac{1}{V}$; and the difference between theſe forces is to the mean elaſtic force as $\frac{IM-KN}{V^2-V.IM-V.KN+IM.KN}$ is to $\frac{1}{V}$; that is, as $\frac{IM-KN}{V^2}$ is to $\frac{1}{V}$; or as IM—KN is to V; if only (upon account of the very narrow limits of the vibration) we ſuppoſe IM and KN to be indefinitely leſs than V. Wherefore ſince V is given, the difference of the forces is as IM—KN, or as HL—IM (becauſe KH is biſected in I); that is, (becauſe HL—IM is to IH as OM is to OI or OP, and IH and OP are given quantities) as OM; that is, if F*f* be biſected in Ω as Ωφ.

" In the ſame manner it may be ſhown, that if PHS*h* be the time from the beginning of the motion of E, PHS*i* will be the time from the beginning of the motion of F, and PHS*k* the time from the beginning of the motion of G; and that the expanſion of EF in the place εφ is to its mean expanſion as EF+Γφ—Eε, or as EF+*lm* is to EF, or as V+*hl* is to V in its regreſs: and its elaſtic force to the mean elaſtic force as $\frac{1}{V+hl}$ is to $\frac{1}{V}$; and that the difference of the elaſtic forces exiſting between E and F, and between F and G is to the mean elaſtic force as *kn—im* is to V; that i, directly as Ωφ.

" But this difference of the elaſtic forces, exiſting between E and Γ, and between F and G, is the comparative elaſtic force by which the phyſical point φ is agitated: and therefore the comparative accelerating force, by which every phyſical point in the medium will continue to be agitated both in progreſs and regreſs, will be directly as its diſtance from the middle point of its vibration; and conſequently will be ſuch as will cauſe the particles to continue their motion undiſturbed, according to the law of a cycloidal pendulum. *Prop.* 38. l. 1. *Newton. Principia.*

" Newton rejects the quantity $= V \times \overline{IM+KN} + IM \times KN$, on ſuppoſition that IM and KN are indefinitely leſs than V. Now, although this may be a reaſonable hypotheſis, yet, that this quantity may be ſafely rejected, will, I think, appear in a more ſatisfactory manner from the following conſiderations derived from experiment: PS, in its greateſt poſſible ſtate, is to V as 1 is to 61.3044 (6); and therefore IM, or KN, in its greateſt poſſible ſtate, (that is, when the vibrations of the body are as great as poſſible, and the particle in the middle point of its vibration) is to V as 1 is to 122.6. Hence $V^2 = 15030.76$, $\overline{V \times \overline{IM+KN}} = 245.2$ and $IM \times KN = 1$; therefore V^2 is to $V^2 - \overline{V \times \overline{IM+KN}} + IM \times KN$ as 15.03076 is to 14786.56; that is, as 61 is to 60 nearly.

" Hence it appears, that the greateſt poſſible error in the accelerating force, in the middle point, is the $\frac{1}{61}$ſt part of the whole. In other points it is much leſs; and in the extreme points the error entirely vaniſhes.

" We ſhould alſo obſerve, that the ordinary ſounds we hear are not produced by the greateſt poſſible vibrations of which the ſounding body is capable; and that in general IM and KN are nearly evaneſcent with reſpect

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respect to V. And very probably the disagreeable sensations we feel in very loud sounds, arise not only from IM or KN bearing a sensible proportion to V, by which means the cycloidal law of the pulses may be in some measure disturbed, but also from the very law of the motion of the sounding body itself being disturbed. For the proof of this law's being observed by an elastic fibre is founded on the hypothesis that the space, through which it vibrates, is indefinitely little with respect to the length of the string. See *Smith's Harmonics*, p. 237. *Helsham*, p. 270.

" 8. If a particle of the medium be agitated according to the law of a cycloidal pendulum, the comparative elastic force, acting on the adjacent particle, from the instant in which it begins to move, will be such as will cause it to continue its motion according to the same law.

" For let us suppose, that three particles of the medium had continued to move for times denoted by the arches PK, PI, PH, the comparative elastic force, acting on the second during the time of its motion, would have been denoted by HL—IM, that is, would have been directly as MO (7). And if this time be diminished till I becomes coincident with P, that is, if you take the particles in that state when the second is just beginning to move, and before the third particle has yet been set in motion; then the point M will fall on P, and MO become PO; that is, the comparative elastic force of the second particle, at the instant in which it begins to move, will be to the force with which it is agitated in any other moment of time, before the subsequent particle has yet been set in motion, directly as its distance from the middle point of vibration. Now this comparative elastic force, with which the second particle is agitated in the very moment in which it begins to move, arises from the preceding particle's approaching it according to the law of a pendulum; and therefore, if the preceding particle approaches it in this manner, the force by which it will be agitated, in the very moment it begins to move, will be exactly such as should take place in order to move it according to the law of a pendulum. It therefore sets out according to that law, and consequently the subsequent elastic forces generated in every successive moment, will also continue to be of the just magnitude which should take place, in order to produce such a motion.

" 9. The pulses of the air are propagated from sounding bodies, according to the law of a cycloidal pendulum. The point E, fig. 3. of any elastic fibre producing a sound, may be considered as a particle of air vibrating according to the law of a pendulum (1). This point E will therefore move according to this law for a certain time, denoted by the arch IH, fig. 4. before the second particle begins to move; for sound is propagated in time through the successive particles of air (4). Now from that instant, the comparative elastic force which agitates F, is (8) directly as its distance from the middle point of vibration. F therefore sets out with a motion according to the law of a pendulum: and therefore the comparative elastic force by which it will be agitated until G begins to move, will continue that law (8). Consequently F will approach G in the same manner as E approached F, and the comparative elastic force of G, from the instant in which it begins to move will be directly as its distance from the middle point of vibration; and so on in succession. Therefore all the particles of air in the pulses successively set out from their proper places according to the law of a pendulum, and therefore (7) will finish their entire vibrations according to the same law.

" *Cor.* 1. The number of pulses propagated is the same with the number of vibrations of the tremulous body, nor is it multiplied in their progress; because the little physical line *ey*. fig. 3. as soon as it returns to its proper place, will there quiesce; for its velocity which is denoted by the line IM, then vanishes, and its density becomes the same with that of the ambient medium. This line, therefore, will no longer move, unless it be again driven forwards by the impulse of the sounding body, or of the pulses propagated from it.

" *Cor.* 2. In the extreme points of the little space through which the particle vibrates, the expansion of the air is in its natural state; for the expansion of the physical line is to its natural expansion as V $\mp$ IM is to V; but IM is then equal to nothing. In the middle point of the progress the condensation is greatest: for IM is then greatest, and consequently the expansion V—IM least. In the middle of the regress, the rarefaction is greatest for im, and consequently V$+im$, is then greatest.

" 10. To find the velocity of the pulses, the density and elastic force of the medium being given.

" This is the 49th Prop. B. II. Newton, in which he shows, that whilst a pendulum, whose length is equal to the height of the homogeneous atmosphere, vibrates once forwards and backwards, the pulses will describe a space equal to the periphery of a circle described with that altitude as its radius.

" *Cor.* 1. He thence shows, that the velocity of the pulses is equal to that which a heavy body would acquire in falling down half the altitude of that homogeneous atmosphere; and therefore, that all pulses move equally fast, whatever be the magnitude of PS, or the time of its being described; that is, whether the tone be loud or low, grave or acute. See *Hales de Sonis*, § 49.

" *Cor.* 2. And also, that the velocity of the pulses is in a ratio compounded of the direct subduplicate ratio of the elastic force of the medium, and the inverse subduplicate of its density. Hence sounds move somewhat faster in summer than in winter. See *Hales de Sonis*, p. 141.

" 11. The strength of a tone is as the moment of the particles of air. The moment of these particles (the medium being given) is as their velocity; and the velocity of these particles is as the velocity of the string which sets them in motion (9). The velocities of two different strings are equal when the spaces which they describe in their vibrations are to each other as the times of these vibrations: therefore, two different tones are of equal strength, when the spaces, through which the strings producing them vibrate, are directly as the times of their vibration.

" 12. Let the strength of the tones of the two strings AB, CD, which differ in tension only (fig. 5. 6.) be equal. Quere the ratio of the inflecting forces F and f? From the hypothesis of the equality of the strength of the tones, it follows (11), that the space

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GE must be to the space HF as $f^{\frac{1}{2}}$ to $F^{\frac{1}{2}}$ (*Smith's Harm.* Prop. 24. Cor. 4.). Now the forces inflecting AB, CD, through the equal spaces GE, HP, are to each other as the tending forces, that is, as F to *f*, (*Malcom's Treatise on Music*, p. 52.). But the force inflecting CD through HP is to the force inflecting it through HF as HP or GE to HF (*ib.* p. 47.), that is, by the hyp. as $f^{\frac{1}{2}}$ to $F^{\frac{1}{2}}$. Therefore, *ex æquo*, the forces inflecting AB and CD, when the tones are equally strong, are to each other as $F \times f^{\frac{1}{2}}$ to $f \times F^{\frac{1}{2}}$, or as $F^{\frac{1}{2}}$ to $f^{\frac{1}{2}}$. That is, the forces necessary to produce tones of equal strength in various strings which differ only in tension, are to each other in the subduplicate ratio of the tending forces, that is, inversely as the time of one vibration, or directly as the number of vibrations performed in a given time. Thus, if CD be the acute octave to AB, its tending force will be quadruple that of AB, (*Malcom's Treatise on Music*, p. 53.): and therefore to produce tones of equal strength in these strings, the force impelling CD must be double that impelling AB; and so in other cases.

"Suppose, now, that the strings AB, CD (fig. 6. 7.) differ in length only. The force inflecting AB through GE is to the tending force, which is given, as GE to AG; and this tending force is to the force inflecting CD through the space HP equal to GE, as HD to HP. Therefore, *ex æquo*, the forces inflecting AB and CD through the equal spaces GE and HP, are to each other as HD to AG, or as CD to AB. But the force inflecting CD through HP is to the force inflecting it through HF, as HP or GE to HF, that is, because these spaces are as the times (11), as AB to CD. Therefore, *ex æquo*, the forces inflecting AB and CD, when the tones are equally strong, are to each other in a ratio of equality. Hence we should suppose, that in this case, an equal number of equal impulses would generate equally powerful tones in these strings. But we are to observe, that the longer the string, the greater, *cæteris paribus*, is the space through which a given force inflects it (*Malcom*); and therefore whatever diminution is produced in the spaces through which the strings move in their successive vibrations, arising either from the want of perfect elasticity in the strings, or from the resistance of the air, this diminution will bear a greater proportion to the less space, through which the shorter string vibrates. And this is confirmed by experience; for we find that the duration of the tone and motion of the whole string exceeds that of any of its subordinate parts. Therefore, after a given interval of time, a greater quantity of motion will remain in the longer string; and consequently, after the successive equal impulses have been made, a greater degree of motion will still subsist in it. That is, a given number of equal impulses being made on various strings differing in length only, a stronger sound will be produced in that which is the longer."

Chap. III. *Of the Velocity, &c. of Sound. Axioms.*

Velocity of sound.

By the experiments of some philosophers it has been proved, that sound travels at about the rate of 1142 feet in a second, or near 13 miles in a minute; nor do any obstacles hinder its progress, a contrary wind only a small matter diminishing its velocity. The method of calculating its progress is easily made known. When a gun is discharged at a distance, we see the fire long before we hear the sound. If then we know the distance of the place, and know the time of the interval between our first seeing the fire and then hearing the report, this will shew us exactly the time the sound has been travelling to us. For instance, if the gun is discharged a mile off, the moment the flash is seen, you take a watch and count the seconds till you hear the sound; the number of seconds is the time the sound has been travelling a mile. Again, By the above axiom, we are enabled to find the distance between objects that would be otherwise immeasurable. For example, suppose you see the flash of a gun in the night at sea, and tell seven seconds before you hear the report, it follows therefore that the distance is seven times 1142 feet, that is, 24 yards more than a mile and a half. In like manner, if you observe the number of seconds between the lightning and the report of the thunder, you know the distance of the cloud from whence it proceeds.

Reverberated Sounds.

Its progress calculated.

Distances calculated by means of sound.

But according to another philosopher, Dr Thomas Young, the velocity of sound is not quite so great. "It has been demonstrated, he observes, by M. de la Grange and others, that any impression whatever communicated to one particle of an elastic fluid, will be transmitted through that fluid with an uniform velocity, depending on the constitution of the fluid, without reference to any supposed laws of the continuation of that impression. Their theorem for ascertaining this velocity is the same as Newton has deduced from the hypothesis of a particular law of continuation: but it must be confessed, that the result differs somewhat too widely from experiment, to give us full confidence in the perfection of the theory. Corrected by the experiments of various observers, the velocity of any impression transmitted by the common air, may, at an average, be reckoned 1130 feet in a second." (*Phil. Trans.* vol. xc. p. 116.).

All sound travel at the same rate.

Derham has proved by experiment, that all sounds whatever travel at the same rate. The sound of a gun and the striking of a hammer, are equally swift in their motions; the softest whisper flies as swiftly, as far as it goes, as the loudest thunder.

To these axioms we may add the following:

Smooth and clear sounds proceed from bodies that are homogeneous, and of an uniform figure; and harsh or obtuse sounds, from such as are of a mixed matter and irregular figure.

The velocity of sounds is to that of a brisk wind as fifty to one.

The strength of sounds is greatest in cold and dense air, and least in that which is warm and rarefied.

Every point against which the pulses of sound strike, becomes a centre from which a new series of pulses are propagated in every direction.

Sound describes equal spaces in equal times.

Chap. IV. *Of Reverberated Sounds.*

Sound, like light, after it has been reflected from several places, may be collected in one point, as into a focus; and it will be there more audible than in any other part, even than at the place from whence it proceeded. On this principle it is that a whispering gallery is constructed.

The

Reverberated Sounds.

Whiſpering gallery.

The form of a whiſpering gallery muſt be that of a concave hemiſphere (E), as ABC fig. 8.; and if a low ſound or whiſper be uttered at A, the vibrations expanding themſelves every way will impinge on the points DDD, &c. and from thence be reflected to EEE, and from thence to the points F and G, till at laſt they all meet in C, where, as we have ſaid, the ſound will be the moſt diſtinctly heard.

Speaking trumpet.

The augmentation of ſound by means of ſpeaking-trumpets, is uſually illuſtrated in the following manner: Let ABC fig. 9. be the tube, BD the axis, and B the mouth-piece for conveying the voice to the tube. Then it is evident when a perſon ſpeaks at B in the trumpet, the whole force of his voice is ſpent upon the air contained in the tube, which will be agitated through its whole length, and, by various reflections from the ſide of the tube to the axis, the air along the middle part of the tube will be greatly condenſed, and its *momentum* proportionably increaſed, ſo that when it comes to agitate the air at the orifice of the tube AC, its force will be as much greater than what it would have been without the tube, as the ſurface of a ſphere, whoſe radius is equal to the length of the tube, is greater than the ſurface of the ſegment of ſuch a ſphere whoſe baſe is the orifice of the tube. For a perſon ſpeaking at B, without the tube, will have the force of his voice ſpent in exciting concentric ſuperficies of air all round the point B; and when thoſe ſuperficies or pulſes of air are diffuſed as far as D every way, it is plain the force of the voice will there be diffuſed through the whole ſuperficies of a ſphere whoſe radius is BD; but in the trumpet it will be ſo confined, that at its exit it will be diffuſed through ſo much of that ſpherical ſurface of air as correſponds to the orifice of the tube. But ſince the force is given, its intenſity will be always inverſely as the number of particles it has to move; and therefore in the tube it will be to that without, as the ſuperficies of ſuch a ſphere to the area of the large end of the tube nearly.

" But it is obvious, Dr M. Young obſerves, that the confinement of the voice can have little effect in increaſing the ſtrength of the ſound, as this ſtrength depends on the velocity with which the particles move. Were this reaſoning concluſive, the voice ſhould iſſue through the ſmalleſt poſſible orifice; cylindrical tubes would be preferable to any that increaſed in diameter; and the leſs the diameter, the greater would be the effect of the inſtrument; becauſe the plate or maſs of air to be moved, would, in that caſe, be leſs, and conſequently the effect of the voice the greater; all which is contradicted by experience.

" The cauſe of the increaſed of ſound in theſe tubes muſt therefore be derived from ſome other principles: and among theſe we ſhall probably find, that what the ingenious Kircher has ſuggeſted in his Phonurgia is the moſt deſerving of our attention. He tells us, that " the augmentation of the ſound depends on its reflection from the tremulous ſides of the tube; which reflections, conſpiring in propagating the pulſes in the ſame direction, muſt increaſe its intenſity." Newton alſo ſeems to have conſidered this as the principal cauſe, in the ſcholium of Prop. 50. B. II. Princip. when he ſays, " we hence ſee why ſounds are ſo much increaſed in ſtentorophonic tubes, for every reciprocal motion is, in each return, increaſed by the generating cauſe.

Reverberated Sounds.

" Farther, When we ſpeak in the open air, the effect on the tympanum of a diſtant auditor is produced merely by a ſingle pulſe. But when we uſe a tube, all the pulſes propagated from the mouth, except thoſe in the direction of the axis, ſtrike againſt the ſides of the tube, and every point of impulſe becoming a new centre, from whence the pulſes are propagated in all directions, a pulſe will arrive at the ear from each of thoſe points; thus, by the uſe of a tube, a greater number of pulſes are propagated to the ear, and conſequently the ſound increaſed. The confinement too of the voice may have a little effect, though not ſuch as is aſcribed to it by ſome; for the condenſed pulſes produced by the naked voice, freely expand every way; but in tubes, the lateral expanſion being diminiſhed, the direct expanſion will be increaſed, and conſequently the velocity of the particles, and the intenſity of the ſound. The ſubſtance alſo of the tube has its effect; for it is found by experiment, that the more elaſtic the ſubſtance of the tube, and conſequently the more ſuſceptible it is of theſe tremulous motions, the ſtronger is the ſound.

" If the tube be laid on any nonelaſtic ſubſtance, it deadens the ſound, becauſe it prevents the vibratory motion of the parts. The ſound is increaſed in ſpeaking-trumpets, if the tube be ſuſpended in the air; becauſe the agitations are then carried on without interruption. Theſe tubes ſhould increaſe in diameter from the mouth-piece, becauſe the parts vibrating in directions perpendicular to the ſurface will conſpire in impelling forward the particles of air, and conſequently, by increaſing their velocity, will increaſe the intenſity of the ſound: and the ſurface alſo increaſing, the number of points of impulſe and of new propagation will increaſe proportionally. The ſeveral cauſes therefore, of the increaſe of ſound in theſe tubes, Dr Young concludes to be, 1. The diminution of the lateral, and conſequently the increaſe of the direct, expanſion and velocity of the included air. 2. The increaſe of the number of pulſes, by increaſing the points of new propagation. 3. The reflections of the pulſes from the tremulous ſides of the tube, which impel the particles of air forward, and thus increaſe their velocity." (*Enquiry into the principal Phenomena of Sound*, p. 56.)

Echoes.

An echo is a reflection of ſound ſtriking againſt ſome object, as an image is reflected in a glaſs: but it has been diſputed what are the proper qualities in a body for thus reflecting ſounds. It is in general known, that caverns, grottoes, mountains, and ruined buildings, return this reflection of ſound. We have heard of a very extraordinary echo, at a ruined fortreſs near Louvain, in Flanders. If a perſon ſung, he only heard his own voice, without any repetition: on the contrary, thoſe who ſtood at ſome diſtance heard the echo but not the voice; but then they heard it with ſurpriſing variations, ſometimes louder, ſometimes ſofter, now more near,

(E) A cylindric or elliptic arch will anſwer ſtill better than one that is circular.

Reverberated Sounds.

near, then more distant. There is an account in the memoirs of the French Academy, of a similar echo near Rouen.

It has been already observed that every point against which the pulses of sound strike becomes the centre of a new series of pulses, and sound describes equal distances in equal times; therefore, when any sound is propagated from a centre, and its pulses strike against a variety of obstacles, if the sum of the right lines drawn from that point to each of the obstacles, and from each obstacle to a second point, be equal, then will the latter be a point in which an echo will be heard. "Thus let A fig. 10. be the point from which the sound is propagated in all directions, and let the pulses strike against the obstacles C, D, E, F, G, H, I, &c. each of these points becomes a new centre of pulses by the first principle, and therefore from each of them one series of pulses will pass through the point B. Now if the several sums of the right lines $\overline{AC+CB}$, $\overline{AD+DC}$, $\overline{AE+EB}$, $\overline{AG+GB}$, $\overline{AH+HB}$, $\overline{AI+IB}$, &c. be all equal to each other, it is obvious that the pulses propagated from A to these points, and again from these points to B, will all arrive at B at the same instant, according to the second principle; and therefore, if the hearer be in that point, his ear will at the same instant be struck by all these pulses. Now it appears from experiment (see *Musschenbroek*, vol. ii. p. 210.), that the ear of an exercised musician can only distinguish such sounds as follow one another at the rate of 9 or 10 in a second, or any slower rate: and therefore, for a distinct perception of the direct and reflected sound, there should intervene the interval of $\frac{1}{9}$th of a second; but in this time sound describes $\frac{1142}{9}$ or 127 feet nearly. And therefore, unless the sum of the lines drawn from each of the obstacles to the points A and B exceeds the interval AB by 127 feet, no echo will be heard at B. Since the several sums of the lines drawn from the obstacles to the points A and B are of the same magnitude, it appears that the curve passing through all the points C, D, E, F, G, H, I, &c. will be an ellipse, (*Prop.* 14. b. ii. *Ham. Con.*). Hence all the points of the obstacles which produce an echo, must lie in the surface of the oblong spheroid, generated by the revolution of this ellipse round its major axis.

"As there may be several spheroids of different magnitudes, so there may be several different echoes of the same original sound. And as there may happen to be a greater number of reflecting points in the surface of an exterior spheroid than in that of an interior, a second or a third echo may be much more powerful than the first, provided that the superior number of reflecting points, that is, the superior number of reflected pulses propagated to the ear, be more than sufficient to compensate for the decay of sound which arises from its being propagated through a greater space. This is finely illustrated in the celebrated echoes at the lake of Killarney in Kerry, where the first return of the sound is much inferior in strength to those which immediately succeed it.

"From what has been laid down it appears, that for the most powerful echo, the sounding body should be in one focus of the ellipse which is the section of the echoing spheroid, and the hearer in the other. However, an echo may be heard in other situations, though not so favourably; as such a number of reflected pulses may arrive at the same time at the ear as may be sufficient to excite a distinct perception. Thus a person often hears the echo of his own voice; but for this purpose he should stand at least 63 or 64 feet from the reflecting obstacle, according to what has been said before. At the common rate of speaking, we pronounce not above three syllables and a half, that is, seven half syllables in a second; therefore, that the echo may return just as soon as three syllables are expressed, twice the distance of the speaker from the reflecting object must be equal to 1000 feet; for as sound describes 1142 feet in a second, $\frac{7}{8}$ths of that space, that is, 1000 feet nearly, will be described while six half or three whole syllables are pronounced; that is, the speaker must stand near 500 feet from the obstacle. And in general, the distance of the speaker from the echoing surface, for any number of syllables, must be equal to the seventh part of the product of 1142 feet multiplied by that number.

"In churches we never hear a distinct echo of the voice, but a confused sound when the speaker utters his words too rapidly; because the greatest difference of distance between the direct and reflected courses of such a number of pulses as would produce a distinct sound, is never in any church equal to 127 feet, the limit of eches.

"But though the first reflected pulses may produce no echo, both on account of their being too few in number, and too rapid in their return to the ear; yet it is evident, that the reflecting surface may be so formed, as that the pulses which come to the ear after two reflections or more, may, after having described 127 feet or more, arrive at the ear in sufficient numbers, and also so nearly at the same instant, as to produce an echo, though the distance of the reflecting surface from the ear be less than the limit of echoes. This is confirmed by a singular echo in a grotto on the banks of the little brook called the Dinan, about two miles from Castlecomber, in the county of Kilkenny. As you enter the cave, and continue speaking loud, no return of the voice is perceived; but on your arriving at a certain point, which is not above 14 or 15 feet from the reflecting surface, a very distinct echo is heard. Now this echo cannot arise from the first course of pulses that are reflected to the ear, because the breadth of the cave is so small, that they would return too quickly to produce a distinct sensation from that of the original sound: it therefore is produced by those pulses, which, after having been reflected several times from one side of the grotto to the other, and having run over a greater space than 127 feet, arrive at the ear in considerable numbers, and not more distant from each other, in point of time, than the ninth part of a second."

To what has been said of reflected sounds, we shall add an extract on the same subject from the ingenious paper which we have already quoted.

"M. de la Grange has also demonstrated, that all impressions are reflected by an obstacle terminating an elastic fluid, with the same velocity with which they arrived at that obstacle. When the walls of a passage, or

Amuſing Experiments, &c.

or of an unfurniſhed room, are ſmooth and perfectly parallel, any exploſion, or a ſtamping with the foot, communicates an impreſſion to the air, which is reflected from one wall to the other, and from the ſecond again towards the ear, nearly in the ſame direction with the primitive impulſe: this takes place as frequently in a ſecond, as double the breadth of the paſſage is contained in 1130 feet; and the ear receives a perception of a muſical ſound, thus determined in its pitch by the breadth of the paſſage. On making the experiment, the reſult will be found accurately to agree with this explanation. If the ſound is predetermined, and the frequency of vibrations ſuch as that each pulſe, when doubly reflected, may coincide with the ſubſequent impulſe proceeding directly from the ſounding body, the intenſity of the ſound will be much increaſed by the reflection; and alſo, in a leſs degree, if the reflected pulſe coincides with the next but one, the next but two, or more, of the direct pulſes. The appropriate notes of a room may readily be diſcovered by ſinging the ſcale in it; and they will be found to depend on the proportion of its length or breadth to 1130 feet. The ſound of the ſtopped diapaſon pipes of an organ is produced in a manner ſomewhat ſimilar to the note from an exploſion in a paſſage; and that of its reed pipes to the reſonance of the voice in a room: the length of the pipe in one caſe determining the ſound; in the other, increaſing its ſtrength. The frequency of the vibrations does not at all immediately depend on the diameter of the pipe. It muſt be confeſſed, that much remains to be done in explaining the preciſe manner in which the vibration of the air in an organ pipe is generated. M. Daniel Bernouilli has ſolved ſeveral difficult problems relating to the ſubject; yet ſome of his aſſumptions are not only gratuitous, but contrary to matter of fact." (*Phil. Tranſ.* vol. xc. p. 118.)

We ſhall now cloſe this article with deſcribing a few inventions founded on ſome of the preceding principles, which may perhaps amuſe and not be altogether uninſtructive to a number of our readers.

Amuſing Experiments and Contrivances.

The converſing ſtatue.

I. Place a concave mirror of about two feet diameter, as AB, fig. 11. in a perpendicular direction. The focus of this mirror may be at 15 or 18 inches diſtance from its ſurface. At the diſtance of about five or ſix feet let there be a partition, in which there is an opening EF, equal to the ſize of the mirror; againſt this opening muſt be placed a picture, painted in water colours, on a thin cloth, that the ſound may eaſily paſs through it (G).

Behind the partition, at the diſtance of two or three feet, place another mirror GH, of the ſame ſize as the former, and let it be diametrically oppoſite to it (H).

At the point C let there be placed the figure of a man ſeated on a pedeſtal, and let his ear be placed exactly in the focus of the firſt mirror: his lower jaw muſt be made to open by a wire, and ſhut by a ſpring; and there may be another wire to move the eyes: theſe wires muſt paſs through the figure, go under the floor, and come up behind the partition.

Amuſing Experiments, &c.

Let a perſon, properly inſtructed, be placed behind the partition near the mirror. You then propoſe to any one to ſpeak ſoftly to the ſtatue, by putting his mouth to the ear of it, aſſuring him that it will anſwer inſtantly. You then give the ſignal to the perſon behind the partition, who, by placing his ear to the focus I, of the mirror GH, will hear diſtinctly what the other ſaid; and, moving the jaw and eyes of the ſtatue by the wires, will return an anſwer directly, which will in like manner be diſtinctly heard by the firſt ſpeaker.

This experiment appears to be taken from the Century of Inventions of the Marquis of Worceſter; whoſe deſigns, at the time they were publiſhed, were treated with ridicule and neglect as being impracticable, but are now known to be generally, if not univerſally, practicable. The words of the marquis are theſe: "How to make a brazen or ſtone head in the midſt of a great field or garden, ſo artificial and natural, that though a man ſpeak ever ſo ſoftly, and even whiſper into the ear thereof, it will preſently open its mouth, and reſolve the queſtion in French, Latin, Welſh, Iriſh, or Engliſh, in good terms, uttering it out of its mouth, and then ſhut it until the next queſtion be aſked."—The two following, of a ſimilar nature, appear to have been inventions of Kircher, by means of which (as he informs us *) he uſed to "utter feigned and ludicrous conſultations, with a view to ſhow the fallacy and impoſture of ancient oracles."

* *Phonurgia Nova*, ſect. vi. c. 1.

The communicative buſts.

II. Let there be two heads of plaſter of Paris, placed on pedeſtals, on the oppoſite ſides of a room. There muſt be a tin tube of an inch diameter, that muſt paſs from the ear of one head, through the pedeſtal, under the floor, and go up to the mouth of the other. Obſerve, that the end of the tube which is next the ear of the one head, ſhould be conſiderably larger than that end which comes to the mouth of the other. Let the whole be ſo diſpoſed that there may not be the leaſt ſuſpicion of a communication.

Now, when a perſon ſpeaks, quite low, into the ear of one buſt, the ſound is reverberated through the length of the tube, and will be diſtinctly heard by any one who ſhall place his ear to the mouth of the other: It is not neceſſary that the tube ſhould come to the lips of the buſt.—If there be two tubes, one going to the ear, and the other to the mouth of each head, two perſons may converſe together, by applying their mouth and ear reciprocally to the mouth and ear of the buſts; and at the ſame time other perſons that ſtand in the middle of the chamber, between the heads, will not hear any part of their converſation.

The oracular room, ſpeaking head.

III. Place a buſt on a pedeſtal in the corner of a

(G) The more effectually to conceal the cauſe of this illuſion, the mirror AB may be fixed in the wainſcot, and a gauze or any other thin covering thrown over it, as that will not in the leaſt prevent the ſound from being reflected. An experiment of this kind may be performed in a field or garden, between two hedges, in one of which the mirror AB may be placed, and in the other an opening artfully contrived.

(H) Both the mirrors here uſed may be of tin or gilt paſteboard, this experiment not requiring ſuch as are very accurate.

Amuſing Experiments, &c.

room, and let there be two tubes, as in the foregoing amuſement, one of which muſt go from the mouth and the other from the ear of the buſt, through the pedeſtal and the floor, to an under apartment. There may be likewiſe wires that go from the under jaw and the eyes of the buſt, by which they may be eaſily moved.

A perſon being placed in the under room, and at a ſignal given applying his ear to one of the tubes, will hear any queſtion that is aſked, and immediately reply; moving at the ſame time, by means of the wires, the mouth and the eyes of the buſt, as if the reply came from it.

A ſolar ſonata.

IV. In a large caſe, ſuch as is uſed for dials and ſpring clocks, the front of which, or at leaſt the lower part of it, muſt be of glaſs, covered on the inſide with gauze, let there be placed a barrel organ, which, when wound up, is prevented from playing, by a catch that takes a toothed wheel at the end of the barrel. To one end of this catch there muſt be joined a wire, at the end of which there is a flat circle of cork, of the ſame dimenſion with the inſide of a glaſs tube, in which it is to riſe and fall. This tube muſt communicate with a reſervoir that goes acroſs the front part of the bottom of the caſe, which is to be filled with ſpirits, ſuch as is uſed in thermometers, but not coloured, that it may be the better concealed by the gauze.

This caſe being placed in the ſun, the ſpirits will be rarefied by the heat; and riſing in the tube, will lift up the catch or trigger, and ſet the organ in play: which it will continue to do as long as it is kept in the ſun; for the ſpirits cannot run out of the tube, that part of the catch to which the circle is fixed being prevented from riſing beyond a certain point by a check placed over it.

When the machine is placed againſt the ſide of a room on which the ſun ſhines ſtrong, it may conſtantly remain in the ſame place, if you encloſe it in a ſecond caſe, made of thick wood, and placed at a little diſtance from the other. When you want it to perform, it will be only neceſſary to thrown open the door of the outer caſe, and expoſe it to the ſun.

But if the machine be moveable, it will perform in all ſeaſons by being placed before the fire; and in the winter it will more readily ſtop when removed into the cold.

A machine of this ſort is ſaid to have been invented by Cornelius Dreble, in the laſt century. What the conſtruction of that was, we know not; it might very likely be more complex, but could ſcarcely anſwer the intention more readily.

Automatous harpſichord.

V. Under the keys of a common harpſichord let there be fixed a barrel, ſomething like that in a chamber organ, with ſtops or pins correſponding to the tunes you would have it play. Theſe ſtops muſt be moveable, ſo that the tunes may be varied at pleaſure. From each of the keys let there go a wire perpendicular down: the ends of theſe wires muſt be turned up for about one-fourth of an inch. Behind theſe wires let there be an iron bar, to prevent them from going too far back. Now, as the barrel turns round, its pins take the ends of the wires, which pull down the keys, and play the harpſichord. The barrel and wires are to be all encloſed in a caſe.

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In the chimney of the ſame room where the harpſichord ſtands, or at leaſt in one adjacent, there muſt be a ſmoke jack, from whence comes down a wire, or cord, that, paſſing behind the wainſcot adjoining the chimney, goes under the floor, and up one of the legs of the harpſichord, into the caſe, and round a ſmall wheel fixed on the axis of that firſt mentioned. There ſhould be pulleys at different diſtances, behind the wainſcot and under the floor, to facilitate the motion of the cord.

This machinery may be applied to any other keyed inſtrument as well as to chimes, and to many other purpoſes where a regular continued motion is required.

An inſtrument of this ſort may be conſidered as a perpetual motion, according to the vulgar acceptation of the term; for it will never ceaſe going till the fire be extinguiſhed, or ſome parts of the machinery be worn out.

A ventoſal ſymphony.

VI. At the top of a ſummer-houſe, or other building, let there be fixed a vane AB, fig. 12. on which is the pinion C, that takes the toothed wheel D, fixed on the axis EF, which at its other end carries the wheel G, that takes the pinion H. All theſe wheels and pinions are to be between the roof and the ceiling of the building. The pinion H is fixed to the perpendicular axis IK, which goes down very near the wall of the room, and may be covered after the ſame manner as are bell-wires. At the lower end of the axis IK there is a ſmall pinion L, that takes the wheel M, fixed on the axis of the great wheel NO. In this wheel there muſt be placed a number of ſtops, correſponding to the tunes it is to play. Theſe ſtops are to be moveable, that the tunes may be altered at pleaſure. Againſt this wheel there muſt hang 12 ſmall bells, anſwering to the notes of the gamut. Therefore, as the wheel turns round, the ſtops ſtriking againſt the bells play the ſeveral tunes. There ſhould be a fly to the great wheel, to regulate its motion when the wind is ſtrong. The wheel NO, and the bells, are to be encloſed in a caſe.

There may be ſeveral ſets of bells, one of which may anſwer to the tenor, another to the treble, and a third to the baſs; or they may play different tunes, according to the ſize of the wheel. As the bells are ſmall, if they are of ſilver, their tone will be the more pleaſing.

Inſtead of bells, glaſſes may be here uſed, ſo diſpoſed as to move freely at the ſtroke of the ſtops. This machinery may likewiſe be applied to a barrel-organ; and to many other uſes.

A C Q

Acqs.

ACQS, in *Geography*, a town at the foot of the Pyrenean mountains, in the department of Arriege and late province of Foix in France. It take its name from the hot waters in theſe parts. E. Long. 1. 40. N. Lat. 43. 0.

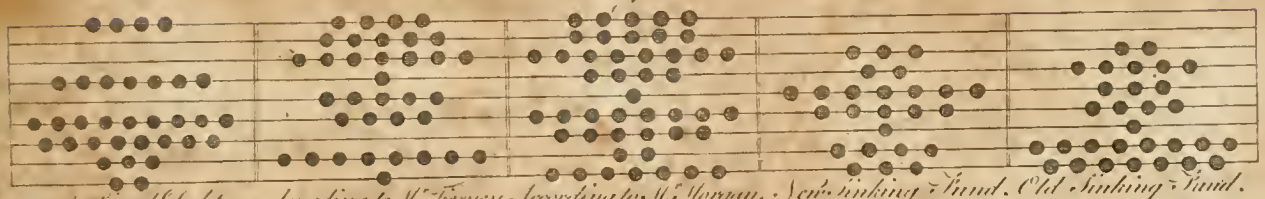
A C Q

Acquapendente.

ACQUAPENDENTE, a pretty large town of Italy, in the territory of the church, and patrimony of St Peter, with a biſhop's ſee. It is ſeated on a mountain, near the river Paglia, ten miles W. of Orvietto, and 57 N. by W. of Rome. It takes its name from a fall

Fig. 1.

Anno Domini.

Fig. 2.

National Debt according to Mr. Addington. According to Mr. Tierney. According to Mr. Morgan. New Sinking Fund. Old Sinking Fund.

ACOUSTICS.

Fig. 1.

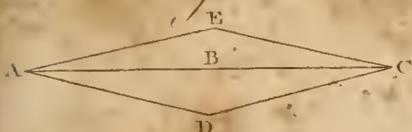


Fig. 2.

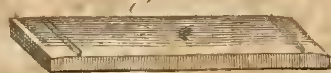
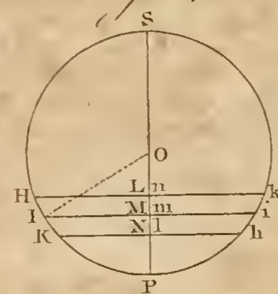


Fig. 4.



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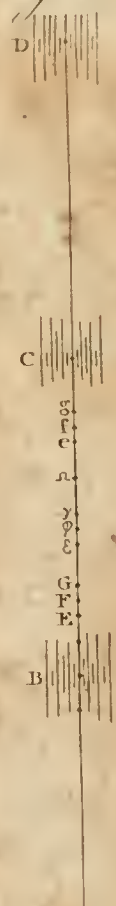

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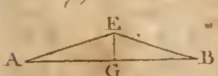

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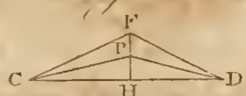

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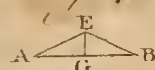

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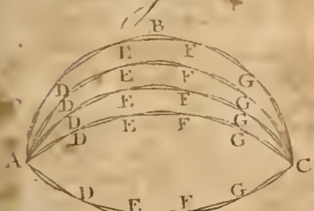


Fig. 10.

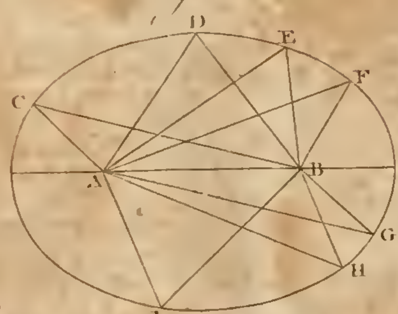


Fig. 9.

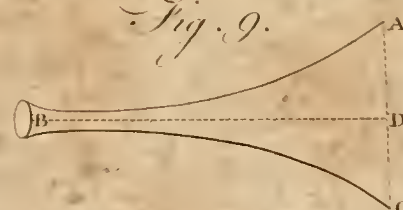
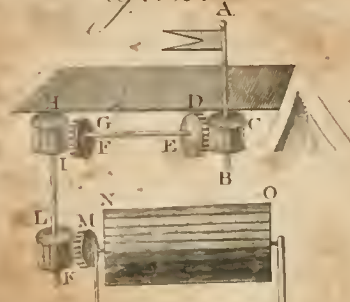


Fig. 11.

Fig. 12.



J. Bell Prin. Wal.s Sculptor fecit

Acquaria || Acragas.

fall of water near it, and is now almoſt deſolate. E. Long. 11. 53. N. Lat. 42. 43.

ACQUARIA, a ſmall town of Italy, in Frigana, a diſtrict of Modena, which is remarkable for its medicinal waters. It is 12 miles ſouth of the city of Modena. E. Long. 11. 17. N. Lat. 44. 24.

ACQUEST, or ACQUIST, in *Law*, ſignifies goods got by purchaſe or donation. See CONQUEST.

ACQUI, a town of Italy, in the duchy of Montferrat, with a biſhop's ſee and commodious baths. It was taken by the Spaniards in 1745, and retaken by the Piedmonteſe in 1746; but after this it was taken again and diſmantled by the French, who afterwards forſook it. It is ſeated on the river Bormia, 25 miles N. W. of Genoa, and 30 S. of Caſal. E. Long. 8. 30. N. Lat. 44. 40.

ACQUISITION, in general, denotes the obtaining or procuring ſomething. Among lawyers, it is uſed for the right or title to an eſtate got by purchaſe or donation.

ACQUITTAL, a diſcharge, deliverance, or ſetting of a perſon free from the guilt or ſuſpicion of an offence.

ACQUITTANCE, a releaſe or diſcharge in writing for a ſum of money, witneſſing that the party has paid the ſaid ſum.—No man is obliged to pay a ſum of money if the demandant refuſes to give an acquittance, which is a full diſcharge, and bars all actions, &c. An acquittance given by a ſervant for a ſum of money received for the uſe of his maſter, ſhall be a good diſcharge for that ſum, provided the ſervant uſed to receive his maſter's rents, debts, &c.

ACRA, a town of Africa, on the coaſt of Guinea, where the Engliſh, Dutch, and Danes, have ſtrong forts, and each fort has its particular village. W. Long. 0. 2. N. Lat. 5. 0.

ACRA, in *Ancient Geography*, one of the hills of Jeruſalem, on which ſtood the lower town, which was the old Jeruſalem; to which was afterwards added Zion, or the city of David. Probably called *Acra*, from the fortreſs which Antiochus built there in order to annoy the temple, and which Simon Maccabæus took and razed to the ground.

ACRA Japygia, in *Ancient Geography*, called *Salentia* by Ptolemy; now *Capo di San Maria di Leuca*: A promontory in the kingdom of Naples, to the ſouth-eaſt of Otranto, where formerly was a town, now lying in ruins, on the Ionian ſea, over againſt the *Montes Acroceraunii* of Epirus.

ACRÆ, in *Ancient Geography*, a town of Sicily, whoſe inhabitants were called *Acrenſes*. It ſtood to the ſouth of Syracuſe, at the diſtance of 24 miles, near the place now called the monaſtery of *Santa Maria d'Arcia*, on an eminence, as appears from Silius Italicus. The Syracuſans were the founders of it, according to Thucydides, 70 years after the building of Syracuſe, or 665 before Chriſt. Hence the epithet *Acræus*.

ACRAGAS, or AGRAGAS, in *Ancient Geography*, ſo called by the Greeks, and ſometimes by the Romans, but more generally *Agrigentum* by the latter; a town of Sicily. In Greek medals the inhabitants are called AKPITANTINOI, and *Agrigentini* by Cicero. The town ſtood upon a mountain, at the confluence of the Acragas and Hypſa, near the port called Εμπορίον by Ptolemy, but Εμπειον, or the Dock, by Strabo; and in the time of the latter, ſcarce a trace of all that ſide remained. In the year before Chriſt 584, the people of Gela built Acragas, 108 years after building their own city. It took its name from the river running by it; and being but two miles from the ſea, enjoyed the conveniences of a ſea port. It was a place of great ſtrength, ſtanding on the top of a very ſteep rock, and waſhed on the ſouth ſide by the river Acragas, now called *Fiume di Gergenti*, and on the ſouth-weſt by the Hypſa, with a citadel to the ſouth-eaſt, externally ſurrounded by a deep gulf, which made it inacceſſible but on the ſide next the town. It was famous for the tyrant Phalaris and his brazen bull. The Agrigentines were a people luxurious in their tables, and magnificent in their dwellings; of whom Empedocles, in Diogenes Laërtius, ſays, that they lived to day as if they were to die tomorrow, and built as if they were to live forever. The country round the city was laid out in vine and olive yards, in the produce of which they carried on a great and profitable commerce with Carthage. E. Long. 13. 30. N. Lat. 37. 20.

Acra || Acre.

ACRAMAR, or VAN, in *Geography*, a town and lake of the greater Armenia in Aſia. The town, which is large, populous, and commercial, is the capital of the government of Van, is ſituated at the foot of the mountains of Diarbekir, and is ſaid to have been built by Semiramis. The lake abounds with fiſh. There are two iſlands in it which are inhabited by religious Armenians. E. Long. 44. 14. N. Lat. 36. 30.

ACRASIA, among phyſicians, implies the predominancy of one quality above another, either with regard to artificial mixtures, or the humours of the human body. The word is Greek, and compounded of α privative, and κεράννυμι, to *mix*; *q. d.* not mixed in a juſt proportion.

ACRASUS, in *Ancient Geography*, a town of Aſia Minor in Lydia. Some imperial Greek medals of this city ſtill exiſt, which were ſtruck under the prætors, in honour of Severus, and ſeveral other emperors.

ACRATH, in *Ancient Geography*, a place in Mauritania Tingitana, now ſuppoſed to be *Velez de Gomara*: A fortified town in the kingdom of Fez, with a citadel and commodious harbour on the Mediterranean, ſcarce a mile diſtant from Penon de Velez, a Spaniſh fort. W. Long. 5. N. Lat. 34. 45.

ACRE, or ACRA, in *Geography*, a ſea-port town in Syria. It was formerly called *Ptolemais*, from one of the Ptolemys: and Acra on account of its fortifications; whence the knights of St John of Jeruſalem called it St John d'Acre. This city was ſucceſſively under the dominion of the Romans and the Moors; and was famous in the time of the cruſades, and underwent ſeveral ſieges both by the Chriſtians and Saracens. It is ſituated at the north angle of a bay, which extends in a ſemicircle of three leagues, as far as the point of Carmel.

During the cruſades, the poſſeſſion of this town was long diſputed by the Chriſtians and Saracens. In 1192 it was taken from the latter by Richard I. of England and Philip of France, after a ſiege of two years, and the ſlaughter of 100,000 Chriſtians, beſide a greater number who periſhed by ſhipwreck or diſeaſe, who gave it to the knights of St John of Jeruſalem. They kept poſſeſſion of it 100 years, when it was retaken by the Saracens, and almoſt entirely deſtroyed. This

Acre. event is rendered memorable by an act of singular resolution with which it was accompanied. A number of beautiful young nuns, terrified at the prospect of being exposed to the brutal lust of the infidels, determined to avoid the violation of their chastity, by rendering themselves objects of aversion. With this view they cut off their noses and mangled their faces. The Saracens, inflamed with resentment at a spectacle which prevented the gratification of their appetites, immediately put them all to the sword. After the expulsion of the crusaders, it remained almost deserted till about the year 1750, when it was fortified by Daher, an Arabian scheik who maintained his independence against the Ottoman power, till the year 1775, when he was basely assassinated by the emissaries of that government at the age of 86 years. He was adored by his people whom his prudence and valour had through life protected against the tyranny and oppression of the pacha. More lately the works erected by Djezzar, within the last ten years, have rendered it one of the principal towns upon the coast. The mosque of this pacha is boasted as a masterpiece of eastern taste. The bazar, or covered market, is not inferior even to those of Aleppo; and its public fountain surpasses in elegance those of Damascus, though the water is of a very indifferent quality. The pacha has derived the more honour from these works, as he was himself both the engineer and architect: he formed the plans, drew the designs, and superintended the execution.

The port of Acre is one of the best situated on the coast, as it is sheltered from the north and north-west winds by the town itself; but it is greatly choked up since the time of Fakr-el-din. Djezzar contented himself with making a landing place for boats. The fortifications, though more frequently repaired than any other in all Syria, are of no importance: there are only a few wretched low towers near the port, on which cannon are mounted; and these rusty iron pieces are so bad, that some of them burst every time they are fired. Its defence on the land side is merely a garden wall without any ditch.

In the year 1799 Acre was again the scene of war, when it was bravely defended by our gallant countryman Sir Sidney Smith, against the military skill and extraordinary exertions of Bonaparte, and some of his ablest generals. The pacha Djezzar was preparing to evacuate the place, and make good his retreat with his women and treasure, when Sir Sidney with his squadron anchored in the road of Caiffa. The fortifications were repaired under the direction of a skilful engineer, which, with the assistance of the English marines, encouraged and animated the pacha to hold out. After the French had renewed and varied the attack, and being as often repulsed with great slaughter, Bonaparte, despairing of success, raised the siege on the 20th of May, the 61st day after breaking ground.

Corn and cotton form the basis of the commerce of Acre, which is becoming more flourishing every day. Of late, the pacha, by an abuse common throughout all the Turkish empire, has monopolized all the trade in his own hands; no cotton can be sold but to him, and from him every purchase must be made. In vain have the European merchants claimed the privileges granted them by the sultan; Djezzar replied, that he was the sultan in his country, and continued his monopoly. The merchants were generally French, and they had six houses at Acre, with a consul: an imperial agent too was lately settled there; also a resident for Russia. Acre.

That part of the bay of Acre in which ships anchor with the greatest security lies to the north of Mount Carmel, below the village of Haifa (commonly called *Caiffa*). The bottom is good holding ground, and does not chafe the cables; but the harbour is open to the north-west wind, which blows violently along all this coast. Mount Carmel, which commands it to the south, is a flattened cone, and very rocky; it is about 2000 feet high. We still find among the brambles wild vines and olive trees, which prove that industry has formerly been employed even in this ungrateful soil: on the summit is a chapel dedicated to the prophet Elias, which affords an extensive prospect over the sea and land. It is 20 miles south of Tyre, and 37 north of Jerusalem. E. Long. 39. 25. N. Lat. 32. 40.

Acre, in the Mogul's dominions, the same with lack, and signifies the sum of 100,000 rupees; the rupee is of the value of the French crown of three livres, or 30 sols of Holland; 100 lacks of rupees make a couron in Indostan, or 10,000,000 rupees: the pound sterling is about eight rupees; according to which proportion, a lack of rupees amounts to 12,500 pounds sterling.

Acre, the universal measure of land in Britain. The word (formed from the Saxon *acher*, or the German *aker*, a field), did not originally signify a determinate quantity of land, but any open ground, especially a wide champaign; and in this antique sense it seems to be preserved in the names of places, as Castleacre, West-acre, &c. An acre in England contains four square roods, a rood 40 perches or poles of $16\frac{1}{2}$ feet each by statute. Yet this measure does not prevail in all parts of England, as the length of the pole varies in different counties, and is called *customary measure*, the difference running from the $16\frac{1}{2}$ feet to 28. The acre is also divided into 10 square chains, of 22 yards each, that is, 4840 square yards. An acre in Scotland contains four square roods; one square rood is 40 square falls; one square fall, 36 square ells; one square ell, nine square feet and 73 square inches; one square foot, 144 square inches. The Scots acre is also divided into 10 square chains; the measuring chain should be 24 ells in length, divided into 100 links, each link $8\frac{928}{1000}$ inches; and so one square chain will contain 10,000 square links. The English statute acre is about three roods and six falls standard measure of Scotland.

The French acre, *arpent*, contains $1\frac{1}{4}$ English acre, or 54,450 square English feet, whereof the English acre contains only 43,560.—The Strasburg acre is about half an English acre.—The Welsh acre contains commonly two English ones.—The Irish acre is equal to one acre two roods and 19 perches $\frac{27}{121}$ English.

Acre-Fight, an old sort of duel fought by English and Scottish combatants, between the frontiers of their kingdoms, with sword and lance: it was also called *camp-fight*, and the combatants *champions*, from the open field being the stage of trial.

Acre-Tax, a tax laid on land at so much per acre. In some places this is also called *acre-shot*. Impositions on lands in the great level are to be raised by a proportionable

Acribeia || Acridophagi.

portionable acre-tax, 20 Car. II. cap. 8.—An acre-tax of 2s. 6d. per acre, for draining Hadenham-level, 13 Geo. I. cap. 18.

ACRIBEIA, a term purely Greek, literally denoting an exquiſite or delicate accuracy; ſometimes uſed in our language, for want of a word of equal ſignification.

ACRID, a name for any thing that is of a ſharp or pungent taſte. See MATERIA MEDICA.

ACRIDOPHAGI, in *Ancient Geography*, an Ethiopian people, repreſented as inhabiting near the deſerts, and to have fed on locuſts. This latter circumſtance their name imports; the word being compounded of the Greek ακρις *locuſt*, and φαγω to *eat*. We have the following account of them by Diodorus Siculus *. Their ſtature was lower than that of other men; they were meagre, and extremely black. In the ſpring, high weſt winds drove from the deſert to their quarter locuſts of an extraordinary ſize, and remarkable for the ſqualid colour of their wings. So great was the number of theſe inſects, that they were the only ſuſtenance of the barbarians, who took them in the following manner: At the diſtance of ſome ſtadia from their habitations there was a wide and deep valley. They filled this valley with wood and wild herbs, with which their country abounded. When the cloud of locuſts appeared, which were driven on by the wind, they ſet fire to the fuel which they had collected. The ſmoke which aroſe from this immenſe fire was ſo thick, that the locuſts, in croſſing the valley, were ſtifled by it, and fell in heaps on the ground. The paſſage of the locuſts being thus intercepted for many days, they made a large proviſion of thoſe inſects. As their country produced great quantities of ſalt, they ſalted them, to render them more palatable, and to make them keep till the next ſeaſon. This peculiar ſupply was their ſole food: they had neither herds nor flocks. They were unacquainted with fiſhing; for they lived at a diſtance from the ſea. They were very active, and ran with great ſwiftneſs. But their life was not of long duration; it exceeded not forty years. The cloſe of their life was extremely miſerable; for in their old age, winged lice of different, but all of ugly forms, bred in their bodies. This malady, which began in the breaſt and belly, ſoon ſpread through the whole frame. The patient at firſt felt an itching; and the agreeable ſenſation produced by his ſcratching of himſelf, preceded a moſt deplorable calamity. For when thoſe lice, which had bred in his body, forced their way out, they cauſed effuſions of corrupt blood, with excruciating pains in the ſkin. The unhappy man, with lamentable cries, was induſtrious himſelf to make paſſages for them with his nails. In ſhort, theſe lice iſſued forth ſucceſſively from the wounds made by the hands of the patient, as from a veſſel full of holes, and in ſuch numbers that it was impoſſible to exterminate them.—Whether this extraordinary and dreadful diſtemper was occaſioned by the food of the inhabitants of this country, or by a peſtilential quality of their climate, it is difficult to determine. Indeed, as to the credibility of the whole account, we muſt leave the reader to judge.

* Lib. iii. and xxxix. Alſo *Strabo*, lib. xvi.

But though the circumſtances of theſe people ſhould be deemed fabulous, yet may the *acridophagia* be true. It is well known, that to this day the inhabitants of Ethiopia, Arabia, &c. frequently uſe locuſts as food. The reader will not be diſpleaſed if we lay before him the reſult of Dr Haſſelquiſt's inquiries as to this particular, who travelled in Syria and Egypt ſo late as the year 1752. This ingenious gentleman, who travelled with a view to improve natural hiſtory, informs us, that he aſked Franks, and many other people who had lived long in theſe countries, whether they had ever heard that the inhabitants of Arabia, Ethiopia, &c. uſed locuſts as food? They anſwered, that they had. He likewiſe aſked the ſame queſtion of Armenians, Copts, and Syrians, who lived in Arabia, and had travelled in Syria and near the Red ſea; ſome of whom ſaid they heard of ſuch a practice, and others that they had often ſeen the people eat theſe inſects. He at laſt obtained complete ſatisfaction on this head from a learned ſcheik at Cairo, who had lived ſix years in Mecca. This gentleman told him, in preſence of M. le Grand the principal French interpreter at Cairo, and others, that a famine frequently rages at Mecca when there is a ſcarcity of corn in Egypt, which obliges the inhabitants to live upon coarſer food than ordinary: That when corn is ſcarce, the Arabians grind the locuſts in hand mills, or ſtone mortars, and bake them into cakes, and uſe theſe cakes in place of bread: That he has frequently ſeen locuſts uſed by the Arabians, even when there was no ſcarcity of corn; but then they boil them, ſtew them with butter, and make them into a kind of fricaſſee; which he ſays is not diſagreeably taſted, for he had ſometimes taſted theſe locuſt fricaſſees out of curioſity.

Acridophagi

A later traveller, Dr Sparrman, informs us *, "That locuſts ſometimes afford a high treat to the more unpoliſhed and remote hordes of the Hottentots; when, as ſometimes happens, after an interval of 8, 10 15, or 20 years, they make their appearance in incredible numbers. At theſe times they come from the north, migrating to the ſouthward, and do not ſuffer themſelves to be impeded by any obſtacles, but fly boldly on, and are drowned in the ſea whenever they come to it. The females of this race of inſects, which are moſt apt to migrate, and are chiefly eaten, are ſaid not to be able to fly; partly by reaſon of the ſhortneſs of their wings, and partly on account of their being heavy and diſtended with eggs; and ſhortly after they have laid theſe in the ſand, they are ſaid to die. It is particularly of theſe that the Hottentots make a brown coffee-coloured ſoup, which at the ſame time, acquires from the eggs a fat and greaſy appearance. The Hottentots are highly rejoiced at the arrival of theſe locuſts, though they are ſure to deſtroy every bit of verdure on the ground: but the Hottentots make themſelves ample amends for this loſs, by falling foul on the animals themſelves, eating them in ſuch quantities as in the ſpace of a few days to get viſibly fatter and in better condition than before."

* *Voyage to the Cape*, vol. i. p. 36.

The Abbé Poiret, alſo, in his Memoir on the Inſects of Barbary and Numidia, informs us, "That the Moors make locuſts a part of their food; that they go to hunt them; fry them in oil and butter; and ſell them publicly at Tunis, at Bonne," &c.

From theſe accounts, we may ſee the folly of that diſpute among divines about the nature of St John's food in the wilderneſs: ſome maintaining the original word to ſignify the fruits of certain trees; others, a kind

Acrii
||
Acrobates.

of birds, &c.: but those who adhered to the literal meaning of the text were at least the most orthodox, although their arguments were perhaps not so strong as they might have been, had they had an opportunity of quoting such authors as the above.

ACRII MONTES, in *Ancient Geography*, mountains in the island of Sicily which are also called *Heræi*.

ACRILLÆ, a city of Sicily between Acræ and Agrigentum, not far from Syracuse, supposed to be the same with Acila which is mentioned by Plutarch.

ACRISIUS, in *Fabulous History*, king of Argos, being told by the oracle that he should be killed by his grand child, shut up his only daughter Danaë in a brazen tower: but Jupiter coming down in a golden shower, begot Perseus upon her. After Perseus had slain the Gorgons, he carried Medusa's head to Argos; which Acrisius seeing, was turned into a statue.

ACRISTIA, in *Geography*, a town of Sicily, 23 miles west-north-west of Magara. It is built on the ruins of the ancient town of Schritea.

ACRITAS, in *Ancient Geography*, a promontory of Messenia, running into the sea, and forming the beginning of the bay of Messene. Now called *Capo de Gallo*, between Methone to the west, and Corone to the east, where the Sinus Coronæus begins.

ACROAMATIC, or ACROATIC, in general, denotes a thing sublime, profound, or abstruse.

ACROAMATICI, a denomination given to the disciples or followers of Aristotle, &c. who were admitted into the secrets of the inner or acroamatic philosophy.

ACROATHOUM, or ACROTHOUM, in *Ancient Geography*, a town situated on the top of Mount Athos, where the inhabitants, according to Mela, were longer lived by half than in any other country; called by the modern Greeks, Αγιον ορος; by the Italians *La Cima di Monte Santo*.

ACROATIC is a name given to Aristotle's lectures to his disciples, which were of two kinds, *exoteric* and *acroatic*. The acroatic were those to which only his own disciples and intimate friends were admitted; whereas the exoteric were public and open to all. But there are other differences. The acroatic were set apart for the higher and more abstruse subjects; the exoteric were employed in rhetorical and civil speculations. Again, The acroatics were more subtle and exact, evidence and demonstration being here aimed at; the exoterics chiefly aimed at the probable and plausible. The former were the subject of the morning exercises in the Lyceum, the latter of the evenings. Besides, the exoterics were published: whereas the acroatics were kept secret; being either entirely concealed, or, if they were published, it was in such obscure terms, that few but his own disciples could be the wiser for them. Hence, when Alexander complained of his preceptor for publishing his acroatics, and thus revealing what should have been reserved to his disciples, Aristotle answered, that they were made public and not public; for that none who had not heard them explained by the author *viva voce*, could understand them.

ACROBATES, in *Antiquity*, were rope-dancers who performed various feats by vaulting or tumbling on a rope; sliding down on a rope from a lofty station with arms and legs extended, in imitation of flying; and running, dancing, and leaping, on a rope stretched horizontally.

Acrobatica
||
Acronius.

ACROBATICA, or ACROBATICUM, from ακρος, *high*, and βαλλω, or βαινω, *I go*; an ancient engine whereby people were railed aloft, that they might see more conveniently about them. The *acrobatica* among the Greeks amounted to the same with what they call *scansorium* among the Latins. Authors are divided as to the use of this engine. Turnebus and Barbarus take it to have been of the military kind, raised by besiegers, high enough to overlook the walls, and discover the state of things on the other side. Baldus rather supposes it a kind of movable scaffold, or cradle, contrived for raising painters, plasterers, and other workmen, to the tops of houses, trees, &c. Some suspect that it might have been used for both purposes; which is the opinion of Vitruvius and Aquinas.

ACROCERAUNIA, or MONTES CERAUNII, in *Ancient Geography*, mountains running out into the sea (so called from their being often thunderstruck), separating the Ionian sea from the Adriatic; where Illyria ends and Epirus begin: now called *Monti della Chimera*.

ACROCHERISMUS, among the Greeks, a sort of gymnastic exercise, in which the two combatants contended with their hands and fingers only, without closing or engaging the other parts of the body.

ACROCORINTHUS, in *Ancient Geography*, a high and steep hill, hanging over the city of Corinth, which was taken within the walls, as an acropolis, or citadel. On its top stood a temple of Venus; and lower down issued the fountain Priene.

ACROMION, in *Anatomy*, the upper part of the scapula or shoulder blade. See ANATOMY.

ACROMONOGRAMMATICUM, in *Poetry*, a kind of poem, wherein every subsequent verse begins with the letter wherewith the immediately preceding one terminated.

ACRON, a celebrated physician of Agrigentum, in Sicily, who lived about the middle of the fifth century before Christ. He first thought of lighting large fires, and purifying the air with perfumes, to put a stop to the pestilence that ravaged Athens, and which was attended with success. He wrote two treatises, according to Suidas, in the Doric dialect; the one on physic, and the other on abstinence or diet.

ACRON, in *Geography*, a territory on the Gold coast of Guinea, in Africa, bordering on the Fantynean country. The Dutch have a fort here called Fort Patience; and under it is a village, inhabited only by fishermen. The other inhabitants are addicted to husbandry, and sell their corn to other countries. There is plenty of game, which is very commodious for the Dutch factory. The people are very ignorant, and go naked like the rest of the negroes. This is called Little Acron; for Great Acron is farther inland, and is a kind of a republic.

ACRONICAL, ACHRONYCAL, or ACHRONICAL, in *Astronomy*, is a term applied to the rising of a star, when the sun is set in the evening: but has been promiscuously used to express a star's rising at sunset, or setting at sunrise.

ACRONIUS LACUS (Mela); a small lake formed by the Rhine, soon after its rise out of the Alps, and after

Acropolis & Aristotanum.

after passing the greater lake at Constance, called *Venetus*, and now the *Bodengee*, or lake of Constance.

ACROPOLIS, in *Ancient Geography*, the citadel, and one of the divisions of Athens; called *Polis*, because constituting the first and original city; and the *Upper* Polis, to distinguish it from the lower, which was afterwards built round it in a large open plain, the Acropolis standing on a rock or eminence in the heart of this plain; and hence its name: To the north it had a wall, built by the Pelasgi, and therefore called *Pelasgic;* and to the south a wall, by Cimon the son of Miltiades, out of the Persian spoils, many ages after the building of the north wall. It had nine gates, and was therefore called *Enneapylon;* yet but one principal gate or entrance, the ascent to which was by a flight of steps of white marble, built in a magnificent manner by Pericles, (Plutarch).

ACROPOLITA, GEORGE, one of the writers in the Byzantine history, was born at Constantinople, in the year 1220, and educated at the court of the emperor John Ducas at Nice. He was employed in the most important affairs of the empire; being sent ambassador to Larissa, to establish a peace with Michael of Epirus; and was constituted judge to try Michael Comnenus, who was suspected of engaging in a conspiracy. Theodorus Lascaris, the son of John, whom he had taught logic, appointed him governor of all the western provinces in his empire. In 1255, he was taken prisoner in a war with Michael Angelus; but gaining his liberty in 1260, by means of the emperor Palæologus, he was sent by him ambassador to Constantine prince of Bulgaria: and was employed in several other negotiations. He wrote, A Continuation of the Greek History, from the taking of Constantinople by the Latins till it was recovered by Michael Palæologus in 1261, which makes part of the Byzantine history; A Treatise concerning Faith, Virtue, and the Soul; An Exposition of the Sermons of St Gregory Nazianzen, and other pieces. Gregory Cyprian, patriarch of Constantinople, in his encomium upon him, prefixed to Acropolita's history, is perhaps somewhat extravagant in his praise, when he says he was equal to Aristotle in philosophy, and to Plato in the knowledge of divine things and Attic eloquence.

ACROSPIRE, a vulgar term for what botanists call the *plumes*.

ACROSPIRED, in malt-making, is the grain's shooting both at the root and blade end.

ACROSTIC, in *Poetry*, a kind of poetical composition, disposed in such a manner, that the initial letters of the verses form the name of some person, kingdom, place, motto, &c. The word is compounded of the Greek ακρος, *extremity*, and στιχος, *verse*. The acrostic is considered by the critics as a species of false wit, and is therefore very little regarded by the moderns.

ACROSTICHUM, RUSTYBACK, WALL-RUE, or FORK-FERN. See BOTANY *Index*.

ACROSTOLIUM, in ancient naval architecture, the extreme part of the ornament used on the prows of ships, which was sometimes in the shape of a buckler, helmet, animal, &c. but more frequently circular, or spiral. It was usual to tear them from the prows of vanquished vessels, and fix them to the conquerors, as a signal of victory. They were frequently represented on the reverse of ancient medals.

Acroteleutic & Act.

ACROTELEUTIC, among ecclesiastic writers, an appellation given to any thing added to the end of a psalm; as the Gloria Patri, or Doxology.

ACROTERI, in *Geography*, a small town in the island of Santorin. N. Lat. 36. 25. E Long. 26. 1.

ACROTERIA, in *Architecture*, small pedestals, usually without bases, anciently placed at the middle or two extremes of pediments or frontispieces, serving to support the statues, &c. It also signifies the figures placed as ornaments on the tops of churches, and the sharp pinnacles that stand in ranges about flat buildings with rails and balusters.

Among ancient physicians, it signified the larger extremities of the body, as the head, hands, and feet. It has also been used for the tips of the fingers, and sometimes for the eminences or processes of bones.

ACROTHYMION, from ακρος, *extreme*, and θυμος, *thyme*. A sort of wart described by Celsus as hard and rough, with a narrow basis and broad top; the top is of the colour of thyme, it easily splits and bleeds. This tumour is also called *thymus*.

ACT, in general, denotes the exertion of power; and differs from power, as the effect from the cause.

ACT, in *Logic*, is particularly understood of an operation of the human mind. Thus to discern and examine, are acts of the understanding; to judge and affirm, are acts of the will. There are voluntary and spontaneous acts; the former are produced by the operation of the soul, the latter without its privity or participation.

ACT, in the universities, signifies a thesis maintained in public by a candidate for a degree; or to show the capacity and proficiency of a student. The candidates for a degree of bachelor and master of arts are to hold philosophical acts; and those for bachelor of divinity, theological acts, &c. At Oxford, the time when masters or doctors complete their degrees, is also called the *act;* which is held with great solemnity. At Cambridge, they call it the *commencement*.

Act of Faith, *Auto da Fe*, in the Romish church, is a solemn day held by the inquisition, for the punishment of heretics, and the absolution of the innocent accused *. They usually contrive the *Auto* to fall on some great festival, that the execution may pass with the more awe and regard; at least it is always on a Sunday.

* See *Inquisition*.

The Auto da Fe may be called the last act of the inquisitorial tragedy; it is a kind of gaol-delivery, appointed as oft as a competent number of prisoners in the inquisition are convicted of heresy, either by their own voluntary or extorted confession, or on the evidence of certain witnesses. The process is thus: In the morning they are brought into a great hall, where they have certain habits put on, which they are to wear in the procession. The procession is led up by Dominican friars; after which come the penitents, some with san-benitoes, and some without, according to the nature of their crimes; being all in black coats without sleeves, and barefooted, with a wax candle in their hands. These are followed by the penitents who have narrowly escaped being burnt, who over their black coats have flames painted with their points turned downwards,

Act. wards, *Fuego revolto*. Next come the negative and relapſed, who are to be burnt, having flames on their habits pointing upwards. After theſe come ſuch as profeſs doctrines contrary to the faith of Rome, who, beſides flames pointing upwards, have their picture painted on their breaſts, with dogs, ſerpents, and devils, all open-mouthed, about it. Each priſoner is attended with a familiar of the inquiſition; and thoſe to be burnt have alſo a Jeſuit on each hand, who are continually preaching to them to abjure. After the priſoners comes a troop of familiars on horſeback; and after them the inquiſitors, and other officers of the court, on mules; laſt of all, the inquiſitor-general on a white horſe, led by two men with black hats and green hat-bands. A ſcaffold is erected in the *Terriero de Paco*, big enough for two or three thouſand people; at one end of which are the priſoners, at the other the inquiſitors. After a ſermon made up of encomiums of the inquiſition, and invectives againſt heretics, a prieſt aſcends a deſk near the middle of the ſcaffold, and having taken the abjuration of the penitents, recites the final ſentence of thoſe who are to be put to death; and delivers them to the ſecular arm, earneſtly beſeeching at the ſame time the ſecular power not to touch their blood, or put their lives in danger. The priſoners being thus in the hands of the civil magiſtrate, are preſently loaded with chains, and carried firſt to the ſecular gaol, and from thence in an hour or two brought before the civil judge; who, after aſking in what religion they intend to die, pronounces ſentence, on ſuch as declare they die in the communion of the church of Rome, that they ſhall be firſt ſtrangled, and then burnt to aſhes; on ſuch as die in any other faith, that they be burnt alive. Both are immediately carried to the Ribera, the place of execution; where there are as many ſtakes ſet up as there are priſoners to be burnt, with a quantity of dry furze about them. The ſtakes of the profeſſed, that is, ſuch as perſiſt in their hereſy, are about four yards high, having a ſmall board towards the top for the priſoner to be ſeated on. The negative and relapſed being firſt ſtrangled and burnt, the profeſſed mount their ſtakes by a ladder; and the Jeſuits, after ſeveral repeated exhortations to be reconciled to the church, part with them, telling them they leave them to the devil, who is ſtanding at their elbow to receive their ſouls, and carry them with him into the flames of hell. On this a great ſhout is raiſed; and the cry is, Let the dogs *beards be made;* which is done by thruſting flaming furzes faſtened to long poles againſt their faces, till their faces are burnt to a coal, which is accompanied with the loudeſt acclamations of joy. At laſt, fire is ſet to the furze at the bottom of the ſtake, over which the profeſſed are chained ſo high, that the top of the flame ſeldom reaches higher than the ſeat they ſit on; ſo that they rather ſeem roaſted than burnt. There cannot be a more lamentable ſpectacle; the ſufferers continually cry out, while they are able, *Miſericordia per amor de Dios*, "Pity for the love of God!" yet it is beheld by all ſexes and ages with tranſports of joy and ſatisfaction.

Act, in dramatic poetry, ſignifies a certain diviſion or part of a play, deſigned to give ſome reſpite both to the actors and ſpectators. The Romans were the firſt who divided their theatrical pieces into acts; for no ſuch diviſions appear in the works of the firſt dramatic poets. Their pieces indeed conſiſted of ſeveral parts or diviſions, which they called *protaſis*, *epitaſis*, *cataſtaſis*, and *cataſtrophe;* but theſe diviſions were not marked by any real interruptions in the theatre. Nor does Ariſtotle mention any thing of acts in his Art of Poetry. But, in the time of Horace, all regular and finiſhed pieces were divided into five acts. Act, Acta.

> *Neve minor, neu ſit quinto productior actu*
> *Fabula, quæ poſci vult, et ſpectata reponi.*
>
> If you would have your play deſerve ſucceſs,
> Give it five acts complete, nor more nor leſs.
> FRANCIS.

The firſt act, according to ſome critics, beſides introducing upon the ſtage the principal characters of the play, ought to propoſe the argument or ſubject of the piece; the ſecond, to exhibit this to the audience, by carrying the fable into execution; the third, to raiſe obſtacles and difficulties; the fourth, to remove theſe, or raiſe new ones in the attempt; and the fifth, to conclude the piece, by introducing ſome accident that may unravel the whole affair. This diviſion, however, is not eſſentially neceſſary; but may be varied according to the humour of the author, or the nature of the ſubject. See POETRY.

Act of Grace. See GRACE.

ACT, among lawyers, is an inſtrument in writing for declaring or juſtifying the truth of any thing. In which ſenſe, records, decrees, ſentences, reports, certificates, &c. are called *acts*.

ACTS alſo denote the deliberations and reſolutions of an aſſembly, ſenate, or convention; as acts of parliament, &c. Likewiſe matters of fact tranſmitted to poſterity in certain authentic books and memoirs.

Acta Conſiſtorii, the edicts or declarations of the council of ſtate of the emperors. Theſe edicts were generally expreſſed in ſuch terms as theſe: "the auguſt emperors, *Diocleſian* and *Maximin*, in council declared, That the children of decurions ſhould not be expoſed to wild beaſts in the amphitheatre."

The ſenate and ſoldiers often ſwore, either through abject flattery or by compulſion, upon the *edicts* of the emperor, as we do upon the *Bible*. And the name of *Apidius Merula* was eraſed by Nero out of the regiſter of ſenators, becauſe he refuſed to ſwear upon the edicts of the emperor Auguſtus.

Acta Diurna, was a ſort of Roman gazette, containing an authorized narrative of the tranſactions worthy of notice which happened at Rome. Petronius has given us a ſpecimen of the *acta diurna* in his account of Trimalchis; and as it may not perhaps be unentertaining to ſee how exactly a Roman newſpaper runs in the ſtyle of an Engliſh one, the following is an article or two out of it:

"On the 26th of July, 30 boys and 40 girls were born at Trimalchi's eſtate at Cuma.

"At the ſame time a ſlave was put to death for uttering diſreſpectful words againſt his lord.

"The ſame day a fire broke out in Pompey's gardens, which began in the night, in the ſteward's apartment."

Acta Populi, among the Romans, were journals or regiſters of the daily occurrences; as aſſemblies, trials, executions, buildings, births, marriages, deaths, &c.

Acts. of illuſtrious perſons, and the like. Theſe were otherwiſe called *Acta Publica* and *Acta Diurna*, or ſimply *Acta*. The Acta differed from Annals, in that only the greater and more important matters were in the latter, and thoſe of leſs note were in the former. Their origin is attributed to Julius Cæſar, who firſt ordered the keeping and making public the acts of the people. Some trace them higher, to Servius Tullius; who, to diſcover the number of perſons born, dead, and alive, ordered that the next of kin, upon a birth, ſhould put a certain piece of money into the treaſury of Juno Lucina; upon a death, into that of Venus Libitina: the like was alſo to be done upon aſſuming the toga virilis, &c. Under Marcus Antoninus, this was carried further: perſons were obliged to notify the births of their children, with their names and ſurnames, the day, conſul, and whether legitimate or ſpurious, to the prefects of the *Ærarium Saturni*, to be entered in the public acts; though before this time the births of perſons of quality appear thus to have been regiſtered.

Acta Senatus, among the Romans, were minutes of what paſſed and was debated in the ſenate houſe. Theſe were alſo called *Commentarii*, and by a Greek name ὑπομνήματα. They had their origin in the conſulſhip of Julius Cæſar, who ordered them both to be kept and publiſhed. The keeping them was continued under Auguſtus, but the publication was abrogated. Afterwards all writings, relating to the decrees or ſentences of the judges, or what paſſed and was done before them, or by their authority, in any cauſe, were alſo called by the name *Acta*: In which ſenſe we read of civil acts, criminal acts, intervenient acts; *acta civilia, criminalia, intervenientia, &c.*

Public Acts. The knowledge of public acts forms part of a peculiar ſcience, called the DIPLOMATIC, of great importance to an hiſtorian, ſtateſman, chronologer, and even critic. The preſervation of them was the firſt occaſion of erecting libraries. The ſtyle of acts is generally barbarous Latin. Authors are divided as to the rules of judging of their genuineneſs, and even whether there be any certain rules at all. F. Germon will have the greater part of the acts of former ages to be ſpurious. Fontanini aſſerts, that the number of forged acts now extant is very ſmall. It is certain there were ſevere puniſhments inflicted on the forgers and falſifiers of acts.—The chief of the Engliſh acts, or public records, are publiſhed by Rymer, under the title of *Fœdera*, and continued by Saunderſon; an extract whereof has been given in French by Rapin, and tranſlated into Engliſh under the title of *Acta Regia*. Great commendations have been given this work: alſo ſome exceptions made to it; as that there are many ſpurious acts, as well as errors, in it; ſome have even charged it with falſifications.—The public acts of France fell into the hands of the Engliſh after the battle of Poictiers, and are commonly ſaid to have been carried by them out of the country. But the tradition is not ſupported by any ſufficient teſtimony.

Acts of the Apoſtles, one of the ſacred books of the New Teſtament, containing the hiſtory of the infant church, during the ſpace of 29 or 30 years from the aſcenſion of our Lord to the year of Chriſt 63.—It was written by St Luke; and addreſſed to Theophilus, the perſon to whom the evangeliſt had before dedicated his Goſpel. We here find the accompliſhment of ſeveral of the promiſes made by our Saviour; his aſcenſion; the deſcent of the Holy Ghoſt; the firſt preaching of the apoſtles, and the miracles whereby their doctrines were confirmed; an admirable picture of the manners of the primitive Chriſtians; and, in ſhort, every thing that paſſed in the church till the diſperſion of the apoſtles, who ſeparated themſelves in order to propagate the goſpel throughout the world. From the period of that ſeparation, St Luke quits the hiſtory of the other apoſtles, who were then at too great a diſtance from him, and confines himſelf more particularly to that of St Paul, who had choſen him for the companion of his labours. He follows that apoſtle in all his miſſions, and even to Rome itſelf; for it appears that the Acts were publiſhed in the ſecond year of St Paul's reſidence in that city, or the 36th year of the Chriſtian era, and in the 9th or 10th year of Nero's reign. The ſtyle of this work, which was originally compoſed in Greek, is much purer than that of the other canonical writers; and it is obſervable, that St Luke, who was much better acquainted with the Greek than with the Hebrew language, always, in his quotations from the Old Teſtament, makes uſe of the Septuagint verſion. The council of Laodicea places the Acts of the Apoſtles among the canonical books, and all the churches have acknowledged it as ſuch without any controverſy.

Acts.

There were ſeveral *Spurious* ACTS OF THE APOSTLES; particularly, 1. *Acts*, ſuppoſed to be written by Abdias *, the pretended biſhop of Babylon, who gave out that he was ordained biſhop by the apoſtles themſelves when they were upon their journey into Perſia. 2. *The Acts of St Peter*: this book came originally from the ſchool of the Ebionites. 3. *The Acts of St Paul*; which is entirely loſt. Euſebius, who had ſeen it, pronounces it of no authority. 4. *The Acts of St John the Evangeliſt*; a book made uſe of by the Encratites, Manichæans, and Priſcillianiſts. 5. *The Acts of St Andrew*; received by the Manichæans, Encratites, and Apotactics. 6. *The Acts of St Thomas the Apoſtle*; received particularly by the Manichæans. 7. *The Acts of St Philip*. This book the Gnoſtics made uſe of. 8. *The Acts of St Matthias*. Some have imagined that the Jews for a long time had concealed the original acts of the life and death of St Matthias written in Hebrew; and that a monk of the abbey of St Matthias at Treves, having got them out of their hands, procured them to be tranſlated into Latin, and publiſhed them; but the critics will not allow them to be authentic.

* See *Abdias*.

Acts of Pilate; a relation ſent by Pilate to the emperor Tiberius, concerning Jeſus Chriſt, his death, reſurrection, aſcenſion, and the crimes of which he was convicted before him †. It was a cuſtom among the Romans, that the proconſuls and governors of provinces ſhould draw up acts, or memoirs, of what happened in the courſe of their government, and ſend them to the emperor and ſenate. The genuine *acts* of Pilate were ſent by him to Tiberius, who reported them to the ſenate; but they were rejected by that aſſembly, becauſe not immediately addreſſed to them: as is teſtified by Tertullian, in his Apol. cap. 5. and 20, 21. The heretics forged acts in imitation of them: in the reign of the emperor Maximin, the Gentiles, to throw an odium on the Chriſtian name, ſpread about ſpurious Acts of Pilate; which the emperor, by a ſolemn edict, ordered

† *Euſebii Hiſt. Eccleſ.* lib. ii. cap. 2. and ix. 5.

Act II. Actio.

ordered to be ſent into all the provinces of the empire, and enjoined the ſchoolmaſters to teach and explain them to their ſcholars, and make them learn them by heart. Theſe acts, both the genuine and the ſpurious, are loſt. There is indeed extant, in the Pſeudo-Hegeſippus, a letter from Pilate to the emperor Claudius, concerning Jeſus Chriſt *; but it diſcovers itſelf at firſt ſight not to be authentic.

*Cave Hiſt Lit rar. ac. Apoſtol.

Act of Parliament is a poſitive law, conſiſting of two parts, the words of the act, and its true ſenſe and meaning; which being joined, make the law. The words of acts of parliament ſhould be taken in a lawful ſenſe. Caſes of the ſame nature are within the intention, though without the letter, of the act; and ſome acts extend by equity to things not mentioned therein. See PARLIAMENT.

ACTÆ, were meadows of remarkable verdure and luxuriancy near the ſea-ſhore, where the Romans uſed to indulge themſelves to a great degree in ſoftneſs and delicacy of living. The word is uſed in this ſenſe by Cicero and Virgil; but Voſſius thinks it can only be uſed in ſpeaking of Sicily, as theſe two authors did.

ACTÆA, HERB-CHRISTOPHER, or BANE-BERRIES: See BOTANY *Index*.

ACTÆON, in fabulous hiſtory, the ſon of Ariſtæus and Autonoe; a great hunter. He was transformed by Diana into a ſtag, becauſe he looked on her while bathing; and was devoured by his own dogs. The effects of impertinent curioſity and expenſive pleaſures ſeem to be the moral of the fable.

ACTANIA, an iſland, according to Pliny, in the North ſea. It lies to the weſt of Holſtein and Ditmerſch, not far from the mouth of the Eyder and Elbe, and is now called *Heyligland*.

ACTE. See SAMBUCUS.

ACTIAN GAMES, in Roman antiquity, were ſolemn games inſtituted by Auguſtus, in memory of his victory over Mark Antony at Actium, held every fifth year, and celebrated in honour of Apollo, ſince called *Actius*. Hence *Actian* Years, an era commencing from the battle of Actium, called the *Era* of *Auguſtus*.

Virgil inſinuates them to have been inſtituted by Æneas; from that paſſage, Æn. III. v. 280.

Actiaque Iliacis celebramus littora ludis.
ÆN. III. 280.

But this he only does by way of compliment to Auguſtus: attributing that to the hero from whom he deſcended, which was done by the emperor himſelf; as is obſerved by Servius.

ACTINIA, in *Zoology*, a genus belonging to the order of Vermes molluſca, called *Animal Flowers*, and *Sea Anemonies*. See VERMES.

ACTINOLITE, in *Mineralogy*. See MINERALOGY *Index*.

ACTIO, in Roman antiquities, an action at law in a court of juſtice. The formalities uſed by the Romans, in judicial actions, were theſe: If the difference failed to be made up by friends, the injured perſon proceeded *in jus reum vocare*, to ſummon the offending party to the court, who was obliged to go, or give bond for his appearance.

The offending party might be ſummoned into court *viva voce*, by the plaintiff himſelf meeting the defendant, declaring his intention to him, and commanding him to go before the magiſtrate and make his defence. If he would not go willingly, he might drag and force him along, unleſs he gave ſecurity for his appearance on ſome appointed day. If he failed to appear on the day agreed on, then the plaintiff, whenſoever he met him, might take him along with him by force, calling any by-ſtanders to bear witneſs, by aſking them *viſne anteſtari?* the by-ſtanders upon this turned their ear toward him in token of their conſent: To this Horace alludes in his ſatire againſt the impertinent, Lib. i. Sat. 9. See this further explained under the article ANTESTARI.

Actio, Action.

Both parties being met before the prætor, or other ſupreme magiſtrate preſiding in the court, the plaintiff propoſed the action to the defendant, in which he deſigned to proſecute him. This they termed *edere actionem;* and was commonly performed by writing it in a tablet, and offering it to the defendant, that he might ſee whether he had better ſtand the ſuit or compound.

In the next place came the *poſtulatio actionis*, or the plaintiff's petition to the prætor, for leave to proſecute the defendant in ſuch an action. The petition was granted by writing at the bottom of it *actionem do*, or refuſed by writing in the ſame manner *actionem non do*.

The petition being granted, the plaintiff *vadabatur reum*, i. e. obliged him to give ſureties for his appearance on ſuch a day in the court; and this was all that was done in public, before the day fixed upon for the trial.

In the mean time, the difference was often made up, either *tranſactione*, by letting the cauſe fall as dubious; or *pactione*, by compoſition for damages amongſt friends.

On the day appointed for hearing, the prætor ordered the ſeveral bills to be read, and the parties ſummoned by an *accenſus*, or beadle. See ACCENSI.

Upon the nonappearance of either party, the defaulter loſt his cauſe: if they both appeared, they were ſaid *ſe ſtetiſſe;* and then the plaintiff proceeded *litem ſive actionem intendere*, i. e. to prefer his ſuit, which was done in a ſet form of words, varying according to the difference of the actions. After this the plaintiff deſired judgment of the prætor, that is, to be allowed a *judex* or *arbiter*, elſe the *recuperatores* or *centumviri*. Theſe he requeſted for the hearing and deciding the buſineſs; but none of them could be deſired but by the conſent of both parties.

The prætor having aſſigned them their judges, defined and determined the number of witneſſes to be admitted, to hinder the protracting of the ſuit; and then the parties proceeded to give their caution, that the judgement, whatever it was, ſhould ſtand and be performed on both ſides. The judges took a ſolemn oath to be impartial; and the parties took the *juramentum calumniæ*. Then the trial began with the aſſiſtance of witneſſes, writings, &c. which was called *diſceptatio cauſæ*.

ACTION, in a general ſenſe, implies nearly the ſame thing with ACT.—Grammarians, however, obſerve ſome diſtinction between *action* and *act;* the former being generally reſtricted to the common or ordinary tranſactions, whereas the latter is uſed to expreſs thoſe which are remarkable. Thus, we ſay it is a good

action

Action. *action* to comfort the unhappy; it is a generous *act* to deprive ourſelves of what is neceſſary for their ſake. The wiſe man propoſes to himſelf an honeſt end in all his actions; a prince ought to mark every day of his life with ſome act of greatneſs. The abbé Girard makes a further diſtinction between the words *action* and *act*. The former, according to him, has more relation to the power that acts than the latter; whereas the latter has more relation to the effect produced than the former: and hence the one is properly the attribute of the other. Thus we may properly ſay, "Be ſure to preſerve a preſence of mind in all your actions; and take care that they be all acts of equity."

ACTION, in *Mechanics*, implies either the effort which a body or power makes againſt another body or power, or the effect itſelf of that effort.

As it is neceſſary, in works of this kind, to have a particular regard to the common language of mechanics and philoſophers, we have given this double definition: but the proper ſignification of the term is the motion which a body really produces, or tends to produce, in another; that is, ſuch is the motion it would have produced, had nothing hindered its effect.

All power is nothing more than a body actually in motion, or which tends to move itſelf; that is, a body which would move itſelf if nothing oppoſed it. The action therefore of a body is rendered evident to us by its motion only; and conſequently we muſt not fix any other idea to the word action, than that of actual motion, or a ſimple tendency to motion. The famous queſtion relating to *vis viva* and *vis mortua*, owes, in all probability, its exiſtence to an inadequate idea of the word action; for had Leibnitz and his followers obſerved, that the only preciſe and diſtinct idea we can give to the word force or action, reduces it to its effect, that is, to the motion it actually produces or tends to produce, they would never have made that curious diſtinction.

Quantity of ACTION, a name given by M. de Maupertuis, in the Memoirs of the Pariſian Academy of Sciences for 1744, and thoſe of Berlin for 1746, to the product of the maſs of a body by the ſpace which it runs through, and by its celerity. He lays it down as a general law, "that, in the changes made in the ſtate "of a body, the quantity of action neceſſary to pro-"duce ſuch change, is the leaſt poſſible." This principle he applies to the inveſtigation of the laws of refraction, of equilibrium, &c. and even to the ways of acting employed by the Supreme Being. In this manner M. de Maupertuis attempts to connect the metaphyſics of final cauſes with the fundamental truths of mechanics, to ſhow the dependence of the colliſion of both elaſtic and hard bodies upon one and the ſame law, which before had always been referred to ſeparate laws; and to reduce the laws of motion, and thoſe of equilibrium, to one and the ſame principle.

ACTION, in *Ethics*, denotes the external ſigns or expreſſions of the ſentiments of a moral agent. See *Active Power*, *infra*.

ACTION, in *Poetry*, the ſame with ſubject or fable. Critics generally diſtinguiſh two kinds, the principal and the incidental. The principal action is what is generally called the *fable*; and the incidental an *epiſode*. See POETRY.

ACTION, in *Oratory*, is the outward deportment of the orator, or the accommodation of his countenance, voice, and geſture, to the ſubject of which he is treating. See ORATORY. Action ſi Active.

ACTION, in a theatrical ſenſe. See DECLAMATION.

Action for the Pulpit. See DECLAMATION.

ACTION, in *Painting* and *Sculpture*, is the attitude or poſition of the ſeveral parts of the face, body, and limbs, of ſuch figures as are repreſented, and whereby they ſeem to be really actuated by paſſions. Thus we ſay, the action of ſuch a figure finely expreſſes the paſſions with which it is agitated: we alſo uſe the ſame expreſſion with regard to animals.

ACTION, in *Phyſiology*, is applied to the functions of the body, whether vital, animal, or natural.

The vital functions, or actions, are thoſe which are abſolutely neceſſary to life, and without which there is no life; as the action of the heart, lungs, and arteries. On the action and reaction of the ſolids and fluids on each other, depend the vital functions. The pulſe and reſpiration are the external ſigns of life. Vital diſeaſes are all thoſe which hinder the influx of the venous blood into the cavities of the heart, and the expulſion of the arterial blood from the ſame.—The natural functions are thoſe which are inſtrumental in repairing the ſeveral loſſes which the body ſuſtains; for life is deſtructive of itſelf, its very offices occaſioning a perpetual waſte. The manducation of food, the deglutition and digeſtion thereof, alſo the ſeparation and diſtribution of the chyle and excrementitious parts, &c. are under the head of natural functions, as by theſe our aliment is converted into our nature. They are neceſſary to the continuance of our bodies.—The animal functions are thoſe which we perform at will, as muſcular motion, and all the voluntary actions of the body: they are thoſe which conſtitute the ſenſes of touch, taſte, ſmell, ſight, hearing, perception, reaſoning, imagination, memory, judgement, affections of the mind. Without any, or all of them, a man may live, but not ſo comfortably as with them.

ACTION, in *Commerce*, is a term uſed abroad for a certain part or ſhare of a public company's capital ſtock. Thus, if a company has 400,000 livres capital ſtock, this may be divided into 400 actions, each conſiſting of 1000 livres. Hence a man is ſaid to have two, four, &c. actions, according as he has the property of two, four, &c. 1000 livres capital ſtock. The tranſferring of actions abroad is performed much in the ſame manner as ſtocks are with us. See STOCKS.

ACTION, in *Law*, is a demand made before a judge for obtaining what we are legally entitled to demand, and is more commonly known by the name of *law ſuit* or *proceſs*. See SUIT.

ACTIONARY, or ACTIONIST, a proprietor of ſtock in a trading company.

ACTIONS, among merchants, ſometimes ſignify moveable effects; and we ſay the merchant's creditors have ſeized on all his actions, when we mean that they have taken poſſeſſion of all his active debts.

ACTIVE, denotes ſomething that communicates action or motion to another; in which acceptation it ſtands oppoſed to paſſive.

ACTIVE, in *Grammar*, is applied to ſuch words as expreſs action; and is therefore oppoſed to paſſive. The active performs the action, as the paſſive receives it.

Active || Acton.

Thus we say, a verb *active*, a conjugation *active*, &c. or an *active* participle.

Active Verbs, are such as do not only signify doing, or acting, but have also nouns following them, to be the subject of the action or impression: Thus, *To love, to teach*, are verbs *active*; because we can say, *To love a thing, to teach a man*. Neuter verbs also denote an action, but are distinguished from active verbs, in that they cannot have a noun following them: such are, *To sleep, to go*, &c. Some grammarians, however, make three kinds of active verbs: the *transitive*, where the action passes into a subject different from the agent; *reflected*, where the action returns upon the agent; and *reciprocal*, where the action turns mutually upon the two agents who produced it.

Active Power, in *Metaphysics*, the power of executing any work or labour; in contradistinction to *speculative* powers*, or the powers of seeing, hearing, remembering, judging, reasoning, &c.

* Dr Reid *on the Active Powers of Man*, p. 12.

The exertion of active power we call *action*; and as every action produces some change, so every change must be caused by some effect, or by the cessation of some exertion of power. That which produces a change by the exertion of its power, we call the *cause* of that change; and the change produced, the *effect* of that cause. See Metaphysics.

Active Principles, in *Chemistry*, such as are supposed to act without any assistance from others; as mercury, sulphur, &c.

ACTIVITY, in general, denotes the power of acting, or the active faculty. See Active.

Sphere of Activity, the whole space in which the virtue, power, or influence, of any object is exerted.

ACTIUM, in *Ancient Geography*, a town situated on the coast of Acarnania, in itself inconsiderable, but famous for a temple of Apollo, a safe harbour, and an adjoining promontory of the same name, in the mouth of the Sinus Ambracius, over against Nicopolis, on the other side of the bay: it afterwards became more famous on account of Augustus's victory over Antony and Cleopatra; and for quinquennial games instituted there, called *Actia* or *Ludi Actiaci*. Hence the epithet *Actius*, given to Apollo (Virgil). *Actiaca æra*, a computation of time from the battle of Actium. The promontory is now called *Capo di Figalo*. The medals of Actium were silver, gold and bronze; and the ordinary type is a flying pegasus.

ACTIUS, in mythology, a surname of Apollo, from Actium, where he was worshipped.

ACTON, a town near London, where is a well that affords a purging water, which is noted for the pungency of its salt. This water is whitish; to the taste it is sweetish, with a mixture of the same bitter which is in the Epsom water. The salt of this water is not quite so soft as that of Epsom; and is more calcareous than it, having more of the salt of lime: for a quantity of the Acton water being boiled high, and mixed with a solution of sublimate in pure water, threw down a yellow sediment. The salt of the Acton water is more nitrous than that of Epsom; it strikes a deep red, or purple, with the tincture of logwood in brandy, as is usual with nitrous salts; it does not precipitate silver out of the spirit of nitre, as common salt does: 1½lb. of this water yields 48 grains of salt.

Actor, Actorum.

ACTOR, in general, signifies a person who acts or performs something.

Actor, among civilians, the proctor or advocate in civil courts or causes; as, *Actor ecclesiæ* has been sometimes used for the advocate of the church; *actor dominicus* for the lord's attorney; *actor villæ*, the steward or head bailiff of a village.

Actor, in the drama, is a person who represents some part or character in the theatre. The drama consisted originally of nothing more than a simple chorus, who sung hymns in honour of Bacchus; so that the primitive actors were only singers and musicians. Thespis was the first that, in order to ease this unformed chorus, introduced a declaimer, who repeated some heroic or comic adventure. Æschylus, finding a single person tiresome, attempted to introduce a second, and changed the ancient recitals into dialogues. He also dressed his actors in a more majestic manner, and introduced the cothurnus or buskin. Sophocles added a third, in order to represent the various incidents in a more natural manner: and here the Greeks stopped, at least we do not find in any of their tragedies above three persons in the same scene. Perhaps they looked upon it as a rule of the dramatic poem never to admit more than three speakers at a time on the stage; a rule which Horace has expressed in the following verse:

Nec quarta loqui persona laboret.

This, however, did not prevent their increasing the number of actors in comedy. Before the opening of a play, they named their actors in full theatre, together with the parts they were to perform. The ancient actors were masked, and obliged to raise their voice extremely, in order to make themselves heard by the innumerable crowd of people who filled the amphitheatres: they were accompanied with a player on the flute, who played a prelude, gave them the tone, and played while they declaimed. Horace speaks of a kind of secondary actors in his time, whose business was to imitate the first; and lessen themselves, to become better foils to their principals.

The moderns have introduced an infinite number of actors upon the stage. This heightens the trouble and distress that should reign there, and makes a diversity, in which the spectator is sure to be interested.

Actors were highly honoured at Athens. At Rome they were despised, and not only denied all rank among the citizens, but even when any citizen appeared upon the stage, he was expelled his tribe and deprived of the right of suffrage by censors. Cicero, indeed, esteems the talents of Roscius: but he values his virtues still more; virtues which distinguished him so remarkably above all others of his profession, that they seemed to have excluded him from the theatre. The French have, in this respect, adopted the ideas of the Romans; and the English those of the Greeks.

Actor, the name of several persons in fabulous history. One *Actor* among the Aurunci is described by Virgil as a hero of the first rank. *Æn.* xii.

ACTORUM tabulæ, in antiquity, were tables instituted by Servius Tullius, in which the births of children were registered. They were kept in the treasury of Saturn.

ACTRESS,

Actreſs || Actuarius.

ACTRESS, in a general ſenſe, a female who acts or performs ſomething.

ACTRESS, in the *Drama*, a female performer. Women actors were unknown to the ancients, among whom men always performed the female character; and hence one reaſon for the uſe of maſks among them.

Actreſſes are ſaid not to have been introduced on the Engliſh ſtage till after the reſtoration of King Charles II. who has been charged with contributing to the corrupting of our manners by importing this uſage from abroad. But this can be but partly true: the queen of James I. acted a part in a paſtoral; and Prynn, in his Hiſtriomaſtix, ſpeaks of women actors in his time as proſtitutes; which was one occaſion of the ſevere proſecution brought againſt him for that book.

There are ſome very agreeable and beautiful talents, of which the poſſeſſion commands a certain ſort of admiration; but of which the exerciſe for the ſake of gain is conſidered, whether from reaſon or prejudice, as a ſort of public proſtitution. The pecuniary recompenſe, therefore, of thoſe who exerciſe them in this manner, muſt be ſufficient, not only to pay for the time, labour, and expence of acquiring the talents, but for the diſcredit which attends the employment of them as the means of ſubſiſtence. The exorbitant rewards of players, opera-ſingers, opera-dancers, &c. are founded upon theſe two principles; the rarity and beauty of the talents, and the diſcredit of employing them in this manner. It ſeems abſurd at firſt ſight, that we ſhould deſpiſe their perſons, and yet reward their talents with the moſt profuſe liberality. While we do the one, however, we muſt of neceſſity do the other. Should the public opinion or prejudice ever alter with regard to ſuch occupations, their pecuniary recompenſe would quickly diminiſh. More people would apply to them, and the competition would quickly reduce the price of their labour. Such talents, though far from being common, are by no means ſo rare as is imagined. Many people poſſeſs them in great perfection, who diſdain to make this uſe of them; and many more are capable of acquiring them, if any thing could be made honourably by them.

ACTUAL, ſomething that is real and effective, or that exiſts truly and abſolutely. Thus philoſophers uſe the terms *actual* heat, *actual* cold, &c. in oppoſition to *virtual or potential*. Hence, among phyſicians, a red hot iron, or fire, is called an actual cautery; in diſtinction from cauteries, or cauſtics, that have the power of producing the ſame effect upon the animal ſolids as actual fire, and are called *potential* cauteries. Boiling water is actually hot; brandy, producing heat in the body, is potentially hot, though of itſelf cold.

Actual Sin, that which is committed by the perſon himſelf; in oppoſition to *original ſin*, or that which he contracted from being a child of Adam.

ACTUARIÆ NAVES, a kind of long and light ſhips among the Romans, thus denominated, becauſe they were chiefly deſigned for ſwiftneſs and expedition. They correſpond to what the French call *brigantines*.

ACTUARIUS, a celebrated Greek phyſician of the 13th century, and the firſt Greek author who has treated of mild purgatives, ſuch as caſſia, manna, ſena, &c. He is the firſt alſo who mentions diſtilled waters. His works were printed in one volume folio, by Henry Stephens in 1567. Actuate || Acuna.

ACTUARIUS, or ACTARIUS, a notary or officer appointed to write the acts or proceedings of a court, or the like. In the Eaſtern empire, the actuarii were properly officers who kept the military accounts, received the corn from the *ſuſceptores* or ſtorekeepers, and delivered it to the ſoldiers.

ACTUATE, to bring into act, or put a thing in action. Thus an agent is ſaid, by the ſchoolmen, to *actuate* a power, when it produces an act in a ſubject. Thus the mind may be ſaid to *actuate* the body; and thus a medicine is ſaid by ſome ancient phyſicians to be actuated or brought into action, when by means of the vital heat it is made to produce its effect.

ACTUS, in *Ancient Architecture*, a meaſure in length equal to 120 Roman feet. In *Ancient Agriculture*, the word ſignified the length of one furrow, or the diſtance a plough goes before it turns.

Actus Minimus was a quantity of land 120 feet in length, and four in breadth.

Actus Major, or *Actus Quadratus*, a piece of ground in a ſquare form, whoſe ſide was equal to 120 feet, equal to half the jugerum.

Actus Intervicinalis, a ſpace of ground four feet in breadth, left between the lands as a path or way.

ACUANITES, in *Eccleſiaſtical Hiſtory*, the ſame with thoſe called more frequently MANICHEES. They took the name from Acuas, a diſciple of Thomas one of the twelve apoſtles.

ACULEATE, or ACULEATI, a term applied to any plant or animal armed with prickles.

ACULEI, the prickles of animals or of plants.

ACULER, in the *Manege*, is uſed for the motion of a horſe, when, in working upon volts, he does not go far enough forward at every time or motion, ſo that his ſhoulders embrace or take in too little ground, and his croupe comes too near the centre of the volt. Horſes are naturally inclined to this fault in making demi-volts.

ACUMINA, in *Antiquity*, a kind of military omen, moſt generally ſuppoſed to have been taken from the points or edges of darts, ſwords, or other weapons.

ACUNA, CHRISTOPHER DE, a Spaniſh Jeſuit, born at Burgos. He was admitted into the ſociety in 1612, being then but 15 years of age. After having devoted ſome years to ſtudy, he went to America, where he aſſiſted in making converts in Chili and Peru. In 1640 he returned to Spain, and gave the king an account how far he had ſucceeded in the commiſſion he had received to make diſcoveries on the river of the Amazons; and the year following he publiſhed a deſcription of this river at Madrid. Acuna was ſent to Rome, as procurator of his province. He returned to Spain with the title of Qualificator of the Inquiſition; but ſoon after embarked again for the Weſt Indies, and was at Lima in 1675, when Father Southwell publiſhed at Rome the Bibliotheque of the Jeſuit writers. Acuna's work is entitled, *Nuevo deſcubrimento del gran rio de las Amazonas*; i. e. "A new diſcovery of the great river of the Amazons." He was 10 months together upon this river, having had inſtructions to inquire into every thing with the greateſt exactneſs, that his majeſty might thereby be enabled to render the navigation more eaſy and commodious. He

Acupuncture || Ad.

went aboard a ſhip at Quito with Peter Texiera, who had already been ſo far up the river, and was therefore thought a proper perſon to accompany him in this expedition. They embarked in February 1639, but did not arrive at Para till the December following. It is thought that the revolution of Portugal, by which the Spaniards loſt all Brazil, and the colony of Para at the mouth of the river of the Amazons, were the cauſe that the relation of this Jeſuit was ſuppreſſed; for, as it could not be of any advantage to the Spaniards, they were afraid it might prove of great ſervice to the Portugueſe. The copies of this work became extremely ſcarce, ſo that the publiſhers of the French tranſlation at Paris aſſerted, that there was not one copy of the original extant, excepting one in the poſſeſſion of the tranſlator, and perhaps that in the Vatican library. M. de Gomberville was the author of this tranſlation: it was publiſhed after his death, with a long diſſertation. An account of the original may be ſeen in the Paris Journal, in that of Leipſic, and in Cheverau's Hiſtory of the World.

ACUPUNCTURE, the name of a ſurgical operation among the Chineſe and Japaneſe, which is performed by pricking the part affected with a ſilver needle. They employ this operation in headachs, lethargies, convulſions, colics, &c.

ACUS, in *Ichthyology*, the trivial name of a ſpecies of ſyngnathus. See SYNGNATHUS.

ACUSIO COLONIA, now ANCONE, according to Holſtenius, between Orange and Valence, near Montelimart, on the banks of the Rhone.

ACUTE, an epithet applied to ſuch things as terminate in a ſharp point or edge. And in this ſenſe it ſtands oppoſed to obtuſe.

ACUTE Angle, in *Geometry*, is that which is leſs than a right angle, or which does not ſubtend 90 degrees.

ACUTE-angled Triangle, is a triangle whoſe three angles are all acute.

ACUTE-angled Cone, is, according to the ancients, a right cone, whoſe axis makes an acute angle with its ſide.

ACUTE, in *Muſic*, is applied to a ſound or tone that is ſharp or high in compariſon of ſome other tone. In this ſenſe, *acute* ſtands oppoſed to *grave*.

ACUTE Accent. See ACCENT.

ACUTE Diſeaſes, ſuch as come ſuddenly to a criſis. This term is uſed for all diſeaſes which do not fall under the head of chronic diſeaſes.

ACUTIATOR, in writers of the barbarous ages, denotes a perſon that whets or grinds cutting inſtruments; called alſo in ancient gloſſaries *acutor*, *ακονητης*, *famiarius*, *coharius*, &c. In the ancient armies there were acutiatores, a kind of ſmiths, retained for whetting or keeping the arms ſharp.

AD, a Latin prepoſition, originally ſignifying *to*, and frequently uſed in compoſition both with and without the *d*, to expreſs the relation of one thing to another.

AD Beſtias, in antiquity, is the puniſhment of criminals condemned to be thrown to wild beaſts.

AD Hominem, in *Logic*, a kind of argument drawn from the principles or prejudices of thoſe with whom we argue.

AD Ludos, in antiquity, a ſentence upon criminals among the Romans, whereby they were condemned to entertain the people by fighting either with wild beaſts or with one another, and thus executing juſtice upon themſelves. Adage || Adam.

AD Metalla, in antiquity, the puniſhment of ſuch criminals as were condemned to the mines, among the Romans; and therefore called *Metallici*.

AD Valorem, a term chiefly uſed in ſpeaking of the duties or cuſtoms paid for certain goods: The duties on ſome articles are paid by the number, weight, meaſure, tale, &c.; and others are paid *ad valorem*, that is, according to their value.

ADAGE, a proverb, or ſhort ſentence, containing ſome wiſe obſervation or popular ſaying. Eraſmus has made a very large and valuable collection of the Greek and Roman adages; and Mr Ray has done the ſame with regard to the Engliſh. We have alſo Kelly's Collection of Scots Proverbs.

ADAGIO, in *Muſic*. Adverbially, it ſignifies *ſoftly*, *leiſurely*: and is uſed to denote the ſloweſt of all times. Uſed ſubſtantively, it ſignifies a ſlow movement. Sometimes this word is repeated, as *adagio*, *adagio*, to denote a ſtill greater retardation in the time of the muſic.

ADALIDES, in the Spaniſh policy, are officers of juſtice, for matters touching the military forces. In the laws of King Alphonſus, the adalides are ſpoken of as officers appointed to guide and direct the marching of the forces in time of war. Lopez repreſents them as a ſort of judges, who take cognizance of the differences riſing upon excurſions, the diſtribution of plunder, &c.

ADAM, the firſt of the human race, was formed by the Almighty on the ſixth day of the creation. His body was made of the duſt of the earth: after which, God animated or gave it life, and Adam then became a rational creature. His heavenly Parent did not leave his offspring in a deſtitute ſtate to ſhift for himſelf; but planted a garden, in which he cauſed to grow not only every tree that was proper for producing food, but likewiſe ſuch as were agreeable to the eye, or merely ornamental. In this garden were aſſembled all the brute creation; and, by their Maker, cauſed to paſs before Adam, who gave all of them names, which were judged proper by the Deity himſelf.—In this review Adam found none for a companion to himſelf. This ſolitary ſtate was ſeen by the Deity to be attended with ſome degree of unhappineſs; and therefore he threw Adam into a deep ſleep, in which condition he took a rib from his ſide, and healing up the wound formed a woman of the rib he had taken out. On Adam's awaking, the woman was brought to him; and he immediately knew her to be one of his own ſpecies, called her his bone and his fleſh, giving her the name of *woman* becauſe ſhe was taken out of man.

The firſt pair being thus created, God gave them authority over the inferior creation, commanding them to ſubdue the earth, alſo to increaſe and multiply and fill it. They were informed of the proper food for the beaſts and for them; the graſs, or green herbs, being appointed for beaſts; and fruits, or ſeeds, for man. Their proper employment alſo was aſſigned them; namely, *to dreſs the garden, and to keep it*.

Though Adam was thus highly favoured and inſtructed by his Maker, there was a ſingle tree, which grew in

Adam. in the middle of the garden, of the fruit of which they were not allowed to eat; being told, that they ſhould ſurely die in the day they ate of it. This tree was named *the Tree of the Knowledge of Good and Evil*. This prohibition, however, they ſoon broke through. The woman having entered into converſation with *the Serpent*, was by him perſuaded, that by eating of the tree ſhe ſhould become as wiſe as God himſelf: and accordingly, being invited by the beauty of the fruit, and its deſirable property of imparting wiſdom, ſhe plucked and eat; giving her huſband of it at the ſame time, who did likewiſe eat.

Before this tranſgreſſion of the divine command, Adam and his wife had no occaſion for clothes, neither had they any ſenſe of ſhame; but immediately on eating the forbidden fruit, they were aſhamed of being naked, and made aprons of fig leaves for themſelves. On hearing the voice of God in the garden, they were terrified, and hid themſelves: but being queſtioned by the Deity, they confeſſed what they had done, and received ſentence accordingly; the man being condemned to labour; the woman to ſubjection to her huſband, and to pain in child-bearing. They were now driven out of the garden, and their acceſs to it prevented by a terrible apparition. They had clothes given them by the Deity made of the ſkins of beaſts. In this ſtate Adam had ſeveral children; the names of only three of whom we are acquainted with, viz. Cain, Abel, and Seth. He died at the age of 930 years.

Theſe are all the particulars concerning Adam's life, that we have on divine authority: but a vaſt multitude of others are added by the Jews, Mahometans, and Papiſts; all of which muſt be at beſt conjectural; moſt of them, indeed, appear downright falſehoods or abſurdities. The curioſity of our readers, it is preſumed, will be ſufficiently gratified by the few which are here ſubjoined.

According to the Talmudiſts, when Adam was created, his body was of immenſe magnitude. When he ſinned, his ſtature was reduced to a hundred ells, according to ſome; to nine hundred cubits, according to others; who think this was done at the requeſt of the angels, who were afraid of ſo gigantic a creature. In the iſland of Ceylon is a mountain, called the *Peak* or mountain of Adam, from its being, according to the tradition of the country, the reſidence of our firſt parents. Here the print of his footſteps, above two palms in length, are ſtill pointed out.

Many reveries have been formed concerning the perſonal beauty of Adam. That he was a handſome well-ſhaped man is probable; but ſome writers, not content with this, affirm, that God, intending to create man, clothed Himſelf with a perfectly beautiful human body, making this his model in the formation of the body of Adam.

Nor has the imagination been leſs indulged concerning the formation of the human ſpecies male and female.—It would be endleſs to recount all the fancies that have been wrote on this ſubject; but as Madame Bourignon has made a conſiderable figure in the *religious*, or rather *ſuperſtitious*, world, we cannot help inſerting ſome of her opinions concerning the firſt man, which are peculiarly marvellous. According to the *revelations* of this lady, Adam before his fall poſſeſſed in himſelf the principles of both ſexes, and the virtue or power of producing his like, without the concurrent aſſiſtance of woman. The diviſion into two ſexes, ſhe imagined *, was a conſequence of man's ſin; and now, ſhe obſerves, mankind are become ſo many *monſters in nature*, being much leſs perfect in this reſpect than plants or trees, which are capable of producing their like alone, and without pain or miſery. She even imagined, that, being in an ecſtacy, ſhe ſaw the figure of Adam before he fell, with the manner how, by himſelf, he was capable of procreating other men. "God," ſays ſhe, "repreſented to my mind the beauty of the firſt world, and the manner how he had drawn it from the chaos: every thing was bright, tranſparent, and darted forth life and ineffable glory. The body of Adam was purer and more tranſparent than cryſtal, and vaſtly fleet; through this body were ſeen veſſels and rivulets of light, which penetrated from the inward to the outward parts, through all his pores. In ſome veſſels ran fluids of all kinds and colours, vaſtly bright, and quite diaphanous. The moſt ravithing harmony aroſe from every motion; and nothing reſiſted, or could annoy him. His ſtature was taller than the preſent race of men; his hair was ſhort, curled, and of a colour inclining to black; his upper lip covered with ſhort hair: and inſtead of the beſtial parts which modeſty will not allow us to name, he was faſhioned as our bodies will be in the life eternal, which I know not whether I dare reveal. In that *region* his noſe was formed after the manner of a *face*, which diffuſed the moſt delicious fragrancy and perfumes; whence alſo men were to iſſue, all whoſe principles were inherent in him: there being in his belly a veſſel, where little eggs were formed; and a ſecond veſſel filled with a fluid, which impregnated thoſe eggs: and when man heated himſelf in the love of God, the deſire he had that other creatures ſhould exiſt beſides himſelf, to praiſe and love God, cauſed the fluid above mentioned (by means of the fire of the love of God), to drop on one or more of theſe eggs, with inexpreſſible delight; which being thus impregnated, iſſued, ſome time after, out of man, by this canal †, in the ſhape of an egg, whence a perfect man was hatched by inſenſible degrees. Woman was formed by taking out of Adam's ſides the veſſels that contained the eggs; which the ſtill poſſeſſes, as is diſcovered by anatomiſts."

Many others have believed, that Adam at his firſt creation was both male and female: others, that he had two bodies joining together at the ſhoulders, and their faces looking oppoſite ways like thoſe of Janus. Hence, ſay theſe, when God created Eve, he had no more to do than to ſeparate the two bodies from one another ‡. Of all others, however, the opinion of Paracelſus ſeems the moſt ridiculous ||. *Negabat primos parentes ante lapſum habuiſſe partes generationi hominis neceſſarias; credebat poſtea acceſſiſſe, ut ſtruman gutturi.*

Extravagant things are aſſerted concerning Adam's knowledge. It is very probable that he was inſtructed by the Deity how to accompliſh the work appointed him, viz. to dreſs the garden, and keep it from being deſtroyed by the brute creatures; and it is alſo probable that he had likewiſe every piece of knowledge communicated to him that was either neceſſary or pleaſing: but that he was acquainted with geometry, mathematics, rhetoric, poetry, painting, ſculpture, &c. is too ridiculous to be credited by any ſober perſon. Some rabbies,

Adam.

* Preface to a book, entitled *Le nouveau Ciel et la nouvelle Terre*, Amſt. 1679.

† *I.e.* the *naſal* canal ſituated as above deſcribed.

‡ See *Androgynes.*

|| Paracelſus *apud* Voſſium *de Philoſophia*, c. ix. p. 71.

Adam. rabbies, indeed, have contented themſelves with equalling Adam's knowledge to that of Moſes and Solomon; while others, again, have maintained that he excelled the angels themſelves. Several Chriſtians ſeem to be little behind theſe Jews in the degree of knowledge they aſcribe to Adam, nothing being hid from him, according to them, except contingent events relating to futurity. One writer indeed (Pinedo) excepts politics; but a Carthuſian friar, having exhauſted in favour of Ariſtotle, every image and compariſon he could think of, at laſt aſſerted that Ariſtotle's knowledge was as extenſive as that of *Adam*.—In conſequence of this ſurpriſing knowledge with which Adam was endued, he is ſuppoſed to have been a conſiderable author. The Jews pretend that he wrote a book on the creation, and another on the Deity. Some rabbies aſcribe the 92d pſalm to Adam; and in ſome manuſcripts the Chaldee title of this pſalm expreſsly declares that this is the ſong of praiſe which the firſt man repeated for the Sabbath day.

Various conjectures have been formed concerning the place where man was firſt created, and where the garden of Eden was ſituated; but none of theſe have any ſolid foundation. The Jews tell us, that Eden was ſeparated from the reſt of the world by the ocean; and that Adam, being baniſhed therefrom, walked acroſs the ſea, which he found every way fordable, by reaſon of his enormous ſtature *. The Arabians imagined paradiſe to have been in the air; and that our firſt parents were thrown down from it on their tranſgreſſion, as Vulcan is ſaid to have been thrown down headlong from heaven by Jupiter.

* This is juſt the picture of the Orion or Polyphemus of the poets. *Æneid.* iii. 663, 664. x. 763.

Strange ſtories are told concerning Adam's children. That he had none in the ſtate of innocence, is certain from Scripture; but that his marriage with Eve was not conſummated till after the fall, cannot be proved from thence. Some imagine, that, for many years after the fall, Adam denied himſelf the connubial joys by way of penance; others, that he cohabited with another woman, whoſe name was LILLITH. The Mahometans tell us, that our firſt parents having been thrown headlong from the celeſtial paradiſe, Adam fell upon the iſle of Serendib, or Ceylon, in the Eaſt Indies; and Eve on Iodda, a port of the Red ſea, not far from Mecca. After a ſeparation of upwards of 200 years, they met in Ceylon, where they multiplied: according to ſome Eve had twenty, according to others only eight, deliveries; bringing forth at each time twins, a male and a female, who afterwards married. The rabbins imagine that Eve brought forth Cain and Abel at a birth; that Adam wept for Abel a hundred years in the valley of tears near Hebron, during which time he did not cohabit with his wife; and that this ſeparation would probably have continued longer, had it not been forbid by the angel Gabriel. The inhabitants of Ceylon affirm, that the ſalt lake on the mountain of Colombo conſiſts wholly of the tears which Eve for one hundred years together ſhed becauſe of Abel's death.

Some of the Arabians tell us, that Adam was buried near Mecca on Mount Abukobeis; others, that Noah, having laid his body in the ark, cauſed it to be carried after the deluge to Jeruſalem by Melchiſedeck the ſon of Shem: of this opinion are the eaſtern Chriſtians; but the Perſians affirm that he was interred in the iſle of Serendib, where his corpſe was guarded by lions at the time the giants warred upon one another. Adam.

St Jerome imagined that Adam was buried at Hebron; others, on Mount Calvary. Some are of opinion that he died on the very ſpot where Jeruſalem was afterwards built; and was buried on the place where Chriſt ſuffered, that ſo his bones might be ſprinkled with the Saviour's blood.

ADAM, *Melchior*, lived in the 17th century. He was born in the territory of Grotkaw in Sileſia, and educated in the college of Brieg, where the dukes of that name, to the utmoſt of their power, encouraged learning and the reformed religion as profeſſed by Calvin. Here he became a firm Proteſtant; and was enabled to purſue his ſtudies by the liberality of a perſon of quality, who had left ſeveral exhibitions for young ſtudents. He was appointed rector of a college at Heidelberg, where he publiſhed his firſt volume of illuſtrious men in the year 1615. This volume, which conſiſted of philoſophers, poets, writers on polite literature, and hiſtorians, &c. was followed by three others: that which treated of divines was printed in 1619; that of the lawyers came next; and, finally, that of the phyſicians: the two laſt were publiſhed in 1620. All the learned men, whoſe lives are contained in theſe four volumes, lived in the 16th, or beginning of the 17th century, and are either Germans or Flemings; but he publiſhed in 1618 the lives of twenty divines of other countries in a ſeparate volume. All his divines are Proteſtants. The Lutherans were not pleaſed with him, for they thought him partial; and will not allow his work to be a proper ſtandard of the learning of Germany. He was the author of ſeveral other works beſides his lives. His induſtry as a biographer is commended by Bayle, who acknowledges his obligations to his labours. He died in 1622.

ADAM, *Robert*, an eminent architect, was born at Edinburgh in the year 1728. He was the ſecond ſon of William Adam, Eſq. of Maryburgh, in the county of Fife, who has alſo left ſome reſpectable ſpecimens of his genius and abilities as an architect in Hopetoun houſe, and the Royal Infirmary of Edinburgh, which were erected from deſigns executed by him. And it was perhaps owing to the fortunate circumſtance of his father's example that young Adam firſt directed his attention to thoſe ſtudies, in the proſecution of which he afterwards roſe to ſuch diſtinguiſhed celebrity. He received his education at the univerſity of Edinburgh, where he had an opportunity of improving and enlarging his mind, by the converſation and acquaintance of ſome of the firſt literary characters of the age who were then riſing into reputation, or have ſince eſtabliſhed their fame as hiſtorians and philoſophers. Among theſe were Mr Hume, Dr Robertſon, Dr Smith, and Dr Ferguſon, who were the friends and companions of the father, and who continued through life their friendſhip and attachment to the ſon.

In the year 1754 Mr Adam travelled to the continent, with a view to extend his knowledge and improve his taſte in architecture, and reſided in Italy for three years. Here he ſurveyed and ſtudied thoſe noble ſpecimens of ancient grandeur which the magnificent public edifices of the Romans, even in ruins, ſtill exhibit. But he ſaw with regret, that the public buildings, conſtructed with more durable materials and

Adam. greater ſtrength and ſolidity, had alone been able to reſiſt, during the lapſe of ages, the injuries of time, and the more deſtructive hand of the northern barbarians, whoſe progreſs was marked with ruin and deſolation. Not a veſtige of any of the private buildings of the wealthy citizens, which have been deſcribed and celebrated by their writers for their magnificence, now remains; and even the ſituation of ſome of the ſplendid villas of the luxurious Romans is ſcarcely known. In tracing the progreſs of architecture and the other fine arts among the Romans, Mr Adam obſerved that they had viſibly declined previous to the time of Diocleſian; but he was alſo convinced that the liberal patronage and magnificence of that emperor had revived during his reign a better taſte for architecture, and had formed artiſts who were capable of imitating the more elegant ſtile of a purer age. He had ſeen this remarkably exemplified in the public baths at Rome, which were erected by him, the moſt entire and the nobleſt of the ancient buildings. Admiring the extent and fertility of genius of the artiſts, from whoſe deſigns ſuch magnificent ſtructures had been executed, he was anxious to ſee and ſtudy any remains that yet exiſted of thoſe maſters whoſe works are ſtriking monuments of an elegant and improved taſte, but whoſe names, amid the wrecks of time, have ſunk into oblivion. It was with this view that he undertook a voyage to Spalatro, in Dalmatia, to viſit and examine the private palace of Diocleſian, in which that emperor reſided for nine years previous to his death, and to which he retired in the year 305, when he reſigned the government of the empire. Mr Adam ſailed from Venice in July 1754, accompanied by M. Cleriſſeau, a French artiſt and antiquarian, and two experienced draughtſmen. On their arrival at Spalatro, they found that though the palace had ſuffered much from the injuries of time, yet it had ſuſtained no leſs from the dilapidations of the inhabitants to procure materials for building, and even the foundations of the ancient ſtructure were covered with modern houſes. With high expectations of ſucceſs, they commenced their labours, but were ſoon interrupted by the jealous vigilance of the government. Suſpecting that their object was to view and make plans of the fortifications, an immediate and peremptory order was iſſued by the governor, commanding them to deſiſt. This order, however, was ſoon counteracted through the mediation of General Græme, the commander in chief of the Venetian forces; and they were permitted to proceed in their undertaking. They reſumed their labours with double ardour, and in five weeks finiſhed plans and views of the fragments which remain, from which they were enabled to execute perfect deſigns of the entire building.

Mr Adam now returned to England, and ſoon roſe to very conſiderable profeſſional eminence. In 1762 he was appointed architect to the king, and the year following he preſented to the public the fruit of his voyage to Spalatro, in a ſplendid work dedicated to his majeſty, which contains engravings and deſcriptions of the ruins of the palace. A later traveller, the Abbé Fortis, ſpeaking of the ruins of this palace, ſays, "I will not pretend to mention the great Roman remains, for which this noble city is chiefly known and celebrated. The lovers of architecture and antiquity are ſufficiently acquainted with them by the work of Mr Adam, who has done full juſtice to theſe ſuperb veſtiges by his elegant drawings and engravings. In general, however, the coarſeneſs of the work, and the bad taſte of the age are equal to the magnificence of the buildings. For all this, I do not mean to detract from the merit of the auguſt remains of Diocleſian's palace. I count them among the moſt reſpectable monuments of antiquity now extant." And the hiſtorian of the Decline and Fall of the Roman Empire, in conſequence of this obſervation, after having expreſſed a high commendation of the work, has thrown out a ſuſpicion of the accuracy of the repreſentations and deſcriptions. "For the account of Diocleſian's palace, ſays Mr Gibbon, we are indebted to an ingenious artiſt of our own time and country, whom a very liberal curioſity had carried into the heart of Dalmatia. But there is room to ſuſpect that the elegance of his deſigns and engravings has ſomewhat flattered the objects which it was their purpoſe to repreſent. We are informed by a more recent and very judicious traveller, that the awful ruins of Spalatro are not leſs expreſſive of the decline of the arts, than of the greatneſs of the Roman empire in the time of Diocleſian." Mr Gibbon's criticiſm is ſcarcely ſupported by the obſervation of the Abbé Fortis; and what the latter has advanced on this ſubject is not perfectly conſiſtent with itſelf: for while he cenſures the coarſeneſs of the work and the bad taſte of the age, he beſtows ſomething like indirect praiſe, when he adds that, he means not to detract from the merit of the auguſt remains of this edifice, and regards it as one of the moſt reſpectable monuments of antiquity now extant. The apparent coarſeneſs of the work is probably owing to the effects of the weather, which have deſtroyed the ſmooth poliſh of the chiſſel which it originally received; and Mr Adam allows, that, previous to this period of the Roman empire, the arts had viſibly declined, but at the ſame time contends, that the buildings erected in the reign of Diocleſian, exhibit convincing proofs of the ſtile and manner of a purer age. But of this, the admirer of this elegant art may judge for himſelf, by conſulting the engravings and deſcriptions, the accuracy and faithfulneſs of which there ſeems to be no reaſon to doubt. Adam.

In the year 1768 Mr Adam obtained a ſeat in parliament. He was choſen to repreſent the county of Kinroſs; and about the ſame time he reſigned his office of architect to the king. But he continued his profeſſional career with increaſing reputation: and about the year 1773, in conjunction with his brother James, who alſo roſe to conſiderable eminence as an architect, he publiſhed another ſplendid work, conſiſting of plans and elevations of public and private buildings which were erected from their deſigns. Among theſe are Lord Mansfield's houſe at Caenwood, Luton houſe in Bedfordſhire belonging to Lord Bute, the new Gateway of the Admiralty Office, the Regiſter Office at Edinburgh &c. which are univerſally admired as precious monuments of elegant deſign and correct taſte. The Adelphi buildings at London, which are alſo ſtriking examples of the inventive genius of the Meſſrs Adam, proved an unſucceſsful ſpeculation. The wealth and power of a nation were perhaps only equal to ſo extenſive an undertaking: it was too great to be attempted by private citizens.

The buildings which have been more lately erected from

Adam. from the designs of Mr Adam, afford additional proofs of the unlimited extent of his invention, and the amazing fertility of his genius. Those parts of the new University of Edinburgh which have been completed, and the Infirmary at Glasgow, need only be mentioned in proof of our remark. The latter edifice we have often beheld and contemplated with those feelings of admiration, elevated to a kind of rapturous enthusiasm, which the rare union of perfect symmetry and elegant disposition of parts combined with inexpressible beauty and lightness into one whole seldom fails to inspire. We have also seen and admired elegant designs executed by Mr Adam, which were intended for the South Bridge and South Bridge Street of Edinburgh, and if they had been adopted, would have added much to the decoration of that quarter of the town; but being considered unsuitable to the taste or economy of the times, they were rejected.

Strange incongruities appear in buildings which have been erected from designs by Mr Adam. But of these it must be observed, that they have been altered and mutilated in the execution, according to the capricious fancy and vulgar taste of the owners; and it is well known that a slight deviation changes the character and mars the effect of the general design. A lady of rank was furnished by Mr Adam with a design of a house, which, after being executed, he was astonished to find out of all proportion. On inquiring the cause, he was informed that the pediment which he had designed would not admit a piece of rude sculpture which represented the arms of the family, and by the date which it bore incontestably proved its antiquity. It was therefore absolutely necessary to enlarge the dimensions of the pediment, to receive this ancient badge of family honour, and sacrifice the beauty and proportion of the whole building. We have seen a large public edifice which was also designed by Mr Adam; but when it was erected, the length was curtailed of the space of two windows, while the other parts remained according to the original plan. It now presents a heavy unsightly pile, instead of that elegance of proportion and correctness of style which the faithful execution of Mr Adam's design would have probably exhibited.

To the last period of his life, Mr Adam displayed an increasing vigour of genius and refinement of taste; for, in the space of one year preceding his death, he designed eight great public works, besides twenty-five private buildings, so various in their style, and beautiful in their composition, that they have been allowed by the best judges, sufficient of themselves to establish his fame unrivalled as an artist. The present improved taste, which now pretty generally prevails in our public and private edifices, undoubtedly owes much to the elegant and correct style introduced by Mr Adam. His fertile genius was not confined merely to the external decoration of buildings; it displayed itself with equal effect in the internal arrangement and disposition of the apartments, and in the varied, elegant, and beautiful ornaments of chimney pieces and ceilings. But not only did he introduce a total change in the architecture of the country, the manufactures also which are in any way connected with decoration, experienced a considerable degree of improvement by the exercise of his inventive powers. His talents extended beyond the line of his own profession; he displayed in his numerous drawings in landscape, a luxuriance of composition, and an effect of light and shadow which have rarely been equalled. Adam || Adami.

He died on the 3d of March 1792, by the bursting of a blood vessel, in the 64th year of his age, and was buried in Westminster Abbey. His funeral was attended by a select number of friends, some of them of distinguished rank, who esteemed him while living, and who wished to express this last mark of regard. The many elegant buildings, public and private, erected in various parts of the kingdom, from the designs of Mr Adam, will remain lasting monuments of his taste and genius; and the natural suavity of his manners, joined to the excellence of his moral character, secured to him the affectionate regard of his friends, and the esteem of all who enjoyed his acquaintance.

James Adam, whom we have already mentioned as associated with his brother in many of his labours, died on the 20th October 1794.

Adam's Apple, a name given to a species of Citrus. See Botany *Index*.

Adam's Bridge, or *Rama's Bridge*, in *Geography*, a ridge of sands and rocks, extending across the north end of Manara gulf, from the island of that name, on the north-west coast of Ceylon, to Ramencote or Ramankoil island, off Raman point.

Adam's Needle. See Yucca, Botany *Index*.

Adam's Peak, a high mountain of the East Indies, in the island of Ceylon, on the top of which it is believed the first man was created. It is in the form of a sugar loaf, and terminates in a circular plain about 200 paces in diameter. The summit is covered with trees, and has a deep lake which supplies the principal rivers of the island. The mountain is seen at the distance of twenty leagues from sea. It is situated in N. Lat. 5. 55. E. Long. 80. 39. See Adam.

Adam, or Adom, a town in the Peræa or on the other side the Jordan, over against Jericho, where the Jordan began to be dried up on the passage of the Israelites, (Joshua).

ADAMA, or Admah, one of the towns that were involved in the destruction of Sodom; (Moses).

ADAMANT, a name sometimes given to the diamond. (See Diamond). It is likewise applied to the scoriæ of gold, the magnet, &c.

ADAMARA, in *Geography*, a district of Abyssinia, near the province of Waldubba, containing several considerable villages, that are inhabited by Mahometans; who by their number and strength contribute to the safety of the monks in that part of the country. It is so called from *Adama*, which in the Amharic dialect signifies *pleasant*, the name of an adjacent mountain. The river Anzo runs in a contiguous valley. (*Bruce's Travels*, 4to, vol. iii. p. 179.)

ADAMIC earth, a name given to common red clay, alluding to that species of earth of which the first man is supposed to have been made.

ADAMI pomum, in *Anatomy*, a protuberance in the fore-part of the throat, formed by the os hyoides. It is thought to be so called upon a strange conceit, that a piece of the forbidden apple, which Adam ate stuck by the way, and occasioned it.

ADAMITES,

Adamites || Adamſon.

ADAMITES, or ADAMIANS, in eccleſiaſtical hiſtory, the name of a ſect of ancient heretics, ſuppoſed to have been a branch of the Baſilidians and Carpocratians.

Epiphanius tells us, that they were called Adamites from their pretending to be re-eſtabliſhed in the ſtate of innocence, and to be ſuch as Adam was at the moment of his creation, whence they ought to imitate him in his nakedneſs. They rejected marriage; maintaining, that the conjugal union would never have taken place upon earth had ſin been unknown.

This obſcure and ridiculous ſect did not at firſt laſt long; but it was revived, with additional abſurdities, in the twelfth century, by one Tandamus, ſince known by the name of *Tanchelin*, who propagated his errors at Antwerp, in the reign of the emperor Henry V. He maintained, that there ought to be no diſtinction between prieſts and laymen, and that fornication and adultery were meritorious actions. Tanchelin had a great number of followers, and was conſtantly attended by 3000 of theſe profligates in arms. His ſect did not, however, continue long after his death; but another appeared under the name of *Turlupins*, in Savoy and Dauphiny, where they committed the moſt brutal actions in open day.

About the beginning of the fifteenth century, one Picard, a native of Flanders, ſpread theſe errors in Germany and Bohemia, particularly in the army of the famous Ziſca, notwithſtanding the ſevere diſcipline he maintained. Picard pretended that he was ſent into the world as a new Adam, to re-eſtabliſh the law of nature; and which, according to him, conſiſted in expoſing every part of the body, and having all the women in common. This ſect found alſo ſome partizans in Poland, Holland, and England: they aſſembled in the night; and it is aſſerted, that one of the fundamental maxims of their ſociety was contained in the following verſe:

Jura, perjura, ſecretum prodere noli.

ADAMS, in *Geography*, a townſhip of Berkſhire county, in the ſtate of Maſſachuſets in North America. It is 140 miles north weſt of Boſton, and contains 2040 inhabitants. In the northern part of this diſtrict, a ſtream called Hudſon's brook, has worn a channel through a ſtratum of white marble, and over the channel the rocks form a fine natural bridge, which is 12 or 15 feet long, 10 feet broad, and more than 60 feet above the water.

ADAMSHIDE, a diſtrict of the circle of Raſtenburg, belonging to the king of Pruſſia, which, with Dombroſken, was bought, in 1737, for 42,000 dollars.

ADAMSON, PATRICK, a Scottiſh prelate, archbiſhop of St Andrew's, was born in the year 1543 in the town of Perth, where he received the rudiments of his education; and afterwards ſtudied philoſophy, and took his degree of maſter of arts at the univerſity of St Andrew's. In the year 1566, he ſet out for Paris, as tutor to a young gentleman. In the month of June of the ſame year, Mary queen of Scots being delivered of a ſon, afterwards James VI. of Scotland and I. of England, Mr Adamſon wrote a Latin poem on the occaſion. In this poem he gave the prince the title of king of France and England, and this proof of his loyalty involved him in difficulties; for the French court was offended, and ordered him to be arreſted; and he was confined for ſix months. He was releaſed only through the interceſſion of Queen Mary, and ſome of the principal nobility, who intereſted themſelves in his behalf. As ſoon as he recovered his liberty, he retired with his pupil to Bourges. He was in this city during the maſſacre at Paris; and the ſame perſecuting ſpirit prevailing among the Catholics at Bourges as at the metropolis, he lived concealed for ſeven months in a public houſe, the maſter of which, upwards of 70 years of age, was thrown from the top thereof, and had his brains daſhed out, for his charity to heretics. Whilſt Mr Adamſon lay thus in his ſepulchre, as he called it, he wrote his Latin poetical verſion of the book of Job, and his Tragedy of Herod in the ſame language. In the year 1573, he returned to Scotland; and, having entered into holy orders, became miniſter of Pailley. In the year 1575, he was appointed one of the commiſſioners, by the general aſſembly, to ſettle the juriſdiction and policy of the church; and the following year he was named, with Mr David Lindſay, to report their proceedings to the earl of Morton, then regent. About this time the earl appointed him one of his chaplains; and, on the death of Biſhop Douglas, promoted him to the archiepiſcopal ſee of St Andrew's, a dignity which brought upon him great trouble and uneaſineſs: for now the clamour of the Preſbyterian party roſe very high againſt him, and many inconſiſtent abſurd ſtories were propagated concerning him. Soon after his promotion, he publiſhed his catechiſm in Latin verſe, a work highly approved even by his enemies; but, nevertheleſs, they ſtill continued to perſecute him with great violence. In 1578, he ſubmitted himſelf to the general aſſembly, which procured him peace but for a very little time; for the year following, freſh accuſations were brought againſt him. In the year 1582, being attacked with a grievous diſeaſe, in which the phyſicians could give him no relief, he happened to take a ſimple medicine from an old woman, which did him ſervice. The woman, whoſe name was Aliſon Pearſon, was thereupon charged with witchcraft, and committed to priſon, but eſcaped out of her confinement; however, about four years afterwards, ſhe was again found and burnt for a witch. In 1583, King James came to St Andrews; and the archbiſhop, being much recovered, preached before him, and diſputed with Mr Andrew Melvil, in preſence of his majeſty, with great reputation; which drew upon him freſh calumny and perſecution. The king, however, was ſo well pleaſed with him, that he ſent him ambaſſador to Queen Elizabeth, at whoſe court he reſided for ſome years. His conduct, during his embaſſy, has been variouſly reported by different authors. Two things he principally laboured, viz. the recommending the king his maſter to the nobility and gentry of England, and the procuring ſome ſupport for the epiſcopal party in Scotland. His eloquent preaching drew after him ſuch crowds of people, and raiſed in their minds ſuch a high idea of the young king his maſter, that Queen Elizabeth forbade him to enter the pulpit during his ſtay in her dominions. In 1584, he was recalled, and ſat in the parliament held in Auguſt at Edinburgh. The Preſbyterian party was ſtill very violent againſt the archbiſhop. A provincial ſynod was held at St Andrew's in April 1586: the archbiſhop

Adamſon.

Adamſon || Adanſon.

biſhop was here accuſed and excommunicated: he appealed to the king and the ſtates, but this availed him little; for the mob being excited againſt him, he durſt ſcarcely appear in public. At the next general aſſembly, a paper being produced, containing the archbiſhop's ſubmiſſion, he was abſolved from the excommunication. In 1588, freſh accuſations were brought againſt him. The year following, he publiſhed the Lamentations of the prophet Jeremiah in Latin verſe; which he dedicated to the king, complaining of his hard uſage. In the latter end of the ſame year, he publiſhed a tranſlation of the Apocalypſe in Latin verſe; and a copy of Latin verſes, addreſſed alſo to his majeſty, deploring his diſtreſs. The king, however, was not moved by his application; for the revenue of his ſee was granted to the duke of Lennox; ſo that the prelate and his family were literally reduced to the want of bread. During the remaining part of his unfortunate life he was ſupported by charitable contribution, and he died in 1591. The character of this prelate has been variouſly repreſented, according to the ſentiments of religion and politics which prevailed. But there is little doubt that he encouraged and ſupported, under the authority of the king, oppreſſive and injurious meaſures. Bigotted and timid, he wanted that firmneſs and intrepidity, which promiſe ſteadineſs and uniformity of conduct in the conſpicuous characters of turbulent times. His learning was unqueſtioned; and he acquired great reputation as a popular preacher. In his adverſity he ſubmitted with pious reſignation to his hard fate. The panegyric of the editor of his works, Mr Wilſon, is extravagant and abſurd. He ſays, that "he was a miracle of nature, and rather ſeemed to be the immediate production of God Almighty, than born of a woman."

ADAMUS. The philoſopher's ſtone is ſo called by alchemiſts; they ſay it is an animal, and that it has carried its inviſible *Eve* in its body, ſince the moment they were united by the Creator.

ADANA, in *Geography*, a town of Aſia Minor, in Natolia, and in the province of Caramania. It is ſituated on the river Choquen; on the banks of which ſtands a ſmall but ſtrong caſtle built on a rock. It has a great number of beautiful fountains brought from the river by means of water-works. Over the river there is a ſtately bridge of fifteen arches, which leads to the water-works. The climate is pleaſant and healthy, and the winter mild and ſerene: but the ſummer is ſo hot as to oblige the principal inhabitants to retire to the neighbouring mountains, where they ſpend ſix months among ſhady trees and grottos, in a moſt delicious manner. The adjacent country is rich and fertile, and produces melons, cucumbers, pomegranates, pulſe, and herbs of all ſorts, all the year round; beſides corn, wine, and fruits in their proper ſeaſon. It is 30 miles north-eaſt of Tarſus, on the road to Aleppo. E. Long. 36. 12. N. Lat. 38. 10.

ADANSON, MICHAEL, a celebrated naturaliſt, was born at Aix in Provence in the year 1727. He was ſent to Paris in early life, and devoted his ſtudies with great aſſiduity to medicine, botany, and aſtronomy, and was a pupil of the celebrated Reaumur. He went to Senegal in the year 1738, where he remained ſix years examining the natural productions of that country. He preſented the fruits of his diſcoveries in geography and natural hiſtory to the Royal Academy; and in conſequence of theſe communications he was appointed one of their correſponding members. In the year 1759, on the death of Reaumur he was elected a member in his place; and about the ſame time he was admitted an honorary member of the Royal Society of London. Having ſpent ſix years in Senegal, he returned to Paris, where he publiſhed a work entitled, *Hiſtoire Naturelle du Senegal*, in 4to; and in 1763 his *Familles des Plantes*, 2 vols 8vo. In the year 1775 he preſented to the academy the plan of a natural hiſtory, which he did not live to execute. He died ſoon after; but the time of his death is not exactly known.

Adanſonia || Adder.

ADANSONIA, ETHIOPIAN SOUR-GOURD, MONKEYS BREAD, or AFRICAN CALABASH TREE. See BOTANY *Index*.

ADAR, the name of a Hebrew month, anſwering to the end of February and beginning of March, the 12th of their ſacred, and 6th of their civil year. On the 7th day of it, the Jews keep a faſt for the death of Moſes; on the 13th, they have the feaſt of Eſther: and on the 14th, they celebrate the feaſt of Purim, for their deliverance from Haman's conſpiracy. As the lunar year, which the Jews followed in their calculations, is ſhorter than the ſolar by about 11 days, which at the end of three years make a month, they then intercalate a 13th month, which they call *Veadar*, or the *ſecond Adar*.

ADARCE, a kind of concreted ſalts found on reeds and other vegetables, and applied by the ancients as a remedy in ſeveral cutaneous diſeaſes.

ADARCON, in Jewiſh antiquity, a gold coin mentioned in Scripture, worth about 15s. ſterling.

ADARME, in *Commerce*, a ſmall weight in Spain, which is alſo uſed at Buenos Ayres, and in all Spaniſh America. It is the 16th part of an ounce, which at Paris is called the *demi-gros*. But the Spaniſh ounce is ſeven per cent. lighter than that of Paris. Stephens renders it in Engliſh by a *drachm*.

ADATAIS, ADATSI, or ADATYS, in *Commerce*, a muſlin or cotton cloth, very fine and clear, of which the piece is ten French ells long, and three quarters broad. It comes from the Eaſt Indies; and the fineſt is made in Bengal.

ADCORDABILIS DENARII, in old law books, ſignify money paid by the vaſſal to his lord, upon the ſelling or exchanging of a fend.

ADCRESCENTES, among the Romans, denoted a kind of ſoldiery, entered in the army, but not yet put on duty; from theſe the ſtanding forces were recruited. See ACCENSI.

ADDA, in *Geography*, a river of Switzerland and Italy, which riſes in Mount Branlio, in the country of the Griſons, and, paſſing through the Valteline, traverſes the lake Como and the Milaneſe, and falls into the Po, near Cremona.

ADDEPHAGIA, in *Medicine*, a term uſed by ſome phyſicians, for gluttony, or a voracious appetite.

ADDER, in *Zoology*, a name for the VIPER. See COLUBER.

ADDER Bolts, or *Adder-flies*. See LIBELLULA.

Sea ADDER, the Engliſh name of a ſpecies of SYNGNATHUS.

Water ADDER, a name given to the COLUBER *Natrix*.

Adder || Addiſon.

Adder-ſtung, is uſed in reſpect of cattle, when ſtung by any kind of venomous reptiles, as adders, ſcorpions, &c. or bit by a hedgehog or ſhrew.—For the cure of ſuch bites, ſome uſe an ointment made of dragon's blood, with a little barley meal, and the whites of eggs.

Adder-Wort, or *Snakeweed*. See POLYGONUM.

ADDEXTRATORES, in the court of Rome, the pope's mitre-bearers, ſo called, according to Ducange, becauſe they walk at the pope's right hand when he rides to viſit the churches.

ADDICE, or ADZE, a kind of crooked axe uſed by ſhipwrights, carpenters, coopers, &c.

ADDICTI, in antiquity, a kind of ſlaves, among the Romans, adjudged to ſerve ſome creditor whom they could not otherwiſe ſatisfy, and whoſe ſlaves they became till they could pay or work out the debt.

ADDICTION, among the Romans, was the making over goods to another, either by ſale, or by legal ſentence; the goods ſo delivered were called *bona addicta*. Debtors were ſometimes delivered over in the ſame manner; and thence called *ſervi addicti*.

ADDICTIO IN DIEM, among the Romans, the adjudging a thing to a perſon for a certain price, unleſs by ſuch a day the owner, or ſome other, give more for it.

ADDISON, LANCELOT, ſon of Lancelot Addiſon a clergyman, was born in the pariſh of Croſby-Ravenſworth in Weſtmorland, in the year 1632. He was educated at Queen's College, Oxford; and at the reſtoration of King Charles II. accepted of the chaplainſhip of the garriſon of Dunkirk: but that fortreſs being delivered up to the French in 1662, he returned to England, and was ſoon after made chaplain to the garriſon of Tangier; where he continued ſeven years, and was greatly eſteemed. In 1670, he returned to England, and was made chaplain in ordinary to the king; but his chaplainſhip of Tangier being taken from him on account of his abſence, he found himſelf ſtraitened in his circumſtances, when he ſeaſonably obtained the rectory of Milſton in Wiltſhire, worth about 120l. per annum. He afterwards became a prebendary of Sarum; took his degree of doctor of divinity at Oxford; and in 1683 was made dean of Litchfield, and the next year archdeacon of Coventry. His life was exemplary; his converſation pleaſing, and greatly inſtructive; and his behaviour as a gentleman, a clergymen, and a neighbour, did honour to the place of his reſidence. He wrote, 1. A Short Narrative of the Revolutions of the Kingdoms of Fez and Morocco: 2. The preſent hiſtory of the Jews: 3. A Diſcourſe on Catechiſing: 4. A Modeſt Plea for the Clergy: 5. An Introduction to the Sacrament: 6. The firſt State of Mahometiſm: and ſeveral other pieces. This worthy divine died on the 20th of April 1703, and left three ſons: Joſeph, the ſubject of the next article; Gulſton, who died while governor of Fort St George; Lancelot, maſter of arts, and fellow of Magdalen college in Oxford: and one daughter, firſt married to Dr Sarte prebendary of Weſtminſter, and afterwards to Daniel Combes, Eſq.

ADDISON, *Joſeph*, the ſon of the preceding Dean Addiſon was born at Milſton, near Amesbury, in Wiltſhire, on the 11th of May 1672; and not being thought likely to live, was baptized the ſame day. He received the firſt rudiments of his education at the place of his nativity, under the reverend Mr Naiſh; but was ſoon removed to Saliſbury, under the care of Mr Taylor; and from thence to the Charter-houſe, where his acquaintance with Sir Richard Steele commenced. About the age of fifteen, he was entered at Queen's college, Oxford, where he applied very cloſely to the ſtudy of claſſical learning, in which he made a ſurpriſing proficiency. Addiſon.

In the year 1687, Dr Lancaſter, dean of Magdalen college, having, by chance, ſeen a Latin poem of Mr Addiſon's, was ſo pleaſed with it, that he immediately got him elected into that houſe, where he took up his degrees of bachelor and maſter of arts. His Latin pieces in the courſe of a few years, were exceedingly admired in both univerſities; nor were they leſs eſteemed abroad, particularly by the celebrated Boileau, who is reported to have ſaid, that he would not have written againſt Perrault, had he before ſeen ſuch excellent pieces by a modern hand. He publiſhed nothing in Engliſh before the twenty-ſecond year of his age; when there appeared a ſhort copy of verſes written by him, and addreſſed to Mr Dryden, which procured him great reputation from the beſt judges. This was ſoon followed by a tranſlation of the Fourth Georgic of Virgil, (omitting the ſtory of Ariſtæus), much commended by Mr Dryden. He wrote alſo the Eſſay on the Georgics, prefixed to Mr Dryden's tranſlation. There are ſeveral other pieces written by him about this time; amongſt the reſt, one dated the 3d of April 1694, addreſſed to H. S. that is, Dr Sacheverel, who became afterwards ſo famous, and with whom Mr Addiſon lived once in the greateſt friendſhip; but their intimacy was ſome time after broken off by their diſagreement in political principles. In the year 1695, he wrote a poem to King William on one of his campaigns, addreſſed to Sir John Somers lord keeper of the great ſeal. This gentleman received it with great pleaſure, took the author into the number of his friends, and beſtowed on him many marks of his favour.

Mr Addiſon had been cloſely preſſed, while at the univerſity, to enter into holy orders; and had once reſolved upon it: but his great modeſty, his natural diffidence, and an uncommonly delicate ſenſe of the importance of the ſacred function, made him afterwards alter his reſolution; and having expreſſed an inclination to travel, he was encouraged thereto by his patron above mentioned, who by his intereſt procured him from the crown a penſion of 300l. per annum to ſupport him in his travels. He accordingly made a tour to Italy in the year 1699; and, in 1701, he wrote a poetical epiſtle from Italy to the earl of Halifax, which has been univerſally eſteemed as a moſt excellent performance. It was tranſlated into Italian verſe by the abbot Antonio Maria Salvini, Greek profeſſor at Florence. In the year 1705, he publiſhed an account of his travels, dedicated to Lord Somers; which, though at firſt but indifferently received, yet in a little time met with its deſerved applauſe.

In the year 1702, he was about to return to England, when he received advice of his being appointed to attend Prince Eugene, who then commanded for the emperor in Italy; but the death of King William happening ſoon after, put an end to this affair as well as his penſion; and he remained for a conſiderable time unemployed.

Addiſon. employed. But an unexpected incident at once raiſed him, and gave him an opportunity of exerting his fine talents to advantage: for in the year 1704, the lord treaſurer Godolphin happened to complain to Lord Halifax, that the duke of Marlborough's victory at Blenheim had not been celebrated in verſe in the manner it deſerved; and intimated, that he would take in kindly, if his lordſhip, who was the known patron of the poets, would name a gentleman capable of doing juſtice to ſo elevated a ſubject. Lord Haliſax replied, ſomewhat haſtily, that he did know ſuch a perſon, but would not mention him; adding, that long had he ſeen, with indignation, men of no merit maintained in luxury at the public expence, whilſt thoſe of real worth and modeſty were ſuffered to languiſh in obſcurity. The treaſurer anſwered very coolly, that he was ſorry there ſhould be occaſion for ſuch an obſervation, but that he would do his endeavour to wipe off ſuch reproaches for the future; and he engaged his honour, that whoever his lordſhip named, as a perſon capable of celebrating this victory, ſhould meet with a ſuitable recompenſe. Lord Halifax thereupon named Mr Addiſon; inſiſting, however, that the treaſurer himſelf ſhould ſend to him: which he promiſed. Accordingly he prevailed on Mr Boyle (afterwards Lord Carlton) then chancellor of the exchequer, to make the propoſal to Mr Addiſon; which he did in ſo polite a manner, that our author readily undertook the taſk. The lord-treaſurer had a ſight of the piece, when it was carried no farther than the celebrated ſimile of the angel; and was ſo pleaſed with it, that he immediately appointed Mr Addiſon a commiſſioner of appeals, vacant by the promotion of Mr Locke, choſen one of the lords commiſſioners for trade. The Campaign is addreſſed to the duke of Marlborough; it gives a ſhort view of the military tranſactions in 1704, and contains a noble deſcription of the two great actions at Schellemberg and Blenheim. In 1705, he attended Lord Halifax to Hanover; and the enſuing year was appointed under ſecretary to Sir Charles Hedges ſecretary of ſtate; in which office he acquitted himſelf ſo well, that the earl of Sunderland, who ſucceeded Sir Charles in December, continued Mr Addiſon in his employment.

A taſte for operas beginning at this time to prevail in England, and many perſons having ſolicited Mr Addiſon to write one, he complied with their requeſt, and compoſed his Roſamond. This, however, whether from the defect of the muſic, or from the prejudices in favour of the Italian taſte, did not ſucceed upon the ſtage; but the poetry of it has been, and always will be juſtly admired. About this time, Sir Richard Steele compoſed his comedy of the Tender Huſband, to which Mr Addiſon wrote a prologue. Sir Richard ſurpriſed him with a dedication of this play, and acquainted the public, that he was indebted to him for ſome of the moſt excellent ſtrokes in the performance. The marquis of Wharton, being appointed lord lieutenant of Ireland in 1709, took Mr Addiſon with him as his ſecretary. Her majeſty alſo made him keeper of the records of Ireland, and, as a farther mark of her favour, conſiderably augmented the ſalary annexed to that place. Whilſt he was in this kingdom, the Tatler was firſt publiſhed; and he diſcovered his friend Sir Richard Steele to be the author, by an obſervation on Virgil, which he had communicated to him. He afterwards aſſiſted conſiderably in carrying on this paper, which the author acknowledges. The Tatler being laid down, the Spectator was ſet on foot, and Mr Addiſon furniſhed great part of the moſt admired papers. The Spectator made its firſt appearance in March 1711, and was brought to a concluſion in September 1712. Addiſon.

His celebrated Cato appeared in 1713. He formed the deſign of a tragedy upon this ſubject when he was very young, and wrote it when on his travels: he retouched it in England, without any intention of bringing it on the ſtage; but his friends being perſuaded it would ſerve the cauſe of liberty, he was prevailed on by their ſolicitations, and it was accordingly exhibited on the theatre, with a prologue by Mr Pope, and an epilogue by Dr Garth. It was received with the moſt uncommon applauſe, having run thirty-five nights without interruption. The Whigs applauded every line in which liberty was mentioned, as a ſatire on the Tories; and the Tories echoed every clap, to ſhow that the ſatire was unfelt. When it was printed, notice was given that the queen would be pleaſed if it was dedicated to her; "but as he had deſigned that compliment elſewhere, he found himſelf obliged," ſays Tickell, "by his duty on the one hand, and his honour on the other, to ſend it into the world without any dedication." It was no leſs eſteemed abroad, having been tranſlated into French, Italian, and German; and it was acted at Leghorn, and ſeveral other places, with vaſt applauſe. The Jeſuits of St Omers made a Latin verſion of it, and the ſtudents acted it with great magnificence.

About this time, another paper called the Guardian was publiſhed by Steele, to which Addiſon was a principal contributor. It was a continuation of the Spectator, and was diſtinguiſhed by the ſame elegance and the ſame variety; but, in conſequence of Steele's propenſity to politics, was abruptly diſcontinued in order to write the Engliſhman.

The papers of Addiſon are marked in the Spectator by one of the letters in the name of *Clio*, and in the Guardian by a *Hand*. Many of theſe papers were written with powers truly comic, with nice diſcrimination of characters, and accurate obſervation of natural or accidental deviations from propriety: but it was not ſuppoſed that he had tried a comedy on the ſtage, till Steele, after his death, declared him the author of "The Drummer." This, however, he did not know to be true by any cogent teſtimony: for when Addiſon put the play into his hands, he only told him it was the work of a gentleman in the company; when it was received, as is confeſſed, with cold diſapprobation, he was probably leſs willing to claim it. Tickell omitted it in his collection; but the teſtimony of Steele, and the total ſilence of any other claimant, has determined the public to aſſign it to Addiſon, and it is now printed with his other poetry. Steele carried "The Drummer" to the playhouſe, and afterwards to the preſs, and ſold the copy for 50 guineas. To Steele's opinion may be added the proof ſupplied by the play itſelf, of which the characters are ſuch as Addiſon would have delineated, and the tendency ſuch as Addiſon would have promoted.

It is ſaid that Mr Addiſon intended to have compoſed an Engliſh dictionary upon the plan of the Italian,

(Della

Addiſon. (Della Cruſca); but, upon the death of the queen, being appointed ſecretary to the lords juſtices, he had not leiſure to carry on ſuch a work. When the earl of Sunderland was appointed lord lieutenant of Ireland, Mr Addiſon was again made ſecretary for the affairs of that kingdom; and, upon the earl's being removed from the lieutenancy, he was choſen one of the lords of trade.

Not long afterwards an attempt was made to revive the Spectator, at a time indeed by no means favourable to literature, when the acceſſion of a new family to the throne filled the nation with anxiety, diſcord, and confuſion; and either the turbulence of the times or the fatiety of the readers put a ſtop to the publication, after an experiment of 80 numbers, which were afterwards collected into an eighth volume, perhaps more valuable than any of thoſe that went before it: Addiſon produced more than a fourth part.

In 1715, he began the Freeholder, a political paper, which was much admired, and proved of great uſe at that juncture. He publiſhed alſo, about this time, verſes to Sir Godfrey Kneller upon the king's picture, and ſome to the princeſs of Wales with the tragedy of Cato.

Before the arrival of King George he was made ſecretary to the regency, and was required by his office to ſend notice to Hanover that the queen was dead, and that the throne was vacant. To do this would not have been difficult to any man but Addiſon, who was ſo overwhelmed with the greatneſs of the event, and ſo diſtracted by choice of expreſſion, that the lords, who could not wait for the niceties of criticiſm, called Mr Southwell, a clerk in the houſe, and ordered him to deſpatch the meſſage. Southwell readily told what was neceſſary, in the common ſtyle of buſineſs, and valued himſelf upon having done what was too hard for Addiſon.

In 1716, he married the counteſs dowager of Warwick, whom he had ſolicited by a very long and anxious courtſhip. He is ſaid to have firſt known her by becoming tutor to her ſon. The marriage, if uncontradicted report can be credited, made no addition to his happineſs; it neither found them nor made them equal. She always remembered her own rank, and thought herſelf entitled to treat with very little ceremony the tutor of her ſon. It is certain that Addiſon has left behind him no encouragement for ambitious love. The year after, 1717, he roſe to his higheſt elevation, being made ſecretary of ſtate; but is repreſented as having proved unequal to the duties of his place. In the houſe of commons he could not ſpeak, and therefore was uſeleſs to the defence of the government. In the office he could not iſſue an order without loſing his time in queſt of fine expreſſions. At laſt, finding by experience his own inability for public buſineſs, he was forced to ſolicit his diſmiſſion, with a penſion of 1500l. a year. Such was the account of thoſe who were inclined to detract from his abilities; but by others his relinquiſhment was attributed to declining health, and the neceſſity of receſs and quiet.

In his retirement, he applied himſelf to a religious work *, which he had begun long before; part of which, ſcarce finiſhed, has been printed in his works. He intended alſo to have given an Engliſh paraphraſe of ſome of David's pſalms. But his ailments increaſed, and cut ſhort his deſigns. He had for ſome time been oppreſſed by an aſthmatic diſorder, which was now aggravated by a dropſy, and he prepared to die conformably to his precepts and profeſſions. He ſent, as Pope relates, a meſſage by the earl of Warwick to Mr Gay, deſiring to ſee him: Gay, who had not viſited him for ſome time before, obeyed the ſummons, and found himſelf received with great kindneſs. The purpoſe for which the interview had been ſolicited was then diſcovered: Addiſon told him, that he had injured him; but that, if he recovered, he would recompenſe him. What the injury was he did not explain, nor did Gay ever know: but ſuppoſed that ſome preferment deſigned for him had by Addiſon's intervention been withheld.—Another deathbed interview, of a more ſolemn nature, is recorded: Lord Warwick was a young man of very irregular life, and perhaps of looſe opinions. Addiſon, for whom he did not want reſpect, had very diligently endeavoured to reclaim him; but his arguments and expoſtulations had no effect: One experiment, however, remained to be tried. When he found his life near its end, he directed the young lord to be called; and when he deſired, with great tenderneſs, to hear his laſt injunctions, told him, "I have ſent for you that you may ſee how a Chriſtian can die." What effect this awful ſcene had on the earl's behaviour is not known: he died himſelf in a ſhort time. Having given directions to Mr Tickell for the publication of his works, and dedicated them on his deathbed to his friend Mr Craggs, he died June 17. 1719, at Hollandhouſe, leaving only one child, a daughter, by his marriage.

Addiſon's courſe of life before his marriage has been detailed by Pope. He had in the houſe with him Budgell, and perhaps Philips. His chief companions were Steele, Budgell, Philips, Carey, Davenant, and Colonel Brett. With one or other of theſe he always breakfaſted. He ſtudied all morning; then dined at a tavern, and went afterwards to Button's. From the coffeehouſe he went again to the tavern, where he often ſat late, and drank too much wine.

Dr Johnſon, in delineating the character of Addiſon, obſerves with Tickell, that he employed wit on the ſide of virtue and religion. He not only made the proper uſe of wit himſelf, but taught it to others; and from his time it has been generally ſubſervient to the cauſe of reaſon and truth. He has diſſipated the prejudice that had long connected gaiety with vice, and eaſineſs of manners with laxity of principles. He has reſtored virtue to its dignity, and taught innocence not to be aſhamed. This is an elevation of literary character, "above all Greek, above all Roman fame." No greater felicity can genius attain than that of having purified intellectual pleaſure, ſeparated mirth from indecency, and wit from licentiouſneſs; of having taught a ſucceſſion of writers to bring elegance and gaiety to the aid of goodneſs; and, to uſe expreſſions yet more awful, of having "turned many to righteouſneſs." As a deſcriber of life and manners, he muſt be allowed to ſtand perhaps the firſt of the firſt rank. His humour, which, as Steele obſerves, is peculiar to himſelf, is ſo happily diffuſed as to give the grace of novelty to domeſtic ſcenes and daily occurrences. He never "outſteps the modeſty of nature," nor raiſes merriment or wonder by the violation of truth.

* *Evidences of the Chriſtian Religion.*

Addiſon. truth. His figures neither divert by diſtortion, nor amaze by aggravation. He copies life with ſo much fidelity, that he can hardly be ſaid to invent; yet his exhibitions have an air ſo much original, that it is difficult to ſuppoſe them not merely the product of imagination. As a teacher of wiſdom he may be confidently followed. His religion has nothing in it enthuſiaſtic or ſuperſtitious; he appears neither weakly credulous nor wantonly ſceptical; his morality is neither dangerouſly lax nor impracticably rigid. All the enchantment of fancy and all the cogency of argument are employed to recommend to the reader his real intereſt, the care of pleaſing the Author of his being. Truth is ſhown ſometimes as the phantom of a viſion, ſometimes appears half-veiled in an allegory; ſometimes attracts regard in the robes of fancy, and ſometimes ſteps forth in the confidence of reaſon. She wears a thouſand dreſſes, and in all is pleaſing.

The doctor, however, has related the following anecdote, which every admirer of Addiſon, every man of feeling, muſt be reluctant to believe. "Steele (ſays the doctor), whoſe imprudence of generoſity, or vanity of profuſion, kept him always incurably neceſſitous, upon ſome preſſing exigence, in an evil hour; borrowed a hundred pounds of his friend, probably without much purpoſe of repayment; but Addiſon, who ſeems to have had other notions of a hundred pounds, grew impatient of delay, and reclaimed his loan by an execution. Steele felt, with great ſenſibility, the obduracy of his creditor; but with emotions of ſorrow rather than of anger." It is much to be wiſhed, ſays Dr Kippis, that Dr Johnſon had produced his authority for this narration. It is very poſſible, that it may be only a ſtory the doctor had ſomewhere heard in converſation, and which is entirely groundleſs: "and this I am the rather inclined to believe, as I have been aſſured, by one of the moſt reſpectable characters in the kingdom, that the fact hath no foundation in truth." Mr Potter, in a late publication, hath informed us, that he is told by the beſt authority that the ſtory is an abſolute falſehood.

Mr Tyers, in "A hiſtorical Eſſay on Mr Addiſon," printed, but not publiſhed, has mentioned ſome facts concerning him, with which we were not before acquainted. Theſe are, That he was laid out for dead as ſoon as he was born: that, when he addreſſed his verſes on the Engliſh poets to Henry Sacheverell, he courted that gentleman's ſiſter; that, whenever Jacob Tonſon came to him for the Spectator, Bayle's French Hiſtorical and Critical Dictionary lay always open before him: that, upon his return to England, after his travels, he diſcharged ſome old debts he had contracted at Oxford, with the generoſity of good intereſt: that he was put into plentiful circumſtances by the death of a brother in the Eaſt Indies: that, having received encouragement from a married lady, of whom he had been formerly enamoured, he had the integrity to reſiſt the temptation: that he refuſed a gratification of a three hundred pounds bank-note, and afterwards of a diamond-ring of the ſame value, from a Major Dunbar, whom he had endeavoured to ſerve in Ireland by his intereſt with Lord Sunderland: and that his daughter by Lady Warwick died a few years ago unmarried, reſiding at Bilton near Rugby, and poſſeſſing an income of more than twelve hundred a-year. Addiſon, Addition.

The following letter, which probably relates to the caſe of Major Dunbar, reflects great honour on Mr Addiſon's integrity. "*June* 26. 1715. SIR, I find there is a very ſtrong oppoſition formed againſt you; but I ſhall wait on my lord lieutenant this morning, and lay your caſe before him as advantageouſly as I can, if he is not engaged in other company. I am afraid what you ſay of his grace does not portend you any good. And now, Sir, believe me, when I aſſure you I never did, nor ever will, on any pretence whatſoever, take more than the ſtated and cuſtomary fees of my office. I might keep the contrary practice concealed from the world, were I capable of it, but I could not from myſelf; and I hope I ſhall always fear the reproaches of my own heart more than thoſe of all mankind. In the mean time, if I can ſerve a gentleman of merit, and ſuch a character as you bear in the world, the ſatisfaction I meet with on ſuch an occaſion is always a ſufficient, and the only reward to, Sir, your moſt obedient, humble ſervant, J. ADDISON."—The anecdote which follows was told by the late Dr Birch. Addiſon and Mr Temple Stanyan were very intimate. In the familiar converſations which paſſed between them, they were accuſtomed freely to diſpute each other's opinions. Upon ſome occaſion, Mr Addiſon lent Stanyan five hundred pounds. After this, Mr Stanyan behaved with a timid reſerve, deference, and reſpect; not converſing with the ſame freedom as formerly, or canvaſſing his friend's ſentiments. This gave great uneaſineſs to Mr Addiſon. One day they happened to fall upon a ſubject, on which Mr Stanyan had always been uſed ſtrenuouſly to oppoſe his opinion. But, even upon this occaſion, he gave way to what his friend advanced, without interpoſing his own view of the matter. This hurt Mr Addiſon ſo much, that he ſaid to Mr Stanyan, "Either contradict me, or pay me the money."

In Tickell's edition of Mr Addiſon's works there are ſeveral pieces hitherto unmentioned, viz. The Diſſertation on Medals; which, though not publiſhed till after his death, yet he had collected the materials, and began to put them in order, at Vienna, in 1702. A pamphlet, entitled, The preſent State of the War, and the Neceſſity of an Augmentation, conſidered. The late Trial and Conviction of Count Tariff. The Whig Examiner came out on the 14th of September 1716; there were five of theſe papers attributed to Mr Addiſon, and they are the ſevereſt pieces he ever wrote. He is ſaid alſo to have been the author of a performance entitled *Diſſertatio de inſignioribus Romanorum Poetis*, and of a Diſcourſe on Ancient and Modern Learning.

ADDITAMENT, ſomething added to another. Thus phyſicians call the ingredients added to a medicine already compounded, *additaments*.

ADDITION, is the joining together or uniting two or more things, or augmenting a thing by the acceſſion of others thereto.

ADDITION, in *Arithmetic*, *Algebra*, &c. See theſe articles.

ADDITION, in *Muſic*, a dot marked on the right ſide of a note, ſignifying that it is to be ſounded or lengthened

Addition || Adel.

ened half as much more as it would have been without such mark.

ADDITION, in *Law*, is that name or title which is given to a man over and above his proper name and surname, to show of what estate, degree, or mystery he is; and of what town, village, or country.

Additions of Estate, or *Quality*, are, Yeoman, Gentleman, Esquire, and such like.

Additions of Degree, are those we call names of dignity; as Knight, Lord, Earl, Marquis, and Duke.

Additions of Mystery, are such as Scrivener, Painter, Mason, and the like.

Additions of Place, are, of Thorp, of Dale, of Woodstock.—Where a man hath household in two places, he shall be said to dwell in both; so that his addition in either may suffice. Knave was anciently a regular addition. By Stat. 1. Hen. V. cap. 5. it was ordained, that in such suits or actions where process of outlawry lies, such addition should be made to the name of the defendant, to show his estate, mystery, and place where he dwells; and that the writs not having such additions should abate if the defendant take exception thereto; but not by the office of the court. The reason of this ordinance was, that one man might not be troubled by the outlawry of another; but by reason of the certain addition, every person might bear his own burden.

ADDITIONS, in distilling, a name given to such things as are added to the wash, or liquor, while in a state of fermentation, in order to improve the vinosity of the spirit, procure a larger quantity of it, or give it a particular flavour. All things, of whatever kind, thus added in the time of fermentation, are called by those of the business who speak most intelligently *additions*; but many confound them with things of a very different nature, under the name of *ferments*. See DISTILLING.

ADDITIONS, in *Heraldry*, some things added to a coat-of-arms, as marks of honour; and therefore directly opposite to abatements. Among additions we reckon BORDURE, QUARTER, CANTON, GYRON, PILE, &c. See these articles.

ADDRESS, in a general sense, is used for skill and good management, and of late has been adopted from the French. It is used also in commerce, as synonymous with direction to a person or place. The word is formed of the French verb, *addresser*, *To direct any thing to a person*.

ADDUCENT MUSCLES, or ADDUCTORS, in *Anatomy*, those muscles which pull one part of the body towards another. See ANATOMY, *Table of the Muscles*.

ADEB, in *Commerce*, the name of a large Egyptian weight, used principally for rice, and consisting of 210 okes, each of three rotolos, a weight of about two drams less than an English pound. But this is no certain weight; for at Rosetto the adeb is only 150 okes.

ADEL, a kingdom on the eastern coast of Africa, which reaches as far as the straits of Babelmandel, which unite the Red sea to the sea of Arabia. This country produces corn, and feeds a great number of cattle. The inhabitants carry on a trade in gold, silver, ivory, oil, frankincense, a sort of pepper, and other merchandises of Arabia and the Indies. The king was formerly a vassal to the grand negus of Abyssinia: but being Mahometans, and the Abyssinians a sort of Christians, they could not agree; and in 1535 came to an open rupture, when the Adelians threw off the yoke, seeking protection from the Grand Signior. The principal places are, Adela, seated in the centre of the country, and the town where the king resides: Zeila, near the Arabian sea, is a rich town, and has a good trade: Barbora, near the sea-coast, is an ancient trading town. It rains very seldom in this country.

Adelia || Aderno.

ADELIA. See BOTANY *Index*.

ADELME, or ALDHELM, son to Kenred, nephew to Ina king of the West Saxons, after having been educated abroad, was abbot of Malmsbury 30 years. He was the first Englishman who wrote in Latin, the first who brought poetry into England, and the first bishop of Sherburn. He lived in great esteem till his death, which happened in 709. He was canonized, and many miracles were ascribed to him. He is mentioned with great honour by Camden and Bayle, and his life was written by William of Malmsbury.

ADELPHIANI, in church history, a sect of ancient heretics, who fasted always on Sundays.

ADELSCALC, in ancient customs, denotes a servant of the king. The word is also written *adelscalche*, and *adelscalus*. It is compounded of the German *ancl*, or *edel*, "noble," and *scalc*, "servant." Among the Bavarians, *adelscalcs* appear to have been the same with royal *thanes* among the Saxons, and those called *ministri regis* in ancient charters.

ADEMPTION, in the *Civil Law*, implies the revocation of a grant, donation, or the like.

ADEN, formerly a rich and considerable town of Arabia the Happy. It is seated by the sea side, a little eastward of the straits of Babelmandel. N. Lat. 12. 40. E. Long. 46. 13.

ADENANTHERA, BASTARD FLOWER-FENCE. See BOTANY *Index*.

ADENBURG, or ALDENBURG, a town of Westphalia, and in the duchy of Burg, subject to the Elector Palatine. It is 12 miles north-east of Cologne, and 17 west of Bonn. E. Long. 7. 25. N. Lat. 51. 2.

ADENIA. See BOTANY *Index*.

ADENOGRAPHY, that part of anatomy which treats of the glandular parts. See ANATOMY.

ADENOIDES, glandulous, or of a glandular form; an epithet applied to the PROSTATÆ.

ADENOLOGY, the same with Adenography.

ADENOS, a kind of cotton; otherwise called *marine cotton*. It comes from Aleppo by the way of Marseilles, where it pays 20 per cent. duty.

ADEONA, in mythology, the name of a goddess invoked by the Romans when they set out upon a journey.

ADEPHAGIA, in mythology, the goddess of gluttony, to whom the Sicilians paid religious worship.

ADEPS, in *Anatomy*, the fat found in the abdomen. It also signifies animal fat of any kind.

ADEPTS, a term among alchemists for those who pretended to have found the panacea and philosophers stone. "Such is the nature, says Paracelsus, of this higher philosophy, that one mortal can no more communicate it to another, than the paper on which letters are traced can of itself declare their meaning. It originates not from man, but from heaven."

ADERBIJAN. See ADIRBEITSAN.

ADERNO, a small place in the Val di Demona in the

Ade || Adhoa.

the kingdom of Sicily. E. Long. 15. 25. N. Lat. 38. 5. Anciently ADRANUM, at the foot of Mount Gibel. The ruined walls of this ancient city ſtill exhibit an air of its former grandeur.

ADES, or HADES, denotes the inviſible ſtate. In the heathen mythology, it comprehends all thoſe regions that lie beyond the river Styx, viz. Erebus, Tartarus, and Elyſium. See HELL.

ADESSENARIANS, ADESSENARII, in church hiſtory, a ſect of Chriſtians who hold the real preſence of Chriſt's body in the euchariſt, though not by way of tranſubſtantiation. They differ conſiderably as to this preſence; ſome holding that the body of Chriſt is in the bread; others, that it is about the bread; and others that is under the bread.

ADFILIATION, a Gothic cuſtom, whereby the children of a former marriage are put upon the ſame footing with thoſe of the ſecond. This is alſo called *unio prolium*, and ſtill retained in ſome parts of Germany, though Heineccius obſerves that this is not adoption.

ADFINES, (Antonine), a town of Swiſſerland, ſuppoſed to be the modern *Pfin*, in the north of the diſtrict of Turgow, on the rivulet Thur, not far from the borders of Suabia, about half-way between Conſtance and Frauenfield. So called, becauſe when Cecinna, general of the emperor Vitellius, with the auxiliary Rhetians, defeated the Helvetii, the former extended their borders thus far, their territory ending here; and, in the time of the Romans, it was the laſt town in this quarter, and of ſome repute.

ADHA, a feſtival which the Mahometans celebrate on the 10th day of the month *Dhoulhegiat*, which is the 12th and laſt of their year. This month being particularly deſtined for the ceremonies which the pilgrims obſerve at Mecca, it takes its name from thence, for the word ſignifies *the month of Pilgrimage*. On that day they ſacrifice with great ſolemnity, at Mecca, and nowhere elſe, a ſheep, which is called by the ſame name as the feſtival itſelf. The Turks commonly call this feſtival the *Great Bairam*, to diſtinguiſh it from the leſſer, which ends their faſt, and which the Chriſtians of the Levant call the *Eaſter of the Turks*. The Mahometans celebrate this feſtival, out of the city of Mecca, in a neighbouring valley; and ſometimes they ſacrifice there a camel. See BAIRAM.

ADHATODA, in *Botany*. See JUSTICIA, BOTANY *Index*.

ACTION of ADHERENCE, in *Scots Law*; an action competent to a huſband or wife, to compel either party to adhere, in caſe of deſertion.

ADHESION, in a general ſenſe, implies the ſticking or adhering of bodies together.

ADHESION, in *Philoſophy*. See COHESION.

ADHESION, in *Anatomy*, a term for one part ſticking to another, which in a natural ſtate are ſeparate. For the moſt part, if any of thoſe parts in the thorax or belly lie in contact, and inflame, they grow together. The lungs very frequently adhere to the pleura.

ADHIL, in *Aſtronomy*, a ſtar of the ſixth magnitude, upon the garment of Andromeda, under the laſt ſtar in her foot.

ADHOA, in ancient cuſtoms, denotes what we otherwiſe call *relief*. In which ſenſe we ſometimes alſo find the word written *adoha*, *adhoamentum*, and *adhogamentum*. Adhoa || Adiantum

ADIANTUM, MAIDEN-HAIR; in *Botany*. See BOTANY *Index*. Adiantum || Adit.

ADIAPHORISTS, in church hiſtory, a name importing lukewarmneſs, given, in the 16th century, to the moderate Lutherans, who embraced the opinions of Melanchthon, whoſe diſpoſition was much more pacific than that of Luther.

ADJAZZO, ADRAZZO, or AJACCIO, in *Geography*, a handſome town and caſtle of Corſica in the Mediterranean, with a biſhop's ſee, and a good harbour. It is populous, and fertile in wine. It is 27 miles ſouth-weſt of Corte. E. Long. 41. 54. N. Lat. 38. 5.

ADJECTIVE, in *Grammar*, a kind of noun joined with a ſubſtantive, either expreſſed or implied, to denote its qualities or accidents. See GRAMMAR.

ADIGE, a river in Italy, which taking its riſe ſouth of the lake Glace among the Alps, runs ſouth by Trent, then eaſt by Verona in the territory of Venice, and falls into the gulf of Venice, north of the mouth of the Po.

ADJOURNMENT, the putting off a court, or other meeting, till another day. There is a difference between the adjournment and the prorogation of the parliament; the former not only being for a ſhorter time, but alſo done by the houſe itſelf; whereas the latter is an act of royal authority.

ADIPOCIRE, derived from *adeps*, fat, and *cera*, wax, denotes a ſubſtance which has been lately examined by chemiſts. It is formed by a certain change which the ſoft parts of animal bodies undergo, when kept for ſome time in running water, or when a great number of dead bodies are heaped together in the ſame place. Great quantities of this ſubſtance were found on removing the animal matters from the burial ground of the *Innocens* at Paris in the year 1787. In this burial-ground, 1200 or 1500 bodies were thrown together into the ſame pit, and being decompoſed, were converted into this ſubſtance. It has ſome of the properties of wax or ſpermaceti. See CHEMISTRY *Index*.

ADIPOSE, a term uſed by anatomiſts for any cell, membrane, &c. that is remarkable for its fatneſs.

ADIRBEITSAN, in *Geography*, a province of Perſia, in Aſia, and part of the ancient Media. It is bounded on the north by the province of Schirvan, on the ſouth by Irac-Agemi and Curdiſtan, on the eaſt by Ghilan and the Caſpian ſea, and on the weſt by Turcomania. E. Long. 42°. to 48°. N. Lat. 36°. to 39°.

ADIT, in a general ſenſe, the paſſage to, or entrance of, any thing.

Adit of a Mine, the hole, or aperture, whereby it is entered and dug, and by which the water and ores are carried away. The term amounts to the ſame with *cuniculus* or *drift*, and is diſtinguiſhed from *air-ſhaft*. The adit is uſually made on the ſide of a hill, towards the bottom thereof, about four, five, or ſix feet high, and eight wide, in form of an arch; ſometimes cut in the rock, and ſometimes ſupported with timber, ſo conducted as that the ſole or bottom of the adit may anſwer to the bottom of the ſhaft, only ſomewhat lower, that the water may have a ſufficient current to paſs away without the uſe of the pump. Damps and the impurity of the air are the great impediments againſt driving

Adit || Adjuncts.

driving adits above 20 or 30 fathoms, by reaſon of the neceſſity, in this caſe, of letting down air-ſhafts from the day to meet the adit, which are often very expenſive, both on account of the great depth of mines, and the hardneſs of the mineral ſtrata to be cut through. The beſt remedy againſt this is that practiſed in the coal mines near Liege, where they work their adits without air ſhafts; the manner of which is deſcribed by Sir James Moray. (*Phil. Tranſ.* vol. i. p. 79.)

Adit of a Mine is ſometimes uſed for the air-ſhaft itſelf, being a hole driven perpendicularly from the ſurface of the earth into ſome part of a mine, to give entrance to the air. To draw off the ſtanding water in winter, in deep mines, they drive up an adit, or air-ſhaft, upon which the air diſengages itſelf from the water, when it begins to run with ſuch violence as produces a noiſe equal to the burſting of a cannon, daſhes every thing in the way againſt the ſides of the mine, and looſens the very rocks at a diſtance. (*Ibid*).

ADJUDICATION, implies the act of adjudging, or determining, a cauſe in favour of ſome perſon.

Adjudication, in *Scots Law*, the name of that action by which a creditor attaches the heritable eſtate of his debtor, or his debtor's heir, in order to appropriate it to himſelf, either in payment or ſecurity of his debt; or that action by which the holder of an heritable right, labouring under any defect in point of form, may ſupply that defect.

ADJUNCT, among philoſophers, ſignifies ſomething added to another, without being any neceſſary part of it. Thus water abſorbed by cloth or a ſponge, is an adjunct, but no neceſſary part of either of theſe ſubſtances.

Adjunct, in *Metaphyſics*, ſome quality belonging to either the body or mind, whether natural or acquired. Thus thinking is an adjunct of the mind, and growth an adjunct of the body.

Adjunct, in *Muſic*, a word which is employed to denominate the connexion or relation between the principal mode and the modes of its two-fifths, which, from the intervals that conſtitute the relation between them and it, are called its *adjuncts*.

Adjunct is alſo uſed to ſignify a colleague, or ſome perſon aſſociated with another as an aſſiſtant.

Adjunct Gods, or *Adjuncts of the Gods*, among the Romans, were a kind of inferior deities, added as aſſiſtants to the principal ones, to eaſe them in their functions. Thus, to Mars was adjoined Bellona and Nemeſis; to Neptune, Salacia; to Vulcan, the Cabiri; to the Good Genius, the Lares; to the Evil, the Lemures, &c.

Adjuncts, in *Rhetoric* and *Grammar*, ſignify certain words or things added to others, to amplify or augment the force of the diſcourſe.

Adjuncts, or Adjoints, in the Royal Academy of Sciences at Paris, denoted a claſs of members, attached to the purſuit of particular ſciences. The claſs of *Adjuncts* was created in 1716, in lieu of the *Eleves*: they were twelve in number; two for geometry, two for mechanics, two for aſtronomy, two for anatomy, two for chemiſtry, and two for botany. The *Eleves* not taken into this eſtabliſhment were admitted on the footing of ſupernumerary *Adjuncts*.

ADJUTANT, in the military art, is an officer whoſe buſineſs it is to aſſiſt the major. Each battalion of foot and regiment of horſe has an adjutant, who receives the orders every night from the brigade-major; which, after carrying them to the colonel, he delivers out to the ſerjeants. When detachments are to be made, he gives the number to be furniſhed by each company or troop, and aſſigns the hour and place of rendezvous. He alſo places the guards; receives and diſtributes the ammunition to the companies, &c.; and, by the major's orders, regulates the prices of bread, beer, and other proviſions. The word is ſometimes uſed by the French for an *aid du-camp*.

Adjutant || Admeaſurement.

Adjutants-general, among the Jeſuits, a ſelect number of fathers, who reſided with the general of the order, each of whom had a province or country aſſigned him, as England, Holland, &c. and their buſineſs was to inform the father general of ſtate occurrences in ſuch countries. To this end they had their correſpondents delegated, emiſſaries, viſitors, regents, provincials, &c.

ADJUTORIUM, a term uſed by phyſicians for any medicine in a preſcription but the capital one.

ADLE EGGS, ſuch as have not received an impregnation from the ſemen of the cock.

ADLEGATION, in the public law of the German empire, a right claimed by the ſtates of the empire of adjoining plenipotentiaries, in public treaties and negotiations, to thoſe of the emperor, for the tranſacting of matters which relate to the empire in general. In which ſenſe *adlegation* differs from *legation*, which is the right of ſending ambaſſadors on a perſon's own account.—Several princes and ſtates of the empire enjoy the right of *legation*, who have not that of *adlegation*, and *vice verſa*. The biſhops, for inſtance, have the right of *adlegation* in the treaties which concern the common intereſt, but no right of *legation* for their own private affairs. The like had the duke of Mantua.—The emperor allows the princes of Germany the privilege of *legation*, but diſputes that of *adlegation*. They challenge it as belonging to them *jure regni*, which they enjoy in common with the emperor himſelf.

ADLOCUTION, Adlocutio, in *Antiquity*, is chiefly underſtood of ſpeeches made by Roman generals to their armies, to encourage them before a battle. We frequently find theſe adlocutions expreſſed on medals by the abbreviature Adlocut. Coh.—The general is ſometimes repreſented as ſeated on a tribunal, often on a bank or mound of turf, with the cohorts ranged orderly round him, in *manipuli* and *turmæ*. The uſual formula in adlocutions was, *Fortis eſſet ac fidus*.

ADMANUENSES, in ancient law books, denote perſons who ſwore by laying their hands on the book.—In which ſenſe, *admanuenſes* amount to the ſame with laymen; and ſtand oppoſed to clerks, who were forbid to ſwear on the book, their word being reputed as their oath; whence they were alſo denominated *fide digni*.

ADMEASUREMENT, Admensuratio, in *Law*, a writ which lies for the bringing thoſe to reaſon, or mediocrity, who uſurp more of any thing than their ſhare. This writ lies in two caſes; termed,

Admeasurement of Dower, *Admenſuratio dotis*, where the widow of the deceaſed holds more from the heir, or his guardian, on account of her dower, than of right belongs to her. And,

Admeasurement || Administrator.

ADMEASUREMENT *of Pasture*, *Admensuratio pasturæ*; this lies between those who have COMMON of pastures appendant to their freehold, or common by vicinage, in case any of them surcharge the common with more cattle than they ought.

ADMINICLE, a term used chiefly in old law-books, to imply an aid, help, assistance, or support. The word is Latin, *adminiculum*; and derived from *adminiculor*, to prop or support.

ADMINICLE, in *Scots Law*, signifies any writing or deed referred to by a party, in an action of law, for proving his allegations.

ADMINICULATOR, an ancient officer of the church, whose business it was to attend to and defend the cause of the widows, orphans, and others destitute of help.

ADMINISTRATION, in general, the government, direction, or management of affairs, and particularly the exercise of distributive justice. Among ecclesiastics, it is often used to express the giving or dispensing the sacraments, &c.

ADMINISTRATION, is also the name given by the Spaniards in Peru to the staple magazine, or warehouse, established at Callao, a small town on the South sea, which is the port of Lima, the capital of that part of South America, and particularly of Peru. The foreign ships which have leave to trade along that coast are obliged to unload here, paying 13 per cent. of the price they sell for, if the cargo be entire, and even 16 per cent. if otherwise; besides which, they pay 3 per 1000, duty, for consulship and some other small royal rights and claims.

ADMINISTRATOR, in *Law*, he to whom the ordinary commits the administration of the goods of a person deceased, in default of an executor.—An action lies for or against an administrator, as for or against an executor; and he shall be accountable to the value of the goods of the deceased, and no farther:—unless there be waste, or other abuse chargeable on him. If the administrator die, his executors are not administrators; but the court is to grant a new administration.—If a stranger, who is neither administrator nor executor, take the goods of the deceased and administer, he shall be charged and sued as an executor, not as an administrator. The origin of administrators is derived from the civil law. Their establishment in England is owing to a statute made in the 31st year of Edward III. Till then, no office of this kind was known beside that of executor: in case of a want of which, the ordinary had the disposal of goods of persons intestate, &c.

ADMINISTRATOR, in *Scots Law*, a person legally empowered to act for another whom the law presumes incapable of acting for himself. Thus tutors or curators are sometimes styled *administrators in law* to pupils, minors, or fatuous persons. But more generally the term is used to imply that power which is conferred by the law upon a father over the persons and property of his children during their minority. See LAW.

ADMINISTRATOR is sometimes used for the president of a province: for a person appointed to receive, manage, and distribute, the revenues of an hospital or religious house; for a prince who enjoys the revenues of a secularized bishop; and for the regent of a kingdom during the minority of a prince, or a vacancy of the throne.

Admirabilis, Admiral.

ADMIRABILIS SAL, the same with GLAUBER'S salt.

ADMIRAL, a great officer or magistrate, who has the government of a navy, and the hearing of all maritime causes.

Authors are divided with regard to the origin and denomination of this important officer, whom we find established in most kingdoms that border on the sea. But the most probable opinion is that of Sir Henry Spelman, who thinks, that both the name and dignity were derived from the Saracens, and, by reason of the holy wars, brought amongst us; for *admiral*, in the Arabian language, signifies a prince, or chief ruler, and was the ordinary title of the governors of cities, provinces, &c. and therefore they called the commander of the navy by that name, as a name of dignity and honour. And indeed there are no instances of admirals in this part of Europe before the year 1284, when Philip of France, who had attended St Lewis in the wars against the Saracens, created an admiral. Du Cange assures us, that the Sicilians were the first, and the Genoese the next, who gave the denomination of *admiral* to the commanders of their naval armaments; and that they took it from the Saracen or Arabic *emir*, a general name for every commanding officer. As for the exact time when the word was introduced among us, it is uncertain; some think it was in the reign of Edward I. Sir Henry Spelman is of opinion that it was first used in the reign of Henry III. because neither the laws of Oleron, made in 1266, nor Bracton, who wrote about that time, make any mention of it; and that the term *admiral* was not used in a charter in the eighth of Henry III. where he granted this office to Richard de Lacy, by these words *Maritimam Angliæ*; but in the 56th year of the same reign, not only the historians, but the charters themselves, very frequently used the word *admiral*.

Anciently there were generally three or four admirals appointed in the English seas, all of them holding the office *durante bene placeto*; and each of them having particular limits under their charge and government; as admirals of the fleet of ships, from the mouth of the Thames, northward, southward, or westward. Besides these, there were admirals of the Cinque Ports, as in the reign of Edward III. when one William Latimer was styled *admiralis quinque portuum*: and we sometimes find that one person has been admiral of the fleets to the southward, northward, and westward: but the title of *admiralis Angliæ* was not frequent till the reign of Henry IV. when the king's brother had that title given him, which in all commissions afterwards was granted to the succeeding admirals. It may be observed, that there was a title above that of admiral of England, which was, *locum tenens regis super mare*, the king's lieutenant general of the sea; this title we find mentioned in the reign of Richard II. Before the use of the word *admiral* was known, the title of *custos maris* was made use of.

Lord High ADMIRAL *of England*, in some ancient records called *capitanus maritimarum*, an officer of great antiquity and trust, as appears by the laws of Oleron, so denominated from the place at which they were made by Richard I. The first title of *admiral of England*, expressly

Admiral. preſsly conferred upon a ſubject, was given by patent of Richard II. to Richard Fitz-Allen, jun. earl of Arundel and Surrey; for thoſe who before enjoyed this office were ſimply termed *admirals*, though their juriſdiction ſeems as extenſive, eſpecially in the reign of Edward III. when the court of admiralty was firſt erected.

This great officer has the management of all maritime affairs, and the government of the royal navy, with power of deciſion in all maritime caſes both civil and criminal: he judges of all things done upon or beyond the ſea, in any part of the world; upon the ſea coaſts, in all ports and heavens, and upon all rivers below the firſt bridge from the ſea. By him, vice-admirals, rear admirals, and all ſea captains, are commiſſioned: all deputies for particular coaſts, and coroners to view dead bodies found on the ſea coaſts, or at ſea: he alſo appoints the judges for his court of admiralty, and may impriſon, releaſe, &c. All ports and havens are *infra corpus comitatus*, and the admiral hath no juriſdiction of any thing done in them. Between high and low water mark, the common law and the high admiral have juriſdiction by turns, one upon the water, and the other upon the land.

The lord admiral has power, not only over the ſeamen ſerving in his ſhips of war, but over all other ſeamen, to arreſt them for the ſervice of the ſtate; and, if any of them run away, without leave of the admiral, he hath power to make a record thereof, and certify the ſame to the ſheriffs, mayors, bailiffs, &c. who ſhall cauſe them to be apprehended and impriſoned.

To the lord high admiral belong all penalties and amercements of all tranſgreſſions at ſea, on the ſea ſhore, in ports and havens, and all rivers below the firſt bridge from the ſea; the goods of pirates and felons condemned or enſlaved, ſea wrecks, goods floating on the ſea, or caſt on the ſhore (not granted to lords of manors adjoining to the ſea), and a ſhare of lawful prizes; alſo all great fiſhes, commonly called *royal fiſhes*, except whales and ſturgeons: to which add, a ſalary of 7000l. a-year.

In ſhort, this is ſo great an office, in point of truſt, honour, and profit, that it has been uſually given to princes of the blood, or the moſt eminent perſons among the nobility. We have had no high admiral for ſome years; the office being put in commiſſion, or under the adminiſtration of the lords commiſſioners of the admiralty, who by ſtatute have the ſame power and authority as the lord high admiral.

Lord High ADMIRAL *of Scotland*, one of the great officers of the crown, and ſupreme judge in all maritime caſes within that part of Britain. See LAW.

ADMIRAL alſo implies the commander in chief of any ſingle fleet or ſquadron; or, in general, any flag-officer whatever. The commander of a fleet carries his flag at the main-top-maſt head. Thus we ſay, *admiral* of the *red*, of the *white*, of the *blue*.

Vice ADMIRAL, is the commander of the ſecond ſquadron, and carries his flag at the fore-top-maſt head.

Rear ADMIRAL, is the commander of the third ſquadron, and carries his flag at the mizen-top-maſt head.

Vice ADMIRAL, is alſo an officer appointed by the lords commiſſioners of the admiralty. There are ſeveral of theſe officers eſtabliſhed in different parts of Great Britain, with judges and marſhals under them, for executing juriſdiction within their reſpective limits. Their decrees, however, are not final, an appeal lying to the court of admiralty in London. Admiral, Admiralty.

ADMIRAL is alſo an appellation given to the moſt conſiderable ſhip of a fleet of merchantmen, or of the veſſels employed in the cod fiſhery of Newfoundland. This laſt has the privilege of chooſing what place he pleaſes on the ſhore to dry his fiſh; gives proper orders, and appoints the fiſhing places to thoſe who come after him; and as long as the fiſhing ſeaſon continues, he carries a flag on his main-maſt.

ADMIRAL, in *Conchology*, the Engliſh name of a ſpecies of the voluta, a ſhell fiſh belonging to the order of vermes teſtacea. See CONCHOLOGY *Index*.

ADMIRALTY properly ſignifies the office of lord high admiral, whether diſcharged by one ſingle perſon, or by joint commiſſioners called *lords of the admiralty*.

Court of ADMIRALTY, is a ſovereign court, held by the lord high admiral, or lords of the admiralty, where cognizance is taken in all maritime affairs, whether civil or criminal.—All crimes committed on the high ſeas, or on great rivers below the firſt bridge next the ſea, are cognizable in this court only, and before which they muſt be tried by judge and jury. But in civil caſes the mode is different, the deciſions being all made according to the civil law. From the ſentences of the admiralty judge an appeal always lay, in ordinary courſe, to the king in chancery, as may be collected from ſtatute 25 Hen. VIII. c. 19. which directs the appeal from the archbiſhop's courts to be determined by perſons named in the king's commiſſion, "like as in caſe of appeal from the admiral court." But this is alſo expreſsly declared by ſtatute 8 Eliz. c. 5. which enacts, that upon an appeal made to the chancery, the ſentence definitive of the delegates appointed by commiſſion ſhall be final.

Appeals from the vice-admiralty courts in America, and our other plantations and ſettlements, may be brought before the courts of admiralty in England, as being a branch of the admiral's juriſdiction, though they may alſo be brought before the king in council. But in caſe of prize veſſels, taken in time of war, in any part of the world, and condemned in any courts of admiralty or vice-admiralty as lawful prize, the appeal lies to certain *commiſſioners of appeals* conſiſting chiefly of the privy council, and not to judges delegates. And this by virtue of divers treaties with foreign nations, by which particular courts are eſtabliſhed in all the maritime countries of Europe for the deciſion of this queſtion, Whether lawful prize or not? for this being a queſtion between ſubjects of different ſtates, it belongs entirely to the law of nations, and not to the municipal laws of either country, to determine it.

Court of ADMIRALTY, in Scotland. See LAW.

Admiralty Bay, in *Geography*, a ſpacious bay with good anchorage on the weſt coaſt of Cook's ſtraits, in the ſouthern iſland of New Zealand. S. Lat. 40. 37. E. Long. 174. 54.

There is a bay of the ſame name on the north-weſt coaſt of America, in N. Lat. 59. 31. W. Long. 140. 18.

Admiralty Inlet, the entrance to the ſuppoſed ſtraits of Juan de Fuca, on the weſt coaſt of New Georgia,

Admiralty Islands ‖ Adolescence.

in N. Lat. 48. 30. W. Long. 124. 15. It was visited by Captain Vancouver in 1792, who found the soil on the shores rich and fertile, well watered, and clothed with luxuriant vegetation.

Admiralty Islands, lie in about 2° 18′ S. Lat. and 146° 44′ E. Long. There are between 20 and 30 islands said to be scattered about here, one of which alone would make a large kingdom. Captain Carteret, who first discovered them, was prevented from touching at them, although their appearance was very inviting, on account of the condition of his ship, and of his being entirely unprovided with the articles of barter which suit an Indian trade. He describes them as clothed with a beautiful verdure of woods, lofty and luxuriant, interspersed with spots that have been cleared for plantations, groves of cocoa nut trees, and houses of the natives, who seem to be very numerous. The largest of these islands is 18 leagues long in the direction of east and west. The discoverer thinks it highly probable that these islands produce several valuable articles of trade, particularly spices, as they lie in the same climate and latitude as the Moluccas.

ADMIRATION, in ethics, is that passion of the mind which is excited by the contemplation of superior and rare excellence, as superior or uncommon wisdom, ingenuity, or benevolence.

ADMONITION, in ecclesiastical affairs, a part of discipline much used in the ancient church. It was the first act, or step, towards the punishment or expulsion of delinquents. In case of private offences, it was performed, according to the evangelical rule, privately: in case of public offence, openly, before the church. If either of those sufficed for the recovery of the fallen person, all further proceedings in the way of censure ceased: if they did not, recourse was had to excommunication.

Admonitio Fustium, a military punishment among the Romans, not unlike our whipping, but it was performed with vine branches.

ADMORTIZATION, in the feudal customs, the reduction of the property of lands or tenements to mortmain. See Mortmain.

ADNATA, in *Anatomy*, one of the coats of the eye, which is also called *conjunctiva* and *albuginea*.

Adnata is also used for any hair, wool, or the like, which grows upon animals or vegetables.

Adnata, or *Adnascentia*, among gardeners, denote those offsets, which by a new germination under the earth, proceed from the lily, narcissus, hyacinth, and other flowers, and afterwards become true roots.

ADNOUN, is used by some grammarians to express what we more usually call an adjective.—The word is formed by way of analogy to adverb; in regard adjectives have much the same office and relation to nouns that adverbs have to verbs. Bishop Wilkins uses the word *adname* in another sense, viz. for what we otherwise call a preposition.

ADOLESCENCE, the state of growing youth; or that period of a person's age, commencing from his infancy, and terminating at his full stature or manhood. The word is formed of the Latin *adolescere*; "to grow."—The state of adolescence lasts so long as the fibres continue to grow, either in magnitude or firmness. The fibres being arrived at the degree of firmness and tension sufficient to sustain the parts, no longer yield or give way to the efforts of the nutritious matter to extend them; so that their farther accretion is stopped, from the very law of their nutrition. Adolescence is commonly computed to be between 15 and 25, or even 30 years of age; though in different constitutions its terms are very different.—The Romans usually reckoned it from 12 to 25 in boys; and to 21 in girls, &c. And yet, among their writers, *juvenis* and *adolescens* are frequently used indifferently for any person under 45 years.

Adollam ‖ Adonia.

ADOLLAM, or Odollam, in *Ancient Geography*, a town in the tribe of Judah, to the east of Eleutheropolis. David is said to have hid himself in a cave near this town, (Bible).

ADOM, in *Geography*, a state or principality of the Gold coast, in Africa. It is a populous, rich, and fertile country, abounding with corn and fruits.

ADON, a populous village in the province of Stuhl-Weissemberg, belonging to Hungary. It lies in a fruitful country, towards the river Danube. E. Long. 19. 20. N. Lat. 47. 30.

ADONAI, one of the names of the Supreme Being in the Scriptures. The proper meaning of the word is *my lords*, in the plural number; as *Adoni* is *my lord*, in the singular. The Jews, who either out of respect, or superstition, do not pronounce the name of *Jehovah*, read *Adonai*, in the room of it, as often as they meet with Jehovah in the Hebrew text. But the ancient Jews were not so scrupulous; nor is there any law which forbids them to pronounce the name of God, (Calmet.)

ADONIA, in antiquity, solemn feasts in honour of Venus, and in memory of her beloved Adonis. The Adonia were observed with great solemnity by most nations; Greeks, Phœnicians, Lycians, Syrians, Egyptians, &c. From Syria, they are supposed to have passed into India. The prophet Ezekiel * is understood to speak of them. They were still observed at Alexandria in the time of St Cyril; and at Antioch in that of Julian the Apostate, who happened to enter that city during the solemnity, which was taken for an ill omen. The Adonia lasted two days: on the first of which certain images of Venus and Adonis were carried, with all the pomp and ceremonies practised at funerals: the women wept, tore their hair, beat their breasts, &c. imitating the cries and lamentations of Venus for the death of her paramour. This lamentation they called Ἀδωνιασμος. The Syrians were not contented with weeping, but subjected themselves to severe discipline, shaved their heads, &c. Among the Egyptians, the queen herself used to carry the image of Adonis in procession. St Cyril mentions an extraordinary ceremony practised by the Alexandrians: A letter was written to the women of Byblus, to inform them that Adonis was found again: this letter was thrown into the sea, which (it was pretended) did not fail punctually to convey it to Byblus in seven days; upon the receipt of which, the Byblian women ceased their mourning, sung his praises, and made rejoicings as if he were raised to life again: Or rather, according to Meursius, the two offices of mourning and rejoicing made two distinct feasts, which were held at different times of the year, the one six months after the other, Adonis being supposed to pass half the year with Proserpine, and half with Venus.—The Egyptian Adonia are said to have been held in memory

* Ch. viii. xiv.

Adonides & Adoptiani.

memory of the death of Oſiris; by others, of his ſickneſs and recovery. Biſhop Patrick dates their origin from the ſlaughter of the firſt born under Moſes.

ADONIDES, in *Botany*, a name given to botaniſts who deſcribed or made catalogues of plants cultivated in any particular place.

ADONIS, ſon of Cynaras king of Cyprus, the darling of the goddeſs Venus: being killed by a wild boar, in the Idalian woods, he was turned into a flower of a blood colour, ſuppoſed to be the anemone. Venus was inconſolable; and no grief was ever more celebrated than this, moſt nations having perpetuated the memory of it by a train of anniverſary ceremonies *. Among Shakeſpeare's poems, is a long one on the ſubject of Venus's affection for Adonis.

* See *Adonia*.

The text of the vulgate in Ezekiel viii. 14. ſays, that this prophet ſaw women ſitting in the temple, and weeping for Adonis: but, according to the reading of the Hebrew text, they are ſaid to weep for Thammuz, or the *hidden one*. Among the Egyptians, Adonis was adored under the name of Oſiris the huſband of Iſis. But he was ſometimes called by the name of Ammuz, or Thammuz, *the concealed*, to denote probably his death or burial. The Hebrews, in deriſion, call him ſometimes *the dead*, Pſal. cvi. 28. and Lev. xix. 28. becauſe they wept for him, and repreſented him as one dead in his coffin; and at other times, they call him the *image of jealouſy*, Ezek. viii. 3. 5. becauſe he was the object of the god Mars's jealouſy. The Syrians, Phœnicians, and Cyprians, called him Adonis; and F. Calmet is of opinion, that the Ammonites and Moabites gave him the name of Baal-peor. See BAAL-PEOR.

ADONIS, *Adonius*, in *Ancient Geography*, a river of Phœnicia, riſing in Mount Lebanon, and falling into the ſea, after a north-weſt courſe, at Byblus; famous in fable, as a beautiful ſhepherd youth (Virgil); ſon of Cynaras, king of the Cyprians, loved by Venus, ſlain by a boar, and turned into a river. Theocritus laments him dead in an idyllion, or rather ode, as did the women yearly, when, in flood time, the river rolled down a red earth, which tinged its waters, deemed to be his wound bleeding afreſh. In the Phœnician language Adan ſignifies a willow, and Adon lord, with the ſame radical letters. Hence Ἰτυιος Ἀδωνις, *Saligna*, and Κυριος or Κυριε Ἀδωνις for Κυριος, *Adonidis horti*, are gardens beautifully arranged, but more adapted for pleaſure than profit.

ADONIS, *Bird's eye*, or *Pheaſant's eye*, in *Botany*. See BOTANY *Index*.

ADONISTS, a ſect or party among divines and critics, who maintain, that the Hebrew points ordinarily annexed to the conſonants of the word Jehovah, are not the natural points belonging to that word, nor expreſs the true pronunciation of it; but are the vowel points, belonging to the words *Adonai* and *Elohim*, applied to the conſonants of the ineffable name Jehovah, to warn the readers, that inſtead of the word Jehovah, which the Jews were forbidden to pronounce, and the true pronunciation of which had been long unknown to them, they are always to read *Adonai*. They are oppoſed to *Jehoviſts*: of whom the principal are Druſius, Capellus, Buxtorf, Alting, and Reland, who has publiſhed a collection of their writings on this ſubject.

ADOPTIANI, in church hiſtory, a ſect of ancient heretics, followers of Felix of Urgel, and Elipand of Toledo, who, towards the end of the eighth century, advanced the notion, that Jeſus Chriſt, in his human nature, is the Son of God, not by nature, but by adoption.

Adoption.

ADOPTION, an act by which any one takes another into his family, owns him for his ſon, and appoints him for his heir.

The cuſtom of adoption was very common among the ancient Greeks and Romans; yet it was not practiſed, but for certain cauſes expreſſed in the laws, and with certain formalities uſual in ſuch caſes. It was a ſort of imitation of nature, intended for the comfort of thoſe who had no children: wherefore he that was to adopt was to have no children of his own, and to be paſt the age of getting any; nor were eunuchs allowed to adopt, as being under an actual impotency of begetting children; neither was it lawful for a young man to adopt an elder, becauſe that it would have been contrary to the order of nature: nay, it was even required that the perſon who adopted ſhould be eighteen years older than his adopted ſon, that there might at leaſt appear a probability of his being the natural father.

Among the Greeks it was called ὑιοτης, *filiation*. It was allowed to ſuch as had no iſſue of their own; excepting thoſe who were not κυριοι ἑαυτων, *their own maſters*, e. g. ſlaves, women, madmen, infants, or perſons under twenty years of age; who being incapable of making wills, or managing their own eſtates, were not allowed to adopt heirs to them. Foreigners being incapable of inheriting at Athens, if any ſuch were adopted, it was neceſſary firſt to make them free of the city. The ceremony of adoption being over, the adopted had his name enrolled in the tribe and ward of his new father; for which entry a peculiar time was allotted, viz. the feſtival Ἀπατουρια. To prevent raſh and inconſiderate adoptions, the Lacedemonians had a law, that adoptions ſhould be tranſacted, or at leaſt confirmed, in the preſence of their kings. The children adopted were inveſted with all the privileges, and obliged to perform all the duties, of natural children; and being thus provided for in another family, ceaſed to have any claim of inheritance, or kindred, in the family which they had left, unleſs they firſt renounced their adoption; which, by the laws of Solon, they were not allowed to do, unleſs they had firſt begotten children, to bear the name of the perſon who had adopted them: thus providing againſt the ruin of families, which would otherwiſe have been extinguiſhed by the deſertion of thoſe who had been adopted to preſerve them. If the children adopted happened to die without children, the inheritance could not be alienated from the family into which they had been adopted, but returned to the relations of the adopter. It ſhould ſeem, that by the Athenian law, a perſon, after having adopted another, was not allowed to marry without permiſſion from the magiſtrate: in effect, there are inſtances of perſons, who being ill uſed by their adoptive children, petitioned for ſuch leave. However this be, it is certain ſome men married after they had adopted ſons: in which caſe, if they begat legitimate children, their eſtates were equally ſhared between the begotten and adopted.

The Romans had two forms of adoption; one be-

fore:

Adoption. fore the prætor; the other at an aſſembly of the people, in the times of the commonwealth, and afterwards by a reſcript of the emperor. In the former, the natural father addreſſed himſelf to the prætor, declaring that he emancipated his ſon, reſigned all his authority over him, and conſented he ſhould be tranſlated into the family of the adopter. The latter was practiſed, where the party to be adopted was already free; and this was called *adrogation*. The perſon adopted changed all his names; aſſuming the prename, name, and ſurname, of the perſons who adopted him.

Beſides the formalities preſcribed by the Roman law, various other methods have taken place; which have given denominations to different ſpecies of adoption, among the Gothic nations, in different ages. As,

Adoption by arms, was when a prince made a preſent of arms to a perſon, in conſideration of his merit and valour. Thus it was that the king of the Heruli was adopted by Theodoric; Athalaric by the emperor Juſtinian; and Coſroes, nephew of the king of Perſia, by the emperor Juſtin.—The obligation here laid on the adoptive ſon was, to protect and defend the father from injuries, affronts, &c. And hence, according to Selden, the ceremony of dubbing knights took its origin as well as name.

Adoption by baptiſm, is that ſpiritual affinity which is contracted by god fathers and god-children in the ceremony of baptiſm. This kind of adoption was introduced into the Greek church, and came afterwards into uſe among the ancient Franks, as appears by the Capitulars of Charlemagne.

In reality, the god-father was ſo far conſidered as adoptive father, that his god-children were ſuppoſed to be entitled to a ſhare in the inheritance of his eſtate.

Adoption by hair, was performed by cutting off the hair of a perſon, and giving it to the adoptive father. It was thus that Pope John VIII. adopted Boſon king of Arles; which, perhaps, is the only inſtance in hiſtory, of adoption, in the order of the eccleſiaſtics; a law that profeſſes to imitate nature, not daring to give children to thoſe in whom it would be thought a crime to beget any.

Adoption by matrimony, is the taking the children of a wife or huſband, by a former marriage, into the condition of proper or natural children; and admitting them to inherit on the ſame footing with thoſe of the preſent marriage. This is a practice peculiar to the Germans: among whom, it is more particularly known by the name of *einkindſchaft*; among their writers in Latin, by that of *unio prolium*, or *union of iſſues*. But the more accurate writers obſerve, that this is no adoption. See AFFILIATION.

Adoption by teſtament, that performed by appointing a perſon heir by will, on condition of his aſſuming the name, arms, &c. of the adopter. Of which kind we meet with ſeveral inſtances in the Roman hiſtory.

Among the Turks, the ceremony of adoption is performed by obliging the perſon adopted to paſs through the ſhirt of the adopter. Hence, among that people to adopt, is expreſſed by the phraſe, *to draw another through my ſhirt*. It is ſaid, that ſomething like this has alſo been obſerved among the Hebrews; where the prophet Elijah adopted Eliſha for his ſon and ſucceſſor, and communicated to him the gift of prophecy, by letting fall his cloak or mantle on him. But adoption, properly ſo called, does not appear to have been practiſed among the ancient Jews: Moſes ſays nothing of it in his laws; and Jacob's adoption of his two grandſons, Ephraim and Manaſſeh, is not ſo properly an adoption, as a kind of ſubſtitution, whereby thoſe two ſons of Joſeph were allotted an equal portion in Iſrael with his own ſons. Adoption Adoration.

ADOPTION is alſo uſed, in *Theology*, for a federal act of God's free grace; whereby thoſe who are regenerated by faith, are admitted into his houſehold, and entitled to a ſhare in the inheritance of the kingdom of heaven.

ADOPTION is ſometimes alſo uſed, in ſpeaking of the ancient clergy, who had a cuſtom of taking a maid or widow into their houſes, under the denomination of an *adoptive* or *ſpiritual ſiſter* or *niece*.

ADOPTION is alſo uſed in ſpeaking of the admiſſion of perſons into certain hoſpitals, particularly that of Lyons, the adminiſtrators whereof have all the power and rights of parents over the children admitted.

ADOPTION is alſo uſed for the reception of a new academy into the body of an old one.—Thus

The French academy of Marſeilles was adopted by that of Paris: on which account, we find a volume of ſpeeches extant, made by ſeveral members of the academy of Marſeilles, deputed to return thanks to that of Paris for the honour.

In a ſimilar ſenſe, adoption is alſo applied by the Greeks, to the admitting a monk, or brother, into a monaſtic community; ſometimes called *ſpiritual adoption*.

ADOPTIVE, denotes a perſon or thing adopted by another.

Adoptive children, among the Romans, were on the ſame footing with natural ones; and accordingly were either to be inſtituted heirs, or expreſsly diſinherited, otherwiſe the teſtament was null. The emperor Adrian preferred adoptive children to natural ones; becauſe we chooſe the former, but are obliged to take the latter at random.

M. Menage has publiſhed a book of eloges, or verſes addreſſed to him; which he calls *Liber Adoptivus*, an adoptive book; and adds it to his other works.—Heinſius, and Furſtemburg of Munſter, have likewiſe publiſhed adoptive books.

In eccleſiaſtical writers we find adoptive women, or ſiſters, (*adoptivæ fœminæ* or *ſorores*), uſed for thoſe handmaids of the ancient clergy, otherwiſe called *ſubintroductæ*.

Adoptive arms, are thoſe which a perſon enjoys by the gift or conceſſion of another, and to which he was not otherwiſe entitled. They ſtand contradiſtinguiſhed from arms of alliance.

We ſometimes meet with adoptive heir, by way of oppoſition to natural heir; and adoptive gods, by way of contradiſtinction to domeſtic ones. The Romans, notwithſtanding the number of their domeſtic, had their adoptive gods, taken chiefly from the Egyptians: ſuch were Iſis, Oſiris, Anubis, Apis, Harpocrates, and Canopus.

ADORATION, the act of rendering divine honours; or of addreſſing a being, as ſuppoſing it a god. The word is compounded of *ad*, "to;" and *os*, *oris*, "mouth;" and literally ſignifies to apply the hand

to

Adoration. to the mouth; *Manum ad os admovere, q. d.* "to kiss the hand;" this being, in the eastern countries, one of the great marks of respect and submission.—The Romans practised adoration at sacrifices, and other solemnities; in passing by temples, altars, groves, &c. at the sight of statues, images, or the like, whether of stone or wood, wherein any thing of divinity was supposed to reside. Usually there were images of the gods placed at the gates of cities, for those who went in or out, to pay their respects to.—The ceremony of adoration among the ancient Romans was thus: The devotee having his head *covered*, applied his right hand to his lips, the fore finger resting on this thumb, which was erect, and thus bowing his head, turned himself round from left to right. The kiss thus given was called *osculum labratum*; for ordinarily they were afraid to touch the images of their gods themselves with their profane lips. Sometimes, however, they would kiss their feet, or even knees, it being held an incivility to touch their mouths; so that the affair passed at some distance. Saturn, however, and Hercules, were adored with the head *bare;* whence the worship of the last was called *institutum peregrinum*, and *ritus Græcanicus*, as departing from the customary Roman method, which was to sacrifice and adore with the face veiled, and the clothes drawn up to the ears, to prevent any interruption in the ceremony by the sight of unlucky objects.—The Jewish manner of adoration was by prostration, bowing, and kneeling.—The Christians adopted the Grecian rather than the Roman method, and adored always *uncovered*. The ordinary posture of the ancient Christians was kneeling, but on Sundays standing: and they had a peculiar regard to the east, to which point they ordinarily directed their prayers.

ADORATION is more particularly used for the act of praying, or preferring our requests or thanksgivings to Almighty God.

ADORATION is also used for certain extraordinary civil honours or respects which resemble those paid to the deity, yet are given to men.

The Persian manner of adoration, introduced by Cyrus, was by bending the knee, and falling on the face at the prince's feet, striking the earth with the forehead, and kissing the ground. This ceremony, which the Greeks called προσκυνειν, Conon refused to perform to Artaxerxes, and Callisthenes to Alexander the Great, as reputing it impious and unlawful.

The adoration performed to the Roman and Grecian emperors consisted in bowing or kneeling at the prince's feet, laying hold of his purple robe, and presently withdrawing the hand and clapping it to the lips. Some attribute the origin of this practice to Constantius. It was only persons of some rank or dignity that were entitled to the honour. Bare kneeling before the emperor to deliver a petition, was also called *adoration*.

The practice of adoration may be said to be still subsisting in England, in the ceremony of kissing the king's or queen's hand, and in serving them at table, both being performed kneeling.

ADORATION is more particularly used for kissing one's hand in presence of another, as a token of reverence. The Jews adored by kissing their hands and bowing down their heads; whence, in their language, *kissing* is properly used for *adoration*.

ADORATION is also used among Roman writers for a high species of applause given to persons who had spoken or performed well in public. (See ACCLAMATION.) We meet with adoration paid to orators, actors, musicians, &c. The method of expressing it was, by rising, putting both hands to their mouth, and then returning them towards the person intended to be honoured. Adoration, Adorea.

ADORATION is also used, in the court of Rome, for the ceremony of kissing the pope's feet.—The introduction of adoration among the Romans is ascribed to the low flattery of Vitellius, who, upon the return of C. Cæsar from Syria, would not approach him otherwise than with his head covered, turning himself round, and then falling on his face. Heliogabalus restored the practice, and Alexander Severus again prohibited it. Diocletian redemanded it; and it was, in some measure, continued under the succeeding princes, even after the establishment of Christianity, as Constantine, Constantius, &c. It is particularly said of Diocletian, that he had gems fastened to his shoes, that divine honours might be more willingly paid him, by kissing his feet. The like usage was afterwards adopted by the popes, and is observed to this day. These prelates, finding a vehement disposition in the people to fall down before them and kiss their feet, procured crucifixes to be fastened on their slippers; by which stratagem, the adoration intended for the pope's person is supposed to be transferred to Christ. Divers acts of this adoration we find offered even by princes to the pope.

ADORATION is also used for a method of electing a pope. The election of popes is performed two ways; by *adoration* and by *scrutiny*. In election by adoration, the cardinals rush hastily, as if agitated by some spirit, to the adoration of some one among them, to proclaim him pope. When the election is carried by scrutiny, they do not adore the new pope till he is placed on the altar.

Barbarous ADORATION is a term used, in the laws of King Canute, for that performed after the manner of the Heathens who adored idols. The Romish church is charged with the adoration of saints, martyrs, images, crucifixes, relics, the virgin, and the host; all which by Protestants are generally aggravated into idolatry on a supposition, that the honour thus paid to them is absolute and supreme, called by way of distinction *Latria*, which is due only to God. Roman Catholics, on the contrary, explain them, as only a relative or subordinate worship, called *Dulia* and *Hyperdulia*, which terminates ultimately in God alone. But may not the same be said of the idol worship of the heathens? The Phœnicians adored the winds, on account of the terrible effects produced by them; the same was adopted by most of the other nations, Persians, Greeks, Romans, &c. The Persians chiefly paid their adorations to the sun and fire; some say also to rivers, the wind, &c. The motive of adoring the sun was the benefits they received from that glorious luminary, which of all creatures has doubtless the best pretensions to such homage.

ADOREA, in Roman antiquity, a word used in different senses; sometimes for all manner of grain, sometimes for a kind of cakes made of fine flour, and offered in sacrifice; and finally for a dole or distribution of corn, as a reward for some service; whence by metonymy it is put for praise or rewards in general.

ADOSCULATION,

Adoſculation ‖ Adramum.

ADOSCULATION, a term uſed by Dr Grew, to imply a kind of impregnation, without intromiſſion; and in this manner he ſuppoſes the impregnation of plants is effected by the falling of the farina fœcundans on the piſtil.

ADOSSEE', in *Heraldry*, ſignifies two figures or bearings being placed back to back.

ADOUR, the name of a river of France, which riſes in the mountains of Bigorre, in the department of the Upper Pyrenees, and running north by Tarbes through Gaſcony, afterwards turns eaſt, and paſſing by Dax, falls into the bay of Biſcay, below Bayonne.

ADOWA, the capital of Tigré in Abyſſinia, is ſituated on the declivity of a hill, on the weſt ſide of a ſmall plain, which is ſurrounded on every ſide by mountains. The name, ſignifying *paſs* or *paſſage*, is characteriſtic of its ſituation; for the only road from the Red ſea to Gondar paſſes by Adowa. The town conſiſts of 300 houſes, is the reſidence of the governor, and has a manufactory of coarſe cotton cloth which circulates in Abyſſinia as the medium of exchange in place of money. N. Lat. 14. 7. E. Long. 38. 50.

ADOXA, Tuberous Moschatel, Hollow-root, or Inglorious, in *Botany*. See Botany *Index*.

AD pondus omnium, among phyſicians, an abbreviation in their preſcriptions, ſignifying that the laſt mentioned ingredient is to weigh as much as all the reſt together.

Ad Quod Damnum, in the *Engliſh Law*, a writ directed to the ſheriff, commanding him to inquire into the damage which may ariſe from granting certain privileges to a place, as a fair, a market, or the like.

ADRA, in *Geography*, a ſea-port town of the province of Granada, in Spain, 47 miles ſouth-eaſt of Granada. N. Lat. 36. 42. E. Long. 2. 37.

ADRACHNE, in *Botany*, a ſpecies of the ſtrawberry tree. See Arbutus, Botany *Index*.

ADRAMMELECH, one of the gods of the inhabitants of Sepharvaim, who were ſettled in the country of Samaria, in the room of thoſe Iſraelites who were carried beyond the Euphrates. The Sepharvaites made their children paſs through the fire, in honour of this idol and another called *Anamelech*. It is ſuppoſed, that Adrammelech meant the ſun, and Anamelech the moon: the firſt ſignifies *the magnificent king*; the ſecond *the gentle king*.

ADRAMYTTIUM, in *Ancient Geography*, now *Andramiti*, a town of Myſia Major, at the foot of Mount Ida, an Athenian colony, with a harbour and dock near the Caïcus. *Adramyttenus* the epithet; as, *Adramyttenus Sinus*, a part of the Egean ſea, on the coaſt of Myſia; *Adramyttenus Conventus*, ſeſſions or aſſizes, the eighth in order of the nine *Conventus Juridici* of the province of Aſia.

ADRANA, a river of Germany (Polybius); now the Eder, riſing on the borders of the county of Naſſau, to the north-eaſt of, and not far from Dillenburg, running through the landgraviate of Heſſe, the county of Waldeck, by Fritzlar, and then again through the landgraviate, and, together with the Fulda, falling into the Weſer, to the ſouth of, and not far from Caſſel.

ADRANUM, or Hadranum, in *Ancient Geography*, now Aderno, which ſee.

Adraſtea ‖ Adrian.

ADRASTEA, in *Mythology*, was the daughter of Jupiter and Neceſſity, and, according to Plutarch, the only fury who executed the vengeance of the gods. The name is derived from King Adraſtus, who firſt erected a temple to that deity.

Adrastea Certamina, in antiquity, a kind of Pythian games, inſtituted by Adraſtus king of Argos, in the year of the world 2700, in honour of Apollo, at Sicyon. Theſe are to be diſtinguiſhed from the Pythian games celebrated at Delphi.

ADRASTUS, in ancient hiſtory, king of Argos, ſon of Talaus and Lyſianiſſa, daughter of Polybius king of Sicyon, acquired great honour in the famous war of Thebes, in ſupport of Polynices his ſon-in-law, who had been excluded the ſovereignty of Thebes by Eteocles his brother, notwithſtanding their reciprocal agreement. Adraſtus, followed by Polynices, and Tydeus his other ſon-in-law, by Capaneus and Hippomedon his ſiſter's ſons, by Amphiaraus his brother-in-law, and by Parthenopæus, marched againſt the city of Thebes; and this is the expedition of the Seven Worthies, which the poets have ſo often ſung. They all loſt their lives in this war except Adraſtus, who was ſaved by his horſe called *Arion*. This war was revived ten years after by the ſons of thoſe deceaſed warriors, which was called the *war of the Epigones*, and ended with the taking of Thebes. None of them loſt their lives except Ægialeus ſon of Adraſtus; which afflicted him ſo much that he died of grief in Megara, as he was leading back his victorious army.

ADRAZZO, or Ajaccio. The ſame with Adjazzo, which ſee.

ADRIA, or Hadria, in *Ancient Geography*, the name of two towns in Italy. One in the country of the Veneti, on the river Tartarus, between the Padus and the Atheſis, called *Atria* by Pliny and Ptolemy, but *Adrias* by Strabo. Another on the river Vomanus, in the territory of the Piceni (to which Antonine's Itinerary from Rome is directed), the country of the anceſtors of the emperor Adrian. From which of theſe the Adriatic ſea is denominated, is matter of doubt. A third opinion is, that it is ſo called from Adrias the ſon of Joan, of Italian origin; (Euſtathius in Dionyſium).

ADRIAN, or Hadrian, Publius Ælius, the Roman emperor. He was born at Rome the 24th of January, in the 76th year of Chriſt, A. U. C. 829. His father left him an orphan, at ten years of age, under the guardianſhip of Trajan, and Cœlius Tatianus a Roman knight. He began to ſerve very early in the armies, having been tribune of a legion before the death of Domitian. He was the perſon choſen by the army of Lower Mœſia, to carry the news of Nerva's death to Trajan, ſucceſſor to the empire. Trajan, however, conceived ſome prejudices againſt him, and Adrian perceiving that he was no favourite with the emperor, endeavoured to ingratiate himſelf with the empreſs Plotina, by which means he ſucceeded in obtaining for his wife, Sabina, the emperor's grand-niece and next heireſs. This was probably the firſt ſtep to his future advancement, and facilitated his aſcent to the throne. As quæſtor he accompanied Trajan in moſt of his expeditions, and particularly diſtinguiſhed himſelf in the ſecond war againſt the Dacians. Afterwards he was ſucceſſively tribune of the people, prætor,

governor

Adrian. governor of Pannonia, and conſul. After the ſiege of Atra in Arabia was raiſed, Trajan, who had already given him the government of Syria, left him the command of the army: and at length, when he found death approaching, it is ſaid he adopted him. Adrian, who was then in Antiochia, as ſoon as he received the news thereof, and of Trajan's death, declared himſelf emperor, on the 11th of Auguſt, A. D. 117.

No ſooner had he arrived at the imperial dignity, than he made peace with the Perſians, to whom he yielded up great part of the conqueſts of his predeceſſors; and from generoſity, or policy, he remitted the debts of the Roman people, which, according to the calculation of thoſe who have reduced them to modern money, amounted to 22,500,000 golden crowns; and he burnt all the bonds and obligations relating to theſe debts, that the people might be under no apprehenſion of being called to an account for them afterwards. There are medals in commemoration of this fact, in which he is repreſented holding a flambeau in his hand, to ſet fire to all thoſe bonds which he had made void. He went to viſit all the provinces; and did not return to Rome till the year 118, when the ſenate decreed him a triumph, and honoured him with the title of *Father of his country*; but he refuſed both, and deſired that Trajan's image might triumph. No prince travelled more than Adrian; there being hardly one province in the empire which he did not viſit. In 120 he went into Gaul; from thence he went over to Britain, in order to ſubdue the Caledonians, who were making continual inroads into the provinces. Upon his arrival they retired towards the north: he advanced, however, as far as York, where he was diverted from his intended conqueſt by the deſcription ſome old ſoldiers he found there, who had ſerved under Agricola, gave him of the country. In hopes, therefore, of keeping them quiet by enlarging their bounds, he delivered up to the Caledonians all the lands lying between the two friths and the Tyne; and, at the ſame time, to ſecure the Roman province from their future incurſions, built the famous wall which ſtill bears his name (A). Having thus ſettled matters in Britain, he returned to Rome, where he was honoured with the title of Reſtorer of Britain, as appears by ſome medals. He ſoon after went into Spain, to Mauritania, and at length into the Eaſt, where he quieted the commotions raiſed by the Parthians. After having viſited all the provinces of Aſia, he returned to Athens in 125, where he paſſed the winter, and was initiated in the myſteries of Eleuſinian Ceres. He went from thence to Sicily, chiefly to view Mount Ætna, contemplate its phenomena, and enjoy the beautiful and extenſive proſpect afforded from its top. He returned to Rome the beginning of the year 129; and, according to ſome, he went again, the ſame year, to Africa; and, after his return from thence, to the eaſt. He was in Egypt in the year 132, reviſited Syria the year following, returned to Athens in 134, and to Rome in 135. The perſecution againſt the Chriſtians was very violent under his reign; but it was at length ſuſpended, in conſequence of the remonſtrances of Quadratus biſhop of Athens, and Ariſtides, two Chriſtian philoſophers, who preſented the emperor with ſome books in favour of the Chriſtian religion. He conquered the Jews; and, by way of inſult, erected a temple to Jupiter on Calvary, and placed a ſtatue of Adonis in the manger of Bethlehem; he cauſed alſo the images of ſwine to be engraven on the gates of Jeruſalem. At laſt he was ſeized with a dropſy, which vexed him to ſuch a degree, that he became almoſt raving mad. A great number of phyſicians were ſent for, and to the multitude of them he aſcribed his death. He died at Baiæ in the 63d year of his age, having reigned 21 years. The Latin verſes he addreſſed to his ſoul, which he compoſed a ſhort time before his death, in a ſtrain of tender levity, have been much criticiſed, and have been the ſubject of numerous tranſlations and imitations. Adrian.

Animula vagula, blandula,
Hoſpes, comeſque corporis,
Quæ nunc abibis in loca
Pallidula, rigida, nudula,
Nec, ut ſoles, dabis jocos?

Ah! fleeting ſpirit! wand'ring fire,
That long haſt warm'd my tender breaſt,
Muſt thou no more this frame inſpire?
No more a pleaſing cheerful gueſt?
Whither, ah whither art thou flying?
To what dark undiſcover'd ſhore?
Thou ſeem'ſt all trembling, ſhiv'ring, dying,
And wit and humour are no more!

POPE.

Some fragments of his Latin poetry are ſtill extant, and there are Greek verſes of his in the Anthology. He alſo wrote the hiſtory of his own life; to which, however, he did not chooſe to put his name; but that

(A) This work, though called by the Roman hiſtorians *murus*, which ſignifies a wall of ſtone, was only compoſed of earth covered with green turf. It was carried on from the Solway frith, a little weſt of the village of Burgh on the Sands, in as direct a line as poſſible, to the river Tyne on the eaſt, at the place where the town of Newcaſtle now ſtands; ſo that it muſt have been above 60 Engliſh, and near 70 Roman miles in length. It conſiſted of four parts: 1. The principal *agger*, mound of earth, or rampart, on the brink of the ditch. 2. The ditch on the north ſide of the rampart. 3. Another rampart on the ſouth ſide of the principal one, about five paces diſtant from it. 4. A large rampart on the north ſide of the ditch.—This laſt was probably the military way to the line of forts on this work: it was ſo to thoſe formerly built by Agricola: and if it did not ſerve the ſame purpoſe in this, there muſt have been no military way attending it.—The ſouth rampart might ſerve for an inner defence in caſe the enemy ſhould beat them from any part of the principal rampart, or it might be deſigned to protect the ſoldiers from any ſudden attack of the provincial Britons.—For many ages, this work hath been in ſo ruinous a condition, that it is impoſſible to diſcover its original dimenſions with certainty. From their appearance, it ſeems probable that the principal rampart was at leaſt 10 or 12 feet high,

Adrian. of Phlegon, one of his freed-men, a very learned perſon, was prefixed to it *. He had great wit and a retentive memory, and he diſtinguiſhed himſelf in the various branches of literature and ſcience. In his natural diſpoſition he was ſuſpicious, envious, cruel, and laſcivious. In his character there was a ſtrange compoſition of virtues and vices. He was affable, courteous, and liberal; but he was capricious and unſteady in his attachments, and violent in his reſentment. Thus he was diſtruſted by his friends, and dreaded by his enemies. Antoninus his ſucceſſor obtained his apotheoſis; and prevented the reſciſſion of his acts, which the ſenate once intended.

* Vide *Spartian, in Adriano.*

Adrian I. *Pope*, aſcended the papal throne, A. D. 772. He was the ſon of Theodore, a Roman nobleman, and poſſeſſed conſiderable talents for buſineſs. He maintained a ſteady attachment to Charlemagne, which provoked Deſiderius, a king of the Lombards, to invade the ſtate of Ravenna, and to threaten Rome itſelf. Charlemagne rewarded his attachment, by marching with a great army to his aid; and having gained many conſiderable advantages over Deſiderius, he viſited the pope at Rome, and expreſſed his piety, by the humiliating ceremony of kiſſing each of the ſteps, as he aſcended to the church of St Peter. The affairs of the church now claimed Adrian's particular attention: for Irene, who, in 780, aſſumed the regency at Conſtantinople, during the minority of her ſon Conſtantine, wiſhing to reſtore the worſhip of images, applied to Adrian for his concurrence. The pontiff readily acquieſced in her propoſal for calling a council, and commiſſioned two legates to attend it. The firſt council, however, was diſperſed by an inſurrection of the citizens; but at the next meeting in the city of Nice, in 787, which was protected by a military force, a decree was paſſed for reſtoring the worſhip of images. Adrian approved the decree, but in the weſtern church it was deemed heretical and dangerous. Charlemagne condemned the innovation, and the French and Engliſh clergy concurred in oppoſing it. A treatiſe, containing 120 heads of refutation, was circulated, as the work of Charlemagne, under the title of "The Caroline Books," in oppoſition to the decree of the council. This work was preſented to the pope by the king's ambaſſador, and the pope wrote a letter to Charlemagne by way of reply. The king, and alſo the Gallican and Engliſh churches, retained their ſentiments; and, in 794, a council was held at Frankfort on the Maine, conſiſting of about 300 weſtern biſhops, by which every kind of image-worſhip was condemned. Adrian did not live to ſee a termination of this conteſt; for after a pontificate of nearly twenty-four years, he died in 795. Adrian ſeems to have directed his chief attention to the embelliſhment of the churches, and the improvement of the city of Rome; and he was probably furniſhed by Charlemagne, out of the plunder of his conqueſts, with ample means for this purpoſe.

Adrian II. *Pope*, ſucceeded Nicholas I. A. D. 867. Having twice refuſed the dignity, he accepted it in the 76th year of his age, at the united requeſt of the clergy, nobility, and people. The conteſt for power between the Greek and Latin churches had been very violent ſome years before his acceſſion to the papal chair. Adrian.

Adrian, during this conteſt with the eaſtern patriarch, was extending his authority over the kings and princes of the weſt. He employed his whole intereſt to induce Charles the Bald, who had taken poſſeſſion of the kingdom of Lorraine, and who had been crowned at Rheims by the archbiſhop Hincmar, to relinquiſh it in favour of the emperor; and he even ſent legates to the king, after having attempted to engage Hincmar, the clergy, and the nobility to deſert him, ordering him to ſurrender to the emperor's right. The king was invincible; and the pope was obliged to give up the conteſt. He alſo farther interfered in the concerns of princes, by taking Charles's rebellious ſon Carloman, and the younger Hincmar, biſhop of Laon, under the protection of the Roman ſee. He proceeded in this buſineſs ſo far, that he was under a neceſſity of ſubmitting without gaining his point. Death terminated his ambitious projects and his life of inquietude, A. D. 872, after a pontificate of five years.

Adrian IV. *Pope*, the only Engliſhman who ever had the honour of ſitting in the papal chair. His name was Nicholas Brekeſpere; and he was born at Langley, near St Alban's, in Hertfordſhire. His father having left his family, and taken the habit of the monaſtery of St Alban's, Nicholas was obliged to ſubmit to the loweſt offices in that houſe for daily ſupport. After ſome time, he deſired to take the habit in that monaſtery, but was rejected by the abbot Richard. Upon this he reſolved to try his fortune in another country, and accordingly went to Paris; where, though in very poor circumſtances, he applied himſelf to his ſtudies with great aſſiduity, and made a wonderful proficiency. But having ſtill a ſtrong inclination to a religious life, he left Paris, and removed to Provence, where he became a regular clerk in the monaſtery of St Rufus. He was not immediately allowed to take the habit; but paſſed ſome time, by way of trial, in recommending himſelf to the monks by a ſtrict attention to all their commands. This behaviour, together with the beauty of his perſon, and prudent converſation, rendered him ſo acceptable to thoſe religious, that after ſome time they entreated him to take the habit of the canonical order. Here he diſtinguiſhed himſelf ſo much by his learning and ſtrict obſervance of the monaſtic diſcipline, that upon the death of the abbot, he was choſen ſuperior of that houſe; and we are told that he rebuilt the convent. Pope Eugenius III. being appriſed of the great merit of Nicholas, and thinking he might be ſerviceable to the church in a higher ſtation, created him cardinal-biſhop of Alba in 1146. In 1148, his holineſs ſent him legate to Denmark and Norway; where, by his fervent preaching

high, and the ſouth one not much leſs; but the north one was conſiderably lower. From the dimenſions of the ditch, taken as it paſſes through a lime-ſtone quarry near Harlow hill, it appears to have been 9 feet deep, and 11 wide at the top, but ſomewhat narrower at the bottom. The north rampart was about 20 feet diſtant from the ditch.

Adrian. ing and diligent inſtructions, he converted thoſe barbarous nations to the Chriſtian faith, and erected Upſal into an archiepiſcopal ſee. When he returned to Rome, he was received by the pope and cardinals with great marks of honour; and Pope Anaſtaſius, who ſucceeded Eugenius, happening to die at this time, Nicholas was unanimouſly choſen to the holy ſee, in November 1154, and he took the name of *Adrian*. When the news of his promotion reached England, King Henry II. ſent Robert abbot of St Alban's, and three biſhops, to Rome, to congratulate him on his election; upon which occaſion Adrian granted very conſiderable privileges to the monaſtery of St Alban's, particularly an exemption from all epiſcopal juriſdiction, excepting to the ſee of Rome. Adrian, in the beginning of his pontificate, boldly withſtood the attempts of the Roman people to recover their ancient liberty under the conſuls, and obliged thoſe magiſtrates to abdicate their authority, and leave the government of the city to the pope. In 1155, he drove the heretic Arnaud of Breſſe, and his followers, out of Rome. The ſame year he excommunicated William king of Sicily, who ravaged the territories of the church, and abſolved that prince's ſubjects from their allegiance. About the ſame time, Frederick king of the Romans, having entered Italy with a powerful army, Adrian met him near Sutrium, and concluded a peace with him. At this interview, Frederick conſented to hold the pope's ſtirrup whilſt he mounted on horſeback. After which, his holineſs conducted that prince to Rome, and in St Peter's church placed the imperial crown on his head, to the great mortification of the Roman people, who aſſembled in a tumultuous manner, and killed ſeveral of the Imperialiſts. The next year a reconciliation was brought about between the pope and the Sicilian king, that prince taking an oath to do nothing farther to the prejudice of the church, and Adrian granting him the title of *King of the two Sicilies*. He built and fortified ſeveral caſtles, and left the papal dominions in a more flouriſhing condition than he found them. But notwithſtanding all his ſucceſs, he was extremely ſenſible of the diſquietudes attending ſo high a ſtation; and declared to his countryman John of Saliſbury, that all the former hardſhips of his life were mere amuſement to the miſfortunes of the popedom; that he looked upon St Peter's chair to be the moſt uneaſy ſeat in the world; and that his crown ſeemed to be clapped burning on his head *. He died September 1. 1159, in the fourth year and tenth month of his pontificate; and was buried in St Peter's church, near the tomb of his predeceſſor Eugenius. There are extant ſeveral letters, and ſome homilies, written by Pope Adrian.

* *Baronius Annal.* tom. xii. an. 1154.

ADRIAN V. *Pope*, a Genoeſe, whoſe name was Ottoboni Fieſci, ſucceeded Innocent V. A. D. 1276. He was by his uncle Innocent IV. created cardinal deacon of St Adrian, and in 1254 ſent by him to England, to ſettle the diſputes between Henry III. and his barons. He was employed again for the ſame purpoſe, by Clement III. when he iſſued a ſentence of excommunication againſt the king's enemies. When he was congratulated on his acceſſion to the papal chair, he ſaid, "I wiſh you had found me a healthy cardinal, rather than a dying pope." After his election he went to Viterbo to meet the emperor Rodolphus, for the purpoſe of oppoſing the uſurpation of Charles, king of the Two Sicilies; but died ſoon after his arrival, having enjoyed his dignity only thirty-eight days. He zealouſly encouraged the cruſade to the Holy Land, and upon his election ſent a large ſum to Conſtantinople towards building galleys. Adrian, Adriani.

ADRIAN, cardinal prieſt, of the title of St Chryſogonus, was a native of Cornetto in Tuſcany. Innocent VIII. ſent him nuncio into Scotland and into France; and after he had been clerk and treaſurer of the apoſtolic chamber, Pope Alexander VI. whoſe ſecretary he had been, honoured him with the cardinal's hat. His life was a continued ſcene of odd alterations. He narrowly eſcaped death the day Alexander VI. poiſoned himſelf by miſtake. Afterward he drew upon himſelf the hatred of Julius II. ſo that he was obliged to go and hide himſelf in the mountains of Trent. Having been recalled by Leo X. he was ſo ungrateful, that he engaged in a conſpiracy againſt him. The pope pardoned his fault; but the cardinal, not caring to truſt to this, made his eſcape, and it could never be known exactly what was become of him. He was one of the firſt who effectually reformed the Latin ſtyle. He ſtudied Cicero with great ſucceſs, and made many excellent obſervations on the propriety of the Latin tongue. The treatiſe he compoſed *De Sermone Latino*, is a proof of this. He had begun a Latin tranſlation of the Old Teſtament. He wrote *De Vera Philoſophia*: This treatiſe was printed at Cologn 1548.

ADRIAN VI. *Pope*, was born at Utrecht in 1459. His father was not able to maintain him at ſchool, but he got a place at Louvain, in a college in which a certain number of ſcholars were maintained *gratis*. It is reported that he uſed to read in the night time by the light of the lamps in the churches or ſtreets. He made a conſiderable progreſs in all the ſciences; led an exemplary life; and there never was a man leſs intriguing and forward than he was. He took his degree of doctor of divinity at Louvain; was ſoon after made canon of St Peter's, and profeſſor of divinity at Utrecht, and then dean of St Peter's and vice-chancellor of the univerſity. He was obliged to leave an academical life, to be tutor to the archduke Charles. This young prince made no great progreſs under him: however, never was a tutor more conſiderably rewarded; for it was by Charles V.'s credit he was raiſed to the papal throne. Leo X. had given him the cardinal's hat in 1517. After this pope's death, ſeveral cabals in the conclave ended in the election of Adrian, with which the people of Rome were very much diſpleaſed. He would not change his name, and in every thing he ſhowed a great diſlike for all oſtentation and ſenſual pleaſures, though ſuch an averſion had been long ago out of date. He was very partial to Charles V. and did not enjoy much tranquillity under the triple crown. He lamented much the wicked morals of the clergy, and wiſhed to eſtabliſh a reformation of manners among them. He died September 14. 1523.

ADRIANI, JOANNI BATTISTA, was born of a patrician family at Florence in 1511. He wrote a Hiſtory of his own Times in Italian; which is a continuation of Guicciardini, beginning at the year 1536; to which Thuanus acknowledges himſelf greatly indebted: beſides which, he compoſed ſix funeral ora-

Adrianists || Adrianum.

tions, on the emperor Charles V. and other noble perſonages; and is thought to have been the author of a long letter on ancient painters and ſculptors, prefixed to the third volume of Vaſari. He died at Florence in 1579.

ADRIANISTS, in eccleſiaſtical hiſtory, a ſect of heretics divided into two branches, the firſt were diſciples of Simon Magus, and flouriſhed about the year 34. Theodoret is the only perſon who has preſerved their name and memory; but he gives us no account of their origin. Probably this ſect, and the ſix others which ſprung from the Simonians, took their name from the particular diſciples of Simon. The ſecond were the followers of Adrian Hamſtead the anabaptiſt; and held ſome particular errors concerning Chriſt.

ADRIANOPLE, a city of Turkey in Europe, in the province of Romania, and the ſee of an archbiſhop under the patriarch of Conſtantinople. It is about ſeven or eight miles in circumference, including the old city and ſome gardens. The houſes are low, moſtly built of mud and clay, and ſome of brick: and the ſtreets are exceedingly dirty. The walls and towers are in a great meaſure fallen to decay. However, there is a beautiful bazar, or market, half a mile long, called Ali Baſſa. It is a vaſt arched building, with ſix gates, and 365 well furniſhed ſhops, kept by Turks, Armenians, and Jews, who pay five crowns a month for each ſhop. The number of inhabitants of all nations and religions may be about 100,000; but it is dear living here, becauſe the proviſions are brought from diſtant places. The air is wholeſome, and the country very pleaſant in the ſummer time, on account of the river and ſtreams that run near and about the city; the chief of which is the Mariza. Theſe promote and preſerve the verdure of the gardens, meadows, and fields, for a conſiderable part of the year. In the winter there is plenty of game. Near the principal bazar there is another, about a mile in length, covered with boards, with holes on each ſide to let in the light. It is full of good ſhops, which contain all kinds of commodities. Sultan Selim's moſque ſtands on the ſide of a hill, in the midſt of the city; and hence this magnificent ſtructure may be ſeen on all ſides. Every thing made of gold and ſilver, jewels, piſtols, ſcimitars, &c. are ſold in another part of the city, called by travellers the *bizeſtein*, though it differs little from a bazar. This contains about 200 ſhops, and is covered like the former: but the covering is ſupported by two rows of large pillars. The grand vizier's palace is nothing more than a convenient houſe, after the Turkiſh manner of building. The emperor's ſeraglio is a regular ſtructure, in a plain near the river Tungia. It is two miles in compaſs, and has ſeven gates, beſides thoſe of the gardens, which are ſeveral miles in circumference. The city is governed by a mullah cadi, who has an abſolute authority both in civil and criminal matters. In the time of the plague; or war, the grand ſignior ſometimes reſides here. The Turks took this city from the Greeks in 1362, and made it the capital of empire, till Mahomet II. took Conſtantinople in 1453. E. Long. 26. 27. N. Lat. 41. 41.

ADRIANUM (or ADRIATICUM) MARE, in *Ancient Geography*, now the gulf of Venice, a large bay in the Mediterranean, between Dalmatia, Sclavonia, Greece, and Italy. It is called by the Greeks Ἀδριας Κολπος; and *Adria* by the Romans, (as *Arbiter Adriæ Notus*, Hor.) Cicero calls it *Hadrianum Mare*; Virgil has *Hadriaticas Undas*. It is commonly called *Mare Adriaticum*, without an aſpiration; but whether it ought to have one, is a diſpute: if the appellation is from *Hadria*, the town of the Piceni, it muſt be written *Hadriaticum*, becauſe the emperor's name, who thence derives his origin, is on coins and ſtones *Hadrianus*; but if from the town in the territory of Venice, as the more ancient, and of which that of the Piceni is a colony, this will juſtify the common appellation *Adriaticum*.

Adrogation || Advent.

ADROGATION, in Roman antiquities, a ſpecies of adoption, whereby a perſon who was capable of chooſing for himſelf was admitted by another into the relation of a ſon. The word is compounded of *ad*, "to," and *rogare*, "to aſk;" on account of a queſtion put in the ceremony of it, Whether the adopter would take ſuch a perſon for his ſon? and another to the adoptive, Whether he conſented to become ſuch a perſon's ſon?

ADSIDELLA, in antiquity, the table at which the flamens ſat during the ſacrifices.

ADSTRICTION, among phyſicians, a term uſed to denote the rigidity of any part.

ADUACA, or ATUACA, anciently a large and famous city of the Tungri; now a ſmall and inconſiderable village, called *Tongeren*, in the biſhopric of Liege, to the north-weſt of the city of Liege, in the territory of Haſpengow, on the rivulet Jecker, that ſoon after falls into the Maeſe. E. Long. 5. 52. N. Lat. 50. 54.

ADVANCE, in the mercantile ſtyle, denotes money paid before goods are delivered, work done, or buſineſs performed.

ADVANCED, in a general ſenſe, denotes ſomething poſted or ſituated before another. Thus,

ADVANCED Ditch, in *Fortification*, is that which ſurrounds the glacis or eſplanade of a place.

ADVANCED Guard, or *Vanguard*, in the art of war, the firſt line or diviſion of an army, ranged or marching in order of battle; or, it is that part which is next the enemy, and marches firſt towards them.

ADVANCED Guard, is more particularly uſed for a ſmall party of horſe ſtationed before the main guard.

ADVANCER, among ſportſmen, one of the ſtarts or branches of a buck's attire, between the back antler and the palm.

ADUAR, in the Arabian and Mooriſh cuſtoms, a kind of ambulatory village, conſiſting of tents, which theſe people remove from one place to another, as ſuits their conveniency.

ADVENT, in the calendar, properly ſignifies the approach of the feaſt of the nativity. It includes four Sundays, which begins on St Andrew's day, or on the Sunday before or after it. During advent, and to the end of the octaves of epiphany, the ſolemnizing of marriage is forbidden without a ſpecial licenſe. It is appointed to employ the thoughts of Chriſtians on the firſt advent or coming of Chriſt in the fleſh, and his ſecond advent or coming to judge the world. The primitive Chriſtians practiſed great auſterity during this ſeaſon.

AD VENTREM INSPICIENDUM, in *Law*, a writ by which a woman is to be ſearched whether ſhe be with child by

Adventure. by a former huſband, on her withholding of lands from the next, failing iſſue of her own body.

ADVENTURE, in a general ſenſe, ſome extraordinary or accidental event. It alſo denotes a hazardous or difficult undertaking.

Bill of ADVENTURE, among *Merchants*, a writing ſigned by a merchant, teſtifying the goods mentioned in it to be ſhipped on board a certain veſſel belonging to another perſon, who is to run all hazards; the merchant only obliging himſelf to account to him for the produce.

Adventure Bay, in Van Diemen's land. "There is a beautiful ſandy beach, about two miles long, at the bottom of Adventure bay, formed to all appearance by the particles which the ſea waſhes from a fine white ſand-ſtone. This beach is very well adapted for hauling a ſeine. Behind it is a plain, with a brackiſh lake, out of which we caught, by angling, ſome bream and trout. The parts adjoining the bay are moſtly hilly, and are an entire foreſt of tall trees, rendered almoſt impaſſable by brakes of fern, ſhrubs, &c. The ſoil on the flat land, and on the lower part of the hills, is ſandy, or conſiſts of a yelloviſh earth, and in ſome parts of a reddiſh clay; but further up the hills, it is of a gray tough caſt. This country, upon the whole, bears many marks of being very dry, and the heat appears to be great. No mineral bodies, nor ſtones of any other kind than the white ſand-ſtone, were obſerved by us; nor could we find any vegetables that afforded ſubſiſtence for man. The foreſt trees are all of one kind, and generally quite ſtraight: they bear cluſters of ſmall white flowers. The principal plants obſerved, are wood-ſorrel, milkwort, cudweed, bell-flower, gladiolus, ſamphire, and ſeveral kinds of fern; the only quadruped, a ſpecies of opoſſum, about twice the ſize of a large rat. The kangooroo, found further northward in New Holland, may alſo be ſuppoſed to inhabit here, as ſome of the inhabitants had pieces of the ſkin of that animal.

"The principal ſorts of birds in the woods are brown hawks or eagles, crows, large pigeons, yelloviſh parroquets, and a ſpecies which they called *motacilla cyanea*, from the beautiful azure colour of its head and neck. On the ſhore were ſeveral gulls, black oyſtercatchers, or ſea pies, and plovers of a ſtone colour.

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

ADVENTURER, in a general ſenſe, denotes one who hazards ſomething.

ADVENTURERS, is particularly uſed for an ancient company of merchants and traders, erected for the diſcovery of lands, territories, trades, &c. unknown. The ſociety of adventurers had its riſe in Burgundy, and its firſt eſtabliſhment from John duke of Brabant in 1248, being known by the name of *The brotherhood of St Thomas à Becket.* It was afterwards tranſlated into England, and ſucceſſively confirmed by Edward III. and IV. Richard III. Henry IV. V. VI. and VII. who gave it the appellation of *Merchant Adventurers.*

ADVERB, in *Grammar*, a particle joined to a verb, adjective, or participle, to explain their manner of acting or ſuffering; or to mark ſome circumſtance or quality ſignified by them. The word is formed from the prepoſition *ad*, "to," and *verbum*, "a verb;" and ſignifies literally a word joined to a verb, to ſhow how, when, or where, one is, does, or ſuffers; as, the boy paints *neatly*, writes *ill;* the houſe ſtands *there*, &c. See GRAMMAR.

ADVERSARIA, among the ancients, a book of accounts, not unlike our journals, or day books. It is more particularly uſed for a kind of common-place book. See COMMON-PLACE BOOK.

ADVERSATIVE, in *Grammar*, a word expreſſing ſome difference between what goes before and what follows it. Thus, in the phraſe, *he is an honeſt man, but a great enthuſiaſt*, the word *but* is an adverſative conjunction.

ADVERSATOR, in *Antiquity*, a ſervant who attended the rich in returning from ſupper, to give them notice of any obſtacles in the way, at which they might be apt to ſtumble.

ADVERTISEMENT, in a general ſenſe, denotes any information given to perſons intereſted in an affair; and is more particularly uſed for a brief account of an affair inſerted in the public papers, for the information of all concerned.

ADULA, in *Ancient Geography*, a mountain in Rhætia, or the country of the Griſons, part of the Alps, in which are the fountains of the Rhine; now *St Gothards.*

ADULE, or ADULIS, in *Ancient Geography*, a town of Egypt built by fugitive ſlaves, diſtant from its port on the Red ſea 20 ſtadia. Pliny calls the inhabitants *Adulitæ.* The epithet is either *Adulitanus;* as, *Monumentum Adulitanum*, on the pompous inſcription of the ſtatue of Ptolemy Euergetes, publiſhed by Leo Alatius, at Rome in 1631, and to be found in Spon and Thevenot: or, *Adulicus;* as *Adulicus Sinus*, a part of the Red ſea.

ADULT, an appellation given to any thing that is arrived at maturity: Thus we ſay, an adult perſon, an adult plant, &c. Among civilians, it denotes a youth between 14 and 25 years of age.

ADULTERER,

Adulterer || Adulterine.

ADULTERER, a man who commits adultery. See ADULTERY.

ADULTERESS, a woman guilty of ADULTERY. An adulteress, by our law, undergoes no temporal punishment whatever, except the loss of her dower; and she does not lose even that, if her husband is weak enough to be reconciled to her, and cohabit with her after the offence committed. 13 Ed. I. cap. 34.

But it is to be observed, that adulteresses are such either by the canon or civil law. According to the former, a woman is an adulteress who, either being herself married, converses carnally with another man; or being single herself, converses with a man that is married. According to the latter, she is not an adulteress, if she be not herself in the married state, though she converses with a man that is. The crime, in this case, was more properly called *stuprum* than *adulterium*. Hence, among the Romans the word *adultera*, "adulteress," differed from *pellex*, which denoted a single woman who cohabited with a married man: and *pellex* differed from *concubina*, which signified her who had only intercourse with an unmarried man. The former was reputed infamous, and the other innocent.

ADULTERATION, the act of debasing, by an improper mixture, something that was pure and genuine.

The word is Latin, formed of the verb *adulterare*, "to corrupt," by mingling something foreign to any substance. We have laws against the adulteration of coffee, tea, tobacco, snuff, wine, beer, bread, wax, hairpowder, &c.

ADULTERATION of coin, properly imports the making or casting of a wrong metal, or with too base or too much alloy.

Adulterations of coins are effected divers ways: as, by forging another stamp or inscription; by mixing impure metals with the gold or silver: most properly, by making use of a wrong metal, or an undue alloy, or too great an admixture of the baser metals with gold or silver. Counterfeiting the stamp, or clipping and lessening the weight, do not so properly come under the denomination of *adulterating*.—Evelyn gives rules and methods, both of adulterating and detecting adulterated metals, &c.—*Adulterating* is somewhat less extensive than *debasing*, which includes diminishing, clipping, &c.

To adulterate or debase the current coin, is a capital crime in all nations.—The ancients punished it with great severity: among the Egyptians both hands were cut off: and by the civil law, the offender was thrown to wild beasts. The emperor Tacitus enacted, That counterfeiting the coin should be capital; and under Constantine it was made treason, as it is also among us. The adulterating of gems is a curious art, and the methods of detecting it no less useful. Nichols Lapid. p. 18.

ADULTERINE, in the *Civil Law*, is particularly applied to a child issued from an adulterous amour or commerce. Adulterine children are more odious than the illegitimate offspring of single persons.—The Roman law even refuses them the title of natural children; as if nature disowned them.—Adulterine children are not easily dispensed with for admission to orders. Those are not deemed adulterine, who are begotten of a woman openly married, through ignorance of a former wife being alive.—By a decree of the parliament of Paris, adulterine children are declared not legitimated by the subsequent marriage of the parties, even though a papal dispensation be had for such marriage, wherein is a clause of legitimation. Adultery.

ADULTERINE Marriages, in St Augustine's sense, denote second marriages, contracted after a divorce.

ADULTERY, an unlawful commerce between one married person and another, or between a married and unmarried person.

Punishments have been annexed to adultery in most ages and nations, though of different degrees of severity. In many it has been capital; in others venial, and attended only with slight pecuniary mulcts. Some of the penalties are serious, and even cruel; others of a jocose and humorous kind. Even contrary things have been enacted as punishments for adultery. By some laws, the criminals are forbidden marrying together, in case they became single; by others, they are forbidden to marry any besides each other; by some, they are incapacitated from ever committing the like crime again; by others, they are glutted with it till it becomes downright nauseous.

Among the rich Greeks, adulterers were allowed to redeem themselves by a pecuniary fine; the woman's father, in such cases, returned the dower he had received from her husband, which some think was refunded by the adulterer. Another punishment among those people was, putting out the eyes of adulterers.

The Athenians had an extraordinary way of punishing adulterers, called παραλιλμος ανασαιδωσις, practised at least on the poorer sort who were not able to pay the fines. This was an awkward sort of empalement, performed by thrusting one of the largest radishes up the anus of the adulterer, or, in defect thereof, a fish with a large head, called *mugil*, "mullet." Alcæus is said to have died this way, though it is doubted whether the punishment was reputed mortal. Juvenal and Catullus speak of this custom as received also among the Romans, though not authorized by an express law as it was among the Greeks.

There are various conjectures concerning the ancient punishment of adultery among the Romans. Some will have it to have been made capital by a law of Romulus, and again by the twelve tables. Others, that it was first made capital by Augustus; and others, not before the emperor Constantine. The truth is, the punishment in the early days was very various, much being left to the discretion of the husband and parents of the adulterous wife, who exercised it differently, rather with the silence and countenance of the magistrate than any formal authority from him. Thus we are told, the wife's father was allowed to kill both parties, when caught in the fact, provided he did it immediately, killed both together, and as it were with one blow. The same power ordinarily was not indulged the husband, except the crime were committed with some mean or infamous person; though, in other cases, if his rage carried him to put them to death, he was not punished as a murderer. On many occasions, however, revenge was not carried so far; but mutilating, castrating, cutting off the ears, noses, &c. served the turn. The punishment allotted by the *lex Julia*, was not, as many have imagined, death; but rather banishment, or deportation, being interdicted fire and water: though

Adultery. Octavius appears, in ſeveral inſtances, to have gone beyond his own law, and to have put adulterers to death. Uader Macrinus, many were burnt at a ſtake. Conſtantine firſt by law made the crime capital. Under Conſtantius and Conſtans, adulterers were burnt, or ſewed in ſacks and thrown into the ſea. Under Leo and Marcian, the penalty was abated to perpetual baniſhment, or cutting off the noſe. Under Juſtinian, a farther mitigation was granted, at leaſt in favour of the wife, who was only to be ſcourged, loſe her dower, and be ſhut up in a monaſtery: after two years, the huſband was at liberty to take her back again; if he refuſed, ſhe was ſhaven, and made a nun for life: But it ſtill remained death in the huſband. The reaſon alleged for this difference is, that the woman is the weaker veſſel. Matthæus declaims againſt the empreſs Theodora, who is ſuppoſed to have been the cauſe of this law, as well as of others procured in favour of that ſex from the emperor.

Under Theodoſius, women convicted of this crime were puniſhed after a very ſingular manner, viz. by a public conſtupration; being locked up in a narrow cell, and forced to admit to their embraces all the men that would offer themſelves. To this end, the gallants were to dreſs themſelves on purpoſe, having ſeveral little bells faſtened to their clothes, the tinkling of which gave notice to thoſe without of every motion. This cuſtom was again aboliſhed by the ſame prince.

By the Jewiſh law, adultery was puniſhed by death in both parties, where they were both married, or only the woman. The Jews had a particular method of trying, or rather purging, an adultereſs, or a woman, ſuſpected of the crime, by making her drink the bitter waters of jealouſy; which, if ſhe were guilty, made her ſwell.

Among the Mingrelians, according to Chardin, adultery is puniſhed with the forfeiture of a hog, which is uſually eaten in good friendſhip between the gallant, the adultereſs, and the cuckold. In ſome parts of the Indies, it is ſaid any man's wife is permitted to proſtitute herſelf to him who will give an elephant for the uſe of her; and it is reputed no ſmall glory to her to have been rated ſo high. Adultery is ſaid to be ſo frequent in Ceylon, that not a woman but practiſes it, notwithſtanding its being puniſhable with death. Among the Japaneſe, and divers other nations, adultery is only penal in the woman. Among the Abyſſinians, the crime of the huſband is ſaid to be only puniſhed on the innocent wife. In the Marian iſlands, on the contrary, the woman is not puniſhable for adultery; but if the man go aſtray he pays ſeverely: the wife and her relations waſte his lands, turn him out of his houſe, &c. Among the Chineſe, there is reaſon to conclude that adultery is not capital; for it is ſaid that fond parents will make a contract with their daughters future huſbands to allow them the indulgence of a gallant.

In Spain, they puniſhed adultery in men by cutting off that part which had been the inſtrument of the crime. In Poland, before Chriſtianity was eſtabliſhed, they puniſhed adultery and fornication in a very particular manner: the criminal they carried to the market-place, and there faſtened him by the teſticles with a nail; laying a razor within his reach, and leaving him under a neceſſity, either of doing juſtice upon himſelf, or of periſhing in that condition.

The Saxons formerly burnt the adultereſs, and over her aſhes erected a gibbet, whereon the adulterer was hanged. In this kingdom, likewiſe, adultery, by the ancient laws, was ſeverely puniſhed. King Edmund the Saxon ordered adultery to be puniſhed in the ſame manner as homicide; and Canute the Dane ordered that a man who committed adultery ſhould be baniſhed, and that the woman ſhould have her noſe and ears cut off. In the time of Henry I. it was puniſhed with the loſs of eyes and genitals. Adultery.

In Britain, adultery is reckoned a ſpiritual offence, that is, cognizable by the ſpiritual courts, where it is puniſhed by fine and penance. The common law takes no farther notice of it, than to allow the party grieved an action and damages. This practice is often cenſured by foreigners, as making too light of a crime, the bad conſequences of which, public as well as private, are ſo great. It has been anſwered, that perhaps this penalty, by civil action, is more wiſely calculated to prevent the frequency of the offence, which ought to be the end of all laws, than a ſeverer puniſhment. He that by a judgement of law is, according to circumſtances, ſtripped of great part of his fortune, thrown into priſon till he can pay it, or forced to fly his country, will, no doubt, in moſt caſes, own that he pays dearly for his amuſement.

As to the moral turpitude of this offence, ſome have vainly endeavoured to deny or explain it away by various arguments, and even by an appeal to Scripture. On the part of the *man* who ſolicits the chaſtity of a married woman, it certainly includes the crime of SEDUCTION, and is attended with miſchief ſtill more complicated and extenſive: It creates a new ſufferer, the injured huſband, upon whoſe ſimplicity and affection is inflicted a wound the moſt painful and incurable that human nature knows. The infidelity of the *woman* is aggravated by cruelty to her children, who are generally involved in their parents ſhame, and always made unhappy by their quarrel.

It has been argued, that theſe conſequences ought leſs to be attributed to the crime than to the diſcovery. But, in the firſt place, the crime could not be diſcovered unleſs it were committed, and the commiſſion is never ſecure from diſcovery. 2dly, If adulterous connections were allowable whenever the parties could hope to eſcape detection, which is the concluſion to which this argument leads, the huſband would be left no other ſecurity for his wife's chaſtity, than in her want of opportunity or temptation; which would probably deter moſt men from marrying; or render marriage a ſtate of continual jealouſy and alarm to the huſband, which would end in the ſlavery and confinement of the wife.

The marriage vow is "witneſſed before God," and accompanied with circumſtances of ſolemnity and religion which approach to the nature of an oath. The married offender, therefore, incurs a crime little ſhort of perjury, and the ſeduction of a married woman is little leſs than ſubornation of perjury:—and this guilt is independent of the diſcovery.

But the uſual apology for adultery is the prior tranſgreſſion of the other party; and ſo far, indeed, as the bad effects of adultery are anticipated by the conduct of the huſband or wife who offends firſt, the guilt of the ſecond offender is extenuated. But this can never

amount

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amount to a justification; unless it could be shown that the obligation of the marriage vow depends upon the condition of reciprocal fidelity; a construction which appears founded neither in expediency, nor in the terms of the vow, nor in the design of the legislature which prescribed the marriage rite. The way of considering the offence upon the footing of *provocation and retaliation*, is a childish trifling with words.

"Thou shalt not commit adultery," was an interdict delivered by God himself; yet Scripture has been adduced as giving countenance to the crime. As Christ told the woman taken in adultery, "Neither do *I condemn thee*," we must believe, it is said, that he deemed her conduct either not criminal, or at least not a crime of the heinous nature we represent it to be. But from a more attentive examination of the case, it will be evident that nothing can be concluded from it favourable to such an opinion. The transaction is thus related *: 'Early in the morning Jesus came again into the temple, and all the people came unto him; and he sat down and taught them. And the Scribes and Pharisees brought unto him a woman taken in adultery; and when they had set her in the midst, they say unto him, Master, this woman was taken in adultery in the very act. Now Moses in the law commanded us that such should be stoned, but what sayest thou? This they said, tempting him, that they might have to accuse him. But Jesus stooped down, and with his finger wrote on the ground, as though he heard them not. So when they continued asking him, he lifted up himself, and said unto them, He that is without sin amongst you, let him first cast a stone at her; and again he stooped down and wrote on the ground: and they which heard it, being convicted by their own conscience, went out one by one, beginning at the eldest, even unto the last; and Jesus was left alone, and the woman standing in the midst. When Jesus had lifted up himself, and saw none but the woman, he said unto her, Woman, where are those thine accusers? Hath no man condemned thee? She said, No man, Lord: and Jesus said unto her, *Neither do I condemn thee;* go and sin no more.'

* *St John's Gospel*, chap. viii.

'This they said tempting him, that they might have to accuse him;' that is, to draw him into an exercise of judicial authority, that they might have to accuse him before the Roman governor of usurping or intermeddling with the civil government.

Paley's Moral and Political Philosophy, p. 258 3d edit. 4to.

"This was their design; and Christ's behaviour throughout the whole affair proceeded from a knowledge of this design, and a determination to defeat it. He gives them at first a cold and sullen reception, well suited to the insidious intention with which they came: 'he stooped down, and with his finger wrote on the ground as though he heard them not.' 'When they '*continued* asking him,' when they teased him to speak, he dismissed them with a rebuke, which the impertinent malice of their errand, as well as the secret character of many of them, deserved: 'he that is without sin (that is, this sin) among you, let him first 'cast a stone at her.' This had its effect. Stung with the reproof, and disappointed of their aim, they stole away one by one, and left Jesus and the woman alone. And then follows the conversation, which is the part of the narrative most material to our present subject. 'Jesus saith unto her, Woman, where are 'those thine accusers? Hath no man condemned thee? 'She said, No man, Lord. And Jesus said unto her, 'Neither do I condemn thee; go and sin no more.' Now, when Christ asked the woman, 'Hath no man '*condemned* thee?" he certainly spoke, and was understood by the woman to speak, of a legal and judicial condemnation; otherwise her answer, 'No man, Lord,' was not true. In every other sense of condemnation, as blame, censure, reproof, private judgement, and the like, many had condemned her; all those, indeed, who brought her to Jesus. If then a judicial sentence was what Christ meant by *condemning* in the question, the common use of language requires us to suppose that he meant the same in his reply, 'Neither do I con'demn thee:' i. e. I pretend to no judicial character or authority over thee; it is no office or business of mine to pronounce or execute the sentence of the law. When Christ adds, 'Go and sin no more,' he in effect tells her that she had sinned already; but as to the degree or quality of the sin, or Christ's opinion concerning it, nothing is declared, or can be inferred, either way."

Adultery.

It has been controverted, whether adultery may be lawfully committed in war, with the enemies wives? The answer is in the negative, and the authorized practice of civilized nations is agreeable to this. It has also been a famous question, whether it be lawful for a woman to commit adultery with the consent of her husband, and for the procuring some great good to him? St Austin apparently allows of it; at least, does not condemn it *.

* *De Serm. Dom. in Mont.* lib. i. cap. 16. § 49. *et De Civ. Dei*, lib. xvi. cap. 25.

It has likewise been a dispute, whether it be lawful for one of the parties married to commit adultery, with the consent of the other, for the sake of having children? Of which we have instances in Abraham, who, on this account, conversed with Hagar; and likewise among the Greeks and Romans. Pollman, a German professor, has a dissertation on the husband's right to alienate his wife's body to another's use.

It is much disputed, whether adultery dissolves the bond of matrimony, and be a sufficient cause of divorce, so that the parties may marry again. This was allowed in the ancient church, and is still continued in the Greek, as well as the Lutheran and Calvinist churches. Romanists, however, disallow of it, and the council of Trent even anathematized those who maintain it; though the canon of anathematization was mitigated in deference to the republic of Venice, in some of whose dominions, as Zant, Cephalonia, &c. the contrary usage obtains. The ecclesiastical courts in England so far agree with the Papists, that they only grant a divorce *à mensa et thoro*, in case of adultery; so that a complete divorce, to enable the parties to marry again, cannot be had without an act of parliament.

ADULTERY is also used in ancient customs, for the punishment or fine imposed for that offence, or the privilege of prosecuting for it. In which sense, *adulterium* amounts to the same with what the Saxons call *legerwita*.

ADULTERY is sometimes used in a more extensive sense, for any species of impurity or crime against the virtue of chastity; and in this sense divines understand the seventh commandment.

Adultery, Advocate.

ADULTERY is alſo uſed, eſpecially in Scripture, for idolatry, or departing from the true God to the worſhip of a falſe one.

ADULTERY is alſo uſed, in eccleſiaſtical writers, for a perſon's invading or intruding into a biſhopric during the former biſhop's life. The reaſon of the appellation is, that a biſhop is ſuppoſed to contract a kind of ſpiritual marriage with his church. The tranſlation of a biſhop from one ſee to another was alſo reputed a ſpecies of adultery; on the ſuppoſition of its being a kind of ſecond marriage, which, in thoſe days, was eſteemed a degree of adultery. This concluſion was founded on that text of St Paul, *Let a biſhop be the huſband of one wife*, by a forced conſtruction of church for wife, and of biſhop for huſband. (Du Cange).

ADULTERY is alſo uſed by ancient naturaliſts, for the act of ingrafting one plant upon another. In which ſenſe, Pliny ſpeaks of the adulteries of trees, *arborum adulteria*, which he repreſents as contrary to nature, and a piece of luxury or needleſs refinement.

ADVOCATE, among the Romans, a perſon ſkilled in their law, who undertook the defence of cauſes at the bar. The Roman advocates anſwered to one part of the office of a barriſter in England, viz. the pleading part; for they never gave counſel, that being the buſineſs of the *juriſconſulti*.

The Romans, in the firſt ages of their ſtate, held the profeſſion of an advocate in great honour; and the ſeats of their bar were crowded with ſenators and conſuls; they, whoſe voices commanded the people, thinking it an honour to be employed in defending them. They were ſtyled *comites*, *honorati*, *clariſſimi*, and even *patroni*; as if their clients were not leſs obliged to them than freed men to their maſters. The bar was not at that time venal. Thoſe who aſpired to honours and offices took this way of gaining an intereſt in the people, and always pleaded *gratis*. But no ſooner were luxury and corruption introduced into the commonwealth, than the bar became a ſharer in them. Then it was that the ſenators let out their voices for pay, and zeal and eloquence were ſold to the higheſt bidder. To put a ſtop to this abuſe, the tribune Cincius procured a law to be paſſed, called from him *Lex Cincia*, whereby the advocates were forbid to take any money of their clients. It had before this been prohibited the advocates to take any preſents or gratuities for their pleading. The emperor Auguſtus added a penalty to it: notwithſtanding which, the advocates played their part ſo well, that the emperor Claudius thought it an extraordinary circumſtance, when he obliged them not to take above eight great ſeſterces, which are equivalent to about 64l. ſterling, for pleading each cauſe.

ADVOCATE is ſtill uſed in countries and courts where the civil law obtains, for thoſe who plead and defend the cauſes of clients truſted to them.

ADVOCATE of a city, in the German polity, a magiſtrate appointed in the emperor's name to adminiſter juſtice.

ADVOCATE is more particularly uſed in church hiſtory, for a perſon appointed to defend the rights and revenues of a church or religious houſe. The word *advocatus*, or *advowee*, is ſtill retained for what we uſually call the *patron*, or he who has the advowſon, or right of preſentation in his own name.

Advocate.

Conſiſtorial ADVOCATES; officers of the conſiſtory at Rome, who plead in all oppoſitions to the diſpoſal of benefices in that court: they are ten in number.

Elective ADVOCATES, thoſe choſen by the abbot, biſhop, or chapter; a particular licenſe being had from the king or prince for that purpoſe. The elections were originally made in the preſence of the count of the province.

Feudal ADVOCATES. Theſe were of the military kind, who, to make them more zealous for the intereſt of the church, had lands granted them in fee, which they held of the church, and did homage, and took an oath of fidelity to the biſhop or abbot. Theſe were to lead the vaſſals of the church to war, not only in private quarrels of the church itſelf, but in military expeditions for the king's ſervice, in which they were the ſtandard-bearers of their churches.

Fiſcal ADVOCATE, *fiſci advocatus*, in Roman antiquity, an officer of ſtate under the Roman emperors, who pleaded in all cauſes wherein the *fiſcus*, or private treaſury, was concerned.

Juridical ADVOCATES, in the middle age, were thoſe who from attending cauſes in the court of the *comes*, or count of the province, became judges themſelves, and held courts of their vaſſals thrice a-year, under the name of the *tria placita generalia*. In conſideration of this further ſervice, they had a particular allowance of one-third part of all fines, or mulcts, impoſed on defaulters, &c. beſides a proportion of diet for themſelves and ſervants.

Matricular ADVOCATES, were the advocates of the mother or cathedral churches.

Military ADVOCATES, thoſe appointed for the defence of the church, rather by arms and authority than by pleading and eloquence. Theſe were introduced in the times of confuſion, when every perſon was obliged to maintain his own property by force; biſhops and abbots not being permitted to bear arms, and the ſcholaſtic or gowned advocates being equally unacquainted with them, recourſe was had to knights, noblemen, ſoldiers, or even to princes.

Nominative ADVOCATES, thoſe appointed by a king or pope. Sometimes the churches petitioned kings, &c. to appoint them an advocate: at other times this was done of their own accord. By ſome regulations, no perſon was capable of being elected advocate, unleſs he had an eſtate in land in the ſame county.

Regular ADVOCATES, thoſe duly formed and qualified for their profeſſion, by a proper courſe of ſtudy, the requiſite oath, ſubſcription, licenſe, &c.

Subordinate ADVOCATES, thoſe appointed by other ſuperior ones, acting under them, and accountable to them. There were various reaſons for the creation of theſe ſubordinate advocates; as, the ſuperior quality of the principal advocate, his being detained in war, or being involved in other affairs; but chiefly the too great diſtance of ſome of the church lands, and their lying in the dominions of foreign princes.

Supreme or *Sovereign* ADVOCATES, were thoſe who had the authority in chief; but acted by deputies or ſubordinate advocates. Theſe were called alſo *principal*, *greater*, and ſometimes *general* advocates. Such in many caſes were kings, &c. when either they had been choſen advocates, or became ſuch by being founders or endowers of churches. Princes had alſo

Advocate, Advocation.

another title to advocateſhip, ſome of them pretending to be *advocati nati* of the churches within their dominions.

Advocates, in the Engliſh courts, are more generally called *counſel*. See Counsel.

Faculty of Advocates, in Scotland, a reſpectable body of lawyers, who plead in all cauſes before the courts of ſeſſion, juſticiary, and exchequer. They are alſo entitled to plead in the houſe of peers, and other ſupreme courts in England.

In the year 1680, the faculty founded a library upon a very extenſive plan, ſuggeſted by that learned and eminent lawyer Sir George M'Kenzie of Roſehaugh, advocate to King Charles II. and King James VII. who enriched it with many valuable books. It has been daily increaſing ſince that time, and now contains not only the beſt collection of law books in Europe, but a very large and ſelect collection of books in all ſubjects. Beſides, this library contains a great number of original manuſcripts, and a vaſt variety of Jewiſh, Grecian, Roman, Scots, and Engliſh coins and medals.

A candidate for the office of an advocate undergoes three ſeveral trials: The firſt is in Latin, upon the civil law and Greek and Roman antiquities; the ſecond, in Engliſh, upon the municipal law of Scotland; and, in the third, he is obliged to defend a Latin theſis, which is impugned by three members of the faculty. Immediately before putting on the gown, the candidate makes a ſhort Latin ſpeech to the lords, and then takes the oaths to the government and *de fideli*.

The faculty at preſent conſiſts of above 200 members. As an advocate or lawyer is eſteemed the genteeleſt profeſſion in Scotland, many gentlemen of fortune take the degree of advocate, without having any intention of practiſing at the bar. This circumſtance greatly increaſes their number, gives dignity to the profeſſion and enriches their library and public fund. It is from this reſpectable body that all vacancies on the bench are generally ſupplied.

Lord Advocate, or *King's Advocate*, one of the eight great officers of ſtate in Scotland, who as ſuch ſat in parliament without election. He is the principal crown lawyer in Scotland. His buſineſs is to act as a public proſecutor, and to plead in all cauſes that concern the crown; but particularly in ſuch as are of a criminal nature. The office of king's advocate is not very ancient: It ſeems to have been eſtabliſhed about the beginning of the 16th century. Originally he had no power to proſecute crimes without the concurrence of a private party; but, in the year 1597, he was empowered to proſecute crimes at his own inſtance. He has the privilege of pleading in court with his hat on. This privilege was firſt granted to Sir Thomas Hope; who having three ſons lords of ſeſſion, it was thought indecent that the father ſhould plead uncovered before the ſons, who as judges ſat covered.

Bill of ADVOCATION, in *Scots Law*, a writing drawn up in the form of a petition; whereby a party, in an action before an inferior court, applies to the ſupreme court, or court of ſeſſion, for calling the action from the inferior court before itſelf.

Letters of Advocation, in *Scots Law*, the decree or warrant of the court of ſeſſion upon cognizance of the facts ſet forth in the bill, drawn up in the form of a ſummons, and paſſing under the ſignet, diſcharging the inferior judge and all others from further procedure in the cauſe, and advocating it to itſelf. Advowee.

ADVOWEE, in ancient cuſtoms and law books, denotes the advocate of a church, religious houſe, or the like. There were advowees of cathedrals, abbeys, monaſteries, &c. Thus, Charlemagne had the title of advowee of St Peters; King Hugh, of St Riquier; and Bolandus mentions ſome letters of Pope Nicholas, by which he conſtituted King Edward the Confeſſor, and his ſucceſſors, advowees of the monaſtery at Weſtminſter, and of all the churches in England. Theſe advowees were the guardians, protectors, and adminiſtrators of the temporal concerns of the churches, &c. and under their authority were paſſed all contracts which related to them. It appears alſo, from the moſt ancient charters, that the donations made to churches were conferred on the perſons of the advowees. They always pleaded the cauſes of the churches in court, and diſtributed juſtice for them, in the places under their juriſdiction. They alſo commanded the forces furniſhed by their monaſteries, &c. for the war; and even were their champions, and ſometimes maintained duels for them.

This office is ſaid to have been firſt introduced in the fourth century, in the time of Stillico; though the Benedictines do not fix its origin before the eighth century. By degrees, men of the firſt rank were brought into it, as it was found neceſſary either to defend with arms or to protect with power and authority. In ſome monaſteries they were only called *conſervators*; but theſe, without the name, had all the functions of advowees. There were alſo ſometimes ſeveral ſub-advowees, or ſub-advocates, in each monaſtery, who officiated inſtead of the advowees themſelves; which, however, proved the ruin of monaſteries; thoſe inferior officers running into great abuſes.

Hence alſo, huſbands, tutors, and every perſon in general, who took upon him the defence of another, were denominated *advowees*, or advocates. Hence ſeveral cities had their advowees; which were eſtabliſhed long after the eccleſiaſtical ones, and doubtleſs from their example. Thus we read in hiſtory of the advowees of Augſburg, of Arras, &c.

The *vidames* aſſumed the quality of advowees; and hence it is, that ſeveral hiſtorians of the eighth century confound the two functions together. Hence alſo it is, that ſeveral ſecular lords in Germany bear mitres for their creſts, as having anciently been advowees of the great churches.

Spelman diſtinguiſhes two kinds of eccleſiaſtical advowees.—The one, of cauſes or proceſſes, *advocati cauſarum*; the other, of territory or lands, *advocati ſoli*. The former were nominated by the king, and were uſually lawyers, who undertook to plead the cauſes of the monaſteries. The other, which ſtill ſubſiſt, and are ſometimes called by their primitive name, *advowees*, though more uſually *patrons*, were hereditary; as being the founders and endowers of churches, &c. or their heirs.

Women were ſometimes advowees, *advocatiſſæ*. And, in effect, the canon law mentions ſome who had this title, and who had the ſame right of preſentation, &c. in their churches which the advowees themſelves had.

In

Advowſon, Aduſt.

In a ſtat. 25 Edw. III. we meet with *advowee paramount* for the higheſt patron; that is, the king.

ADVOWSON, or ADVOWZEN, in *Common Law*, ſignifies a right to preſent to a vacant benefice. Advowſon is ſo called, becauſe the right of preſenting to the church was firſt gained by ſuch as were founders, benefactors, or maintainers of the church.

Though the nomination of fit perſons to officiate in every dioceſe was originally in the biſhop, yet they were content to let the founders of churches have the nomination of the perſons to the churches ſo founded, reſerving to themſelves a right to judge of the fitneſs of the perſons nominated.

Advowſons formerly were moſt of them appendant to manors, and the patrons were parochial barons: the lordſhip of the manor and patronage of the church were ſeldom in different hands, until advowſons were given to religious houſes. But of late times the lordſhip of the manor and advowſon of the church have been divided.

Advowſons are *preſentative*, *collative*, or *donative*: *preſentative*, where the patron preſents or offers his clerk to the biſhop of the dioceſe, to be inſtituted in his church; *collative*, where the benefice is given by the biſhop, as original patron thereof, or by means of a right he has acquired by lapſe; *donative*, as where the king or other patron does, by a ſingle donation in writing, put the clerk into poſſeſſion, without preſentation, inſtitution, or induction.

Sometimes, anciently, the patron had the ſole nomination of the prelate, abbot, or prior; either by inveſtiture (*i. e.* delivery of a paſtoral ſtaff), or by direct preſentation to the dioceſan; and if a free election was left to the religious, yet a *congé d'elire*, or licenſe of election, was firſt to be obtained of the patron, and the perſon elected was confirmed by him. If the founder's family became extinct, the patronage of the convent went to the lord of the manor. Unleſs the ſeveral colleges in the univerſities be reſtrained in the number of advowſons they may receive, it is argued they will in time acquire ſuch a ſtock as to fruſtrate the deſign of their foundation (which is the education of youth), by creating too quick a ſucceſſion of fellows; ſo that there will not be in the colleges a ſufficient number of perſons of competent age, knowledge, and experience, to inſtruct and form the minds of the youth. In ſome colleges the number of advowſons is ſaid to be already two-thirds, or more, of the number of fellows. It is objected, on the other ſide, that the ſucceſſion of fellows may be too ſlow as well as too quick; whereby perſons well qualified may be detained ſo long in colleges as not to have ſtrength or activity enough left for the diſcharge of parochial functions.

Colleges holding more advowſons in number than a moiety of the fellows, are not capable of purchaſing more. Grants of advowſons by Papiſts are void. 9 Geo. II. c. 36. § 5. 11 Geo. II. c. 17. § 5.

Advowſons are temporal inheritances and lay fees; they may be granted by deed or will, and are aſſets in the hands of heirs or executors. Preſentations to advowſons for money, or other reward, are void. 31 Eliz. cap. 6.

In Scotland, this right is called *patronage*. See PATRONAGE.

ADUST, ADUSTUS, among phyſicians, &c. is applied to ſuch humours as by long heat become of a hot and fiery nature. Such is choler ſuppoſed to be. Melancholy is uſually conſidered as black and aduſt bile. Blood is ſaid to be aduſt, when, by reaſon of ſome extraordinary heat, its more ſubtle parts are all evaporated, leaving the groſſer, with all the impurities therein, half torrified,

Ady
ſi
Æacus.

ADY, in *Natural Hiſtory*, a name given to the palm tree of the iſland of St Thomas. It is a tall tree with a thick, bare, upright ſtem, growing ſingle on its root, of a thin light timber, and full of juice. The head of this tree ſhoots into a vaſt number of branches, which being cut off, or an inciſion being made therein, afford a great quantity of ſweet juice, which fermenting ſupplies the place of wine among the Indians. The fruit of this tree is called by the Portugueſe *caryoces* and *carioſſe*; and by the black natives, *abanga*. This fruit is of the ſize and ſhape of a lemon; and contains a kernel, which is good to eat. The fruit itſelf is eaten roaſted, and the raw kernels are often mixed with mandioc meal. Theſe kernels are ſuppoſed very cordial. An oil is alſo prepared from this fruit, which anſwers the purpoſe of oil or butter. This oil is alſo uſed for anointing ſtiff and contracted parts of the body.

ADYNAMIA, in *Medicine*, of α privative, and δυναμις *ſtrength*, want of power, debility, or weakneſs, from ſickneſs.

ADYNAMIÆ, the ſecond claſs of Dr Cullen's noſological arrangement, which includes thoſe diſeaſes in which the involuntary motions, whether vital or natural, are diminiſhed.

ADYNAMON, among ancient phyſicians, a kind of weak factitious wine, prepared from muſt boiled down with water; to be given to patients to whom genuine wine might be hurtful.

ADYTUM, in Pagan antiquity, the moſt retired and ſacred place of temples, into which none but the prieſts were allowed to enter. The *Sanctum Sanctorum* of the temple of Solomon was of the nature of the pagan adytum, none but the high prieſt being admitted into it, and he but once a-year.

ADZE, or ADDICE, a cutting tool of the axe kind; having its blade made thin and arching, and its edge at right angles to the handle; chiefly uſed for taking off thin chips of timber or boards, and for paring away certain irregularities which the axe cannot come at. The adze is uſed by carpenters, but more by coopers, as being convenient for cutting the hollow ſides of boards, &c. It is ground from a baſe on its inſide to its outer edge; ſo that, when it is blunt, they cannot conveniently grind it without taking its helve out of the eye.

AE, or Æ, a diphthong compounded of A and E. Authors are by no means agreed as to the uſe of the *æ* in Engliſh words. Some, out of regard to etymology, inſiſt on its being retained in all words, particularly technical ones, borrowed from the Greek and Latin; while others, from a conſideration that it is no proper dipbthong in our language, its ſound being no other than that of the ſimple *e*, contend that it ought to be entirely diſuſed; and, in fact, the ſimple *e* has of late been adopted inſtead of the Roman *æ*, as in the word *equator*, &c.

ÆACEA, in Grecian antiquity, ſolemn feſtivals and games celebrated at Ægina, in honour of Æacus.

ÆACUS, the ſon of Jupiter by Ægina. When

Ædile
||
Ægagropila.

Æbudæ
||
Ædile.

the isle of Ægina was depopulated by a plague, his father, in compassion to his grief, changed all the ants upon it into men and women, who were called *Myrmidones*, from μυρμηξ, *an ant*. The foundation of the fable is said to be, that when the country had been depopulated by pirates, who forced the few that remained to take shelter in caves, Æacus encouraged them to come out, and by commerce and industry recover what they had lost. His character for justice was such, that, in a time of universal drought, he was nominated by the Delphic oracle to intercede for Greece, and his prayer was answered. See the article ÆGINA. The Pagans also imagined that Æacus, on account of his impartial justice, was chosen by Pluto one of the three judges of the dead; and that it was his province to judge the Europeans.

ÆBUDÆ, a name anciently given to the Western islands of Scotland.

ÆBURA, in *Ancient Geography*, a town of Spain, in Estremadura, on the river Guadiana, to the west of Merida; now called *Talavera*. W. Long. 7. 15. N. Lat. 38. 40.

ÆCHMALOTARCHA, in Jewish antiquity, a title given to the principal leader or governor of the Hebrew captives residing in Chaldea, Assyria, and the neighbouring countries. This magistrate was called by the Jews, *rosch-galath*, i. e. the chief of the captivity: but the above term, of like import in the Greek, is that used by Origen and others who wrote in the Greek tongue.

The Jewish writers assure us, that the *æchmalotarchæ* were only to be chosen out of the tribe of Judah. The eastern Jews had their princes of the captivity, as the western Jews their patriarchs. The Jews are still said to have an *æchmalotarcha* at Babylon, but without the authority of the ancient ones. (*Basnage Hist. Jews*, and *Prideaux's Connection.*)

ÆCIDIUM, in *Botany*. See BOTANY *Index*.

ÆCULANUM, in *Ancient Geography*, a town of the Hirpini in Italy, at the foot of the Apennines, to the east of Abellinum, contracted *Æclanum*, situated between Beneventum and Tarentum. The inhabitants are called *Æculani* by Pliny; and *Æclanenses*, in an ancient inscription (Gruter). The town is now called *Fricento*, (Cluverius), 43 miles east of Naples. E. Long. 15. 28. N. Lat. 41. 15.

ÆDES, in Roman antiquity, besides its more ordinary signification of a house, likewise signified an inferior kind of temple, consecrated to some deity.

ÆDICULA, a term used to denote the inner part of the temple, where the altar and statue of the deity stood.

ÆDILATE, the office of ædile, sometimes called *Ædility*. See the next article.

ÆDILE (*ædilis*), in Roman antiquity, a magistrate whose chief business was to superintend buildings of all kinds, but more especially public ones, as temples, aqueducts, bridges, &c. To the ædiles likewise belonged the care of the highways, public places, weights and measures, &c. They also fixed the prices of provisions, took cognizance of debauches, punished lewd women, and such persons as frequented gaming houses. The custody of the plebiscita, or orders of the people, was likewise committed to them. They had the inspection of comedies and other pieces of wit; and were obliged to exhibit magnificent games to the people, at their own expence, whereby many of them were ruined. To them also belonged the custody of the plebiscita, and the censure and examination of books. They had the power, on certain occasions, of issuing edicts; and, by degrees, they procured to themselves a considerable jurisdiction, the cognizance of various causes, &c. This office ruined numbers by its expensiveness; so that, in Augustus's time, even many senators declined it on that account.

All these functions which rendered the ædiles so considerable belonged at first to the ædiles of the people, *ædiles plebeii*, or *minores*: these were only two in number, and were first created in the same year as the tribunes: for the tribunes, finding themselves oppressed with the multiplicity of affairs, demanded of the senate to have officers, to whom they might intrust matters of less importance: and accordingly two ædiles were created; and hence it was that the ædiles were elected every year at the same assembly as the tribunes. But these plebeian ædiles having refused, on a signal occasion, to treat the people with shows, as pleading themselves unable to support the expence thereof, the patricians made an offer to do it, provided they would admit them to the honours of the *ædilate*. On this occasion there were two new ædiles created, of the number of the patricians, in the year of Rome 388; they were called *ædiles curules*, or *majores*; as having a right to sit on a curule chair, enriched with ivory, when they gave audience; whereas the plebeian ædiles only sat on benches.—Besides that the curule ædiles shared all the ordinary functions with the plebeian, their chief employ was, to procure the celebration of the grand Roman games, and to exhibit comedies, shows of gladiators, &c. to the people; and they were also appointed judges in all cases relating to the selling or exchanging estates.

To ease these four first ædiles, Cæsar created a new kind, called *ædiles cerealis*, as being deputed chiefly to take care of the corn, which was called *donum Cereris*; for the Heathens honoured Ceres as the goddess who presided over corn, and attributed to her the invention of agriculture. These ædiles cereales were also taken out of the order of patricians. In the municipal cities there were ædiles, and with the same authority as at Rome.

We also read of an *ædilis alimentarius*, expressed in abbreviature by *Ædil. alim.* whose business seems to have been to provide diet for those who were maintained at the public charge, though others assign him a different office.—In an ancient inscription we also meet with *ædile* of the camp, *ædilis castrorum*.

ÆDILITIUM EDICTUM, among the Romans, was that whereby a remedy was given to a buyer in case a vicious or unsound beast, or slave, was sold to him. It was called *ædilitium*, because the preventing of frauds in sales and contracts belonged especially to the curule ædiles.

ÆDITUUS, in Roman antiquity, an officer belonging to the temple, who had the charge of the offerings, treasure, and sacred utensils. The female deities had a female officer of this kind called *Æditua*.

ÆGAGROPILA, a ball composed of hair, generated in the stomach of the chamois goat, which is similar to those found in cows, hogs, &c. There is another

Ægæ ‖ Ægilops.

another ſpecies of ball found in ſome animals, particularly horſes, which is a calculous concretion.

ÆGÆ, or ÆGÆA, in *Ancient Geography*, the name of *Ædeſſa*, ſo called from the following adventure: Caranus, the firſt king of Macedonia, being ordered by the oracle to ſeek out a ſettlement in Macedonia, under the conduct of a flock of goats, ſurpriſed the town of Ædeſſa, during a thick fog and rainy weather, in following the goats that fled from the rain; which goats ever after, in all his military expeditions, he cauſed to precede his ſtandard; and in memory of this he called Ædeſſa *Ægea*, and his people *Ægeadæ*. And hence probably, in the prophet Daniel, the he-goat is the ſymbol of the king of Macedon.

ÆGEAN SEA, in *Ancient Geography*, now the *Archipelago*, a part of the Mediterranean, ſeparating Europe from Aſia; waſhing, on the one hand, Greece and Macedonia; on the other, Caria and Ionia. The origin of the name is greatly diſputed. Feſtus advances three opinions: one, that it is ſo called from the many iſlands therein, at a diſtance appearing like ſo many goats; another, becauſe Ægea queen of the Amazons periſhed in it: a third opinion is, becauſe Ægeus, the father of Theſeus, threw himſelf headlong into it.

ÆGEUS, in fabulous hiſtory, was king of Athens, and the father of Theſeus. The Athenians having baſely killed the ſon of Minos king of Crete, for carrying away the prize from them, Minos made war upon the Athenians; and being victorious, impoſed this ſevere condition on Ægeus, that he ſhould annually ſend into Crete ſeven of the nobleſt of the Athenian youths, choſen by lot, to be devoured by the Minotaur. On the fourth year of this tribute, the choice fell on Theſeus; or, as others ſay, he himſelf entreated to be ſent. The king, at his ſon's departure, gave orders, that as the ſhip ſailed with black ſails, it ſhould return with the ſame in caſe he periſhed; but, if he became victorious, he ſhould change them into white. When Theſeus returned to Crete, after killing the Minotaur, and forgot to change the ſails in token of his victory, according to the agreement with his father; the latter, who watched the return of the veſſel, ſuppoſing by the black ſails that his ſon was dead, caſt himſelf headlong into the ſea, which afterwards obtained the name of the *Ægean ſea*. The Athenians decreed Ægeus divine honours; and ſacrificed to him as a marine deity, the adopted ſon of Neptune.

ÆGIAS, among phyſicians, a white ſpeck on the pupil of the eye, which occaſions a dimneſs of ſight.

ÆGIDA, (Pliny); now *Capo d'Iſtria*, the principal town on the north of the territory of Iſtria, ſituated in a little iſland, joined to the land by a bridge. In an inſcription, (Gruter), it is called *Ægidis Inſula*. E. Long. 14. 20. N. Lat. 45. 50. It was afterwards called *Juſtinopolis*, after the emperor Juſtinus.

ÆGILOPS, the name of a tumour in the great angle of the eye; either with, or without, an inflammation. The word is compounded of αἴξ *goat*, and ὤψ, *eye*; as goats are ſuppoſed extremely liable to this diſtemper.

Authors frequently uſe the words *ægilops*, *anchilops*, and *fiſtula lachrymalis*, promiſcuouſly; but the more accurate, after Ægineta, make a difference.—The tumour, before it becomes ulcerous, is properly called *anchilops*; and, after it is got into the lachrymal paſſages, and has rendered the os lachrymale carious, *fiſtula lachrymalis*.

If the ægilops be accompanied with an inflammation, it is ſuppoſed to take its riſe from the abundance of blood which a plethoric habit diſcharges on the corner of the eye. If it be without an inflammation, it is ſuppoſed to proceed from a viſcous pituitous humour, thrown upon this part.

The method of cure is the ſame as that of the ophthalmia. But before it has reached the lachrymal paſſages, it is managed like other ulcers. If the ægilops be neglected, it burſts, and degenerates into a fiſtula, which eats into the bone.

ÆGILOPS, in *Botany*. See BOTANY *Index*.

ÆGIMURUS, in *Ancient Geography*, an iſland in the bay of Carthage, about 30 miles diſtant from that city, (Livy); now the *Goletta*: This iſland being afterwards ſunk in the ſea, two of its rocks remained above water, which were called *Aræ*, and mentioned by Virgil, becauſe the Romans and Carthaginians entered into an agreement or league to limit their reſpective boundaries by theſe rocks.

Ægimurus ‖ Ægina.

ÆGINA, in fabulous hiſtory, the daughter of Æſopus, king of Bœotia, was beloved by Jupiter, who debauched her in the ſimilitude of a lambent flame, and then carried her from Epidaurus to a deſert iſland called *Oenope*, which afterwards obtained her own name.

ÆGINA, in *Ancient Geography*, an iſland in the Saronic bay, or bay of Engia, 20 miles diſtant from the Piræus, formerly vying with Athens for naval power, and at the ſea-fight of Salamis diſputing the palm of victory with the Athenians. It was the country and kingdom of Æacus, who called it *Ægina* from his mother's name, it being before called *Oenopia*, (Ovid.) The inhabitants were called *Æginetæ*, and *Æginenſes*. The Greeks had a common temple dedicated to Jupiter in Ægina. The Æginetæ applied to commerce; and were the firſt who coined money called Νομισμα Αἰγινητικον; hence *Æginetieum æs*, formerly in great repute. The inhabitants were called *Myrmidones*, or a nation of ants, from their great application to agriculture. See ÆACUS.

The iſland was ſurrounded by Attica, the territory of Megara, and the Peloponneſus, each diſtant about 100 ſtadia, or 12 miles and a half. In circumference it was reckoned 180 ſtadia, or 22 miles and a half. It was waſhed on the eaſt and ſouth by the Myrtoan and Cretan ſeas.

It is now called *Æyina*, or *Ægina*, the *g* ſoft and the *i* ſhort. The temple above mentioned is ſituated upon the ſummit of a mountain called *Panhellenius*, at ſome diſtance from the ſhore. The Æginetans affirmed it was erected by ÆACUS; in whoſe time Greece being terribly oppreſſed by drought, the Delphic oracle was conſulted; and the reſponſe was, That Jupiter muſt be rendered propitious by Æacus. The cities entreated him to be their mediator: He ſacrificed and prayed to Jupiter Panhellenius, and procured rain.

The temple was of the Doric order, and had ſix columns in front. Twenty one of the exterior columns are yet ſtanding, with two in the front of the pronaos and of the poſticum, and five of the number which formed the ranges of the cell. The entablature, except the

Ægina. the architrave, is fallen. The ſtone is of a light brownish colour, much eaten in many places, and indicating a very great age. Some of the columns have been injured by boring to their centres for the metal. In ſeveral, the junction of the parts is ſo exact, that each ſeems to conſiſt of one piece. This ruin Mr Chandler conſiders as ſcarcely to be paralleled in its claim to a remote antiquity. The ſituation on a lonely mountain, at a diſtance from the ſea, has preſerved it from total demolition, amid all the changes and accidents of numerous centuries.

Near the ſhore is a barrow, raiſed, it is related, for Phocus upon the following occaſion. Telamon and Peleus, ſons of Æacus, challenged their half brother Phocus to contend in the Pentathlum. In throwing the ſtone, which ſerved as a quoit, Peleus hit Phocus, who was killed; when both of them fled. Afterwards Telamon ſent a herald to aſſert his innocence. Æacus would not ſuffer him to land, or to apologize, except from the veſſel; or, if he choſe rather, from a heap caſt up in the water. Telamon, entering the private port by night, raiſed a barrow, as a token, it is likely, of a pious regard for the deceaſed. He was afterwards condemned, as not free from guilt; and ſailed away again to Salamis. The barrow in the ſecond century, when ſeen by Pauſanias, was ſurrounded with a fence, and had on it a rough ſtone. The terror of ſome dreadful judgement to be inflicted from heaven had preſerved it entire and unaltered to his time; and in a country depopulated and neglected, it may ſtill endure for many ages.

The ſoil of this iſland is, as deſcribed by Strabo, very ſtony, eſpecially the bottoms, but in ſome places not unfertile in grain. Beſides corn, it produces olives, grapes, and almonds; and abounds in pigeons and partridges. It has been related, that the Æginetans annually wage war with the feathered race, carefully collecting or breaking their eggs, to prevent their multiplying, and in conſequence a yearly famine. They have no hares, foxes, or wolves. The rivers in ſummer are all dry. The waiwode or governor farms the revenue of the Grand Signior for 12 purſes, or 6000 piaſtres. About half this ſum is repaid yearly by the caratch-money, or poll tax.

ÆGINA, the capital of the above iſland. Its ſite has been long forſaken. Inſtead of the temples mentioned by Pauſanias, there are 13 lonely churches, all very mean; and two Doric columns ſupporting their architrave. Theſe ſtand by the ſea-ſide toward the low cape; and, it has been ſuppoſed, are a remnant of a temple of Venus, which was ſituated by the port pricipally frequented. The theatre, which is recorded as worth ſeeing, reſembled that of the Epidaurians both in ſize and workmanſhip. It was not far from the private port; the ſtadium, which, like that at Priene, was conſtructed with only one ſide, being joined to it behind, and each ſtructure mutually ſuſtaining and propping the other. The walls belonging to the ports and arſenal were of excellent maſonry, and may be traced to a conſiderable extent, above, or nearly even with, the water. At the entrance of the mole, on the left, is a ſmall chapel of St Nicholas; and oppoſite, a ſquare tower with ſteps before it, detached from which a bridge was laid acroſs, to be removed on any alarm. This ſtructure, which is mean, was erected by the Venetians, while at war with the Turks in 1693. Ægineta || Ægis.

ÆGINETA, PAULUS, a celebrated ſurgeon of the iſland of Ægina, for whence he derived his name. According to Mr Le Clerc's calculation, he lived in the fourth century; but Abulpharagius the Arabian, who is allowed to give the beſt account of thoſe times, places him with more probability in the ſeventh. His knowledge in ſurgery was very great, and his works are deſervedly famous. Fabricius ab Aquapendente has thought fit to tranſcribe him in a great variety of places. Indeed the doctrine of Paulus Ægineta, together with that of Celſus and Albucaſis, make up the whole text of this author. He is the firſt writer who takes notice of the cathartic quality of rhubarb; and, according to Dr Milward, is the firſt in all antiquity who deſerves the title of man-midwife.

ÆGINHARD, the celebrated ſecretary and ſuppoſed ſon-in-law of Charlemagne. He is ſaid to have been carried through the ſnow on the ſhoulders of the affectionate and ingenious Imma, to prevent his being tracked from her apartments by the emperor her father: a ſtory which the elegant pen of Addiſon has copied and embelliſhed from an old German chronicle, and inſerted in the 3d volume of the Spectator.—This happy lover (ſuppoſing the ſtory to be true) ſeems to have poſſeſſed a heart not unworthy of ſo enchanting a miſtreſs, and to have returned her affection with the moſt faithful attachment; for there is a letter of Æginhard's ſtill extant, lamenting the death of his wife, which is written in the tendereſt ſtrain of connubial affliction; it does not, however, expreſs that this lady was the affectionate princeſs; and indeed ſome late critics have proved that Imma was not the daughter of Charlemagne.—But to return to our hiſtorian: He was a native of Germany, and educated by the munificence of his imperial maſter, of which he has left the moſt grateful teſtimony in his preface to the life of that monarch. Æginhard, after the loſs of his lamented wife, is ſuppoſed to have paſſed the remainder of his days in religious retirement, and to have died ſoon after the year 840. His life of Charlemagne, his annals from 741 to 889, and his letters, are all inſerted in the 2d volume of Ducheſne's *Scriptores Francorum*. There is an improved edition of this valuable hiſtorian, with the annotations of Hermann Schmincke, in 4to, 1711.

ÆGIPAN, in *Heathen Mythology*, a denomination given to the god Pan, becauſe he was repreſented with the horns, legs, feet, &c. of a goat.

ÆGIPHILA, GOAT-FRIEND, in *Botany*. See BOTANY *Index*.

ÆGIS, in the *Ancient Mythology*, a name given to the ſhield or bucker of Jupiter and Pallas.

The goat Amalthea, which had ſuckled Jove, being dead, that god is ſaid to have covered his buckler with the ſkin; whence the appellation *ægis*, from αιξ, αιγος, *the-goat*. Jupiter, afterwards reſtored the animal to life, covered it with a new ſkin, and placed it among the ſtars. He made a preſent of his buckler to Minerva: whence that goddeſs's buckler is alſo called *ægis*.

Minerva, having killed the Gorgon Meduſa, nailed her head in the middle of the ægis, which henceforth had

Ægiſthus || Ægopodium.

had the faculty of converting into ſtone all thoſe who looked upon it; as Meduſa herſelf had done during her life.

Others ſuppoſe the ægis not to have been a buckler, but a cuiraſs, or breaſtplate; and it is certain the ægis of Pallas, deſcribed by Virgil, Æn. lib. viii. ver. 435, muſt have been a cuiraſs; ſince that poet ſays expreſsly, that Meduſa's head was on the breaſt of the goddeſs. But the ægis of Jupiter, mentioned a little higher, ver. 354, ſeems to have been a buckler: the words

Cum ſæpe nigrantem
Ægida *concuteret dextra*,

are deſcriptive of a buckler; but not at all of a cuiraſs or breaſtplate.

Servius makes the ſame diſtinction on the two paſſages of Virgil; for on verſe 354, he takes the ægis for the buckler of Jupiter, made, as above mentioned, of the ſkin of the goat Amalthea; and on verſe 435, he deſcribes the ægis as the armour which covers the breaſt, and which in ſpeaking of men is called *cuiraſs*, and *ægis* in ſpeaking of the gods. Many authors have overlooked theſe diſtinctions for want of going to the ſources.

ÆGISTHUS, in ancient hiſtory, was the ſon of Thyeſtes by his own daughter Pilopeia, who, to conceal her ſhame, expoſed him in the woods; ſome ſay he was taken up by a ſhepherd, and ſuckled by a goat, whence he was called *Ægiſthus*. He ſeduced Clytemneſtra the wife of Agamemnon, and lived with her during the ſiege of Troy. Afterwards with her aſſiſtance he ſlew her huſband, and reigned ſeven years in Mycenæ. He was, together with Clytemneſtra, ſlain by Oreſtes. Pompey uſed to call Julius Cæſar *Ægiſthus*, on account of his having ſeduced his wife Mutia, whom he afterwards put away, though he had three children by her.

ÆGITHALLUS, in *Ancient Geography*, a promontory and citadel of Sicily, between Drepanum and the Emporium Ægiſtanum, afterwards called *Acellus*; corruptly written *Ægitharſos*, in Ptolemy; ſituated near Mount Eryx, and now called *Capo di Santo Teodoro*.

ÆGIUM, in *Ancient Geography*, a town of *Achaia Propria*, five miles from the place where Helice ſtood, and famous for the council of the Acheans, which uſually met there on account either of the dignity or commodious ſituation of the place. It was alſo famous for the worſhip of Ομαγυριος Ζευς, *Conventional Jupiter*, and of *Panachæan Ceres*. The territory of Ægium was watered by two rivers, viz. the Phœnix and Meganites. The epithet is *Ægienſis*. There is a coin in the cabinet of the king of Pruſſia, with the inſcription AIΓI, and the figure of a tortoiſe, which is the ſymbol of Peloponneſus, and leaves no doubt as to the place where it was ſtruck.

ÆGOBOLIUM, in antiquity, the ſacrifice of a goat offered to Cybele. The ægobolium was an expiatory ſacrifice, which bore a near reſemblance to the taurobolium and criobolium, and ſeems to have been ſometimes joined with them.

ÆGOPODIUM, SMALL WILD ANGELICA, GOUTWORT, GOATSFOOT. See BOTANY *Index*.

ÆGOPRICON. See BOTANY *Index*. Ægopricon,

ÆGOSPOTAMOS, in *Ancient Geography*, a river in the Thracian Cherſoneſus, falling with a ſouth-eaſt courſe into the Helleſpont, to the north of Seſtos; alſo a town, ſtation, or road for ſhips at its mouth. Here the Athenians, under Conon, through the fault of his colleague Iſocrates, received a ſignal overthrow from the Lacedemonians under Lyſander, which was followed by the taking of Athens, and put an end to the Peloponneſian war. The Athenian fleet having followed the Lacedemonians, anchored in the road, over againſt the enemy, who lay before Lampaſcus. The Helleſpont is not above two thouſand paces broad in that place. The two armies ſeeing themſelves ſo near each other, expected only to reſt that day, and were in hopes of coming to a battle on the next. Ægoſpotamos.

But Lyſander had another deſign in his view. He commanded the ſeamen and pilots to go on board their galleys, as if they were in reality to fight the next morning at break of day, to hold themſelves in readineſs, and to wait his orders with profound ſilence. He commanded the land army in like manner to draw up in order of battle upon the coaſt, and to wait the day without noiſe. On the morrow, as ſoon as the ſun was riſen, the Athenians began to row towards them with their whole fleet in one line, and to bid them defiance. Lyſander, though his ſhips were ranged in order of battle, with their heads towards the enemy, lay ſtill without making any movement. In the evening, when the Athenians withdrew, he did not ſuffer his ſoldiers to go aſhore, till two or three galleys, which he had ſent out to obſerve them, were returned with advice that they had ſeen the enemy land. The next day paſſed in the ſame manner, as did the third and fourth. Such a conduct, which argued reſerve and apprehenſion, extremely augmented the ſecurity and boldneſs of the Athenians, and inſpired them with an extreme contempt for an army, which fear, in their ſenſe, prevented from ſhowing themſelves, and attempting any thing.

Whilſt this paſſed, Alcibiades, who was near the fleet, took horſe, and came to the Athenian generals: to whom he repreſented, that they kept upon a very diſadvantageous coaſt, where there were neither ports nor cities in the neighbourhood; that they were obliged to bring their proviſions from Seſtos with great danger and difficulty; and that they were very much in the wrong to ſuffer the ſoldiers and mariners of the fleet, as ſoon as they were aſhore, to ſtraggle and diſperſe themſelves at their own pleaſure, whilſt they were faced in view by the enemy's fleet, accuſtomed to execute the orders of their general with the readieſt obedience, and upon the ſlighteſt ſignal. He offered alſo to attack the enemy by land with a ſtrong body of Thracian troops, and to force them to a battle. The generals, eſpecially Tydeus and Menander, jealous of their command, did not content themſelves with refuſing his offers, from the opinion, that if the event proved unfortunate, the whole blame would fall on them, and if favourable, that Alcibiades alone would have the honour of it; but rejected alſo with inſult his wiſe and ſalutary counſel, as if a man in diſgrace loſt his ſenſe and abilities with the favour of the commonwealth. Alcibiades withdrew.

The fifth day the Athenians preſented themſelves again,

Ægospotamos || Ægytilla

again, and offered battle; retiring in the evening according to cuſtom with more inſulting airs than the days before. Lyſander, as uſual, detached ſome galleys to obſerve them, with orders to return with the utmoſt diligence when they ſaw the Athenians landed, and to put up a brazen buckler at each ſhip's head as ſoon as they reached the middle of the channel. He in the mean time ran through the whole line in his galley, exhorting the pilots and officers to hold the ſeamen and ſoldiers in readineſs to row and fight on the firſt ſignal.

As ſoon as the bucklers were put up in the ſhips heads, and the admiral galley had given the ſignal by the ſound of trumpet, the whole fleet ſet forward in good order. The land army at the ſame time made all poſſible haſte to the top of the promontory to ſee the battle. The ſtrait that ſeparates the two continents in this place is about fifteen ſtadia, or three quarters of a league in breadth; which ſpace was preſently cleared through the activity and diligence of the rowers. Conon the Athenian general was the firſt who perceived from ſhore, that fleet advance in good order to attack him; upon which he immediately cried out for the troops to embark. In the height of ſorrow and trouble, ſome he called to by their names, ſome he conjured, and others he forced to go on board their galleys; but all his endeavours and emotions were ineffectual, the ſoldiers being diſperſed on all ſides. For they were no ſooner come on ſhore, than ſome ran to the ſutlers, ſome to walk in the country, ſome to ſleep in their tents, and others had begun to dreſs their ſuppers. This proceeded from the want of vigilance and experience in their generals, who, not ſuſpecting the leaſt danger, indulged themſelves in their taking repoſe, and gave their ſoldiers the ſame liberty.

The enemy had already fallen on with loud cries and a great noiſe of their oars, when Conon, diſengaging himſelf with nine galleys, of which number was the ſacred ſhip called the *Paralian*, ſtood away for Cyprus, where he took refuge with Evagoras. The Peloponneſians, falling upon the reſt of the fleet, took immediately the galleys which were empty, and diſabled and deſtroyed ſuch as began to fill with men. The ſoldiers, who ran without order or arms to their relief, were either killed in the endeavour to get on board, or flying on ſhore were cut to pieces by the enemy, who landed in purſuit of them. Lyſander took 3000 priſoners, with all the generals, and the whole fleet. After having plundered the camp, and faſtened the enemy's galleys to the ſterns of his own, he returned to Lampſacus amidſt the ſound of flutes and ſongs of triumph. It was his glory to have achieved one of the greateſt military exploits recorded in hiſtory with little or no loſs, and to have terminated a war in the ſmall ſpace of an hour, which had already laſted 27 years, and which, perhaps, without him, had been of much longer continuance.

ÆGYPT. See EGYPT.

ÆGYPTIACUM, in *Pharmacy*, the name of ſeveral detergent ointments; as black, red, white, ſimple, and compound.

ÆGYPTILLA, in *Natural Hiſtory*, the name of a ſtone deſcribed by the ancients, and ſaid, by ſome authors, to have the remarkable quality of giving water the colour and taſte of wine. This ſeems a very imaginary virtue, as are indeed too many of thoſe in former ages attributed to ſtones. The deſcriptions left us of this remarkable foſſil tell us, that it was variegated with, or compoſed of, veins of black and white, or black and bluiſh, with ſometimes a plate or vein of whitiſh red. The authors of theſe accounts ſeem to have underſtood by this name the ſeveral ſtones of the onyx, ſardonyx, and cameo kind; all which we have at preſent common among us, but none of which poſſeſſes any ſuch ſtrange properties.

Ægyptus || Ælian.

ÆGYPTUS, in fabulous hiſtory, was the ſon of Belus, and brother of Danaus. See BELIDES.

ÆINAUTÆ, in antiquity, αἰναυται, *always mariners*, a denomination given to the ſenators of Miletus, becauſe they held their deliberations on board a ſhip, and never returned to land till matters had been agreed on.

ÆLFRIC, an eminent eccleſiaſtic of the 10th century, was the ſon of an earl of Kent, and a monk of the Benedictine order in the monaſtery of Abingdon. In 963, he was ſettled in the cathedral of Wincheſter, under Athelwold the biſhop, and undertook the inſtruction of the youth of the dioceſe, for which purpoſe he compiled a Latin Saxon vocabulary, and ſome Latin colloquies. He alſo tranſlated from the Latin into Saxon many of the hiſtorical books of the Old Teſtament. While he reſided at Wincheſter he drew up Canons, which are a kind of charge to be delivered by the biſhops to their clergy. He was afterwards abbot of St Alban's, biſhop of Wilton, and, finally, in 994, tranſlated to the ſee of Canterbury. Here he had a hard ſtruggle for ſome years in bravely defending his dioceſe againſt the incurſions of the Danes. He died in 1005, and was buried at Abingdon; but his remains were removed to Canterbury in the reign of Canute. Ælfric is held up as one of the moſt diſtinguiſhed prelates of the Saxon church. His learning, for the times, was conſiderable, his morals were pure, and his religious ſentiments were untainted with many of the corruptions of the age in which he lived. Beſide the works already mentioned, he tranſlated two volumes of Homilies from the Latin Fathers.

ÆLFRIC, ſurnamed *Bata*, pupil of the former, was promoted to the archbiſhopric of York in 1023, and died in 1051.

ÆLFRIC, an abbot of Malmeſbury in 974, was created biſhop of Crediton in 977, and died in 981.

ÆLIA *Capitolina*, a name given to the city built by the emperor Adrian, A. D. 134, near the ſpot where the ancient Jeruſalem ſtood, which he found in ruins when he viſited the eaſtern parts of the Roman empire. A Roman colony was ſettled here, and a temple, in place of that of Jeruſalem, was dedicated to Jupiter Capitolinus. Hence the name is derived, to which he prefixed that of his own family.

ÆLIAN, CLAUDIUS, born at Præneſte in Italy. He taught rhetoric at Rome, according to Perizonius, under the emperor Alexander Severus. He was ſurnamed Μελιγλωσσος, *Honey-mouth*, on account of the ſweetneſs of his ſtyle in his diſcourſes and writings. To this excellence the poet alludes:

O jocunda, Covine, ſolitudo,
Carrucâ magis, eſſedoque gratum,
Facundi mihi munus Æliani. MARTIAL.

He

Ælii Ænaria.

He was likewiſe honoured with the title of *Sophiſt*, an appellation in his days given only to men of learning and wiſdom. He loved retirement, and devoted himſelf to ſtudy. He greatly admired and ſtudied Plato, Ariſtotle, Iſocrates, Plutarch, Homer, Anacreon, Archilochus, &c. and, though a Roman, gives the preference to the writers of the Greek nation. His two moſt celebrated works are, his Various Hiſtory, and Hiſtory of Animals. He compoſed likewiſe a book on Providence, mentioned by Euſtathius; and another on Divine Appearances, or The Declarations of Providence. There have been ſeveral editions of his Various Hiſtory.

ÆLII PONS, in *Ancient Geography*, one of the fortreſſes near the wall or rampart, or, in the words of the Notitia, through the line of the hither wall; built, as is thought, by Adrian, now named Portland, in Northumberland, between Newcaſtle and Morpeth, (Camden.)

ÆLIUS PONS, now *il Ponte St Angelo*, a ſtone bridge at Rome, over the Tiber, which leads to the Burgo and Vatican from the city, along Adrian's mole, built by the emperor Adrian.

ÆLFRED. See ALFRED.

ÆLURUS, in *Egyptian Mythology*, the deity or god of cats; repreſented ſometimes like a cat, and ſometimes like a man with a cat's head. The Egyptians had ſo ſuperſtitious a regard for this animal, that the killing it, whether by accident or deſign, was puniſhed with death; and Diodorus relates, that, in the time of extreme famine, they choſe rather to eat one another than touch theſe ſacred animals.

AEM, AM, or AME, a liquid meaſure uſed in moſt parts of Germany; but different in different towns: the aem commonly contains 20 vertils, or 80 maſſes; that of Heidelberg is equal to 48 maſſes; and that of Wirtemberg to 160 maſſes. See AAM.

ÆMILIUS PAULUS, the ſon of Æmilius Paulus who was killed at the battle of Cannæ. He was twice conſul. In his firſt conſulate he triumphed over the Ligurians; and in the ſecond ſubdued Perſeus king of Macedonia, and reduced that country to a Roman province, on which he obtained the ſurname of Macedonicus. He returned to Rome loaded with glory, and triumphed for three days. He died 168 years before Chriſt.

ÆMILIUS, *Paulus*, a celebrated hiſtorian, born at Verona, who obtained ſuch reputation in Italy, that he was invited into France by the cardinal of Bourbon, in the reign of Louis XII. in order to write the hiſtory of the kings of France in Latin, and was preſented to a canonry in the cathedral of Paris. He was near 30 years in writing that hiſtory, which has been greatly admired; and died at Paris on the 5th of May 1529.

ÆMOBOLIUM, in antiquity, the blood of a bull or ram offered in the ſacrifices, called *taurobolia* and *criobolia*; in which ſenſe the word occurs in ancient inſcriptions.

ÆNARIA, in *Ancient Geography*, an iſland in the bay of Cumæ, or over-againſt Cumæ in Italy, (Pliny). It is alſo called *Inarime* (Virgil); and now *Iſchia*: ſcarce three miles diſtant from the coaſt, and the promontory Miſenus to the weſt; 20 miles in compaſs; called *Pithecuſa* by the Greeks. It is one of the Oenotrides, and fenced round by very high rocks, ſo as to be inacceſſible but on one ſide: it was formerly famous for its earthen ware. See ISCHIA.

Æneas Ænigma.

ÆNEAS, in fabulous hiſtory, a famous Trojan prince, the ſon of Anchiſes and Venus. At the deſtruction of Troy, he bore his aged father on his back, and ſaved him from the Greeks; but being too ſolicitous about his ſon and houſehold gods, loſt his wife Creüſa in the eſcape. Landing in Africa, he was kindly received by Queen Dido: but quitting her coaſt, he arrived in Italy, where he married Lavinia the daughter of King Latinus, and defeated Turnus, to whom ſhe had been contracted. After the death of his father-in-law, he was made king of the Latins, over whom he reigned three years: but joining with the Aborigines, he was ſlain in a battle againſt the Tuſcans. Virgil has rendered the name of this prince immortal, by making him the hero of his poem. See ÆNEID.

ÆNEAS SYLVIUS, *Pope*. See PIUS II.

ÆNEATORES, in antiquity, the muſicians in an army, including thoſe who played trumpets, horns, &c, The word is formed from *æneus*, on account of the brazen inſtruments uſed by them.

ÆNEID, the name of Virgil's celebrated epic poem. The ſubject of the Æneid, which is the eſtabliſhment of Æneas in Italy, is extremely happy. Nothing could be more intereſting to the Romans than to look back to their origin from ſo famous a hero. While the object was ſplendid itſelf, the traditionary hiſtory of his country opened intereſting fields to the poet; and he could glance at all the future great exploits of the Romans, in its ancient and fabulous ſtate. *Blair's Lectures.*

As to the unity of action, it is perfectly well preſerved in the Æneid. The ſettlement of Æneas, by the order of the gods, is conſtantly kept in view. The epiſodes are linked properly with the main ſubject. The nodus, or intrigue of the poem, is happily managed. The wrath of Juno, who oppoſes Æneas, gives riſe to all his difficulties, and connects the human with the celeſtial operations throughout the whole poem.

One great imperfection of the Æneid, however, is, that there are almoſt no marked characters in it. Achates, Cloanthes, Gyas, and other Trojan heroes who accompanied Æneas into Italy, are inſipid figures. Even Æneas himſelf is without intereſt. The character of Dido is the beſt ſupported in the whole Æneid.

The principal excellency of Virgil is tenderneſs. His ſoul was full of ſenſibility. He muſt have felt himſelf all the affecting circumſtances in the ſcenes he deſcribes; and he knew how to touch the heart by a ſingle ſtroke. In an epic poem this merit is the next to ſublimity. The ſecond book of the Æneid is one of the greateſt maſterpieces that ever was executed. The death of old Priam, and the family-pieces of Æneas, Anchiſes, and Creüſa, are as tender as can be conceived. In the fourth book, the unhappy paſſion and death of Dido are admirable. The epiſodes of Pallas and Evander, of Niſus and Euryalus, of Lauſus and Mezentius, are all ſuperlatively fine.

In his battles, Virgil is far inferior to Homer. But in the important epiſode, the deſcent into hell, he has outdone Homer by many degrees. There is nothing in antiquity to equal the ſixth book of the Æneid.

ÆNGINA, one of the iſlands of the Archipelago.

Ænigma. It lies in the bay of Engia, and the town of that name contains about 800 houſes and a caſtle; and near it are the ruins of a magnificent ſtructure, which was probably a temple.

ÆNIGMA, denotes any dark ſaying, wherein ſome well known thing is concealed under obſcure language. The word is Greek, Αἴνιγμα, formed of *αἰνίτεσθαι, obſcurè innuere*, to hint a thing darkly, and of *αἶνος*, an obſcure ſpeech or diſcourſe. The popular name is *riddle*; from the Belgic *raeden*, or the Saxon *araethan*, to interpret. F. Bouhours, in the memoirs of Trevoux, defines an ænigma, a diſcourſe or painting, including ſome hidden meaning, which is propoſed to be gueſſed.

Painted ÆNIGMAS, are repreſentations of the works of nature or art, concealed under human figures, drawn from hiſtory or fable.

A Verbal ÆNIGMA, is a witty, artful, and abſtruſe deſcription of any thing.—In a general ſenſe, every dark ſaying, every difficult queſtion, every parable, may paſs for an *ænigma*. Hence obſcure laws are called *Ænigmata Juris*. The alchemiſts are great dealers in the ænigmatic language, their proceſſes for the philoſophers ſtone being generally wrapped up in riddles: e. g. *Fac ex mare et fœmina circulum, inde quadrangulum, hinc triangulum, fac circulum, et habebis lapidem philoſophorum.*—F. Meneſtrier has attempted to reduce the compoſition and reſolution of ænigmas to a kind of art, with fixed rules and principles, which he calls the philoſophy of *ænigmatic* images.

The Subject of an ÆNIGMA, or the thing to be concealed and made a myſtery of, he juſtly obſerves, ought not to be ſuch in itſelf; but, on the contrary, common, obvious, and eaſy to be conceived. It is to be taken, either from nature, as the heavens or ſtars; or from art, as painting, the compaſs, a mirror, or the like.

The form of ÆNIGMAS conſiſts in the words, which, whether they be in proſe or verſe, contain either ſome deſcription, a queſtion, or a proſopopœia. The laſt kind are the moſt pleaſing, inaſmuch as they give life and action to things which otherwiſe have them not. To make an ænigma, therefore, two things are to be pitched on, which bear ſome reſemblance to each other, as the ſun and a monarch; or a ſhip and a houſe; and on this reſemblance is to be raiſed a ſuperſtructure of contrarieties to amuſe and perplex. It is eaſier to find great ſubjects for ænigmas in figures than in words, inaſmuch as painting attracts the eyes and excites the attention to diſcover the ſenſe. The ſubjects of ænigmas in painting, are to be taken either from hiſtory or fable: the compoſition here is a kind of metamorphoſis, wherein, e. g. human figures are changed into trees, and rivers into metals. It is eſſential to ænigmas, that the hiſtory or fable, under which they are preſented, be known to every body; otherwiſe it will be two ænigmas inſtead of one; the firſt of the hiſtory or fable, the ſecond of the ſenſe in which it is to be taken. Another eſſential rule of the ænigma is, that it only admits of one ſenſe. Every ænigma which is ſuſceptive of different interpretations, all equally natural, is ſo far imperfect. What gives a kind of erudition to an ænigma, is the invention of figures in ſituations, geſtures, colours, &c. authorized by paſſages of the poets, the cuſtoms of artiſts in ſtatues, baſſo relievos, inſcriptions, and medals.—In foreign colleges, Ænigma.

The Explication of ÆNIGMAS makes a conſiderable exerciſe; and that one of the moſt difficult and amuſing, where wit and penetration have the largeſt field. —By explaining an ænigma, is meant the finding a motto correſponding to the action and perſons repreſented in a picture, taken either from hiſtory or mythology. The great art of this exerciſe conſiſts in the choice of a motto, which either by itſelf, or the circumſtances of time, place, perſon who ſpeaks, or thoſe before whom he is ſpeaking, may divert the ſpectators, and furniſh occaſion for ſtrokes of wit; alſo in ſhowing to advantage the conformities between the figure and thing figured, giving ingenious turns to the reaſons employed to ſupport what is advanced, and in artfully introducing pieces of poetry to illuſtrate the ſubject and awaken the attention of the audience.

As to the ſolution of enigmas, it may be obſerved, that thoſe expreſſed by figures are more difficult to explain than thoſe conſiſting of words, by reaſon images may ſignify more things than words can; ſo that to fix them to a particular ſenſe, we muſt apply every ſituation, ſymbol, &c. and without omitting a circumſtance.—As there are few perſons in hiſtory, or mythology, but have ſome particular character of vice or virtue, we are, before all things, to attend to this *character*, in order to divine what the figure of a perſon repreſented in a painting ſignifies, and to find what agreement this may have with the ſubject whereof we would explain it. Thus, if Proteus be repreſented in a picture, it may be taken to denote *inconſtancy*, and applied either to a phyſical or moral ſubject, whoſe character is to be changeable, e. g. an almanack, which expreſſes the weather, the ſeaſons, heat, cold, ſtorms, and the like. The *colours* of figures may alſo help to unriddle what they mean: for *white*, inſtance, is a mark of innocence, *red* of modeſty, *green* of hope, *black* of ſorrow, &c. When figures are accompanied with *ſymbols*, they are leſs precarious; theſe being, as it were, the ſoul of ænigmas, and the key that opens the myſtery of them. Of all the kinds of ſymbols which may be met with in thoſe who have treated profeſſedly on the ſubject, the only true ænigmatical are thoſe of Pythagoras, which, under dark proverbs, hold forth leſſons of morality; as when he ſays *Stateram ne tranſilias*, to ſignify, Do no injuſtice.

But it muſt be added, that we meet with ſome ænigmas in hiſtory, complicated to a degree which much tranſcends all rules, and has given great perplexity to the interpreters of them. Such is that celebrated ancient one, *Ælia Lelia Criſpis*, about which many of the learned have puzzled their heads. There are two exemplars of it: one found 140 years ago, on a marble near Bologna; the other in an ancient MS. written in Gothic letters, at Milan. It is controverted between the two cities, which is to be reputed the more authentic.

The Bononian *Ænigma*.

D. M.
Ælia Lælia Criſpis,
Nec vir, nec mulier,
Nec androgyna;
Nec puella, nec juvenis,

Nec anus ;
Nec caſta, nec meretrix,
Nec pudica ;
Sed omnia :
Sublata
Neque fame, neque ferro,
Neque veneno ;
Sed omnibus :
Nec cælo, nec terris,
Nec aquis,
Sed ubique jacet.
Lucius Agatho Priſcius,
Nec maritus, nec amator,
Nec neceſſarius ;
Neque mœrens, neque gaudens,
Neque flens ;
Hanc,
Nec molem, nec pyramidem,
Nec ſepulchrum,
Sed omnia,
Scit et neſcit, cui poſuerit.

That is to ſay, *To the gods manes, Ælia Lælia Criſpis, neither man, nor woman, nor hermaphrodite; neither girl, nor young woman, nor old; neither chaſte, nor a whore; but all theſe: killed neither by hunger, nor ſteel, nor poiſon; but by all theſe: reſts neither in heaven, nor on earth, nor in the waters; but everywhere. Lucius Agatho Priſcius, neither her huſband, nor lover, nor friend; neither ſorrowful, nor joyful, nor weeping, certain, or uncertain, to whom he rears this monument, neither erects her a temple, nor a pyramid, nor a tomb, but all theſe.* In the MS. at Milan, inſtead of *D. M.* we find *A. M. P. P. D.* and at the end the following addition :

Hoc eſt ſepulchrum intus cadaver non habens,
Hoc eſt cadaver ſepulchrum extra non habens,
Sed cadaver idem eſt et ſepulchrum.

We find near 50 ſeveral ſolutions of this ænigma advanced by learned men. Marius Michael Angelo maintains *Ælia Lælia Criſpis* to ſignify rain water falling into the ſea. Ri. Vitus firſt explained it of Niobe turned to a ſtone, afterwards of the rational ſoul, and afterwards of the Platonic idea; Jo. Turrius, of the *materia prima;* Fr. Schottus, of an eunuch; Nic. Bernardus, of the philoſopher's ſtone, in which he is followed by Borrichius; Zach. Pontinus, of three human bodies in the ſame ſituation, and buried by three different men at the ſame time; Neſmondius, of a law-ſuit; Jo Gaſ. Gerartius, of love; Zu. Boxhornius, of a ſhadow; P. Terronus, of muſic; Fort. Licetus, of generation, friendſhip, and privation; M. Ov. Montalbanus, of hemp; Car. Cæſ. Malvaſia, of an abortive girl promiſed in marriage; Pet. Mengulus, of the rule of chaſtity, preſcribed by the founder of the military religion of St Mary; M. de Ciconia, of Pope Joan; Heumannus, of Lot's wife; and laſtly, J. C. S. an anonymous writer in the Leipſic Acts, of the Chriſtian church.

ÆNIGMATOGRAPHY, or ÆNIGMATHOLOGY, the art of reſolving or making ænigmas.

ÆNONA, in *Ancient Geography*, a city of Liburnia, called by Pliny *Civitas Praſini*, the reaſon of which is unknown; alſo *Enona*, and is now called *Nona*; on the Adriatic, by which it is for the greater part ſurrounded; over againſt the iſland Giſſa, from which it is diſtant four miles to the weſt. E. Long. 16°. N. Lat. 28°.

ÆNUS, in *Ancient Geography*, now the *Inn*, a river of Germany, which, riſing in the country of the Griſons, out of the Alps, in the diſtrict called Gotteshaus-punt, runs through the Griſons, the county of Tyrol, the duchy of Bavaria, and through Paſſau into the Danube.

ÆNUS, *Ænos*, or *Ænum*, in *Ancient Geography*, a town of Thrace, ſituated on the eaſtmoſt mouth of the Hebrus, which has two mouths; and ſaid to be built by the Cumeans. It was a free town, in which ſtood the tomb of Polydorus, (Pliny); *Ænius* is the epithet. Here the brother of Cato Uticenſis died, and was honoured with a monument of marble in the forum of the Ænii, (Plutarch); called *Ænei*, (Stephanus). Livy ſays that the town was otherwiſe called *Abſynthus*. Now *Eno*.

ÆNITHOLOGIUS, in *Poetry*, a verſe of two dactyls and three trochæi; as *Præſia dira placent truci juventæ*.

ÆOLIÆ INSULÆ, now *Iſoli Lipari*, in *Ancient Geography*, ſeven iſlands, ſituated between Sicily and Italy, ſo called from Æolus, who reigned there about the time of the Trojan war. The Greeks call them *Hephæſtiades;* and the Romans *Vulcaniæ*, from their fiery eruptions. They are alſo called *Liparæorum Inſulæ*, from their principal iſland Lipara. Dionyſius Periegetes calls them πλαῦαι, becauſe circumnavigable.

ÆOLIC, in a general ſenſe, denotes ſomething belonging to Æolis.

ÆOLIC, or ÆOLIAN, in *Grammar*, denotes one of the five dialects of the Greek tongue. It was firſt uſed in Bœotia; whence it paſſed into Æolia, and was that which Sappho and Alcæus wrote in. The Æolic dialect generally throws out the aſpirate or ſharp ſpirit, and agrees in ſo many things with the DORIC dialect, that the two are uſually confounded together.

The *Æolic digamma* is a name given to the letter Ϝ, which the Æolians uſed to prefix to words beginning with vowels, as Ϝοινος, for οινος; alſo to inſert between vowels, as οϜις, for οις.

Æolic Verſe, in *Proſody*, a verſe conſiſting of an iambus, or ſpondee; then of two anapeſts, ſeparated by a long ſyllable; and, laſtly, of another ſyllable. Such as, *O ſtelliferi conditor orbis.* This is otherwiſe called *eulogic* verſe; and, from the chief poets who uſed it, *Archilochian* and *Pindaric*.

ÆOLIPILE, in *Hydraulics*, is a hollow ball of metal, generally uſed in courſes of experimental philoſophy, in order to demonſtrate the poſſibility of converting water into an elaſtic ſteam or vapour by heat. The inſtrument, therefore, conſiſts of a ſlender neck, or pipe, having a narrow orifice inſerted into the ball by means of a ſhouldered ſcrew. This pipe being taken out, the ball is filled almoſt full of water, and the pipe being again ſcrewed in, the ball is placed on a pan of kindled charcoal, where it is well heated, and there iſſues from the orifice a vapour, with prodigious violence and great noiſe, which continues till all the included water is diſcharged. The ſtronger the fire is, the more elaſtic and violent will be the ſteam; but care muſt be taken that the ſmall orifice of the pipe be not,

Æolis || Æon.

by any accident, ſtopped up; becauſe the inſtrument would in that caſe infallibly burſt in pieces, with ſuch violence as might greatly endanger the lives of the perſons near it. Another way of introducing the water is to heat the ball red hot when empty, which will drive out almoſt all the air; and then by ſuddenly immerging it in water, the preſſure of the atmoſphere will force in the fluid, till it is nearly full. Des Cartes and others have uſed this inſtrument to account for the natural cauſe and generation of the wind: and hence it was called *Æolipila*: q. d. *pila Æoli*, the ball of Æolus or of the god of the winds.

ÆOLIS, or ÆOLIA, in *Ancient Geography*, a country of the Hither Aſia, ſettled by colonies of Æolian Greeks. Taken at large, it comprehends all Troas, and the coaſt of the Helleſpont to the Propontis, becauſe in thoſe parts there were ſeveral Æolian colonies: more ſtrictly, it is ſituated between Troas to the north, and Ionia to the ſouth. The people are called *Æoles* or *Æolii*.

ÆOLIUM MARE, in *Ancient Geography*, a part of the Egean ſea, waſhing Æolis; called alſo *Myſium*, from Myſia. Now called *Golfo di Smyrna*.

ÆOLUS, in heathen mythology, the god of the winds, was ſaid to be the ſon of Jupiter by Acaſta, or Sigeſia, the daughter of Hippotus: or, according to others, the ſon of Hippotus by Meneclea, daughter of Hyllus king of Lipara. He dwelt in the iſland Strongyle, now called *Strombolo*, one of the ſeven iſlands called *Æolian* from their being under the dominion of Æolus. Others ſay, that his reſidence was at Rhegium, in Italy; and others again place him in the iſland Lipara. He is repreſented as having authority over the winds, which he held enchained in a vaſt cavern, to prevent their continuing the devaſtations they had been guilty of before they were put under his direction. Mythologiſts explain the original of theſe fables, by ſaying, that he was a wiſe and good prince; and, being ſkilled in aſtronomy, was able, by the flux and reflux of the tides, and the nature of the volcano in the iſland Strongyle, to foretel ſtorms and tempeſts.

Harp of ÆOLUS, or the Æolian lyre. See ACOUSTICS.

ÆON, a Greek word, properly ſignifying the age or duration of any thing.

ÆON, among the followers of Plato, was uſed to ſignify any virtue, attribute, or perfection: hence they repreſented the deity as an aſſemblage of all poſſible æons; and called him *pleroma*, a Greek term ſignifying *fulneſs*. The Valentinians, who, in the firſt ages of the church, blended the conceits of the Jewiſh cabaliſts, the Platoniſts, and the Chaldean philoſophers, with the ſimplicity of the Chriſtian doctrine, invented a kind of Theogony, or Genealogy of Gods (not unlike that of Heſiod), whom they called by ſeveral glorious names, and all by the general appellation of ÆONS: among which they reckoned Ζωη, *Life*; Λογος, *Word*; Μονογενης, *Only-begotten*; Πληρωμα, *Fulneſs*; and many other divine powers and emanations, amounting in number to thirty: which they fancied to be ſucceſſively derived from one another; and all from one ſelf-originated deity, named *Bythus*, i. e. *profound* or *unfathomable*; whom they called likewiſe, *The moſt high and ineffable Father*. See VALENTINIANS.

ÆORA, among ancient writers on medicine, is uſed for geſtation; which ſort of exerciſe was often preſcribed by the phyſicians of thoſe days. Other exerciſes conſiſted principally in the motion of the body; but in the *æora* the limbs were at reſt, while the body was carried about and moved from place to place, in ſuch a manner as the phyſician preſcribed. It had therefore the advantages of exerciſe, without the fatigue of it.—This exerciſe was promoted ſeveral ways: ſometimes the patient was laid in a ſort of hammock, ſupported by ropes, and moved backward and forward; ſometimes his bed run nimbly on its feet. And beſide theſe, the ſeveral ways of travelling were accounted ſpecies of the *æora*, whether in the litter, in a boat or ſhip, or on even ground in a chariot.—Aſclepiades was the firſt who brought geſtation into practice, which was uſed as a means to recover ſtrength after a fever, &c.

Æora || Æra.

ÆQUANA JUGA, in *Ancient Geography*, mountains of Picenum, in the kingdom of Naples, now called *Montagna di Sorrento*, denominated from the town Æqua, which being deſtroyed, was replaced by Vicus, now *Vico di Sorrento*: called alſo *Æquana*, (Sil. Italicus).

ÆQUIMELIUM, in antiquity, a place in Rome, where ſtood the houſe of Spurius Melius, who, by largeſſes corrupting the people, affected the ſupreme power: refuſing to appear before the dictator Cincinnatus, he was ſlain by Servilius Ahala, maſter of the horſe; his houſe was razed to the ground; and the ſpot on which it ſtood was called *Area Equimelii*, (Livy).

ÆRA, in chronology, a fixed point of time from whence any number of years is begun to be counted.

It is ſometimes alſo written in ancient authors *Era*. The origin of the term is conteſted, though it is generally allowed to have had its riſe in Spain. Sepulveda ſuppoſes it formed from A. ER. A. the notæ or abbreviatures of the words, *annus erat Auguſti*, occaſioned by the Spaniards beginning their computation from the time their country came under the dominion of Auguſtus, or that of receiving the Roman calendar. This opinion, however ingenious, is rejected by Scaliger, not only on account that in the ancient abbreviatures *A* never ſtood for *annus*, unleſs when preceded by *V* for *vixit*; and that it ſeems improbable they ſhould put ER for *erat*, and the latter A, without any diſcrimination, both for *annus* and *Auguſtus*. Voſſius nevertheleſs favours the conjecture, and judges it at leaſt as probable, as either that of Iſidore, who derives *æra* from *æs*, the "tribute-money," wherewith Auguſtus taxed the world: or that of Scaliger himſelf, who deduces it likewiſe from *æs*, though in a different manner. *Æs*, he obſerves, was uſed among the ancients for an *article* or *item* in an account; and hence it came alſo to ſtand for a ſum or number itſelf. From the plural *æra*, came by corruption *æra*, *æram*, in the ſingular: much as *Oſtia*, *Oſtiam*, the name of a place, from *Oſtia*, the mouths of the Tyber.

The difference between the terms *æra* and *epoch* is, that the æras are certain points fixed by ſome people, or nation; and the epochs are points fixed by chronologiſts and hiſtorians. The idea of an æra comprehends alſo a certain ſucceſſion of years proceeding from a fixed point of time, and the epoch is that point itſelf. Thus the

Ærarium ‖ Aeria.

the Chriſtian æra began at the epoch of the birth of Jeſus Chriſt. See CHRONOLOGY, where the different Eras, &c. are enumerated and explained.

ÆRARIUM, the treaſury or place where the public money was depoſited amongſt the Romans.

Ærarium Sanctius contained the monies ariſing from the twentieth part of all legacies: this was kept for the extreme neceſſities of the ſtate.

Ærarium Privatum was the emperor's privy purſe, or the place where the money ariſing from his private patrimony was depoſited.

Ærarium Viceſimarum, the place where the money ariſing from the taxes levied from foreign countries was laid up, ſo called becauſe it moſt commonly conſiſted of a twentieth part of the produce.

Ærarium Ilithyæ, or *Junonis Lucinæ*, was where the monies were depoſited which parents paid for the birth of each child.

There are ſeveral other treaſuries mentioned in hiſtory, as the *ærarium Juventutis*, *Veneris*, &c. The temple of Saturn was the public treaſury of Rome, either becauſe Saturn firſt taught the Italians to coin money, or, which is moſt likely, becauſe this temple was the ſtrongeſt and moſt ſecure, and therefore the fitteſt, place for that purpoſe.

Ærarium differs from *fiſcus*, as the firſt contained the public money, the ſecond that of the prince. The two are, however, ſometimes indiſcriminately uſed for each other.

ÆRARIUS, a name given by the Romans to a degraded citizen, who had been ſtruck off the liſt of his century. Such perſons were ſo called becauſe they were liable to all the taxes (*æra*), without enjoying any of its privileges.

The *ærarii* were incapable of making a will, of inheriting, of voting in aſſemblies, of enjoying any poſt of honour or profit; in effect, were only ſubject to the burdens, without the benefits of ſociety; yet they retained their freedom, and were not reduced to the condition of ſlaves. To be made an *ærarius* was a puniſhment inflicted for ſome offence, and reputed one degree more ſevere than to be expelled a tribe, *tribu moveri*.

ÆRARIUS was alſo an officer inſtituted by Alexander Severus, for the diſtribution of the money given in largeſſes to the ſoldiery or people.

ÆRARIUS was alſo uſed for a perſon employed in coining or working braſs.

Theſe are ſometimes called *ærarii fuſores*: at other times, *ærarius* is diſtinguiſhed from *fuſor*; the former anſwering to what we now call copperſmiths, the latter to founders.

ÆRARIUS was likewiſe applied to a ſoldier who receives pay.

AERIA, or EERIA, in *Ancient Geography*, the ancient name of Egypt. The ſcholiaſt on Apollonius Rhodius, ſays, that not only Theſſaly, but Egypt, was called Ἠερίη by the Greeks, which Euſebius alſo confirms: and hence Apollinarius, in his tranſlation of the 114th Pſalm, uſes it for Egypt. Heſychius applies this name to Ethiopia.

AERIAL, in a general ſenſe, denotes ſomething partaking of the nature of air; thus aerial ſubſtances, aerial particles, &c.

Aerial ‖ Aerophylacea.

Aerial Perſpective. See PERSPECTIVE and PAINTING.

AERIANS, in church hiſtory, a branch of Arians, who, to the doctrines of that ſect, added ſome peculiar dogmas of their own; as, that there is no difference between biſhops and prieſts; a doctrine maintained by many modern divines, particularly of the preſbyterian and reformed churches. The ſect received its denomination from Aerius an Armenian prieſt of the fourth century. He founded his doctrine chiefly upon ſome paſſages in St Paul; and, among others, upon that in 1 Tim. iv. 14. where the apoſtle exhorts him not to neglect *the gift he had received by the laying on of the hands of the Preſbytery*. Here, obſerves Aerius, is no mention of biſhops: on the contrary, Timothy evidently received his ordination from the preſbyters or prieſts.—Epiphanius zealouſly maintains the ſuperiority of biſhops againſt the Aerians. The word *preſbytery*, uſed by the apoſtle, he obſerves, includes both biſhops and prieſts; the whole ſenate or aſſembly of the eccleſiaſtics of the place.

FLOS ÆRIS, among alchemiſts, ſmall ſcales procured from copper melted by a ſtrong heat; it is ſometimes uſed for ærugo or verdigris.

AEROGRAPHY, from ἀηρ, *air*, and γραφω, *I deſcribe*; a deſcription of the air, or atmoſphere, its limits, dimenſions, properties, &c. This amounts to much the ſame with aerology, unleſs we ſuppoſe the latter to enter into the rational, and the former to confine itſelf to a deſcription of the more obvious affections thereof. See METEOROLOGY.

AEROMANCY, a ſpecies of divination performed by means of air, wind, &c. See DIVINATION.

AEROMETRY, the ſcience of meaſuring the air. It comprehends not only the doctrine of the air itſelf, conſidered as a fluid body; but alſo its preſſure, elaſticity, rareſaction, and condenſation. But the term is at preſent not much in uſe, this branch of natural philoſophy being more frequently called Pneumatics. See PNEUMATICS.

AERONAUT, a perſon who navigates or floats in the air by means of an air balloon. See AEROSTATION.

AERONAUTICA, from ἀηρ, and ναυτικος, derived from ναυς, *ſhip*; the art of ſailing in a veſſel or machine through the atmoſphere, ſuſtained as a ſhip in the ſea. See AEROSTATION.

AEROPHYLACEA, a term uſed by naturaliſts for caverns or reſervoirs of air, ſuppoſed to exiſt in the bowels of the earth. Kircher ſpeaks much of aerophylacea, or huge caverns replete with air, diſpoſed under ground; from whence, through numerous occult paſſages, that element is conveyed either to ſubterraneous receptacles of water, which, according to him, are hereby raiſed into ſprings or rivers, or into the funds of ſubterraneous fire, which are hereby fed and kept alive for the reſtoration of metals, minerals, and the like.

AEROSTATION,

IN its primitive ſenſe, denotes the ſcience of weights ſuſpended in the air; but in its modern acceptation, it ſignifies *aerial navigation*, or the art of navigating through the atmoſphere. Hence alſo the machines which are employed for this purpoſe are called *aeroſtats*, or *aeroſtatic* machines; and from their globular ſhape, *air balloons*.

The romances of almoſt every nation have recorded inſtances of perſons being carried through the air, both by the agency of ſpirits and by mechanical inventions; but till the time of Friar Bacon, who died in 1292, no rational principle appears ever to have been thought of by which this might be accompliſhed. He had written upon the ſubject, and not only aſſures us of the practicability of the art, but that he knew how to conſtruct a machine in which a man might tranſport himſelf through the air like a bird; and he affirms that the experiment had been ſucceſsfully made by another perſon. The machine conſiſted of two large thin ſhells, or hollow globes of copper, which were exhauſted of air; and thus being lighter than air, would ſupport a chair on which a perſon might ſit.

Friar Bacon firſt publiſhed the true principles of aeroſtation.

Many had been of opinion, that, by means of artificial wings, fixed to the arms or legs, a man might fly as well as a bird: but theſe opinions were thoroughly refuted by Borelli in his treatiſe *De Motu Animalium*, where, from a compariſon between the power of the muſcles which move the wings of a bird, and thoſe which move the arms of a man, he demonſtrates that the latter are utterly inſufficient to ſtrike the air with ſuch force as to raiſe him from the ground. It cannot be denied, however, that wings of this kind, if properly conſtructed, and dexterouſly managed, might be ſufficient to break the fall of a human body from a high place, ſo that ſome adventurers in this way might poſſibly come off with ſafety; though by far the greateſt number of thoſe who have raſhly adopted ſuch ſchemes, have either loſt their lives or limbs in the attempt.

Impoſſibility of flying by mechanical means.

Scheme of Biſhop Wilkins and Albertus de Saxonia.

In the year 1672, Biſhop Wilkins publiſhed a treatiſe, entitled, The Diſcovery of the New World; in which he mentions, though in a very indiſtinct and confuſed manner, the true principle on which the air is navigable; quoting, from Albertus de Saxonia and Francis Mendoza, "that the air is in ſome part of it navigable: and upon this ſtatic principle, any braſs or iron veſſel (ſuppoſe a kettle), whoſe ſubſtance is much heavier than that of water, yet being filled with the lighter air, it will ſwim upon it and not ſink. So ſuppoſe a cup or wooden veſſel upon the outward borders of this elementary air, the capacity of it being filled with fire, or rather ethereal air, it muſt neceſſarily, upon the ſame ground, remain ſwimming there, and of itſelf can no more fall than an empty ſhip can ſink." This idea, however, he did not by any means purſue, but reſted his hopes entirely upon mechanical motions, to be accompliſhed by the mere ſtrength of a man, or by ſprings, &c. and which have been demonſtrated incapable of anſwering any uſeful purpoſe.

The only perſon who brought his ſcheme of flying to any kind of rational principle was the Jeſuit Francis Lana, cotemporary with Biſhop Wilkins. His method was ſimilar to Friar Bacon's. He was acquainted with the real weight of the atmoſphere, and, juſtly concluded, that if a globular veſſel were exhauſted of air, it would weigh leſs than before; and conſidering that the ſolid contents of veſſels increaſe in much greater proportion than their ſurfaces; he ſuppoſed that a metalline veſſel might be made ſo large, that, when emptied of its air, it would be able not only to raiſe itſelf in the atmoſphere, but to carry up paſſengers along with it: and he made a number of calculations neceſſary for putting the project in execution. But though the theory was here unexceptionable, the means propoſed were certainly inſufficient to accompliſh the end: for a veſſel of copper, made ſo thin as was neceſſary to make it float in the atmoſphere, would be utterly unable to reſiſt the external preſſure; which being demonſtrated by thoſe ſkilled in mechanics, no attempt was made on that principle.

Biſhop Lana's ſcheme.

In the year 1709, however, as we are informed by a letter publiſhed in France in 1784, a Portugueſe projector, Friar Guſman, applied to the king for encouragement to his invention of a flying machine. The principle on which his was conſtructed, if indeed it had any principle, ſeems to have been that of the paper kite. The machine was conſtructed in form of a bird, and contained ſeveral tubes through which the wind was to paſs, in order to fill a kind of ſails, which were to elevate it; and when the wind was deficient, the ſame effect was to be performed by means of bellows concealed within the body of the machine. The aſcent was alſo to be promoted by the electric attraction of pieces of amber placed in the top, and by two ſpheres encloſing magnets in the ſame ſituation.

Strange propoſal of Friar Guſman.

Theſe childiſh inventions ſhow the low ſtate of ſcience at that time in Portugal, eſpecially as the king, in order to encourage him to farther exertions in ſuch an uſeful invention, granted him the firſt vacant place in his college of Barcelos or Santarem, with the firſt profeſſorſhip in the univerſity of Coimbra, and an annual penſion of 600,000 reis during his life. Of this De Guſman, it is alſo related, that, in the year 1736, he made a wicker baſket of about ſeven or eight feet diameter, and covered with paper, which raiſed itſelf about 200 feet in the air, and the effect was generally attributed to witchcraft.

In the year 1766, Mr Henry Cavendiſh aſcertained the weight and other properties of inflammable air, determining it to be at leaſt ſeven times lighter than common air. Soon after which it occurred to Dr Black, that perhaps a thin bag filled with inflammable air might be buoyed up by the common atmoſphere, and he thought of having the allantois of a calf prepared for this purpoſe: but his other avocations prevented him from proſecuting the experiment. The ſame thought occurred ſome years afterwards to Mr Cavallo; and he has the honour of being the firſt who made experiments

Poſſibility of bodies riſing in the air thought of by Dr Black and Mr Cavallo.

periments on the ſubject. He firſt tried bladders; but the thinneſt of theſe, however well ſcraped and prepared, were found too heavy. He then tried Chineſe paper; but that proved ſo permeable, that the vapour paſſed through it like water through a ſieve. His experiments, therefore, made in the year 1782, proceeded no farther than blowing up ſoap bubbles with inflammable air, which aſcended rapidly to the ceiling, and broke againſt it.

Aeroſtation diſcovered by Monſ. Montgolfier.

But while the diſcovery of the art of aeroſtation ſeemed thus on the point of being made in Britain, it was all at once announced in France, and that from a quarter whence nothing of the kind was to have been expected. Two brothers, Stephen and John Montgolfier, natives of Annonay, and maſters of a conſiderable paper manufactory there, had turned their thoughts towards this project as early as the middle of the year 1782. The idea was firſt ſuggeſted by the natural aſcent of the ſmoke and clouds in the atmoſphere; and their deſign was to form an artificial cloud, by encloſing the ſmoke in a bag, and making it carry up the covering along with it. Towards the middle of November that year the experiment was made at Avignon with a fine ſilk bag of a parallelopiped ſhape. By applying burning paper to the lower aperture, the air was rarefied, and the bag aſcended in the atmoſphere, and ſtruck rapidly againſt the ceiling. On repeating the experiment in the open air, it roſe to the height of about 70 feet.

Account of his experiments.

An experiment on a more enlarged ſcale was now projected; and a new machine, containing about 650 cubic feet, was made, which broke the cords that confined it, and roſe to the height of about 600 feet. Another of 35 feet in diameter roſe about 1000 feet high, and fell to the ground three quarters of a mile from the place where it aſcended. A public exhibition was next made on the 5th of June 1783, at Annonay, where a vaſt number of ſpectators aſſembled. An immenſe bag of linen, lined with paper, and containing upwards of 23,000 cubic feet, was found to have a power of lifting about 500 pounds, including its own weight. The operation was begun by burning chopped ſtraw and wool under the aperture of the machine, which immediately began to ſwell: and after being ſet at liberty aſcended into the atmoſphere. In ten minutes it had aſcended 6000 feet; and when its force was exhauſted, it fell to the ground at the diſtance of 7668 feet from the place from whence it ſet out.

Soon after this, one of the brothers arrived at Paris, where he was invited by the Academy of Sciences to repeat his experiments at their expence. In conſequence of this invitation, he conſtructed, in a garden in the fauxbourg of St Germain, a large balloon of an elliptical form. In a preliminary experiment, this machine lifted up from the ground eight perſons who held it, and would have carried them all off if more had not quickly come to their aſſiſtance. Next day the experiment was repeated in preſence of the members of the academy; the machine was filled by the combuſtion of 50 pounds of ſtraw made up in ſmall bundles, upon which about 12 pounds of chopped wool were thrown at intervals. The uſual ſucceſs attended this exhibition: the machine ſoon ſwelled; endeavoured to aſcend; and immediately after ſuſtained itſelf in the air, together with the charge of between 400 and 500 pounds weight. It was evident that it would have aſcended to a great height; but as it was deſigned to repeat the experiment before the king and royal family at Verſailles, the cords by which it was tied down were not cut. But in conſequence of a violent rain and wind which happened at this time, the machine was ſo far damaged, that it became neceſſary to prepare a new one for the time that it had been determined to honour the experiment with the royal preſence; and ſuch expedition was uſed, that this vaſt machine, of near 60 feet in height and 43 in diameter, was made, painted with water colours both within and without, and finely decorated, in no more than four days and four nights. Along with this machine was ſent up a wicker cage, containing a ſheep, a cock, and a duck, which were the firſt animals ever ſent through the atmoſphere. The full ſucceſs of the experiment was prevented by a violent guſt of wind which tore the cloth in two places near the top before it aſcended; however, it roſe to the height of 1440 feet; and after remaining in the air about eight minutes, fell to the ground at the diſtance of 10,200 feet from the place of its ſetting out. The animals were not in the leaſt hurt.

Some animals ſafely ſent thro' the air.

M. Pilatre de Rozier the firſt aerial navigator.

The great power of theſe aeroſtatic machines, and their very gradual deſcent in falling to the ground, had originally ſhowed that they were capable of tranſporting people through the air with all imaginable ſafety; and this was further confirmed by the experiment already mentioned. As M. Montgolfier, therefore, propoſed to make a new aeroſtatic machine of a firmer and better conſtruction than the former, M. Pilatre de Rozier offered himſelf to be the firſt aërial adventurer.

This new machine was conſtructed in a garden in the fauxbourg of St Antoine. It was of an oval ſhape, about 48 feet in diameter, and 74 in height, elegantly painted on the outſide with the ſigns of the zodiac, cyphers of the king's name, and other ornaments. A proper gallery, grate, &c. were appended in the manner afterwards deſcribed; ſo that it was eaſy for the perſon who aſcended to ſupply the fire with fuel, and thus keep up the machine as long as he pleaſed. The weight of the whole apparatus was upwards of 1600 pounds. The experiment was performed on the 15th of October 1783. M. Pilatre having placed himſelf in the gallery, the machine was inflated, and permitted to aſcend to the height of 84 feet, where he kept it afloat for about four minutes and a half: after which he deſcended very gently: and ſuch was its tendency to aſcend, that it rebounded to a conſiderable height after touching the ground. Two days after, he repeated the experiment with the ſame ſucceſs as before; but the wind being ſtrong, the machine did not ſuſtain itſelf ſo well as formerly. On repeating the experiment in calmer weather, he aſcended to the height of 210 feet. His next aſcent was 262 feet; and in the deſcent, a guſt of wind having blown the machine over ſome large trees of an adjoining garden, M. Pilatre ſuddenly extricated himſelf from ſo dangerous a ſituation, by throwing ſome ſtraw and chopped wool on the fire, which raiſed him at once to a ſufficient height. On deſcending again, he once more raiſed himſelf to a proper height by throwing ſtraw on the fire. Some time after, he aſcended in company with

Account of his different voyages.

M. Girond

M. Girond de Villette to the height of 330 feet; hovering over Paris at leaſt nine minutes in ſight of all the inhabitants, and the machine keeping all the while perfectly ſteady.

Theſe experiments had ſhown, that the aeroſtatic machines might be raiſed or lowered at the pleaſure of the perſons who aſcended: they had likewiſe diſcovered, that the keeping them faſt with ropes was no advantage; but, on the contrary, that this was attended with inconvenience and hazard. On the 21ſt of November 1783, therefore, M. Pilatre determined to undertake an aerial voyage in which the machine ſhould be fully ſet at liberty. Every thing being got in readineſs, the balloon was filled in a few minutes; and M. Pilatre placed himſelf in the gallery, counterpoiſed by the marquis d'Arlandes, who occupied the other ſide. It was intended to make ſome preliminary experiments on the aſcending power of the machine; but the violence of the wind prevented this from being done, and even damaged the balloon eſſentially; ſo that it would have been entirely deſtroyed had not timely aſſiſtance been given. The extraordinary exertions of the workmen, however, repaired it again in two hours, and the adventurers ſet out. They met with no inconvenience during their voyage, which laſted about 25 minutes; during which time they had paſſed over a ſpace of above five miles.—From the account given by the marquis d'Arlandes, it appears that they met with ſeveral different currents of air; the effect of which was, to give a very ſenſible ſhock to the machine, and the direction of the motion ſeemed to be from the upper part downwards. It appears alſo that they were in ſome danger of having the balloon burnt altogether; as the marquis obſerved ſeveral round holes made by the fire in the lower part of it, which alarmed him conſiderably, and indeed not without reaſon. However, the progreſs of the fire was eaſily ſtopped by the application of a wet ſponge, and all appearance of danger ceaſed in a very ſhort time.

Montgolfier's machines ſuperſeded by thoſe filled with inflammable air.

This voyage of M. Pilatre and the marquis d'Arlandes may be ſaid to conclude the hiſtory of thoſe aeroſtatic machines which are elevated by means of fire; for though many other attempts have been made upon the ſame principle, moſt of them have either proved unſucceſsful or were of little conſequence. They have therefore given place to the other kind filled with inflammable air (*hydrogen gas*); which, by reaſon of its ſmaller ſpecific gravity, is both more manageable and capable of performing voyages of greater length, as it does not require to be ſupplied with fuel like the others. This was invented a very ſhort time after the diſcovery had been made by M. Montgolfier. This gentleman had indeed deſigned to keep his method in ſome degree a ſecret from the world; but as it could not be concealed, that a bag filled with any kind of fluid lighter than the common atmoſphere would riſe in it, inflammable air was naturally thought of as a proper ſuccedaneum for the rarefied air of M. Montgolfier. The firſt experiment was made by two brothers Meſſrs Roberts, and M. Charles a profeſſor of experimental philoſophy. The bag which contained the gas was compoſed of luteſtring, varniſhed over with a ſolution of the elaſtic gum called *caoutchouc;* and that with which they made their firſt eſſay was only about 13 Engliſh feet in diameter. Many difficulties occurred in filling it with the inflammable air, chiefly owing to their ignorance of the proper apparatus; inſomuch, that, after a whole day's labour from nine in the morning, they had got the balloon only one-third part full. Next morning they were ſurpriſed to find that it had fully inflated of itſelf during the night; but, upon inquiry, it was found, that they had inadvertently left open a ſtop-cock connected with the balloon, by which the common air gaining acceſs, had mixed itſelf with the inflammable air; forming a compound ſtill lighter than the common atmoſphere, but not ſufficiently light to anſwer the purpoſes of aeroſtation. Thus they were obliged to renew their operation; and, by ſix o'clock in the evening of next day, they found the machine conſiderably lighter than the common air; and, in an hour after, it made a conſiderable effort to aſcend. The public exhibition, however, had been announced only for the third day after; ſo that the balloon was allowed to remain in an inflated ſtate for a whole day; during which they found it had loſt a power of aſcent equal to about three pounds, being one-ſeventh part of the whole. When it was at laſt ſet at liberty, after having been well filled with inflammable air, it was 35 pounds lighter than an equal bulk of common air. It remained in the atmoſphere only three quarters of an hour, during which it had traverſed 15 miles. Its ſudden deſcent was ſuppoſed to have been owing to a rupture which had taken place when it aſcended into the higher regions of the atmoſphere.

In what manner a balloon partly filled may inflate itſelf.

Loſs of power in their balloon.

The ſucceſs of this experiment, and the aerial voyage made by Meſſrs Rozier and Arlandes, naturally ſuggeſted the idea of undertaking ſomething of the ſame kind with a balloon filled with inflammable air. The machine uſed on this occaſion was formed of gores of ſilk, covered over with a varniſh made of *caoutchouc*, of a ſpherical figure, and meaſuring 27½ feet in diameter. A net was ſpread over the upper hemiſphere, and was faſtened to a hoop which paſſed round the middle of the balloon. To this a ſort of car, or rather boat, was ſuſpended by ropes, in ſuch a manner as to hang a few feet below the lower part of the balloon: and, in order to prevent the burſting of the machine, a valve was placed in it; by opening of which, ſome of the inflammable air might be occaſionally let out. A long ſilken pipe communicated with the balloon, by means of which it was filled. The boat was made of baſket work, covered with painted linen, and beautifully ornamented; being 8 feet long, 4 broad, and 3½ deep; its weight 130 pounds. At this time, however, as at the former, they met with great difficulties in filling the machine with inflammable air, owing to their ignorance of the moſt proper apparatus. But at laſt, all obſtacles being removed, the two adventurers took their ſeats at three quarters after one in the afternoon of the firſt of December 1783. Perſons ſkilled in mathematics were conveniently ſtationed with proper inſtruments to calculate the height, velocity, &c. of the balloon. The weight of the whole apparatus, including that of the two adventurers, was found to be 604½ pounds, and the power of aſcent when they ſet out was 22 pounds; ſo that the whole difference betwixt the weight of this balloon and an equal bulk of common air was 624 pounds. But the weight of common atmoſphere diſplaced by the inflammable gas

First aerial voyage of Meſſrs Charles and Roberts.

Experiment of Meſſrs Charles and Roberts.

was

was calculated to be 771 pounds, so that there remains 147 for the weight of the latter; and this calculation makes it only 5¼ times lighter than common air.

Specific gravity of the inflammable air in this first voyage.

At the time the balloon left the ground, the thermometer stood at 59° of Fahrenheit's scale; and the quicksilver in the barometer at 30.18 inches; and, by means of the power of ascent with which they left the ground, the balloon rose till the mercury fell to 27 inches, from which they calculated their height to be about 600 yards. By throwing out ballast occasionally as they found the machine descending by the escape of some of the inflammable air, they found it practicable to keep at pretty near the same distance from the earth during the rest of their voyage; the quicksilver fluctuating between 27 and 27.65 inches, and the thermometer between 53° and 57°, the whole time. They continued in the air for the space of an hour and three quarters, when they alighted at the distance of 27 miles from Paris: having suffered no inconvenience during their voyage, nor experienced any contrary currents of air, as had been felt by Messr. Pilatre and Arlandes. As the balloon still retained a great quantity of inflammable gas, Mr Charles determined to take another voyage by himself. Mr Robert accordingly got out of the boat, which was thus lightened by 130 pounds, and of consequence the aerostatic machine now had nearly as much power of ascent. Thus he was carried up with such velocity, that in twenty minutes he was almost 9000 feet high, and entirely out of sight of terrestrial objects. At the moment of his parting with the ground, the globe had been rather flaccid; but it soon began to swell, and the inflammable air escaped from it in great quantity through the silken tube. He also frequently drew the valve that it might be the more freely emitted, and the balloon effectually prevented from bursting. The inflammable gas being considerably warmer than the external air, diffused itself all round, and was felt like a warm atmosphere; but in ten minutes the thermometer indicated a variation of temperature as great as that between the warmth of spring and the ordinary cold of winter. His fingers were benumbed by the cold, and he felt a violent pain in his right ear and jaw, which he ascribed to the dilatation of the air in these organs as well as to the external cold. The beauty of the prospect which he now enjoyed, however, made amends for these inconveniences. At his departure the sun was set on the valleys; but the height to which Mr Charles was got in the atmosphere, rendered him again visible, though only for a short time. He saw, for a few seconds, vapours rising from the valleys and rivers. The clouds seemed to ascend from the earth, and collect one upon the other, still preserving their usual form; only their colour was gray, and monotonous for want of sufficient light in the atmosphere. By the light of the moon, he perceived that the machine was turning round with him in the air; and he observed that there were contrary currents which brought him back again. He observed also, with surprise, the effects of the wind, and that the streamers of his banners pointed upwards; which, he says, could not be the effect either of his ascent or descent, as he was moving horizontally at the time. At last, recollecting his promise of returning to his friends in half an hour, he pulled the valve, and accelerated his descent. When within 200 feet of the earth, he threw out two or three pounds of ballast, which rendered the balloon again stationary; but, in a little time afterwards, he gently alighted in a field about three miles distant from the place whence he set out; though, by making allowance for all the turnings and windings of the voyage, he supposes that he had gone through nine miles at least. By the calculations of M. de Meunier, he rose at this time not less than 10,500 feet high; a height somewhat greater than that of Mount Ætna. A small balloon, which had been sent off before the two brothers set out on their voyage, took a direction opposite to that of the large one, having met with an opposite current of air, probably at a much greater height.

Mr Charles ascends by himself.

Has a pain in his ear and jaw when in the higher regions.

Various currents of wind and eddies in these regions.

Streamers of his banners turn upwards.

The subsequent aerial voyages differ so little from that just now related, that any particular description of them seems to be superfluous. It had occurred to Mr Charles, however, in his last flight, that there might be a possibility of directing the machine in the atmosphere; and this was soon attempted by Mr Jean Pierre Blanchard, a gentleman who had, for several years before, amused himself with endeavours to fly by mechanical means, though he had never succeeded in the undertaking. As soon as the discovery of the aerostatic machines was announced, however, he resolved to add the wings of his former machine to a balloon, and made no doubt that it would then be in his power to direct himself through the air at pleasure. In his first attempt he was frustrated by the impetuosity of a young gentleman, who insisted, right or wrong, on ascending along with him. In the scuffle which ensued on this occasion, the wings and other apparatus were entirely destroyed; so that M. Blanchard was obliged to commit himself to the direction of the wind; and in another attempt it was found, that all the strength he could apply to the wings was scarce sufficient to counteract the impression of the wind in any degree. In his voyage, he found his balloon, at a certain period, acted upon by two contrary winds; but, on throwing out four pounds of ballast, he ascended to a place where he met with the same current he had at setting out from the earth. His account of the sensations he felt during this voyage, was somewhat different from that of Mr Charles; having, in one part of it, found the atmosphere very warm, in another cold; and having once found himself very hungry, and at another time almost overcome by a propensity to sleep. The height to which he arose, as measured by several observations with mathematical instruments, was thought to be very little less than 10,000 feet; and he remained in the atmosphere an hour and a quarter.

Attempts to guide aerostatic machines in the atmosphere.

Two first voyages of M. Blanchard.

His sensations while in the atmosphere.

The attempts of Mr Blanchard to direct his machine through the atmosphere, were repeated in the month of April 1784 by Messr. Morveau and Bertrand, at Dijon, who raised themselves with an inflammable air balloon to the height, as it was thought, of 13,000 feet; passing through a space of 18 miles in an hour and 25 minutes. Mr Morveau had prepared a kind of oars for directing the machine through the air; but they were damaged by a gust of wind, so that only two of them remained serviceable; by working these, however, they were able to produce a sensible effect on the motion of the machine. In a third aerial voyage performed by Mr Blanchard, he seemed to produce

Voyage of Messr. Morveau and Bertrand.

Third voyage of M. Blanchard.

duce ſome effect by the agitation of his wings, both in aſcending, deſcending, moving ſideways, and even in ſome meaſure againſt the wind; however, this is ſuppoſed, with ſome probability, to have been a miſtake, as, in all his ſucceeding voyages, the effects of his machinery could not be perceived.

Second voyage of Meſſrs Charles and Robert.

The ſucceſs of Meſſrs Charles and Robert in their former experiments, encouraged them ſoon to repeat them, with the addition of ſome machinery to direct their courſe. Having enlarged their former balloon to the ſize of an oblong ſpheroid 46½ feet long and 27½ in diameter, they made it to float with its longeſt part parallel to the horizon. The wings were made in the ſhape of an umbrella without the handle, to the top of which a ſtick was faſtened parallel to the aperture of the umbrella. Five of theſe were diſpoſed round the boat, which was near 17 feet in length. The balloon was filled in three hours, and, with the addition of 450 pounds of ballaſt, remained *in æquilibrio* with the atmoſphere. About noon, on the 19th of September 1784, they began to aſcend very gently in conſequence of throwing out 24 pounds of ballaſt, but were ſoon obliged to throw out eight pounds more, in order to avoid running againſt ſome trees. Thus they roſe to the height of 1400 feet, when they perceived ſome thunder clouds near the horizon. On this they aſcended and deſcended, to avoid the danger, as the wind blew directly towards the threatening clouds; but, from the height of 600 feet to that of 4200 above the ſurface of the earth, the current was quite uniform and in one direction. During their voyage they loſt one of their oars; but found, that by means of thoſe which remained, they conſiderably accelerated their courſe. From the account of their voyage, it would ſeem that they had paſſed ſafely through the thunder clouds; as we are informed, that, about 40 minutes after three they heard a loud clap of thunder; and three minutes after, another much louder; at which time the thermometer ſunk from 77 to 59 degrees. This ſudden cold, occaſioned by the approach of the clouds, condenſed the inflammable air ſo that the balloon deſcended very low, and they were obliged to throw out 40 pounds of ballaſt; yet on examining the heat of the air within the balloon, they found it to be 104°, when that of the external atmoſphere was only 63°. When they had got ſo high that the mercury in the barometer ſtood only at 23.94 inches, they found themſelves becalmed; ſo that the machine did not go even at the rate of two feet in a ſecond, though it had before gone at the rate of 24 feet in a ſecond. On this they determined to try the effect of their oars to the utmoſt; and, by working them for 35 minutes, and marking the ſhadow of the balloon on the ground, they found, in that time, that they had deſcribed the ſegment of an ellipſis whoſe longeſt diameter was 6000 feet. After having travelled about 150 miles, they deſcended, only on account of the approach of night, having ſtill 200 pounds of ballaſt left.

Are in danger of running into thunder clouds.

Heat of the air within their balloon.

Effect of their oars in moving the machine.

Their concluſion, with regard to the effect of their wings, is as follows: "Thoſe experiments ſhow, that far from going againſt the wind, as is ſaid by ſome perſons to be poſſible in a certain manner, and ſome aeronauts pretend to have actually done, we only obtained, by means of two oars, a deviation of 22 degrees: it is certain, however, that if we could have uſed our four oars, we might have deviated about 40 degrees from the direction of the wind; and as our machine would have been capable of carrying ſeven perſons, it would have been eaſy for five perſons to have gone, and to have put in action eight oars, by means of which a deviation of about 80 degrees would have been obtained.

"We have already obſerved (ſay they), that if we did not deviate more than 22 degrees, it was becauſe the wind carried us at the rate of 24 miles an hour; and it is natural to judge, that, if the wind had been twice as ſtrong as it was, we ſhould not have deviated more than one-half of what we actually did; and, on the contrary, if the wind had been only half as ſtrong, our deviation would have been proportionably greater."

Having thus related all that has been done with regard to the conducting of aeroſtatic machines through the atmoſphere, we ſhall now relate the attempts that have been made to leſſen their expence, by falling upon ſome contrivance to aſcend without throwing out ballaſt, and to deſcend without loſing any of the inflammable air. The firſt attempt of this kind was made by the duke de Chartres; who, on the 15th of July 1784, aſcended with the two brothers, Roberts, and a fourth perſon, from the park of St Cloud. The balloon was of an oblong form, made to aſcend with its longeſt diameter horizontally, and meaſured 55 feet in length and 24 in breadth. It contained within it a ſmaller balloon filled with common air; by blowing into which with a pair of bellows, and thus throwing in a conſiderable quantity of common air, it was ſuppoſed that the machine would become ſufficiently heavy to deſcend, eſpecially as, by the inflation of the internal bag, the inflammable air in the external one would be condenſed into a ſmaller ſpace, and thus become ſpecifically heavier. The voyage, however, was attended with ſuch circumſtances as rendered it impoſſible to know what would have been the event of the ſcheme. The power of aſcent with which they ſet out, ſeems to have been very great; as, in three minutes after parting with the ground, they were loſt in the clouds, and involved in ſuch a denſe vapour that they could ſee neither the ſky nor the earth. In this ſituation they ſeemed to be attacked by a whirlwind, which, beſides turning the balloon three times round from right to left, ſhocked and beat it ſo about, that they were rendered incapable of uſing any of the means propoſed for directing their courſe, and the ſilk ſtuff of which the helm had been compoſed was even torn away. No ſcene can be conceived more terrible than that in which they were now involved. An immenſe ocean of ſhapeleſs clouds rolled one upon another below them, and ſeemed to prevent any return to the earth, which ſtill continued inviſible, while the agitation of the balloon became greater every moment. In this extremity they cut the cords which held the interior balloon, and of conſequence it fell down upon the aperture of the tube that came from the large balloon into the boat, and ſtopped it up. They were then driven upwards by a guſt of wind from below, which carried them to the top of that ſtormy vapour in which they had been involved. They now ſaw the ſun without a cloud; but the heat of his rays, with the diminiſhed denſity of the atmoſphere had ſuch an effect on the inflammable air, that the balloon ſeemed

Contrivances uſed to prevent the waſte of inflammable air.

Voyage of the duke de Chartres.

Is involved in dark clouds and attacked by a whirlwind.

every

every moment ready to burſt. To prevent this, they introduced a ſtick through the tube, in order to puſh away the inner balloon from its aperture: but the expanſion of the inflammable air puſhed it ſo cloſe, that all attempts of this kind proved ineffectual. It was now, however, become abſolutely neceſſary to give vent to a very conſiderable quantity of the inflammable air; for which purpoſe the duke de Chartres himſelf bored two holes in the balloon, which tore open for the length of ſeven or eight feet. On this they deſcended with great rapidity: and would have fallen into a lake, had they not haſtily thrown out 60 pounds of ballaſt, which enabled them juſt to reach the water's edge.

The ſucceſs of the ſcheme for raiſing or lowering aeroſtatic machines by means of bags filled with common air being thus rendered dubious, another method was thought of. This was to put a ſmall aeroſtatic machine with rarefied air under an inflammable air balloon, but at ſuch a diſtance that the inflammable air of the latter might be perfectly out of the reach of the fire uſed for inflating the former; and thus, by increaſing or diminiſhing the fire in the ſmall machine, the abſolute weight of the whole would be conſiderably diminiſhed or augmented. This ſcheme was unhappily put in execution by the celebrated M. Pilatre de Rozier, and another gentleman named Mr Romaine. Their inflammable air balloon was about 37 feet in diameter, and the power of the rarefied air one was equivalent to about 60 pounds. They aſcended without any appearance of danger or ſiniſter accident: but had not been long in the atmoſphere when the inflammable air balloon was ſeen to ſwell very conſiderably, at the ſame time that the aeronauts were obſerved, by means of teleſcopes, very anxious to get down, and buſied in pulling the valve and opening the appendages to the balloon, in order to facilitate the eſcape of as much inflammable air as poſſible. A ſhort time after this the whole machine was on fire, when they had then attained the height of about three quarters of a mile from the ground. No exploſion was heard; and the ſilk which compoſed the air balloon continued expanded, and ſeemed to reſiſt the atmoſphere for about a minute; after which it collapſed, and the remains of the apparatus deſcended along with the two unfortunate travellers ſo rapidly, that both of them were killed. Mr Pilatre ſeemed to have been dead before he came to the ground; but Mr Romaine was alive when ſome perſons came up to the place where he lay, though he expired immediately after.

nfortu- te voy- e and ath of eſſrs Ro- er and omaine.

Theſe are the moſt remarkable attempts that have been made to improve the ſcience of aeroſtation; though a great number of other expeditions through the atmoſphere have taken place. But of all the voyages which had been hitherto projected or put in execution, the moſt daring was that of Mr Blanchard and Dr Jeffries acroſs the ſtraits of Dover, which ſeparate Britain from France. This took place on the 7th of January 1785, being a clear froſty morning, with a wind, barely perceptible, at N. N. W. The operation of filling the balloon began at 10 o'clock, and, at three quarters after 12, every thing was ready for their departure. At one o'clock Mr Blanchard deſired the boat to be puſhed off, which now ſtood only two feet diſtant from that precipice ſo finely deſcribed by Shakeſpeare in his tragedy of King Lear. As the balloon was ſcarcely ſufficient to carry two, they were obliged to throw out all their ballaſt except three bags of 10 pounds each; when they at laſt roſe gently; though making very little way on account of there being ſo little wind. At a quarter after one o'clock, the barometer, which on the cliff ſtood at 29.7 inches, was now fallen to 27.3, and the weather proved fine and warm. They had now a moſt beautiful proſpect of the ſouth coaſt of England, and were able to count 37 villages upon it. After paſſing over ſeveral veſſels, they found that the balloon, at 50 minutes after one, was deſcending, on which they threw out a ſack and a half of ballaſt; but as they ſaw that it ſtill deſcended, and with much greater velocity than before, they now threw out all the ballaſt. This ſtill proving ineffectual, they next threw out a parcel of books they carried along with them, which made the balloon aſcend, when they were about midway betwixt France and England. At a quarter paſt two, finding themſelves again deſcending, they threw away the remainder of their books, and, ten minutes after, they had a moſt enchanting proſpect of the French coaſt. Still, however, the machine deſcended; and as they had now no more ballaſt, they were obliged to throw away their proviſions, the wings of their boat, and every thing they could poſſibly ſpare. "We threw away (ſays Dr Jeffries) our only bottle, which, in its deſcent caſt out a ſteam like ſmoke, with a ruſhing noiſe; and when it ſtruck the water, we heard and felt the ſhock very perceptibly on our car and balloon." All this proving inſufficient to ſtop the deſcent of the balloon, they next threw out their anchors and cords, and at laſt ſtripped off their clothes, faſtening themſelves to certain ſlings, and intending to cut away the boat as their laſt reſource. They had now the ſatisfaction, however, to find that they were riſing; and as they paſſed over the high lands between Cape Blanc and Calais the machine roſe very faſt, and carried them to a greater height than they had been at any former part of their voyage. They deſcended ſafely among ſome trees in the foreſt of Guiennes, where there was juſt opening enough to admit them.

It would be tedious as well as unneceſſary to recount all the other aerial voyages that have been performed in our own or other countries: It appeared ſufficient for the purpoſe of this article to notice thoſe which were moſt remarkable and intereſting; and therefore an account of the ingenious Mr Baldwin's excurſion from Cheſter, alluded to above, muſt not be omitted in our enumeration.

yage of ſſrs nchard d Jeffries oſs the ſits of ver.

On the 8th of September 1785, at forty minutes paſt one P. M. Mr Baldwin aſcended from Cheſter in Mr Lunardi's balloon. After traverſing in a variety of different directions, he firſt alighted, at 28 minutes after three, about twelve miles from Cheſter, in the neighbourhood of Frodſham; then reaſcending and purſuing his excurſion, he finally landed at Rixton moſs, five miles N. N. E. of Wavington, and 25 miles from Cheſter. Mr Baldwin has publiſhed his Obſervations and remarks made during his voyage, and taken from minutes. Our limits will not admit of relating many of his obſervations; but the few following are ſome of the moſt important and curious. "The ſenſation of aſcending is compared to that of a ſtrong preſſure from the bottom of the car upwards againſt Baldwin's voyage.

the ſoles of his feet. At the diſtance of what appeared to him ſeven miles from the earth, though by the barometer ſcarcely a mile and a half, he had a grand and moſt enchanting view of the city of Cheſter and its adjacent places below. The river Dee appeared of a red colour; the city very diminutive; and the town entirely blue. The whole appeared a perfect plain, the higheſt building having no apparent height, but reduced all to the ſame level; and the whole terreſtrial proſpect appeared like a coloured map. Juſt after his firſt aſcent, being in a well watered and maritime part of the country, he obſerved a remarkable and regular tendency of the balloon towards the ſea; but ſhortly after riſing into another current of air, he eſcaped the danger: this upper current he ſays, was viſible to him at the time of his aſcent, by a lofty ſound ſtratum of clouds flying in a faſe direction. The perſpective appearance of things to him was very remarkable. The loweſt bed of vapour that firſt appeared as cloud was pure white, in detached fleeces, increaſing as they roſe: they preſently coaleſced, and formed, as he expreſſes it, a ſea of cotton, tufting here and there by the action of the air in the undiſturbed part of the clouds. The whole became an extended white floor of cloud, the upper ſurface being ſmooth and even. Above this white floor he obſerved, at great and unequal diſtances, a vaſt aſſemblage of thunder clouds, each parcel conſiſting of whole acres in the denſeſt form: he compares their form and appearance to the ſmoke of pieces of ordnance, which had conſolidated as it were into maſſes of ſnow, and penetrated through the upper ſurface or white floor of common clouds, there remaining viſible and at reſt. Some clouds had motions in ſlow and various directions, forming an appearance truly ſtupendous and majeſtic." He endeavours to convey ſome idea of the ſcene by a figure; (and from this fig. 1. Plate II. is copied). *A* repreſents a circular view he had from the car of the balloon, himſelf being over the centre of the view, looking down on the white floor of clouds, and ſeeing the city of Cheſter through an opening, which diſcovered the landſcape below, limited by ſurrounding vapour to leſs than two miles in diameter. The breadth of the outer margin defines his apparent height in the balloon (viz. 4 miles) above the white floor of clouds. Mr Baldwin alſo gives a curious deſcription of his tracing the ſhadow of the balloon over tops of volumes of clouds. At firſt it was ſmall, in ſize and ſhape like an egg; but ſoon increaſed to the magnitude of the ſun's diſc, ſtill growing larger, and attended with a moſt captivating appearance of an iris encircling the whole ſhadow at ſome diſtance round it, the colours of which were remarkably brilliant. The regions did not feel colder, but rather warmer than below. The ſun was hotteſt to him when the balloon was ſtationary. The diſcharge of a cannon, when the balloon was at a conſiderable height, was diſtinctly heard by the aeronaut; and a diſcharge from the ſame piece when at the height of thirty yards, ſo diſturbed him as to oblige him for ſafety to lay hold firmly of the cords of the balloon. At a conſiderable height he poured down a pint bottle full of water; and as the air did not oppoſe a reſiſtance ſufficient to break the ſteam into ſmall particles, it moſtly fell down in large drops. In the courſe of the balloon's track it was found much affected by the water (a circumſtance obſerved in former aerial voyages). At one time the direction of the balloon kept continually over the water, going directly towards the ſea, ſo much as to endanger the aeronaut; the mouth of the balloon was opened, and in two minutes he deſcended into an under current blowing from the ſea: he kept deſcending, and landed at Bellair farm in Rinſley, 12 miles from Cheſter. Here he lightened his car by 31 pounds, and inſtantly reaſcending, was carried into the interior part of the country, performing a number of different manœuvres. At his greateſt altitude he found his reſpiration free and eaſy. Several bladders which he had along with him crackled and expanded very conſiderably. Clouds and land, as before, appeared on the ſame level. By way of experiment, he tried the upper valve two or three times, the neck of the balloon being cloſe; and remarked, that the eſcape of the gas was attended with a growling noiſe like millſtones, but not near ſo loud. Again, round the ſhadow of the balloon, on the clouds he obſerved the iris. A variety of other circumſtances and appearances he met with, is fancifully deſcribed; and at 53 minutes paſt three he finally landed.

View from the balloon.

Appearance of the clouds.

The following is an account of an eſtabliſhment formed in France during the late war for the improvement of aerial navigation:

"The aeroſtatic inſtitute, founded by the committee of public ſafety, and enveloped in the moſt profound ſecrecy at Meudon, to which alſo was added a camp for the exerciſe of the artillery, is even yet looked upon as a ſecret arrangement of the republic, reſpecting which the greateſt precautions are taken; the doors being ſhut againſt the public and all foreigners. Aeroſtatic inſtitute in France.

It was impoſſible to have ſelected a more convenient ſpot for the eſtabliſhment of the aeronautic inſtitute than the royal lodge of Meudon. From its elevated ſite on a mountain, it commands a beautiful and extenſive proſpect over a plain covered with villages and cultivated fields, interſected by the Seine, and terminated by the city of Paris.

The perfection and the rational application of aeronautics are the objects of the labours of this eſtabliſhment, to which the celebrated natural philoſopher Guyton Morveau has in particular rendered the moſt important ſervices. But the inſtitution ſtood in need of ſuch a director as Conté, for whom Guyton Morveau has procured the appointment. With a love of the ſcience Conté unites a penetrating genius for reſearch and invention, accompanied by indefatigable aſſiduity. Objects of it.

The corps of aeronauts, intended to ſerve in the armies of the republic, and conſiſting of fifty courageous youths, is trained at the ſchool of Meudon: it is there the balloons are prepared which are ſent off to the armies; and every day in ſummer the pupils are employed, at one time in performing their exerciſes, at another in making reſearches, in natural philoſophy, with a balloon which is kept conſtantly filled for the purpoſe. Employment of the pupils.

The improvement in the preparation of the balloon, the diſcovery of a new mode of filling it with inflammable air from the ſubſtance of water (hydrogen gas), diſcovered by Lavoiſier, the invention of a new telegraph, connected with the balloon, are the principal advances which have been made in aeroſtatics at Meudon under the direction of Conté.

The

The old lodge of Meudon ſerves as a manufactory for the preparation of the balloons, and of all the apparatus neceſſary to accompany them to the armies. The new lodge is appropriated to the inſtitute, and to the accommodation of the pupils, and of the director and his family. There were prepared the *Entreprenant* for the army of the north, by means of which the hoſtile army was reconnoitred at the battle of Fleurus; the *Céleſte* for the army of the Sambre and Maeſe; the *Hercule* and the *Intrépide* for the army of the Rhine and Moſelle.

Mode of preparing the balloons.

The ſilk for the balloons is manufactured at Lyons, and is very thick and ſtrong: and Conté has rendered them much more durable by the precaution of only varniſhing the outer ſurface. The varniſh is of an excellent quality; it ſufficiently hardens the outſide, and does not make the ſilk ſtick together when the balloon is folded. Moreover, experience has proved that the inner coat of varniſh cannot reſiſt the operation of filling the balloon, that it is corroded by the gas, and that this friction renders the ſilk flabby.

The filling of the balloon with hydrogen gas is the reſult of the diſcoveries made by the great Lavoiſier, and has for its baſis his important experiment of the decompoſition of water. The gas is prepared by the following ſimple and unexpenſive proceſs.

The gas.

Six or more hollow iron cylinders are ſet in brick work, beſide and over each other, in a furnace which may be conſtructed in twelve hours; and both ends of each cylinder are made to project from the furnace. The openings of theſe cylinders are ſtopped with ſtrong iron covers, through which metal tubes are let in. The tube at one end ſerves for pouring water, previouſly heated, into the cylinders when red hot; that on the oppoſite ſide is deſtined to conduct the air which firſt preſents itſelf, through a reſervoir filled with a cauſtic lixivium, and to convey it into the balloon. The cylinders are partly filled with coarſe iron filings, which the exceſſive heat of the furnace, kept up with pit coal during the whole time of the operation, reduces to a ſtate of excandeſcence. At this ſtage of the proceſs, the valve of one of the tubes of each cylinder is opened, and a ſmall quantity of boiling water is gently poured into the heated cylinder. As ſoon as the vapour of the water touches the heated iron, the two ſubſtances which compoſe the water are ſeparated: the one (the oxygen) attaches itſelf to the iron, which it calcines, and which, after the operation, is found partly cryſtallized, after the manner of volcanic productions: the other of the component ſubſtances of the water (the hydrogen) combines with a quantity of the igneous ſubſtance termed *calorique*, and becomes inflammable air (hydrogen gas), which continues in a permanent ſtate of elaſtic fluidity, and weighs ſeven or eight times leſs than the atmoſpheric air.

As the water contains a ſmall portion of the ſubſtance of *carbone* (*carbonique*) which would render the air in the balloon heavy, the air, as it firſt ruſhes out of the cylinders is made to paſs through a reſervoir of water impregnated with a cauſtic alkali. This fluid attracts to itſelf all the *carbonique*, and nothing riſes into the balloon but very pure and inflammable air.

During the operation, it has ſometimes happened that the cylinders, heated to excandeſcence, melted. To guard againſt this accident, the projecting end of the cylinder is furniſhed with a pyrometer, and a ſcale, which, by means of an iron rod, indicates the degrees of rarefaction of the air. A particular point on the ſcale announces the moment when the cylinders are heated in the degree neareſt to fuſion: when ſuch is the caſe, the fire is immediately diminiſhed. The operation of filling a balloon of thirty feet diameter employs one third of a day.

The exerciſing balloon at Meudon is of a ſpherical form, and thirty-two feet in diameter. Its upper half is covered with a linen caſe to keep off the rain from the balloon and its netting. This netting, woven with ſtrong cords, embraces the upper part of the balloon, and is deſtined to ſupport the car for the reception of the aeronauts. The balloon, kept conſtantly full and ready for aſcent, and expoſed in the open air in all weathers, preſerves its buoyant ſtation in the atmoſphere, being faſtened on the great terrace of the lodge. When the weather is favourable, the aeronautic exerciſes are begun. The balloon is ſet free from its faſtenings, and elevated to a certain height; when the car is made faſt to the cords which hang down from the net: the whole of this is done in five minutes. A colonel then mounts the car with one of the pupils, and the balloon riſes to the height, generally, of from a hundred and ſixty to two hundred and forty yards. The pupils ſeparate into diviſions, for the purpoſe of holding the balloon in the air, ſuffering it to mount, and drawing it down, by means of three principal ropes faſtened to the net, and ramified with ſeveral others: in theſe manœuvres they employ the aid of a capſtern. When the balloon has been newly filled, has yet ſuffered no evaporation, and ſtill retains all its force, it requires the ſtrength of twenty perſons to hold it; and in that ſtate it will bear eight hundred weight. After a ſpace of two months, though much evaporated, it is ſtill capable of bearing two perſons with their inſtruments, and even a conſiderable ballaſt, at the ſame height in the air: but then ten perſons are ſufficient to hold it.

Exerciſes of the pupils.

The car is conſtructed of a light lattice work of wood, lined with prepared leather, and hangs about ſixteen feet beneath the balloon: it affords convenient room for two perſons ſeated oppoſite each other, with the neceſſary inſtruments for making obſervations.

Form of the car.

The balloon aſcends as often in the day as is requiſite for the ſucceſſion of obſervations which are to be made; but theſe aſcents take place only in calm and ſerene weather. Whenever any unforeſeen accident occurs, the aerial machine is hauled down in five minutes. In ſtrong guſts of wind which ſuddenly ariſe, the aeronauts are always expoſed to ſome danger: the balloon, held by the ropes, cannot riſe freely; and its vibrations and fluctuation reſemble thoſe of a paper kite which has not yet reached a certain degree of altitude. This ſpectacle, nevertheleſs, is more terrific to the ſpectator than to the aeronaut, who, ſeated in his car, which its own weight preſerves in a perpendicular poſition under the balloon, is but ſlightly affected by its deſultory motion. No inſtance of any unfortunate accident has yet occurred at Meudon.

All fear, all idea of danger, vaniſhes on examining the ſolidity of the whole apparatus, the precautionary meaſures adopted with the moſt prudent foreſight and the utmoſt ſecurity, and eſpecially when we are more

particularly,

particularly acquainted with the cool unaffuming ſteadineſs of Conté, the director of the whole.

When the return of peace ſhall allow more leiſure, and ſhall favour the employment of this apparatus in other experiments than thoſe immediately connected with the military ſervice, we may expect to derive from it the moſt important and diverſified advantages to natural ſcience. The experiments will then be conducted under the direction of a committee of naturaliſts from the national inſtitute, with a view of making diſcoveries in natural philoſophy, meteorology, and other branches. When the labours of the aeroſtatic inſtitute ſhall have accompliſhed ends ſo important to the arts, and of ſo great general utility, there will be printed a particular account of the eſtabliſhment, and of the courſe of experiments purſued: at preſent, theſe matters are kept from the knowledge of the public.

Utility of aeroſtatic experiments.

Aeroſtatic telegraph.

The moſt recent invention of Conté, admirable for its ſimplicity and preciſion, is the aeroſtatic telegraph. It conſiſts of eight cylinders of varniſhed black ſilk, ſtretched on hoops, and reſembling thoſe little pocket lanterns of crimped paper, which draw out and fold down again on themſelves. Theſe eight moveable cylinders, each three feet in diameter, and of a proportionate length, are ſuſpended from the bottom of the car, connected together with cords, and hanging one above another, at the diſtance of four feet. By means of cords paſſing through the bottom of the car, the aeronautic obſervers direct thoſe cylinders, give them different poſitions at will, and thus carry on their telegraphic correſpondence from the regions of the air.

Conté has further applied his thoughts to the invention of a ſimilar aeroſtatic telegraph, which, without the aſſiſtance of a great balloon, or an aerial correſpondent, ſhould be managed by a perſon ſtanding on the ground, by means of cords; the apparatus being ſuſpended to a ſmall balloon, of only twelve feet diameter.

Aſcent of a balloon at the battle of Fleurus.

Coutel, captain of the aeronautic corps, was the man who aſcended with the *Entreprenant* balloon on the 26th of June, 1794, and who conducted the wonderful and important ſervice of reconnoitring the hoſtile armies at the battle of Fleurus, accompanied by an adjutant and a general. He aſcended twice on that day, to obſerve, from an elevation of four hundred and forty yards, the poſition and manœuvres of the enemy. On each occaſion he remained four hours in the air, and, by means of preconcerted ſignals with flags, carried on a correſpondence with General Jourdan, the commander of the French army.

His intended aſcent had been made known to the enemy, who, at the moment when the balloon began to take its flight, opened the fire of a battery againſt the aeronauts. The firſt volley was directed too low: one ball, nevertheleſs, paſſed between the balloon and the car, and ſo near to the former, that Coutel imagined it had ſtruck it. When the ſubſequent diſcharges were made, the balloon had already reached ſuch a degree of altitude, as to be beyond the reach of cannon ſhot, and the aeronauts ſaw the balls flying beneath the car. Arrived at their intended height, the obſervers, remote from danger, and undiſturbed, viewed all the evolutions of the enemies, and, from the peaceful regions of the air, commanded a diſtinct and comprehenſive proſpect of two formidable armies engaged in the work of death." (*Month. Mag.* vol. vi. p. 337.)

Garnerin's voyage in England remarkable for its rapidity.

On the 28th of June, 1802, M. Garnerin, a French aeronaut, in company with an Engliſh gentleman, aſcended in a balloon of 20 feet diameter from Ranelagh gardens. They paſſed over London, roſe to the height of 10,000 feet, and landed in three quarters of an hour from the time of their aſcent on a common near Colcheſter, a diſtance of near 60 miles from London. The temperature of the air when they aſcended to the clouds was 15 degrees lower than on the ſurface of the earth; but when they roſe above the clouds, it became ſenſibly milder. The rapidity of M. Garnerin's voyage is unequalled in the hiſtory of aeroſtation.

Uſes of aeroſtation.

The frequency of aerial voyages, accompanied with particular details of trifling and unintereſting circumſtances, and apparently made with a view to promote the intereſt of particular perſons, regardleſs of any advancement in knowledge, had ſunk the ſcience of aeroſtation ſo low in the opinion of moſt people, that before we give an account of the moſt proper methods of conſtructing theſe machines, it is neceſſary to premiſe ſomething concerning the uſes to which they may poſſibly be applied. Theſe, according to Mr Cavallo, are the following:—

"The ſmall balloons, eſpecially thoſe made of paper, and raiſed by means of ſpirit of wine, may ſerve to explore the direction of the winds in the upper regions of the atmoſphere, particularly when there is a calm below; they may ſerve for ſignals in various circumſtances, in which no other means can be uſed; and letters or other ſmall things may be eaſily ſent by them, as for inſtance from ſhips that cannot ſafely land on account of ſtorms, from beſieged places, iſlands, or the like. The larger aeroſtatic machines may anſwer all the above mentioned purpoſes in a better manner; and they may, beſides, be uſed as a help to a perſon who wants to aſcend a mountain, a precipice, or to croſs a river; and perhaps one of theſe machines tied to a boat by a long rope, may be, in ſome caſes, a better ſort of ſail than any that is uſed at preſent. The largeſt ſort of machines, which can take up one or more men, may evidently be ſubſervient to various economical and philoſophical purpoſes. Their conveying people from place to place with great ſwiftneſs, and without trouble, may be of eſſential uſe, even if the art of guiding them in a direction different from that of the wind ſhould never be diſcovered. By means of thoſe machines the ſhape of certain ſeas and lands may be better aſcertained; men may aſcend to the tops of mountains they never viſited before; they may be carried over marſhy and dangerous grounds; they may by that means come out of a beſieged place, or an iſland; and they may, in hot climates, aſcend to a cold region of the atmoſphere, either to refreſh themſelves, or to obſerve the ice, which is never ſeen below; and, in ſhort, they may be thus taken to ſeveral places, to which human art hitherto knew of no conveyance.

"The philoſophical uſes, to which theſe machines may be ſubſervient, are numerous indeed: and it may be ſufficient to ſay, that hardly any thing which paſſes in the atmoſphere is known with preciſion, and that principally for want of a method of aſcending into it. The formation of rain, of thunder ſtorms, of vapours, hail,

hail, ſnow, and meteors in general, require to be attentively examined and aſcertained. The action of the barometer, the refraction and temperature of the air in various regions, the deſcent of bodies, the propagation of ſound, &c. are ſubjects which all require a ſeries of obſervations and experiments, the performance of which could never have been properly expected before the diſcovery of aeroſtatic machines."

To theſe uſes we may add the gratification of curioſity and pleaſure, as a very ſtrong inducement to the practice of an art, in which, with any tolerable degree of caution, there appears not to be the ſmalleſt danger. Every one who has tried the experiment teſtifies, that the beauty of the proſpect afforded by an aſcent, or the pleaſure of being conveyed through the atmoſphere, cannot be exceeded. No one has felt the leaſt of that giddineſs conſequent upon looking from the top of a very high building or of a precipice, nor have they any of the ſickneſs ariſing from the motion of a veſſel at ſea. Many have been carried by balloons at the rate of 30, 40, or even 50 miles an hour, without feeling the leaſt inconvenience, or even agitation of the wind; the reaſon of which is, that as the machine moves with nearly the velocity of the wind itſelf, they are always in a calm, and without uneaſineſs. Some have apprehended danger from the electricity of the atmoſphere; and have thought, that a ſtroke of lightning, or the ſmalleſt electric ſpark, happening near a balloon, might ſet fire to the inflammable air, and deſtroy both the machine and the adventurers. Mr Cavallo has ſuggeſted ſeveral conſiderations for diminiſhing apprehenſions of this kind. Balloons have been already raiſed in every ſeaſon of the year, and even when thunder has been heard, without injury. In caſe of danger, the aeronauts may either deſcend to the earth, or aſcend above the region of the clouds and thunder ſtorms. Beſides, as balloons are formed of materials that are not conductors of electricity, they are not like to receive ſtrokes, eſpecially as by being encompaſſed with air, they ſtand inſulated. Moreover, inflammable air by itſelf, or unmixed with a certain quantity of common air, will not burn; ſo that if an electric ſpark ſhould happen to paſs through the balloon, it would not ſet fire to the inflammable air, unleſs a hole was made in the covering.

Principles of aeroſtation.

The general principles of aeroſtation are ſo little different from thoſe of hydroſtatics, that it may ſeem ſuperfluous to inſiſt much upon them. It is a fact univerſally known, then when a body is immerſed in any fluid, if its weight be leſs than an equal bulk of that fluid, it will riſe to the ſurface; but if heavier, it will ſink; and if equal, it will remain in the place where it is left. For this reaſon ſmoke aſcends into the atmoſphere, and heated air in that which is colder. The aſcent of the latter is ſhown in a very eaſy and ſatisfactory manner by bringing a red-hot iron under one of the ſcales of a balance, by which the latter is inſtantly made to aſcend; for as ſoon as the red hot iron is brought under the ſcale, the hot air being lighter than that which is colder, aſcends, and ſtrikes the bottom, which is thus impelled upwards, and the oppoſite ſcale deſcends, as if a weight had been put into it.

Experiments ſhowing the impulſe of heated air.

Upon this ſimple principle depends the whole theory of aeroſtation; for it is the ſame thing whether we render the air lighter by introducing a quantity of heat into it, or encloſing a quantity of gas ſpecifically lighter than the common atmoſphere in a certain ſpace; both will aſcend, and for the ſame reaſon. A cubic foot of air, by the moſt accurate experiments, has been found to weight about 554 grains, and to be expanded by every degree of heat, marked on Fahrenheit's thermometer, about $\frac{1}{500}$th part of the whole. By heating a quantity of air, therefore, to 500 degrees of Fahrenheit, we ſhall juſt double its bulk when the thermometer ſtands at 54 in the open air, and in the ſame proportion we ſhall diminiſh its weight; and if ſuch a quantity of this hot air be encloſed in a bag, that the exceſs of the weight of an equal bulk of common air weighs more than the bag with the air contained in it, both the bag and air will riſe into the atmoſphere, and continue to do ſo until they arrive at a place where the external air is naturally ſo much rarefied that the weight becomes equal: and here the whole will float.

The power of hot air in raiſing weights, or rather that by which it is itſelf impelled upwards, may be ſhown in the following manner: Roll up a ſheet of paper into a conical form, and, by thruſting a pin into it near the apex, prevent it from unrolling. Faſten it then, by its apex, under one of the ſcales of a balance by means of a thread, and, having properly counterpoiſed it by weights, put it into the oppoſite ſcale; apply the flame of a candle underneath, you will inſtantly perceive the cone to ariſe, and it will not be brought into equilibrium with the other but by a much greater weight than thoſe who have never ſeen the experiment would believe. If we try this experiment with more accuracy, by getting proper receptacles made which contain determinate quantities of air, we ſhall find that the power of the heat depends much more on the capacity of the bag which contains it than could well be ſuppoſed. Thus, let a cubical receptacle be made of a ſmall wooden frame covered with paper capable of containing one foot of air, and let the power of a candle be tried with this as above directed for the paper cone. It will then be found that a certain weight may be raiſed; but a much greater one will be raiſed by having a receptacle of the ſame kind which contains two cubic feet; a ſtill greater by one of three feet; a yet greater by one of four feet, &c. and this even though the very ſame candle be made uſe of; nor is it known to what extent even the power of this ſmall flame might be carried.

Rarefied air balloons ought to be made as large as poſſible.

From theſe experiments it appears, that in the aeroſtatic machines conſtructed on Montgolfier's plan, it muſt be an advantage to have them as large as poſſible; becauſe a ſmaller quantity of fire will then have a greater effect in raiſing them, and the danger from that element, which in this kind of machine is chiefly to be dreaded, will be in a great meaſure avoided. On this ſubject it may be remarked, that as the cubical contents of a globe, or any other figure of which balloons are made, increaſe much more rapidly than their ſurfaces, there muſt ultimately be a degree of magnitude at which the ſmalleſt imaginable heat would raiſe any weight whatever. Thus, ſuppoſing any aeroſtatic machine capable of containing 500 cubic feet, and the air within it to be only one degree hotter than the external atmoſphere; the tendency of this machine to riſe, even without the application of artificial heat, would

How balloons might riſe by the common heat of the atmoſphere.

be near an ounce. Let its capacity be increaſed 16 times; and the tendency to ariſe will be equivalent to a pound, though this may be done without making the machine 16 times heavier than before. It is certain, however, that all aeroſtatic machines have a tendency to produce or preſerve heat within them, which would by no means be imagined by thoſe who have not made the experiment. When Meſſrs Charles and Roberts made their longeſt aerial voyage of 150 miles, they had the curioſity to try the temperature of the air within their balloon, in compariſon with that of the external atmoſphere; and at this time they found, that, when the external atmoſphere was 63°, the thermometer within the balloon ſtood at 104°. Such a difference of temperature muſt have given a machine of the magnitude which carried them a conſiderable aſcending power independent of any other cauſe, as it amounted to 41 grains on every cubic foot; and therefore in a machine containing 50,000 ſuch feet would have been almoſt 200 pounds. Hence we may eaſily account for what happened at Dijon, and is recorded by Mr Morveau. "A balloon, intended to be filled with inflammable air, being completed, was, by way of trial, filled with common air, and in that ſtate expoſed to the atmoſphere. Now it was obſerved, and indeed a ſimilar obſervation had been made before, that the air within the balloon was much hotter than the circumambient air: the thermometer in the former ſtood at 120°; whereas in the latter, even when the ſun ſhone upon it, the thermometer ſtood at 84°. This ſhowed a conſiderable degree of rarefaction within the balloon; and conſequently it was ſuſpected, that, by means of this rarefaction alone, eſpecially if it were to increaſe a little, the balloon might aſcend. On the 30th of May, about noon, the wind being rather ſtrong, agitated the balloon ſo that two men were employed to take care of it; but, notwithſtanding all their endeavours, it eſcaped from its confinement; and, lifting up about 65 pounds weight of cords, equatorial circle, &c. roſe many feet high, and, paſſing over ſome houſes, went to the diſtance of 250 yards, where at length it was properly ſecured."

A balloon at Dijon riſes thus into the atmoſphere.

This difference between the external and internal heat being ſo very conſiderable, muſt have a great influence upon aeroſtatic machines, and will undoubtedly influence thoſe filled with inflammable air as well as the other kind. Nor is it unlikely, that the ſhort time which many aerial voyagers have been able to continue in the atmoſphere may have been owing to the want of a method of preſerving this internal heat. It may naturally be ſuppoſed, and indeed it has always been found, that balloons, in paſſing through the higher regions of the atmoſphere, acquire a very conſiderable quantity of moiſture, not only from the rain or ſnow they ſometimes meet with, but even from the dew and vapour which condenſes upon them. On this an evaporation will inſtantly take place; and, as it is the property of this operation to produce a very violent cold, the internal heat of the balloon muſt be ſoon exhauſted in ſuch a manner as to make it become ſpecifically heavier than the common atmoſphere, and conſequently deſcend in a much ſhorter time than it would have done by the mere loſs of air. To this, in all probability, we are to aſcribe the deſcent of the balloon which carried Meſſrs Blanchard and Jeffries; and which ſeemed ſo extraordinary to many people, that they were obliged to have recourſe to an imaginary attraction in the waters of the ocean, in order to ſolve the phenomenon. This ſuppoſition is rejected by Mr Cavallo; who explains the matter, by remarking, that in two former voyages made with the ſame machine, it could not long ſupport two men in the atmoſphere; ſo that we had no occaſion to wonder at its weakneſs on this occaſion. "As for its riſing higher (ſays he), juſt when it got over the land, that may be eaſily accounted for. In the firſt place, the two travellers threw out their clothes juſt about that time; ſecondly, in conſequence of the wind's then increaſing, the balloon travelled at a much greater rate than it had done whilſt over the ſea; which increaſe of velocity leſſened its tendency to deſcend: beſides which, the viciſſitudes of heat and cold may produce a very conſiderable effect; for if we ſuppoſe, that the air over the land was colder than that over the ſea, the balloon coming into the latter from the former, continued to be hotter than the circumambient air for ſome time after; and conſequently, it was comparatively much lighter when in the cold air over the land, than when in the hotter air over the ſea; hence it floated eaſier in the former than in the latter caſe."

Internal heat of the balloons has great influence on aerial voyages.

Great tendency of Mr Blanchard's balloon to deſcend accounted for.

It ſeems indeed very probable, that there was ſomething uncommon in the caſe of Mr Blanchard's balloon while paſſing over the ſea; for, as it roſe higher after reaching the land than in any former period of the voyage, and likewiſe carried them to a diſtance over land more than half of that which they had paſſed over water, we can ſcarce avoid ſuppoſing, that it had a tendency to deſcend when over the water more than when over land, independent of any loſs of air. Now, it does not appear that the air over the ſea is at all warmer than that above land: on the contrary, there is every reaſon to believe, that the ſuperior reflective power of the land renders the atmoſphere above it warmer than the ſea can do: but it is very natural to ſuppoſe, that the air above the ſea is more moiſt than that above land; and conſequently, by letting fall its moiſture upon the balloon, muſt have occaſioned an evaporation that would deprive the machine of its internal heat, which it would partly recover after it entered the warmer and drier atmoſphere over land.

We ſhall now proceed to the conſtruction of aeroſtatic machines; of which the ſmaller are only for amuſement, or ſome ſlight expetiments, and are very eaſily made. As in all of them, however, it is of the utmoſt conſequence to have the weight as little as poſſible, the ſhape becomes an object of great conſideration. For this purpoſe a ſpherical figure has been mathematically demonſtrated to be the beſt; as capable of containing a greater quantity under a ſmaller ſurface than any other. Thus a perfect ſphere contains leſs ſurface in proportion to its ſolidity than a ſpheroid; a ſpheroid leſs than a cylinder; the latter leſs than a cube; and a cube ſtill leſs than a parallelopiped. In all caſes, therefore, where we can fill the whole capacity of the balloon with air equally light, the ſpherical figure is undoubtedly to be preferred: and this holds good with regard to all inflammable air balloons, whether their ſize be great or ſmall: but in the rarefied air ones, where the under part muſt neceſſarily be much colder than the upper, the globular ſhape ſeems not ſo proper.

Conſtruction of aeroſtatic machines.

Of their ſhape.

proper. An inverted cone, or truncated pyramid, with the ſmaller part undermoſt, ſeems then to be moſt proper, as it allows the heated air (which has a great tendency to expand as well as to aſcend) to collect in the wide part at the top, while the uſeleſs ſurface, in the lower part, and which, in any other figure, would contain only the colder and heavier air, is thus thrown aſide. In fact it has been found, that aeroſtatic machines, raiſed by means of rarefied air, when made of the ſhape of a parallelopiped, or even one deviating ſtill more from the ſhape of a globe, have anſwered the purpoſe as well as they could have been ſuppoſed to do, had ever ſo much care been taken in forming them exactly to that ſhape. The very firſt machine made by Mr Montgolfier was in form of a parallelopiped; and though it contained only 40 cubic feet, ſhowed a very conſiderable power of aſcent. A very large one, 74 feet high, which Mr Montgolfier had deſigned to exhibit before the royal family, had the middle part of it priſmatic for about the height of 25 feet; its top was a pyramid of 29 feet; and its lower part was a truncated cone of near 20 feet. It weighed 1000 pounds; and, notwithſtanding its ſhape, in a very ſhort time manifeſted a power of aſcent equal to 500 pounds. Another aeroſtatic machine of a ſmall ſize, but of the figure of a parallelopiped, being ſuffered to aſcend with 30 ſheets of oiled paper fixed in a wire frame, and ſet on fire, roſe to a great height, and in 22 minutes could not be ſeen. It ſeems therefore, that, with regard to the ſhape of theſe machines, it is by no means neceſſary to adhere rigidly to that of a ſphere; but that any oblong form anſwers very well.

Materials. For experimental purpoſes, both the inflammable and rarefied air balloons may be made of paper; the former being made of that kind called *thin poſt*, varniſhed over with linſeed oil; the latter either of that or any other kind, without varniſh. In order to avoid the danger of burning, however, it has been propoſed to impregnate the paper of which theſe ſmall rarefied air balloons are made with a ſolution of ſal ammoniac, alum, or ſome other ſalt: but this does not ſeem to be neceſſary. Thoſe filled with inflammable air have been made of gold-beaters ſkin or peeled bladders; but the cheaper material of paper is undoubtedly preferable.

Beſt varniſh for inflammable air balloons. For aeroſtatic machines of a larger ſize; the material univerſally employed is varniſhed ſilk; and for thoſe of the rarefied air kind, linen painted over with ſome ſize colour, or lined with paper. The beſt varniſh for an inflammable air balloon is that made with birdlime, and recommended by Mr Faujas de Saint Fond, in a treatiſe publiſhed on the ſubject. The following is his method of preparing it: "Take one pound of birdlime, put it into a new proper earthen pot that can reſiſt the fire, and let it boil gently for about one hour, viz. till it ceaſe to crackle; or, which is the ſame thing, till it is ſo far boiled, as that a drop of it being let fall upon the fire will burn: then pour upon it a pound of ſpirit of turpentine, ſtirring it at the ſame time with a wooden ſpatula, and keeping the pot at a good diſtance from the flame, leſt the vapour of this eſſential oil ſhould take fire. After this, let it boil for about ſix minutes longer: then pour upon the whole three pounds of boiling oil of nuts, linſeed, or poppy, rendered drying by means of litharge; ſtir it well, let it boil for a quarter of an hour longer, and the varniſh is made. After it has reſted for 24 hours, and the ſediment has gone to the bottom, decant it into another pot; and when you want to uſe it, warm, and apply it with a flat bruſh upon the ſilk ſtuff, whilſt that is kept well ſtretched. One coat of it may be ſufficient; but if two are neceſſary, it will be proper to give one on each ſide of the ſilk, and to let them dry in the open air while the ſilk remains extended."

Mr Cavallo's method. Mr Cavallo gives the following method of preparing this varniſh, which he prefers to that of M. de St Fond.—"In order to render linſeed oil drying, boil it with two ounces of ſaccharum ſaturni and three ounces of litharge, for every pint of oil, till the oil has diſſolved them, which will be accompliſhed in half an hour; then put a pound of birdlime and half a pint of the drying oil into a pot (iron or copper pots are the ſafeſt for this purpoſe), the capacity of which may be equal to about one gallon, and let it boil very gently over a ſlow charcoal fire till the birdlime ceaſes to crackle, which will be in about half or three quarters of an hour; then pour upon it two pints and a half more of drying oil, and let it boil for one hour longer, ſtirring it very frequently with an iron or wooden ſpatula. As the varniſh, whilſt boiling, and eſpecially when it is nearly done, ſwells very much, care ſhould be had to remove, in thoſe caſes, the pot from the fire, and to replace it when the varniſh ſubſides, otherwiſe it will boil over. Whilſt the ſtuff is boiling, the operator ſhould, from time to time, examine whether the varniſh has boiled enough; which is thus known:—Take ſome of it upon the blade of a knife, and then, after rubbing the blade of another knife upon it, ſeparate the knives; and when, on this ſeparation, the varniſh begins to form threads between the two, you may conclude that it is done; and, without loſing time, it muſt be removed from the fire. When it is almoſt, though not quite, cold, add about an equal quantity of ſpirit of turpentine: mix it well together, and let it reſt till the next day; when, having warmed it a little, ſtrain and bottle it. If it is too thick, add ſome more ſpirit of turpentine. When this varniſh is laid upon the ſilk, the ſtuff ſhould be made perfectly dry, and ſtretched; ſo that the varniſh, which ought to be uſed lukewarm, may fill up the pores of the ſtuff. The varniſh ſhould be laid once very thin upon one ſide of the ſtuff; and, about 12 hours after, two other coats of it ſhould be laid on, one on each ſide; and, 24 hours after, the ſilk may be uſed, though, in cold weather, it may be left to dry ſome time longer."

Much has been ſaid in France of their elaſtic gum varniſh, and its compoſition kept a ſecret; but Mr Baldwin, after many expenſive trials, declares to the world what he conſiders as the ſecret; and it is merely this: "Take any quantity of caoutchouc, as two ounces avoirdupois; cut it into ſmall bits with a pair of ſciſſars; put a ſtrong iron ladle (like that uſed by plumbers) over a common pitcoal or other fire. The fire muſt be gentle, glowing, and without ſmoke. When the ladle is hot, much below a red heat, put a ſingle bit into the ladle. If *black* ſmoke iſſues, it will preſently flame and diſappear, or it will evaporate without flame: the ladle is then too hot. When the ladle is leſs hot, put in a ſecond bit, which will pro-

duce a *white* ſmoke. This *white* ſmoke will continue during the operation, and evaporate the caoutchouc: therefore no time is to be loſt; but little bits are to be put in, a few at a time, till the whole are melted. It ſhould be continually and gently ſtirred with an iron or braſs ſpoon. Two pounds or one quart of the beſt drying oil (or of raw linſeed oil, which together with a few drops of neats foot oil, has ſtood a month, or not ſo long, on a lump of quicklime, to make it more or leſs drying), is to be put into the melted caoutchouc, and ſtirred till hot, and the whole poured into a glazed veſſel through a coarſe gauze or fine ſieve. When ſettled and clear, which will be in a few minutes, it will be fit for uſe either hot or cold." Mr Baldwin is not at liberty, he obſerves, to publiſh the art of laying on the varniſh: but ſays, that it conſiſts in making no *inteſtine motion* in the varniſh, which would create minute bubbles; that therefore bruſhes are improper. Mr Blanchard's method of making elaſtic gum varniſh for the ſilk of a balloon, is the following. "Diſſolve elaſtic gum (caoutchouc) cut ſmall in five times its weight of ſpirit of turpentine, by keeping them ſome days together; then boil one ounce of this ſolution in eight ounces of drying linſeed oil for a few minutes; laſtly, ſtrain it. It muſt be uſed warm." The pieces of ſilk for the balloon muſt be cut out of a proper ſize, according to the dimenſions, after the varniſh is ſufficiently dry. They may be joined by laying about half an inch of the edge of one piece over the edge of the other, and ſewing them by a double ſtitching. Mr Blanchard uſes expeditiouſly the following method: He lays about half an inch of the edge of one piece flat over the edge of the other, and paſſes a hot iron over it; in doing which a piece of paper ought to be laid both under and over the ſilk. The joining may be rendered more ſecure by running it with a ſilk thread, and ſticking a ribband over it. The ribbands laid over ſeams may be ſtuck with common glue, provided the varniſh of the ſilk is properly dried. When the glue is quite dry, the ribbands ſhould be varniſhed over, to prevent their being unglued by the rain.

Of cutting the gores for a globe.

The beſt method of cutting the pieces of ſilk that are to form a balloon, is to deſcribe a pattern of wood or ſtiff card-paper, and then to cut the ſilk upon it. As the edges of ſuch a pattern are not perfect circles, they cannot be deſcribed by a pair of compaſſes; but the beſt method of drawing them is as follows. Firſt, Draw on a flat ſurface two right lines AE and BC, fig. 2. perpendicular to each other. Secondly, Find the circumference anſwering to the given diameter of the balloon in feet and decimals of a foot; and make AD and DE each equal to a quarter of the circumference, ſo that the whole length AE of the pattern may be equal to half the circumference. Thirdly, Divide AD into 18 equal parts; and to the points of diviſion apply the lines *fg*, *hi*, *kl*, &c, parallel to each other, and perpendicular to AD. Fourthly, Divide the whole circumference in twice the given number of pieces, and make DC and BB each equal to the quotient of this diviſion: ſo that the whole, BC, is equal to the greateſt breadth of one of theſe pieces. Fifthly, Multiply the above mentioned quotient by the decimals annexed to *fg*, viz. 0.99619, and then the product expreſſes the length of *fg*; again, multiply the ſame length of DE by the decimals annexed to *hi*, and the product expreſſes the length of *hi*; and, in ſhort, the product ariſing from the multiplication of the length of DC by the decimals annexed to each of the parallel lines, gives the length of that line. Laſtly, Having found the lengths of all theſe lines, draw by hand a curve line paſſing through all the extremities of the ſaid lines, and that is the edge of one quarter of the pattern. The other quarters may be eaſily deſcribed, by applying to them a piece of paper cut according to that already found. Suppoſe, for example, that the diameter of the balloon to be conſtructed is 20 feet, and that it is required to make it of 12 pieces; then, in order to draw the pattern for thoſe pieces, find the circumference of the balloon, which is 62.85 feet, and dividing it by four, the quotient is 15.7 feet; make therefore AD equal to 15.7 feet, and DE likewiſe of the ſame length. Divide the circumference 62.83 by 24, which is double the number of pieces that are to form the balloon, and the quotient, 2.618 feet, is the length of DC and likewiſe of BD; ſo that BC is equal to 5.236 feet. Then having divided the line AD into 18 equal parts, and having drawn the parallel lines from thoſe points of diviſion, find the length of each of thoſe lines by multiplying 2.618 by the decimals annexed to that line. Thus, 2.618 multiplied by 0.99619, gives 2.608 feet for the length of *fg*; and again, multiplying 2.618 by 0.98481, gives 2.578 feet for the length of *hi*; and ſo of the reſt. In cutting the pieces after ſuch a pattern, care ſhould be taken to leave them about three quarters of an inch all round larger than the pattern, which will be taken up by the ſeams.

To the upper part of the balloon there ſhould be adapted, and well fitted in, a valve, opening inwards; to which ſhould be faſtened a ſtring paſſing through a hole made in a ſmall piece of round wood fixed in the loweſt part of the balloon oppoſite to the valve, and the end of this ſtring faſtened in the car below, ſo that the aeronaut may open the valve when occaſion requires. The action of this valve may be underſtood from fig. 3. A round braſs plate AB has a round hole CD, about two or three inches diameter, covered on both ſides with ſtrong ſmooth leather. On the inſide there is a ſhutter E, alſo of braſs, covered with leather, which is to cloſe the hole CD; being about two inches larger in diameter than the hole. It is faſtened to the leather of the plate AB; and by a ſpring, which need not be very ſtrong, it is kept againſt the hole. The elaſticity of the gas itſelf will help to keep it ſhut. To this ſhutter the ſtring is faſtened, by which it is occaſionally opened for the eſcape of gas. A ſmall ſtring or other ſecurity ſhould be fixed to the ſhutter and the plate, ſo as not to admit the ſhutter to be opened beyond a certain ſafe diſtance. To the lower part of the balloon two pipes ſhould be fixed, made of the ſame ſtuff as the envelope; 6 inches diameter for a balloon of 30 feet, and proportionably larger for balloons of a greater capacity. They muſt be long enough for the car. For balloons of 18 feet and leſs diameter, one neck or pipe will be ſufficient. Theſe pipes are the apertures through which the inflammable gas is introduced into the balloon.

The car or boat is beſt made of wicker-work, covered with leather, and well painted or varniſhed over; and the proper method of ſuſpending it, is by ropes proceeding

ceeding from the net which goes over the balloon. This net ſhould be formed to the ſhape of the balloon, and fall down to the middle of it, with various cords proceeding from it to the circumference of a circle about two feet below the balloon; and from that circle other ropes ſhould go to the edge of the boat. This circle may be made of wood, or of ſeveral pieces of ſlender cane bound together. The meſhes of the net may be ſmall at top, againſt which part of the balloon the inflammable air exerts the greateſt force; and increaſe in ſize as they recede from the top. A hoop has ſometimes been applied round the middle of the balloon to faſten the net. This, though not abſolutely neceſſary, is beſt made of pieces of cane bound together, and covered with leather.

With regard to the rarefied-air machines, Mr Cavallo recommends firſt to ſoak the cloth in a ſolution of ſal ammoniac and common ſize, uſing one pound of each to every gallon of water; and when the cloth is quite dry, to paint it over in the inſide with ſome earthy colour, and ſtrong ſize or glue. When this paint has dried perfectly, it will then be proper to varniſh it with oily varniſh, which might dry before it could penetrate quite through the cloth. Simply drying linſeed oil will anſwer the purpoſe as well as any, provided it be not very fluid.

Of filling aeroſtatic machines.

It now only remains to give ſome account of the method by which aeroſtatic machines may be filled with their proper gas, in order to give them their power of aſcending into the atmoſphere; and here we are enabled to determine with much greater preciſion concerning the inflammable air balloons than the others.

Methods of procuring inflammable air.

With regard to them, a primary conſideration is, the moſt proper method of procuring the inflammable air. It may be obtained in various ways, as will be ſhown under the article CHEMISTRY. But the moſt advantageous methods are, by applying acids to certain metals; by expoſing animal, vegetable, and ſome mineral ſubſtances, in a cloſe veſſel to a ſtrong fire; or by tranſmitting the vapour of certain fluids through red-hot tubes.

1. In the firſt of theſe methods, iron, zinc, and ſulphuric acid are the materials moſt generally uſed. The ſulphuric acid muſt be diluted with five or ſix parts of water. Iron may be expected to yield in the common way 1700 times its own bulk of gas; or one cubic foot of inflammable air to be produced by $4\frac{1}{2}$ ounces of iron, the like weight of ſulphuric acid, and $22\frac{1}{2}$ ounces of water. Six ounces of zinc, an equal weight of ſulphuric acid, and 30 ounces of water, are neceſſary for producing the ſame quantity of gas. It is more proper to uſe the turnings or chippings of great pieces of iron, as of cannon, &c. than the filings of that metal, becauſe the heat attending the effervescence will be diminiſhed; and the diluted acid will paſs more readily through the interſtices of the turnings when they are heaped together, than through the filings, which ſtick cloſer to one another. The weight of the inflammable air thus obtained by means of ſulphuric acid, is, in the common way of procuring it, generally one ſeventh part of the weight of common air; but with the neceſſary precautions for philoſophical experiments, leſs than one-tenth of the weight of common air. Two other ſorts of elaſtic fluids are ſometimes generated with the inflammable air. Theſe may be ſeparated from it by paſſing the inflammable air through water in which quicklime has been diſſolved. The water will abſorb theſe fluids, cool the inflammable air, and prevent its over-heating the balloon when introduced into it.

Fig. 4. of Plate II. repreſents an apparatus deſcribed by Mr Cavallo as proper for filling balloons of the ſize of two or three feet in diameter with inflammable air, after paſſing it through water.—A is the bottle with the ingredients; BCD a tube faſtened in the neck at B, and paſſing through C, the cork of the other bottle, in which there is another hole made to receive the tube on which the balloon is tied. Thus it is plain, that the inflammable air coming out of the tube D will paſs firſt through the water of the bottle E and then into the balloon. Two ſmall caſks may be uſed inſtead of the bottles A and E.

2. Inflammable air may be obtained at a much cheaper rate by the action of fire on various ſubſtances; but the gas which theſe yield is not ſo light as that produced by the effervescence of acids and metals. The ſubſtances proper to be uſed in this way are, pitcoal, aſphaltum, amber, rock-oil, and other minerals; wood, and eſpecially oak, camphor-oil, ſpirits of wine, æther, and animal ſubſtances, which yield air in different degrees, and of various ſpecific gravities; but pitcoal is the preferable ſubſtance. A pound of this expoſed to a red heat, yields about three cubic feet of inflammable air, which, whether it be paſſed through water or not, weighs about one-fourth of the weight of common air. Dr Prieſtley found, as we have elſewhere noticed, that animal or vegetable ſubſtances will yield ſix or ſeven times more inflammable air when the fire is ſuddenly increaſed than when it is gently raiſed, though it be afterwards made very ſtrong. Mr Cavallo obſerves, that the various ſubſtances above enumerated generally yield all their inflammable air in about one hour's time. The general method is, to encloſe the ſubſtances in iron or earthen veſſels, and thus expoſe them to a ſtrong fire ſufficient to make the veſſels red hot: the inflammable air proceeding from the aperture of the veſſel is received into a tube or refrigeratory, and, paſſing through the tube or worm, is at laſt collected in a balloon or other veſſel. A gun-barrel has often been uſed for eſſays of this kind. The ſubſtance is put into it ſo as to fill ſix or eight inches of its loweſt part, the remainder filled with dry ſand: a tube, adapted to the mouth of the barrel, is brought into a baſon of water under an inverted receiver; and the part of the barrel containing the ſubſtance being put into the fire and made red-hot, the inflammable air is collected in the inverted receiver. As the gun-barrel cannot ſerve for producing a large quantity of inflammable air, Mr Cavallo recommends, as the moſt advantageous ſhape, the following contrivance: Let the veſſel be made of clay, or rather of iron, in the ſhape of a Florence flaſk, ſomewhat larger, and whoſe neck is longer and larger (See ABC, fig. 5.) Put the ſubſtance to be uſed into this veſſel, ſo as to fill about four-fifths or leſs of its cavity AB. If the ſubſtance is of ſuch a nature as to ſwell much by the action of the fire, lute a tube of braſs, or firſt a braſs and then a leaden tube, to the neck C of the veſſel; and let the end D of the tube be ſhaped as in the figure, ſo that going into the water of a tube HI, it may terminate under a ſort of inverted veſ-

fel EF, to the upper aperture of which the balloon G is adapted. Things thus prepared, if the part AB of the veſſel is put into the fire, and made red hot, the inflammable air produced will come out of the tube CD, and paſſing through the water will at laſt enter into the balloon G. Previous to the operation, as a conſiderable quantity of common air remains in the inverted veſſel EF, which it is more proper to expel, the veſſel EF ſhould have a ſtop-cock K, through which the common air may be ſucked out, and the water aſcend as high as the ſtop cock. The dimenſions of ſuch an apparatus Mr Cavallo gives thus: Diameter of largeſt part of the veſſel ABC ſeven inches, length of whole veſſel 16 inches; diameter of its aperture one inch, diameter of the cavity of the tube CD three-fourths of an inch; lower aperture of the veſſel EF ſix inches, leaſt height of the veſſel EF 24 inches; its aperture F about two inches. The aperture of the veſſel EF ſhould be at leaſt one foot below the ſurface of the water in HI. Care muſt be taken that the fire uſed in this proceſs be at a ſufficient diſtance, otherwiſe it may happen to fire the inflammable air which may eſcape out of the veſſel EF.

3. The laſt method of obtaining inflammable air was diſcovered by Mr Lavoiſier, and alſo by Dr Prieſtley. Mr Lavoiſier made the ſteam of boiling water paſs through the barrel of a gun, kept red hot by burning coals. Dr Prieſtley uſes, inſtead of the gun-barrel, a tube of red-hot braſs, upon which the ſteam of water has no effect, and which he fills with the pieces of iron which are ſeparated in the boring of cannon. By this method he obtains an inflammable air, the ſpecific gravity of which is to that of common air as 1 to 13. In this method, not yet indeed reduced to general practice, a tube about three quarters of an inch in diameter, and about three feet long, is filled with iron turnings; then the neck of a retort, or cloſe boiler, is luted to one of its ends, and the worm of a refrigeratory is adapted to its other extremity. The middle part of the tube is then ſurrounded with burning coals, ſo as to keep about one foot in length of it red hot, and a fire is always made under the retort or boiler ſufficient to make the water boil with vehemence. In this proceſs a conſiderable quantity of inflammable air comes out of the worm of the refrigeratory. It is ſaid that iron yields one-half more air by this means than by the action of ſulphuric acid.

For filling large balloons, a greater apparatus is neceſſary; and the only materials that can, with any certainty of ſucceſs, be employed for producing the proper gas, are, ſulphuric acid, and iron filings or turnings.

It has indeed been recommended to uſe zinc inſtead of iron filings, becauſe white vitriol, the ſalt produced by the union of the ſulphuric acid and zinc, is much more valuable than the green ſort produced by the union of the ſame acid with iron. But though this is undoubtedly the caſe, it will as certainly be found, upon trial, that the ſuperior price of the zinc will be more than an equivalent for all the advantage that can be derived from the additional price of the white vitriol.

Mr Cavallo's receipt. For a balloon of 30 feet diameter, Mr Cavallo recommends 3900 pounds of iron turnings, as much ſulphuric acid, and 19,500 pounds of water. Theſe proportions, however, appear too great with reſpect to the acid and metal, and too little with reſpect to the water. Sulphuric acid will not exert its power upon iron unleſs it be diluted with five or ſix times its quantity of water; in which caſe, a much ſmaller quantity of both acid and metal will ſerve.

Mr Lunardi's method. Mr Lunardi, who from the number of his voyages had certainly much practical knowledge in aeroſtation, filled his balloon at Edinburgh and Glaſgow with about 2000 pounds of iron (the borings of cannon procured from Carron), as much ſulphuric acid, and 12,000 pounds of water. The iron was placed in his veſſels in layers, with ſtraw between them, in order to increaſe the ſurface. His apparatus was not materially different from that of Mr Cavallo, fig. 6. where AA are two tubs, about three feet in diameter and nearly two feet deep, inverted in large tubs BB filled with water. In the bottom of each of the inverted tubs a hole is made, and a tube E of tin adapted, which is about ſeven inches in diameter, and ſeven or eight long. To theſe tubes the ſilken ones of the balloon are to be tied. Round each of the tubs B, five, ſix, or more ſtrong caſks are placed; in the top of each two holes are made, and to one of theſe holes a tin tube is adapted, and ſo ſhaped, that, paſſing over the edge of the tub B, and through the water, it may terminate with its aperture under the inverted tub A. The other hole of theſe caſks ſerves for the introduction of materials, and is ſtopped with a wooden plug. When the balloon is to be filled, put the net over it, and let it be ſuſpended as ſhown by CDF; and having expelled all the common air from it, let the ſilken tube be faſtened round the tin ones EE; and the materials being put into the caſks, the inflammable air, paſſing into the balloon, will ſoon diſtend, and render it capable of ſupporting itſelf; after which the rope GH may be ſlipped off. As the balloon continues to be filled, the net is adjuſted properly round it; the cords that ſurround it are faſtened to the hoop MN; then the boat IK being placed between the two ſets of caſks, is faſtened to the hoop MN, and every thing that is required to be ſent up, as ballaſt, inſtruments, &c. is placed in it. At laſt, when the balloon is little more than three quarters full, the ſilken tubes are ſeparated from the tin ones of the inverted tubs, and their extremities being tied up, are placed in the boat. Laſtly, The aeronauts being ſeated in the boat, the lateral ropes are ſlipped off, and the machine is abandoned to the air. (See *Blanchard's Balloon*, Plate III.) This apparatus was at laſt reduced by Mr Lunardi to its utmoſt ſimplicity, by uſing only two large caſks, and ſuffering the vapour to go into the balloon without paſſing through water. Thus his balloon was filled in leſs than half an hour, when before, it had required two hours at leaſt. The ſinking of his caſks in the ground was alſo an additional convenience, as it created no confuſion, and rendered the materials much more eaſily conveyed into them.

Of filling rarefied balloons. With regard to the rarefied air balloons, the method of filling them is as follows. A ſcaffold ABCD, fig. 7. the breadth of which is at leaſt two-thirds of the diameter of the machine, is elevated about ſix or eight feet above the ground. From the middle of it deſcends a well E, riſing about two or three feet above it, and reaching to the ground, furniſhed with a door or two, through which the fire in the well is ſupplied with fuel. The well ſhould be conſtructed of brick or of plaſtered wood.

Fig. 7.

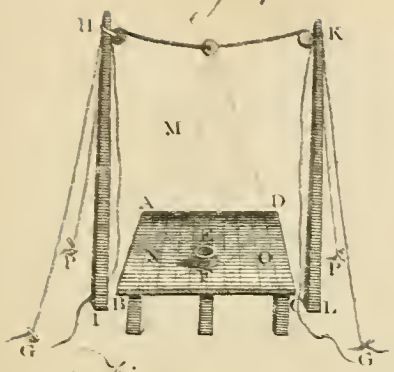


Fig. 6.

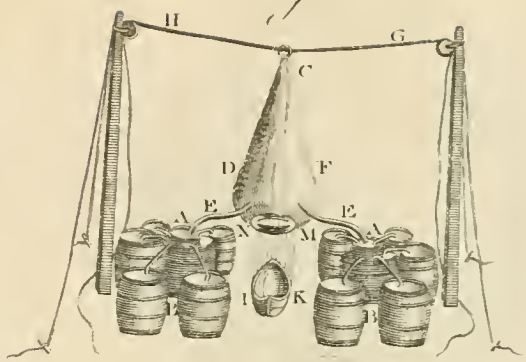


Fig. 11.

Fig. 3.

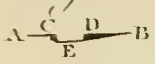


Fig. 1.

Fig. 2.

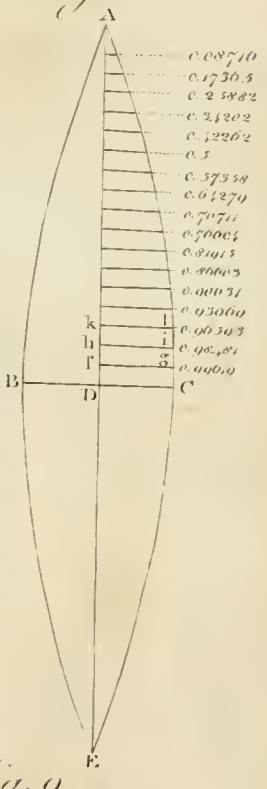


Fig. 10.

Fig. 5.

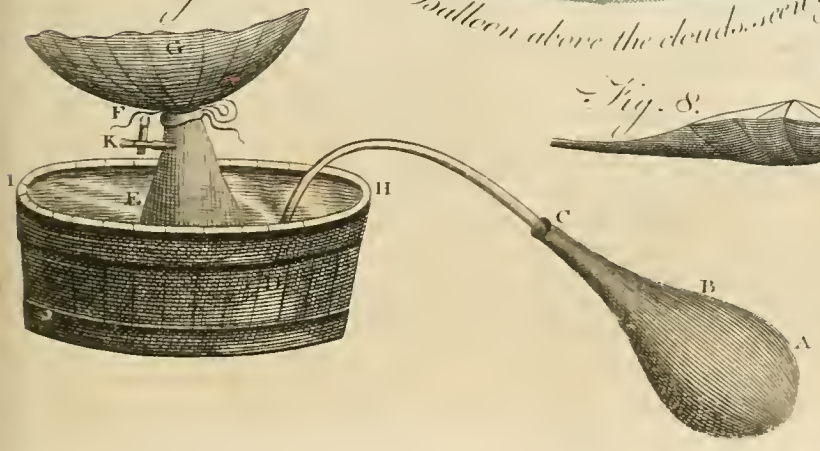


Fig. 8.

Fig. 9.

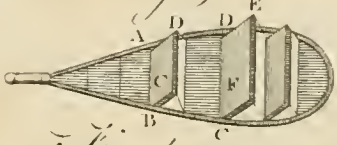


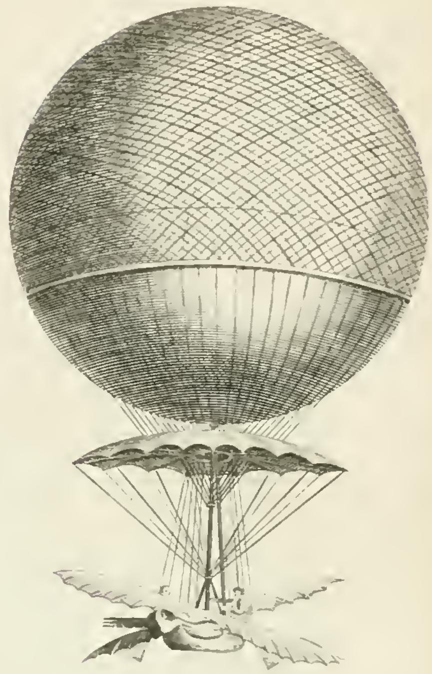
Fig. 4.

Made from a Balloon above the clouds seen by A. Baldwin.

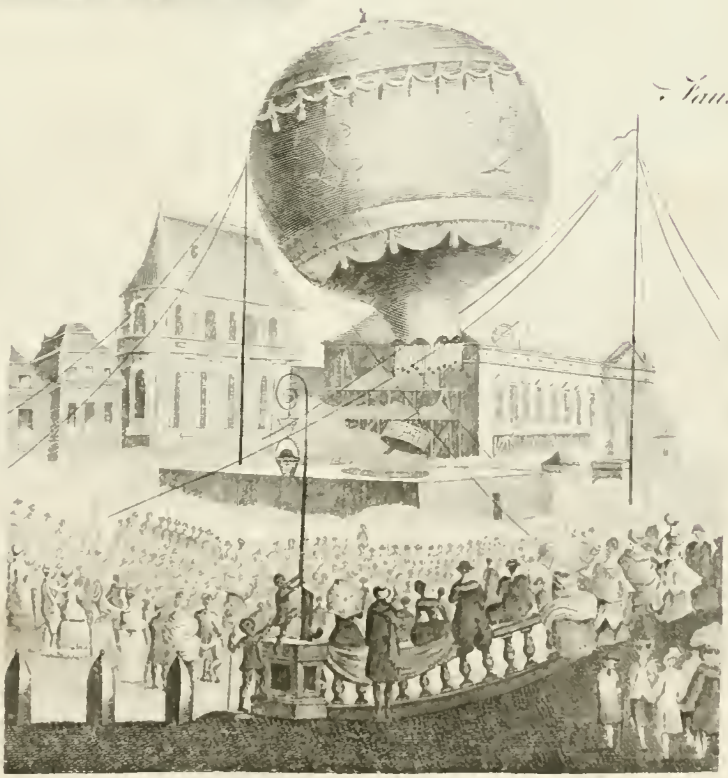
A. Bell Prin. Mal. Sculptor fecit.

Montgolfier's Balloon,
Fauxbourg St. Antoine

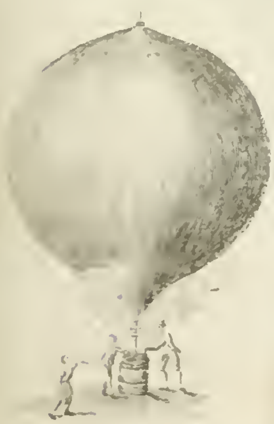
Blanchard's Balloon.



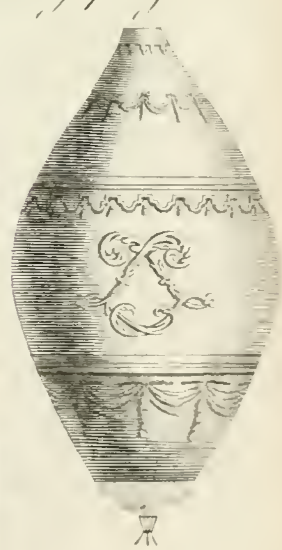
Verfailles
B.



Charles, & Roberts, B.
Camp de Mars.



Montgolfier's B.
Fauxbourg of St. Germain.



A. Bell Prin. Wal. Sculptor fecit.

wood, and its diameter ſhould be ſomewhat leſs than that of the machine. On each ſide of the ſcaffold are erected two maſts HI, KL, each of which has a pulley at the top, and rendered firm by means of ropes KG, KP, HP, HG. The machine to be filled is to be placed on the ſcaffold, with its neck round the aperture of the well. The rope paſſing over the pullies of the two maſts, ſerves, by pulling its two ends, to lift the balloon about 15 feet or more above the ſcaffold; and the reſt of the machine is repreſented by the dotted lines in the figure MNO. The machine is kept ſteady, and held down, whilſt filling, by ropes paſſing through loops or holes about its equator; and the ropes may eaſily be diſengaged from the machine, by ſlipping them through the loops when it is able to ſuſtain itſelf. The proper combuſtibles to be lighted in the well, are thoſe which burn quick and clear, rather than ſuch as produce much ſmoke; becauſe it is hot air, and hot ſmoke, that is required to be introduced into the machine. Small wood and ſtraw have been found to be very fit for this purpoſe. Mr Cavallo obſerves, as the reſult of many experiments with ſmall machines, that ſpirit of wine is upon the whole the beſt combuſtible; but its price may prevent its being uſed for large machines. As the current of hot air aſcends, the machine will ſoon dilate, and lift itſelf above the ſcaffold and gallery which was covered by it. The paſſengers, fuel, inſtruments, &c. are then placed in the gallery. When the machine makes efforts to aſcend, its aperture muſt be brought, by means of the ropes annexed to it, towards the ſide of the well a little above the ſcaffold; the fire-place is then ſuſpended in it, the fire lighted in the grate, and the lateral ropes being ſlipped off, the machine is abandoned to the air. (See *Montgolfier's balloon*, Plate III.) It has been determined by accurate experiments, that only one-third of the common air can be expelled from theſe large machines: and therefore the aſcending power of the rarefied air in them can be eſtimated as only equal to half an ounce avoirdupois for every cubic foot.

The conduct of balloons, when conſtructed, filled, and actually aſcending in the atmoſphere, is an object of great importance in the practice of aeroſtation. The method generally uſed for elevating or lowering the balloons with rarefied air, has been the increaſe or diminution of the fire: and this is entirely at the command of the aeronaut, as long as he has any fuel in the gallery. The inflammable air balloons have been generally raiſed or lowered by diminiſhing the weight in the boat, or by letting out ſome of the gas through the valve: but the alternate eſcape of the air in deſcending, and diſcharge of the ballaſt for aſcending, will by degrees render the machine incapable of floating; for in the air it is impoſſible to ſupply the loſs of ballaſt, and very difficult to ſupply that of inflammable air. Theſe balloons will alſo riſe or fall by means of the rarefaction or condenſation of the encloſed air, occaſioned by heat and cold. It has been propoſed to aid a balloon in its alternate motion of aſcent and deſcent, by annexing to it a veſſel of common air, which might be condenſed for lowering the machine, and rarefied again, by expelling part of it, for raiſing the machine: But a veſſel adapted to this purpoſe muſt be very ſtrong; and, after all, the aſſiſtance afforded by it would not be very conſiderable. M. Meunier, in order to attain this end, propoſes to encloſe one balloon filled with common air in another filled with inflammable air: as the balloon aſcends, the inflammable air is dilated, and of courſe compreſſes the internal balloon containing the common air: and by diminiſhing its quantity, leſſens its weight. If it ſhould be neceſſary to ſupply this loſs, he ſays it may be eaſily done by a pair of bellows fixed in the gallery. Others have propoſed to annex a ſmall machine with rarefied air to an inflammable air balloon by ropes, at ſuch a diſtance that the fire of the former might not affect the inflammable air of the latter: the whole apparatus, thus combined, of balloons formed on the two principles of heated and inflammable air, might be raiſed or lowered by merely increaſing or diminiſhing the fire in the lower balloon.

Wings or oars are the only means of this ſort that have been uſed with ſome ſucceſs: and, as Mr Cavallo obſerves, they ſeem to be capable of conſiderable improvement; although great effects are not to be expected from them, when the machine goes at a great rate. The beſt methods of moving thoſe wings are by the human ſtrength applied ſimilarly to the oars of a waterman. They may be made in general of ſilk ſtretched between wires, tubes, or ſticks; and when uſed, muſt be turned edgewiſe when they are moved in the direction in which the machine is intended to be impelled, but flat in the oppoſite direction. Fig. 8. is the repreſentation of one of Mr Blanchard's wings. Fig. 9. is one of thoſe uſed by Mr Lunardi, which conſiſts of many ſilk ſhutters or valves, ABCD, DECF, &c. every one of which opens on one ſide only, viz. ADBC opens upon the line AB, DECF opens upon the line DC, &c. In conſequence of this conſtruction, this ſort of oars does not need being turned edgewiſe. Fig. 10. repreſents one of the wings uſed by the brothers Roberts in the aerial voyage of the 19th September 1784; and fig. 11. repreſents one of the wings conſtructed by Count Zambeccari, which conſiſts of a piece of ſilk ſtretched between two tin tubes ſet at an angle; but theſe wings are ſo contrived as to turn edgewiſe by themſelves when they go on one direction. Other contrivances have been made to direct aeroſtatic machines, but they have moſtly been invented to effect a power upon them as upon a ſhip. It appears, however, that they can have no effect when a machine is only moved by the wind alone, becauſe the circumambient air is at reſt in reſpect to the machine. The caſe is quite different with a veſſel at ſea, becauſe the water on which it float ſtands ſtill whilſt the veſſel goes on; but it muſt be time and experience that can realize the expectations ſuggeſted by theſe contrivances.

Aerſchot || Æſchines.

AERSCHOT, a town of the Auſtrian Netherlands, in the duchy of Brabant, and capital of the duchy of Aerſchot. It is ſeated on the river Demur, ten miles eaſt of Malines or Mechlin, and eight north of Louvain. E. Long. 5. 44. N. Lat. 51.

ÆRUGINOUS, an epithet given to ſuch things as reſemble or partake of the nature of the ruſt of copper.

ÆRUGO, in *Natural Hiſtory*, properly ſignifies the ruſt of copper, whether natural or artificial. The former is found about copper mines, and the latter, called *verdigris*, made by corroding copper plates with acids.

ÆRUSCATORES, in *Antiquity*, a kind of ſtrolling beggars, not unlike gypſies, who drew money from the credulous by fortune-telling, &c. It was alſo a denomination given to gripping exactors, or collectors of the revenue. The Galli, or prieſts of Cybele, were called *æruſcatores magnæ matris*; and μητραγυρται, on account of their begging or collecting alms in the ſtreets; to which end they had little bells to draw people's attention, ſimilar to ſome orders of mendicants abroad.

AERY, or AIRY, among ſportſmen. See AIRY.

ÆS UXORIUM, in *Antiquity*, a ſum paid by bachelors, as a penalty for living ſingle to old age. This tax for not marrying ſeems to have been firſt impoſed in the year of Rome 350, under the cenſorſhip of M. Furius Camillus and M. Poſthumus. At the cenſus, or review of the people, each perſon was aſked, *Et tu ex anima ſententia uxorem habes liberum quærendorum cauſa?* He who had no wife was hereupon fined after a certain rate, called *æs uxorium*.

Æs per et libram was a formula in the Roman law, whereby purchaſes and ſales were ratified. Originally the phraſe ſeems to have been only uſed in ſpeaking of things ſold by weight, or by the ſcales; but it afterwards was uſed on other occaſions. Hence even in adoptions, as there was a kind of imaginary purchaſe, the formula thereof expreſſed, that the perſon adopted was bought *per æs et libram*.

Æs Flavum, yellow copper, among the Romans, an appellation given to the coarſer kinds of braſs.

The ancients had different kinds of braſs, as *æs candidum*, *æs Corinthium*, denoting probably different metallic alloys or mixtures.

Æs Caldarium, a term uſed by the German mineraliſts, for a ſubſtance which ſometimes occurs to thoſe who work upon cobalt, and is uſed for making the fine blue colour called *ſmalt*.

Æs Uſtum, a chemical preparation, made of thin leaves of copper, ſulphur, and nitre, placed *ſtratum ſuper ſtratum* in a crucible, and ſet in a charcoal fire till all the ſulphur is conſumed; after which, the copper is taken out of the crucible, and reduced to powder. Some quench the leaves of copper in vinegar, and repeat the calcination.—Its principal uſe is in colouring glaſs, to which it gives a beautiful tincture. The ſurgeons uſe it as a deterſive, and ſome have given it internally; but it is certainly a very dangerous medicine, and ſhould be avoided.

ÆSCHINES, an Athenian, a Socratic philoſopher, the ſon of Charinus a ſauſage-maker. He was continually with Socrates; which occaſioned this philoſopher to ſay, that the ſauſage maker's ſon was the only perſon who knew how to pay a due regard to him. It is ſaid that poverty obliged him to go to Sicily to Dionyſius the Tyrant; and that he met with great contempt from Plato, but was extremely well received by Ariſtippus; to whom he ſhowed ſome of his dialogues, and received from him a handſome reward. He would not venture to profeſs philoſophy at Athens, Plato and Ariſtippus being in ſuch high eſteem; but he opened a ſchool in which he taught philoſophy to maintain himſelf. He afterwards wrote orations for the forum. Phrynicus, in Photius, ranks him amongſt the beſt orators, and mentions his orations as the ſtandard of the pure Attic ſtyle. Hermogenes has alſo ſpoken very highly of him. He wrote beſides ſeveral Dialogues, of which there are only three extant: 1. Concerning virtue, whether it can be taught. 2. Eryxias, or Eraſiſtratus; concerning riches, whether they are good. 3. Axiochus; concerning death, whether it is to be feared. Mr Le Clerc has given a Latin tranſlation of them, with notes and ſeveral diſſertations, entitled *Sylvæ Philologicæ*. Æſchines.

ÆSCHINES, a celebrated Grecian orator, was born at Athens 327 years before the Chriſtian era. According to his own account, he was of diſtinguiſhed birth; according to that of Demoſthenes, he was the ſon of a courtezan, and a humble performer in a company of comedians. But whatever was the true hiſtory of his birth and early life, his talents, which were conſiderable, procured him great applauſe, and enabled him to be a formidable rival to Demoſthenes himſelf. The two orators, inſpired probably with mutual jealouſy and animoſity, became at laſt the ſtrenuous leaders of oppoſing parties. Æſchines was accuſed by Demoſthenes of having received money as a bribe when he was employed on an embaſſy to Philip of Macedon. He indirectly retaliated this charge, by bringing an accuſation againſt Cteſiphon the friend of Demoſthenes for having moved a decree, contrary to the laws, to confer on Demoſthenes a golden crown, as a mark of public approbation. A numerous aſſembly of judges and citizens met to hear and decide the queſtion: each orator employed all his powers of eloquence; but Demoſthenes, with ſuperior talents, and with juſtice on his ſide, was victorious; and Æſchines was ſent into exile. The reſentment of Demoſthenes was now ſoftened into generous kindneſs; for when Æſchines was going into baniſhment, he requeſted him to accept of a ſum of money; which made him exclaim, "How do I regret leaving a country where I have found an enemy ſo generous, that I muſt deſpair of ever meeting with a friend who ſhall be like him!"

Æſchines opened a ſchool of eloquence at Rhodes, which was the place of his exile, and he commenced his lectures by reading to his audience the two orations which had been the cauſe of his baniſhment. His own oration received great praiſe; but that of Demoſthenes was heard with boundleſs applauſe. In ſo trying a moment, when vanity muſt be ſuppoſed to have been deeply wounded, with a noble generoſity of ſentiment, he ſaid, "What would you have thought if you had heard him thunder out the words himſelf."—Æſchines afterwards removed to Samos, where he died, in the 75th year of his age. Three of his orations only are extant. His eloquence is not without energy,

Æschylus. energy, but it is diffuse and ornamented, and more calculated to please than to move the passions. (*Gen. Biog.*)

ÆSCHYLUS, the tragic poet, was born at Athens. The time of his birth is not exactly ascertained; some suppose that it was in the 65th, others in the 70th Olympiad; but according to Stanley, who follows the Arundelian marbles, he was born in the 63d Olympiad. He was the son of Euphorian, and brother to Cynegirus and Aminias, who distinguished themselves in the battle of Marathon, and the sea fight of Salamis, at which engagements Æschylus was likewise present. In this last action, according to Diodorus Siculus, Aminias, the younger of the three brothers, commanded a squadron of ships, and fought with so much conduct and bravery, that he sunk the admiral of the Persian fleet, and signalized himself above all the Athenians. To this brother our poet was, upon a particular occasion, obliged for saving his life: Ælian relates, that Æschylus being charged by the Athenians with certain blasphemous expressions in some of his pieces, was accused of impiety, and condemned to be stoned to death: They were just going to put the sentence in execution, when Aminias, with a happy presence of mind, throwing aside his cloak, showed his arm without a hand, which he had lost at the battle of Salamis in defence of his country. This sight made such an impression on the judges, that, touched with the remembrance of his valour, and with the friendship he showed for his brother, they pardoned Æschylus. Our poet, however, resented the indignity of this prosecution, and resolved to leave a place where his life had been in danger. He became more determined in this resolution when he found his pieces less pleasing to the Athenians than those of Sophocles, though a much younger writer. Some affirm, that Æschylus never sat down to compose but when he had drank liberally. He wrote a great number of tragedies, of which there are but seven remaining: and notwithstanding the sharp censures of some critics, he must be allowed to have been the father of the tragic art. In the time of Thespis, there was no public theatre to act upon; the strollers driving about from place to place in a cart. Æschylus furnished his actors with masks, and dressed them suitably to their characters. He likewise introduced the buskin, to make them appear more like heroes.—The ancients gave Æschylus also the praise of having been the first who removed murders and shocking sights from the eyes of the spectators. He is said likewise to have lessened the number of the chorus. M. Le Fevre has observed, that Æschylus never represented women in love in his tragedies; which, he says, was not suited to his genius; but, in representing a woman transported with fury, he was incomparable. Longinus says, that Æschylus has a noble boldness of expression; and that his imagination is lofty and heroic. It must be owned, however that he affected pompous words, and that his sense is too often obscured by figures: this gave Salmasius occasion to say, that he was more difficult to be understood than the Scripture itself. But notwithstanding these imperfections, this poet was held in great veneration by the Athenians, who made a public decree that his tragedies should be played after his death. He was killed in the 69th year of his age, by an eagle letting fall a tortoise upon his head as he was walking in the fields. He had the honour of a pompous funeral from the Sicilians, who buried him near the river Gela; and the tragedians of the country performed plays and theatrical exercises at his tomb.—The best edition of his plays is that of London, 1663, folio, with a Latin translation and a learned commentary by Thomas Stanley.

Æschynomene || Æsop.

ÆSCHYNOMENE, BASTARD SENSITIVE PLANT, in *Botany*. See BOTANY *Index*.

ÆSCULAPIUS, in the heathen mythology, the god of physic, was the son of Apollo and the nymph Coronis. He was educated by the centaur Chiron, who taught him physic; by which means Æsculapius cured the most desperate diseases. But Jupiter, enraged at his restoring to life Hippolitus, who had been torn in pieces by his own horses, killed him with a thunderbolt. According to Cicero, there were three deities of this name: the first, the son of Apollo, worshipped in Arcadia, who invented the probe, and bandages for wounds; the second, the brother of Mercury, killed by lightning; and the third, the son of Arisippus and Arsince, who first taught the art of tooth drawing and purging. At Epidaurus, Æsculapius's statue was of gold and ivory, with a long beard, his head surrounded with rays, holding in one hand a knotty stick, and the other entwined with a serpent; he was seated on a throne of the same materials as his statue, and had a dog lying at his feet. The Romans crowned him with laurel, to represent his descent from Apollo; and the Phaliasins represented him as beardless. The cock, the raven, and the goat, were sacred to this deity. His chief temples were at Pergamus, Smyrna, Trica a city in Ionia, and the isle of Coos; in all which votive tablets were hung up, showing the diseases cured by his assistance. But his most famous shrine was at Epidaurus; where, every five years, games were instituted to him, nine days after the Isthmian games at Corinth.

ÆSCULUS, the HORSE CHESNUT, in *Botany*. See BOTANY *Index*.

ÆSOP, the Phrygian, lived in the time of Solon, about the 50th Olympiad, under the reign of Crœsus the last king of Lydia. As to genius and abilities, he was greatly indebted to nature; but in other respects not so fortunate, being born a slave and extremely deformed. St Jerome, speaking of him, says he was unfortunate in his birth, condition in life, and death; hinting thereby at his deformity, servile state, and tragical end. His great genius, however, enabled him to support his misfortunes; and in order to alleviate the hardships of servitude, he compose those entertaining and instructive fables which have acquired him so much reputation. He is generally supposed to have been the inventor of that kind of writing; but this is contested by several, particularly Quintilian, who seems to think that Hesiod was the first author of fables. Æsop, however, certainly improved this art to a very great degree; and hence it is that he has been accounted the author of this sort of productions:

Æsopus auctor quam materiam reperit,
Hanc ego polivi versibus senariis. PHÆD.

Mine is the task, in easy verse,
The tales of Æsop to rehearse.

The

Æſop. The firſt maſter whom Æſop ſerved, was one Caraſius Demarchus, an inhabitant of Athens, and there, in all probability, he acquired his purity in the Greek tongue. After him he had ſeveral maſters; and at length came under a philoſopher named Idmon or Iadmon, who enfranchiſed him. After he had recovered his liberty, he ſoon acquired a great reputation amongſt the Greeks; ſo that, according to Meziriac, the report of his wiſdom having reached Crœſus, he ſent to inquire after him, and engaged him in his ſervice. He travelled through Greece, according to the ſame author; whether for his own pleaſure, or upon the affairs of Crœſus, is uncertain; and paſſing by Athens ſoon after Piſiſtratus had uſurped the ſovereign power, and finding that the Athenians bore the yoke very impatiently, he told them the fable of the frogs who petitioned Jupiter for a king. The images made uſe of by Æſop are certainly very happy inventions to inſtruct mankind; they poſſeſs all that is neceſſary to perfect a precept, having a mixture of the uſeful with the agreeable. "Æſop the fabuliſt (ſays Aulus Gellius) was deſervedly eſteemed wiſe, ſince he did not, after the manner of the philoſophers, rigidly and imperiouſly dictate ſuch things as were proper to be adviſed and perſuaded; but framing entertaining and agreeable apologues, he thereby charms and captivates the human mind."—Æſop was put to death at Delphi. Plutarch tells us, that he came there with a great quantity of gold and ſilver, being ordered by Crœſus to offer a ſacrifice to Apollo, and to give a conſiderable ſum to each inhabitant: but a quarrel ariſing betwixt him and the Delphians, he ſent back the money to Crœſus; for he thought thoſe for whom the prince deſigned it, had rendered themſelves unworthy of it. The inhabitants of Delphi brought an accuſation of ſacrilege againſt him; and pretending they had convicted him, threw him headlong from a rock. For this cruelty and injuſtice, we are told they were viſited with famine and peſtilence; and conſulting the oracle, they received for anſwer, that the god deſigned this as a puniſhment for their treatment of Æſop: they endeavoured to make an atonement, by raiſing a pyramid to his honour.

Æsop, *Clodius*, a celebrated actor, who flouriſhed about the 670th year of Rome. He and Roſcius were cotemporaries, and the beſt performers who ever appeared upon the Roman ſtage; the former excelling in tragedy, the latter in comedy. Cicero put himſelf under their direction to perfect his action. Æſop lived in a moſt expenſive manner, and at one entertainment is ſaid to have had a diſh which coſt above eight hundred pounds; this diſh, we are told, was filled with ſinging and ſpeaking birds, ſome of which coſt near 50l. The delight which Æſop took in this ſort of birds proceeded, as Mr Bayle obſerves, from the expence. He did not make a diſh of them becauſe they could ſpeak, according to the refinement of Pliny upon this circumſtance, this motive being only by accident; but becauſe of their extraordinary price. If there had been any birds that could not ſpeak, and yet more ſcarce and dear than theſe, he would have procured ſuch for his table. Æſop's ſon was no leſs luxurious than his father, for he diſſolved pearls for his gueſts to ſwallow. Some ſpeak of this as a common practice of his; but others mention his falling into this exceſs only on a particular day, when he was treating his friends. Horace * ſpeaks only of one pearl of great value, which he diſſolved in vinegar, and drank. Æſop, notwithſtanding his expences, is ſaid to have died worth above 160,000l. When he was upon the ſtage, he entered into his part to ſuch a degree, as ſometimes to be ſeized with a perfect ecſtacy: Plutarch mentions it as reported of him, that whilſt he was repreſenting Atreus deliberating how he ſhould revenge himſelf on Thyeſtes, he was ſo tranſported beyond himſelf in the heat of action, that with his truncheon he ſmote one of the ſervants croſſing the ſtage, and laid him dead on the ſpot.

Æſtimatio ‖ Æther.

* Sat II. lib. ii. 239.

ÆSTIMATIO CAPITIS, a term met with in old law books for a fine anciently ordained to be paid for offences committed againſt perſons of quality, according to their ſeveral degrees.

ÆSTIVAL, in a general ſenſe, denotes ſomething connected with, or belonging to, ſummer. Hence, æſtival ſign, æſtival ſolſtice, &c.

ÆSTUARIA, in *Geography*, denotes an arm of the ſea, which runs a good way within land. Such is the Briſtol channel, and many of the friths of Scotland.

ÆSTUARIES, in ancient baths, were ſecret paſſages from the hypocauſtum into the chambers.

ÆSTUARY, among phyſicians, a vapour bath, or any other inſtrument for conveying heat to the body.

ÆSYMNIUM, in antiquity, a monument erected to the memory of the heroes by Æſymnus the Megarean. He, conſulting the oracle in what manner the Megareans might be moſt happily governed, was anſwered, *If they held conſultation with the more numerous:* whom he taking for the dead, built the ſaid monument, and a ſenate-houſe that took within its compaſs the monument; imagining, that thus the dead would aſſiſt at their conſultations. (Pauſanias).

AETH, or Ath, a ſtrong little town in the Auſtrian Netherlands and province of Hainault, ſituated on the river Dender, about twenty miles ſouth-weſt of Bruſſels.

ÆTHALIA, or Ilua, in *Ancient Geography*, now *Elba;* an iſland on the coaſt of Etruria, in compaſs an hundred miles, abounding in iron. It was ſo called from αἰθάλη, ſmoke, which iſſued from the ſhops of Vulcan.

ÆTHELSTAN, ſee Athelstan.

ÆTHER, is uſually underſtood of a thin, ſubtile matter, or medium, much finer and rarer than air; which commencing from the limits of our atmoſphere, poſſeſſes the whole heavenly ſpace.—The word is Greek, αἰθὴρ, ſuppoſed to be formed from the verb αἴθειν, "to burn, to flame;" ſome of the ancients, particularly Anaxagoras, ſuppoſing it to be of the nature of fire.

The philoſophers cannot conceive that the largeſt part of the creation ſhould be perfectly void; and therefore they fill it with a ſpecies of matter under the denomination of *æther*. But they vary extremely as to the nature and character of this æther. Some conceive it as a body *ſui generis*, appointed only to fill up the vacuities between the heavenly bodies; and therefore confined to the regions above our atmoſphere. Others ſuppoſe it of ſo ſubtile and penetrating a nature, as to pervade the air and other bodies, and poſſeſs the pores and intervals thereof. Others deny the exiſtence of any ſuch ſpecific matter; and think the air itſelf, by that immenſe tenuity and expanſion it is found capable

Æther. of, may diffuſe itſelf through the interſtellar ſpaces, and be the only matter found therein.

In effect, æther, being no object of our ſenſe, but the mere work of imagination, brought only upon the ſtage for the ſake of hypotheſis, or to ſolve ſome phenomenon, real or imaginary; authors take the liberty to modify it how they pleaſe. Some ſuppoſe it of an elementary nature, like other bodies; and only diſtinguiſhed by its tenuity, and the other affections conſequent thereon: which is the philoſophical æther. Others will have it of another ſpecies, and not elementary; but rather a ſort of fifth element, of a purer, more refined, and ſpirituous nature, than the ſubſtances about our earth; and void of the common affections thereof, as gravity, &c. The heavenly ſpecies being the ſuppoſed region or reſidence of a more exalted claſs of beings, the medium muſt be more exalted in proportion. Such is the ancient and popular idea of æther, or æthereal matter.

The term *æther* being thus embarraſſed with a variety of ideas, and arbitrarily applied to ſo many different things, the later and ſeverer philoſophers chooſe to ſet it aſide, and in lieu thereof ſubſtitute other more determinate ones. Thus, the Carteſians uſe the term *materia ſubtilis*; which is their æther: and Sir Iſaac Newton, ſometimes a *ſubtile ſpirit*, as in the cloſe of his *Principia*; and ſometimes a *ſubtile* or *æthereal medium*, as in his *Optics*.

Heat, Sir Iſaac Newton obſerves, is communicated through a vacuum almoſt as readily as through air: but ſuch communication cannot be without ſome interjacent body, to act as a medium. And ſuch body may be ſubtile enough to penetrate the pores of glaſs, and may permeate thoſe of all other bodies, and conſequently be diffuſed through all the parts of ſpace.

The exiſtence of ſuch an æthereal medium being ſettled, that author proceeds to its properties; inferring it to be not only rarer and more fluid than air, but exceedingly more elaſtic and active: in virtue of which properties he ſhows, that a great part of the phenomena of nature may be produced by it. To the weight, e. g. of this medium, he attributes gravitation, or the weight of all other bodies; and to its elaſticity the elaſtic force of the air and of nervous fibres, and the emiſſion, refraction, reflection, and other phenomena of light; as alſo, ſenſation, muſcular motion, &c. In fine, this ſame matter ſeems the *primum mobile*, the firſt ſource or ſpring of phyſical action in the modern ſyſtem.

The Carteſian æther is ſuppoſed not only to pervade, but adequately to fill, all the vacuities of bodies: and thus to make an abſolute plenum in the univerſe.

But Sir Iſaac Newton overturns this opinion, from divers conſiderations; by ſhowing, that the celeſtial ſpaces are void of all ſenſible reſiſtance: and, hence it follows, that the matter contained therein muſt be immenſely rare, in regard the reſiſtance of bodies is chiefly as the denſity; ſo that if the heavens were thus adequately filled with a medium or matter, how ſubtile ſoever, they would reſiſt the motion of the planets and comets much more than quickſilver or gold. But it has been ſuppoſed that what Newton has ſaid of æther is to be conſidered only as a conjecture, and eſpecially as no new proofs of its exiſtence have been adduced ſince his time.

The late diſcoveries in electricity have thrown great light upon this ſubject, and rendered it extremely probable that the æther ſo often talked of is no other than the electric fluid, or ſolar light, which diffuſes itſelf throughout the whole ſyſtem of nature. Æther || Ætites.

ÆTHER, in *Chemiſtry*, a light, volatile, and very inflammable liquid, produced by diſtillation of acids with rectified ſpirit of wine. See CHEMISTRY *Index*.

ÆTHEREAL, *Ætherevs*, ſomething that belongs to, or partakes of, the nature of ÆTHER. Thus we ſay, the *æthereal ſpace*, *æthereal regions*, &c.

Some of the ancients divided the univerſe, with reſpect to the matter contained therein, into elementary and æthereal.

Under the æthereal world was included all that ſpace above the uppermoſt element, viz. fire. This they ſuppoſed to be perfectly homogeneous, incorruptible, unchangeable, &c. The Chaldees placed an æthereal world between the empyreum and the region of the fixed ſtars. Beſides which, they ſometimes alſo ſpeak of a ſecond æthereal world, meaning by it the ſtarry orb: and a third æthereal world, by which is meant the planetary region.

ÆTHIOPIA. See ETHIOPIA and ABYSSINIA.

ÆTHIOPS, *Mineral*, *Martial*, and *Antimonial*. See CHEMISTRY *Index*.

ÆTHUSA, FOOL'S PARSLEY, in *Botany*. See BOTANY *Index*.

AETIANS, in church hiſtory, a branch of Arians, who maintained that the Son and Holy Ghoſt are in all things diſſimilar to the Father. See AETIUS.

ÆTIOLOGY, is that part of pathology which is employed in exploring the cauſes of diſeaſes.

AETION, a celebrated painter, who has left us an excellent picture of Roxana and Alexander, which he exhibited at the Olympic games; it repreſents a magnificent chamber, where Roxana is ſitting on a bed of a moſt ſplendid appearance, which is rendered ſtill more brilliant by her beauty. She looks downwards, in a kind of confuſion, being ſtruck with the preſence of Alexander ſtanding before her. A number of little Cupids flutter about, ſome holding up the curtain, as if to ſhow Roxana to the prince, whilſt others are buſied in undreſſing the lady; ſome pull Alexander by the cloak, who appears like a young baſhful bridegroom, and preſent him to his miſtreſs: he lays his crown at her feet, being accompanied by Epheſtion, who holds a torch in his hand, and leans upon a youth, who repreſents Hymen. Several other little Cupids are repreſented playing with his arms; ſome carry his lance, ſtooping under ſo heavy a weight; others bear along his buckler, upon which one of them is ſeated, whom the reſt carry in triumph; another lies in ambuſh in his armour, waiting to frighten the reſt as they paſs by. This picture gained Aetion ſo much reputation, that the preſident of the games gave him his daughter in marriage.

ÆTITES, or EAGLE-STONE, in *Natural Hiſtory*, a flinty or cruſtated ſtone, hollow within, and containing a *nucleus*, which, on ſhaking, rattles within. It was formerly in repute for ſeveral extraordinary magical as well as medical powers; ſuch as preventing abortion, diſcovering thieves, and other ridiculous properties. The word is formed from ἀετος, "eagle," the popular tradition being, that it is found in the eagle's neſt, whither it is ſuppoſed to be carried while the fe-

Aetius, Ætna.

male fits, to prevent her eggs from being rotten. It is found in feveral parts: near Trevoux in France, one can fcarcely dig a few feet, without finding confiderable ſtrata or beds of the coarſer or ferruginous kind. They are originally ſoft, and of the colour of yellow ochre. But the fineſt and moſt valued of all the eagle-ſtones, are accidental ſtates of one or other of our common pebbles.

AETIUS, one of the moſt zealous defenders of Arianiſm, was born in Syria, and flouriſhed about the year 336. After being ſervant to a grammarian, of whom he learned grammar and logic, he was ordained deacon, and at length biſhop, by Eudoxus patriarch of Conſtantinople. Aetius was baniſhed into Phrygia on account of his religious opinions; but was recalled from exile on the acceſſion of Julian, and was much eſteemed by that emperor. He died, it is ſuppoſed, at Conſtantinople, about the year 366. St Epiphanius has preſerved 47 of his propoſitions againſt the Trinity. His followers were called AETIANS.

AETIUS, a famous phyſician, born at Amida in Meſopotamia, and the author of a work entitled *Tetrabiblos*, which is a collection from the writings of thoſe phyſicians who went before him. He lived, according to Dr Freind, at the end of the 5th or the beginning of the 6th century.

AETIUS, governor of Gallia Narbonenſis in the reign of Valentinian III. forced the Franks who were paſſing into Gaul to repaſs the Rhine. He defeated the Goths; and routed Attila king of the Huns, who invaded Gaul with an army of 700,000 men. But the emperor, jealous of the merit of this great man, killed him in 454, with his own hand, under the pretence that he had permitted the invaſion of the Huns, after Attila's defeat.

ÆTNA, (in the Itineraries *Æthana*, ſuppoſed from *αἴθω*, "to burn;" according to Bochart, from *athuna*, a furnace, or *atuna*, darkneſs), now *Monte Gibello*: a volcano or burning mountain of Sicily, ſituated in N. Lat. 38°. E. Long. 15°.

This mountain, famous from the remoteſt antiquity, both for its bulk and terrible eruptions, ſtands in the eaſtern part of the iſland, in a very extenſive plain, called *Val di Demoni*, from the notion of its being inhabited by devils, who torment the ſpirits of the damned in the bowels of this volcano.

Inconſiſtent accounts concerning the magnitude of Ætna.

Concerning the dimenſions of Mount Ætna, we can ſcarcely extract any thing conſiſtent, even from the accounts of the lateſt and moſt ingenious travellers. Pindar, who lived about 435 years before Chriſt, calls it the *Pillar of Heaven*, on account of its great height. All modern writers likewiſe agree, that this mountain is very high, and very large; but differ much both as to its height and magnitude: ſome making it no leſs than twelve miles high, others eight, others ſix, ſome four; while Mr Brydone, and Sir William Hamilton, who lately aſcended to its higheſt ſummit, reduce its height to little more than two miles; nay, by ſome it is reduced to 10,036 feet, ſomewhat leſs than two miles. No leſs remarkable are the differences concerning its circumference: ſome making it only 60 miles round, others 100; and Signior Recupero, from whom Mr Brydone had his information in this reſpect, affirms it to be no leſs than 183 miles in circuit.

Ætna.

We are ſorry to detract from the merit of Mr Brydone, or to involve in obſcurity what he has been at ſo much pains to elucidate; but every perſon who compares the account of Mount Ætna's circumference, given by Signior Recupero, and to which Mr Brydone ſeems to have aſſented, with its apparent circumference on the map prefixed to that gentleman's tour through Sicily and Malta, muſt at once be ſtruck with the prodigious diſparity. Indeed, it is plain, that in the map, the geographer has not left room for any ſuch mountain: nor can we help thinking, that, by comparing the diſtances of ſome of the Sicilian towns from one another, Signior Recupero's dimenſions will be found enormouſly exaggerated.—Certain it is, that where the geographer has placed Catania, which ſtands at the foot of Mount Ætna, on one ſide, there is no more than 28 miles from the moſt diſtant point of the river Alcantara, which forms the boundary on the oppoſite ſide; ſo that a circle, whoſe radius is 14 or 15 miles, muſt encompaſs as much ſpace as we can poſſibly think is occupied by the baſis of Mount Ætna. Thus we ſhall reduce the circumference of this famous mountain to between 80 and 90 miles; and even when we do ſo, it is perhaps too great.

But if we are embarraſſed with the circumference of Ætna, we are much more ſo with the accounts relating to its height; and one circumſtance, particularly, creates almoſt unſurmountable difficulties. It is agreed upon by all travellers, and among the reſt by Sir William Hamilton, that, from Catania, where the aſcent firſt begins, to the ſummit, is not leſs than 30 miles. The deſcent on the other ſide we have no account of; but whatever ſuppoſition we make, the height of the mountain muſt be prodigious. If we ſuppoſe it likewiſe to be 30 miles, and that Mount Ætna can be repreſented by an equilateral triangle, each of whoſe ſides is 30 miles, we will have an amazing elevation indeed, no leſs than 26 miles perpendicular! Such a height being beyond all credibility, we muſt contract the ſides of our triangle, in proportion to its baſis. We ſhall begin with allowing ten miles for the difference between a ſtraight line from Catania to the ſummit, and the length of the road, occaſioned by the inequalities of the mountain; and ſuppoſing the deſcent on the other ſide to be ſomewhat ſhorter, we may call it 15 miles. Mount Ætna will now be repreſented by a ſcalene triangle, whoſe baſe is 30 miles, its longeſt ſide 20, and its ſhorteſt 15; from which proportions we will ſtill find its height to be betwixt eight and nine miles.—This is ſtill incredible; and when all the various relations concerning the height of Ætna are compared, we hope it will not be thought preſumptuous in us to give it as our opinion, that the true dimenſions of this mountain are as yet unknown. The following meaſures are given by different authors.

Dimenſ uncerta

Height above the ſurface of the ſea, 10,036 feet.

One hundred and eighty miles circumference at the baſe.—Faujas de St Fond, in his Volcans du Vivarais.

Height 12,000 feet.—Brydone. Tour to Sicily.

Height 2500 toiſes.—La Platrière, ſaid as from Recupero.

Height 1950 toiſes.—Diameter 30 miles.—Mentelle Geogr. comp.

Others make its height only 2000 toiſes, and its ſuperficies 300 ſquare miles.

Concerning

Ætna. Concerning the products and general appearance of this volcano, authors are much better agreed.—The journey from Catania to its summit has been lately described by several travellers, M. D'Orville, Mr Brydone, Sir William Hamilton, M. Houel, and the abbé Spallanzani. They all agree, that this single mountain affords an epitome of the different climates throughout the whole world: towards the foot, it is extremely hot; farther up, more temperate; and grows gradually more and more cold the higher we ascend. At the very top, it is perpetually covered with snow: from thence the whole island is supplied with that article, so necessary in a hot climate, and without which the natives say Sicily could not be inhabited. So great is the demand for this commodity, that the bishop's revenues, which are considerable, arise from the sale of Mount Ætna's snow; and he is said to draw 1000l. a-year from one small portion lying on the north side of the mountain. Great quantities of snow and ice are likewise exported to Malta and Italy, making a considerable branch of commerce. On the north side of this snowy region, Mr Brydone was assured, that there are several small lakes which never thaw; and that the snow mixed with the ashes and salt of the mountain are accumulated to a vast depth. The quantity of salts contained in this mountain, he, with great probability, conjectures to be one reason of the preservation of its snows; for salt increases the coldness of snow to a surprising degree.

General appearance, &c.

In the middle of the snowy region stands the great *crater*, or mouth of Ætna; from which, though contrary to the usual method of travellers, we shall begin our particular account of this mountain. Sir William Hamilton describes the crater as a little mountain, about a quarter of a mile perpendicular, and very steep, situated in the middle of a gently inclining plain, of about nine miles in circumference. It is entirely formed of stones and ashes; and, as he was informed by several people of Catania, had been thrown up about 25 or 30 years before the time (1769) he visited Mount Ætna. Before this mountain was thrown up, there was only a prodigious large chasm, or gulf, in the middle of the above-mentioned plain; and it has been remarked, that about once in 100 years the top of Ætna falls in; which undoubtedly must be the case at certain periods, or the mountain behoved continually to increase in height. As this little mountain, though emitting smoke from every pore, appeared solid and firm, Sir William Hamilton and his companions went up to the very top. In the middle is a hollow, about two miles and a half in circumference, according to Sir William Hamilton; three miles and a half, according to Mr Brydone; and three or four, according to Mr D'Orville. The inside is crusted over with salts and sulphur of different colours. It goes shelving down from the top, like an inverted cone; the depth, in Sir W. Hamilton's opinion, nearly corresponding to the height of the little mountain. From many places of this space issue volumes of sulphureous smoke, which being much heavier than the circumambient air, instead of ascending in it, roll down the side of the mountain, till, coming to a more dense atmosphere, it shoots off horizontally, and forms a large track in the air, according to the direction of the wind; which, happily for our travellers, carried it exactly to the side opposite to which they were placed. In the middle of this funnel is the tremendous and unfathomable gulf, so much celebrated, in all ages, both as the terror of this life, and the place of punishment in the next. From this gulf continually issue terrible and confused noises, which in eruptions are increased to such a degree as to be heard at a prodigious distance. Its diameter is probably very different at different times: for Sir W. Hamilton observed, by the wind clearing away the smoke from time to time, that the inverted hollow cone was contracted almost to a point; while Mr D'Orville and Mr Brydone found the opening very large. Both Mr Brydone and Sir W. Hamilton found the crater too hot to descend into it; but Mr D'Orville was bolder: and accordingly he and his fellow traveller, fastened to ropes which two or three men held at a distance for fear of accidents, descended as near as possible to the brink of the gulf; but the small flames and smoke which issued from it on every side, and a greenish sulphur, and pumice stones, quite black, which covered the margin, would not permit them to come so near as to have a full view. They only saw distinctly, in the middle, a mass of matter which rose, in the shape of a cone, to the height of above 60 feet, and which towards the base, as far as their sight could reach, might be 600 or 800 feet. While they were observing this substance, some motion was perceived on the north side, opposite to that whereon they stood; and immediately the mountain began to send forth smoke and ashes. This eruption was preceded by a sensible increase of its internal roarings; which, however, did not continue; but after a moment's dilatation, as if to give it vent, the volcano resumed its former tranquillity; but as it was by no means proper to make a long stay in such a place, our travellers immediately returned to their attendants.

Ætna.

Crater described.

On the summit of Mount Ætna, Sir W. Hamilton observes, that he was sensible of a difficulty in respiration from the too great subtility of the air, independent of what arose from the sulphureous smoke of the mountain. Mr Brydone takes no notice of this: which probably arose from the air being in a more rarefied state at the time of Sir W. Hamilton's observation than of Mr Brydone's; the barometer, as observed by the former, standing at 18 inches and 10 lines, by the latter at 19 inches $6\frac{1}{2}$ lines.

In these high regions there is generally a very violent wind, which, as all our travellers found it constantly blowing from the south, is perhaps most frequently directed from that point. Here Mr Brydone's thermometer fell to 25°.

The top of Ætna being above the common region of vapours, the heavens appear with exceeding great splendour.—Mr Brydone and his company observed, as they ascended in the night, that the number of stars seemed to be infinitely increased, and the light of each of them appeared brighter than usual; the whiteness of the milky-way was like a pure flame which shot across the heavens; and, with the naked eye, they could observe clusters of stars that were invisible from below. Had Jupiter been visible, he is of opinion that some of his satellites might have been discovered with the naked eye, or at least with a very small pocket glass. He likewise took notice of several of those meteors called *falling stars*; which appeared as much elevated as when viewed from the plain; a proof, according to Mr Brydone,

Splendour of the stars seen from the top of Ætna.

Ætna.

done, that "these bodies move in regions much beyond the bounds that some philosophers have assigned to our atmosphere."

Extensive prospect.

To have a full and clear prospect from the summit of Mount Ætna, it is necessary to be there before sunrise; as the vapours raised by the sun, in the day time, will obscure every object: accordingly, our travellers took care to arrive there early enough; and all agree, that the beauty of the prospect from thence cannot be expressed.—Here Mr Brydone and Sir W. Hamilton had a view of Calabria in Italy, with the sea beyond it; the Lipari islands, and Stromboli, a volcano, at about 70 miles distance, appeared just under their feet; the whole island of Sicily, with its rivers, towns, harbours, &c. appeared distinct, as if seen on a map. Massa, a Sicilian author, affirms, that the African coast, as well as that of Naples, with many of its islands, have been discovered from the top of Ætna. The visible horizon here is no less than 800 or 900 miles in diameter. The pyramidal shadow of the mountain reaches across the whole island, and far into the sea on the other side, forming a visible track in the air, which as the sun rises above the horizon, is shortened, and at last confined to the neighbourhood of Ætna. The most beautiful part of the scene, however, in Mr Brydone's opinion, is the mountain itself, the island of Sicily, and the numerous islands lying round it. These last seem to be close to the skirts of Ætna; the distances appearing reduced to nothing.

Division into three zones.

This mountain is divided into three zones, which might properly enough be distinguished by the names of *torrid*, *temperate* and *frigid*: they are, however, known by the names of the *Piedmontese*, or *Regione culta*, the cultivated or fertile region; the *sylvosa*, woody, or temperate zone; and the *Regione deserta*, the frigid or desert zone or region. All these are plainly distinguished from the summit. The *Regione deserta* is marked out by a circle of snow and ice, which extends on all sides to the distance of about eight miles, beginning at the foot of the crater. Great part of this region is smooth and even. This is immediately succeeded by the *sylvosa*, or woody region; which forms a circle of the most beautiful green, surrounding the mountain on all sides. This region is variegated with a vast number of mountains of a conical form, thrown up by Ætna in those eruptions which burst out from its sides. Sir W. Hamilton counted 44 on the Catania side, each having its crater, many with large trees flourishing both within and without the crater. All these, except a few of late date, have acquired a wonderful degree of fertility. The circumference of this zone, or great circle, according to Recupero, is not less than 70 or 80 miles. It is everywhere succeeded by the *Regione culta;* which is much broader than the rest, and extends on all sides to the foot of the mountain. Here terrible devastations are sometimes committed by the eruptions; and the whole region is likewise full of conical mountains thrown up by them. The circumference of this region is, by Recupero, reckoned 183 miles; but we have already given our reasons for rejecting these dimensions.—This region is bounded by the sea to the south and south-east; and on all other sides, by the rivers Semeto and Alcantara, which form the boundaries of Mount Ætna.

Regione deserta.

Regione sylvosa.

Ætna.

The woody region descends eight or nine miles below the *Regione deserta*, but differs greatly in the temperature of its climate. Sir W. Hamilton observed a gradual decrease of the vegetation as he advanced; the under part being covered with large timber trees, which grew gradually less as he approached the third region, and at last degenerated into the small plants of the northern climates. He also observed quantities of juniper and tansy; and was informed by his guide, that later in the season (he visited Ætna in June 1769) there are a great many curious plants, and in some places rhubarb and saffron in great plenty. In Carrera's history of Catania, there is a list of all the plants and herbs of Ætna.

This region is extolled by Mr Brydone as one of the most delightful spots on earth. He lodged for a night in a large cave near the middle, formed by one of the most ancient lavas. It is called *La Spelonca del Capriole*, or the goats cavern; because it is frequented by those animals, which take refuge there in bad weather. Here his rest was disturbed by a mountain thrown up in the eruption 1766. It discharged great quantities of smoke, and made several explosions like heavy cannon fired at a distance; but they could observe no appearance of fire.

This gentleman likewise visited the eastern side of the *Regione sylvosa*, intending to have ascended that way to the summit, and descended again on the south side to Catania, but found it impracticable. On this side, part of the woody region was destroyed in 1755, by an immense torrent of boiling water, which issued from the great crater. Its traces were still very visible, about a mile and a half broad, and in some places more. The soil was then only beginning to recover its vegetative power, which it seems this torrent had destroyed for 14 years. Near this place are some beautiful woods of cork, and evergreen oak, growing absolutely out of the lava, the soil having hardly filled the crevices; and not far off, our traveller observed several little mountains that seemed to have been formed by a late eruption. Each of these had a regular cup, or crater, on the top; and, in some, the middle gulf, or *voragine*, as the Sicilians call it, was still open. Into these gulfs Mr Brydone tumbled down stones, and heard the noise for a long time after. All the fields round, to a considerable distance, were covered with large burnt stones discharged from these little volcanoes.

Eruption of boiling water.

The woody region, especially the east side, called *Carpinetto*, abounds with very large chesnut trees; the most remarkable of which has been called, from its size, *Castagno di Cento Cavalli*, or chesnut tree of a hundred horse. Mr Brydone was greatly disappointed at the sight of this tree, as it is only bush of five large ones growing together: but his guides assured him, that all these five were once united into one item; and Signior Recupero told him, that he himself had been at the expence of carrying up peasants with tools to dig round it, and found all the stems united below ground in one root. The circumference, as measured by Messr. Brydone and Glover who accompanied him, amounted to 204 feet. Here the barometer stood at 26 inches 5 lines and a half, indicating an elevation of near 4000 feet.

Overgrown chesnut trees.

The Piedmontese district is covered with towns, villages,

Regio Culta.

Ætna. lages. monaſteries, &c. and is well peopled, notwithſtanding the danger of ſuch a ſituation; but the fertility of the ſoil tempts people to inhabit that country; and their ſuperſtitious confidence in the ſaints, with the propenſity mankind have to deſpiſe danger which they do not ſee. render them as ſecure there as in any other place. Here, Sir William Hamilton obſerves, they keep their vines low, contrary to the cuſtom of thoſe who inhabit Mount Veſuvius; and they produce a ſtronger wine, but not in ſuch abundance: here alſo many terrible eruptions have burſt forth; particularly one in 1699. At the foot of the mountain raiſed by that eruption, is a hole, through which Sir William Hamilton deſcended, by means of a rope, into ſeveral ſubterraneous caverns, branching out, and extending much farther than he choſe to venture; the cold there was exceſſive, and a violent wind extinguiſhed ſome of the torches. Many other caverns are known in this and the other regions of Ætna; particularly one near this place called *La Spelonca della Palumba*, (from the wild pigeons building their neſts there.) Here Mr Brydone was told that ſome people had loſt their ſenſes, from having advanced too far, imagining they ſaw devils and damned ſpirits.

Subterraneous caverns.

River Acis. In this region the river *Acis*, ſo much celebrated by the poets, in the fable of Acis and Galatea, takes its riſe. It burſts out of the earth at once in a large ſtream, runs with great rapidity, and about a mile from its ſource throws itſelf into the ſea. Its water is remarkably clear; and ſo extremely cold, that it is reckoned dangerous to drink it; it is ſaid, however, to have a poiſonous quality, from being impregnated with vitriol; in conſequence of which cattle have been killed by it. It never freezes, but is ſaid often to contract a greater degree of cold than ice.

Houel's obſervations. The following additional particulars relating to the eruptions, magnitude, ſcenery, and products of this celebrated volcano, are chiefly collected from the *Voyage Pittoreſque* of M. Houel, who appears to have ſurveyed it with greater accuracy than any former traveller.

The form of Mount Ætna is that of a cone, very broad at the baſe, which is more than 40 miles in circumference. From the bottom you aſcend ten leagues before reaching its ſummit on the ſouth ſide; and on any of the other ſides, the way being not ſo ſtraight, would be conſiderably longer. Ætna is entirely compoſed of ſubſtances that have been diſcharged from the volcano in its various exploſions.

It appears from the quantities of marine bodies depoſited all over the under part of Ætna, that it muſt have been once covered by the ſea to at leaſt one half of its preſent height. The whole iſland of Sicily, and the greateſt part of Mount Ætna, have been, in our author's opinion, formed under water. But the period when the eruptions from this volcano firſt commenced, the manner in which the ſea ſubſided, and the preciſe time at which it fell ſo low as its preſent level on the ſhores of Sicily, are facts concerning which we have no certain knowledge.

The general principle, however, Mr Houel thinks may be regarded as undeniable. When this mountain ſtood half under water, the currents of the ocean would gradually accumulate upon it large maſſes, both of its own productions, ſuch as ſhells, and bones of fiſhes, and of various other matters, which would be intermixed with the volcanic matters diſcharged from the focus of the burning mount. In a long ſeries of ages theſe ſtrata of heterogeneous matters would naturally become ſo conſiderable as to form the enormous maſs of mountains with which the volcano is now ſurrounded. The currents of the ocean might often convey the volcanic matters to a conſiderable diſtance from the volcanic focus. And there are mountains at no ſmall diſtance from Ætna, which ſeem to have been produced in this manner. Thoſe of Carlintini, at the diſtance of 15 leagues, conſiſt chiefly of a mixture of pozzolana with calcareous matters. At Lintini, and in places around it, there are diſtinct beds of pozzolana, ſcoriæ, and real lava, as well as others in which all theſe matters are blended together in a maſs of calcareous matter. At Palazzolo, about 24 miles from the city of Syracuſe, the ſides of the hills having been cut by the ſtreams which run down them, in many places to a conſiderable depth, diſplay huge maſſes of lava, and extenſive beds of pozzolana. In the neighbourhood of Noto there are alſo volcanic productions to be found. Ætna.

At Pachino, where the iſland of Sicily forms an angle, there is a range of hills extending for ſeveral miles, which conſiſt all of pozzolana.

The province of Val di Noto is more homogeneous in the matters of which its ſoil conſiſts, than the two other dales of Sicily. Theſe, in every hill which they contain, exhibit a vaſt variety of different matters. So amazing, indeed, is that variety, that they may be conſidered as exhibiting a collection of ſpecimens of all the different materials which enter into the compoſition of the globe. In thoſe two dales few volcanic productions have been yet obſerved. But it is not to be inferred for this reaſon that they contain but few. They may be hereafter diſcovered in great plenty. In the volcano of water at Maccalubbe, between Aragona and Girginti; in the baths of Caſtellamare, near Alcamo and Segeſte; in the baths of Termini; in the iſles of Lipari; in the hot waters of Ali, between Meſſina and Taormina, by the lake in the valley of Caltagirone; in all theſe places, which comprehend the whole circumference of Sicily, the influence of the volcano of Ætna is, in ſome meaſure, felt. Nay, it would even ſeem, that in theſe places there are ſo many volcanic craters. All of theſe are ſo diſpoſed as to ſhow that they exiſted prior not only to the volcanic matters, but to the other ſubſtances intermixed with them.

The waters of the ſea have, in former times, riſen much higher than at preſent. But how they retreated, or whether they are to continue ſtationary at their preſent height, we know not. For more than 2000 years, during which Sicily has been inhabited, and has had cities and harbours, the ſea has not been obſerved either to recede or encroach in any conſiderable degree.

When the ſea ſubſided from Mount Ætna, the mountain muſt have been covered over with ſuch matters as the ſea uſually depoſites; conſequently with calcareous matters. A part of thoſe matters would be indurated by the action of the atmoſphere, while the reſt would be carried down by the rain waters, and again conveyed into the ocean. The torrents of rain

waters.

Ætna. water which pour down the ſides of Mount Ætna have furrowed its ſides, by cutting out for themſelves channels; and they have removed from its ſummit, and are ſtill removing to a further diſtance, all the extraneous bodies upon it. In many places, they flow at preſent over a channel of lava, having cut through all the matters which lay above it: ſtill, however, there remain in many places both calcareous matter and other marine productions, which ſhow that this volcano has been once covered by the waters of the ocean. But theſe are daily waſting away; not only the rains, but men likewiſe, who carry them off as materials for lime and for building, conſpire to deface them.

No fewer than 77 cities, towns, and villages, are ſcattered over the ſides of Ætna. They are moſt numerous on the ſouth ſide, where the temperature of the air is milder than on the north. Reckoning thoſe cities, towns, and villages, one with another, to contain each 1200 or 1500 ſouls, the whole number of the inhabitants of Mount Ætna will then be 92,400, or 115,500. But it is certainly much more conſiderable.

Account of the north-eaſt ſide of the mountain.

Plate IV. fig. 1. exhibits a view of the north eaſt ſide of the mountain, taken at ſea. The lower part preſents to the eye very extenſive plains entirely covered with lava of different thickneſs, on which vegetation has not yet made any progreſs. The nearer the ſhore the more barren is the ground; while the fertility of the ſoil increaſes as we advance farther inwards. The mountain is everywhere full of vaſt excavations; which our author conſiders as a proof, that inſtead of increaſing in bulk, it is actually in a ſtate of decay and diminution. The vaſt torrents of lava, which overſpread the ſides of it from time to time, he conſiders as inſufficient to repair the waſte occaſioned by rains, rivulets, and torrents flowing down from the ſummit. Unleſs the eruptions, therefore, become more frequent than they have been for ſome time paſt, he ſuppoſes that, by degrees, the height of the mountain muſt be reduced to that of the ſurrounding beds of lava. He had not an opportunity of meaſuring the altitude of Ætna himſelf; but he obſerves, that it had been done by the celebrated M. de Sauſſure, who found the elevation to be 10,036 feet. This was done on the 5th of June 1773, at 20 minutes after ſeven in the morning. The height of the barometer on the moſt elevated part at the brink of the crater was 18 inches $11\frac{1}{4}$ lines; which, by the neceſſary corrections, is reduced to 18 inches $10\frac{1}{10}$ lines. At the ſame time the mercury at Catania, placed only one foot above the level of the ſea, ſtood at 28 inches $2\frac{1}{10}$ lines; which muſt be reduced to 28 inches $1\frac{1}{8}$ lines, on account of the neceſſary correction for the thermometer.

Suppoſed to be in a ſtate of decay.

Sauſſure's account of the height of Ætna.

Mountains of calcareous matter.

From Giana our author had an opportunity of contemplating the vaſt number of calcareous mounts ſcattered over that part of Ætna; which (he ſays) "are nothing more than fragments, the ſlender remains of thoſe enormous maſſes which have been depoſited all around the baſe of Mount Ætna; and are a very curious monument of the revolutions which this mountain has undergone." They are of a true calcareous nature; and the inhabitants are accuſtomed to ſupply themſelves with limeſtone from them. They alſo uſe ſtones of which theſe mounts are compoſed for the purpoſes of building; as the lava is ſo hard that it cannot be cut without the greateſt difficulty, and they have no other ſtone in theſe parts. Ætna.

Leaving this place, our author travelled over ſeveral extenſive plains of lava, covered on each ſide of the way with ſtunted trees, but without any cultivation: the lava being of that kind which is very unfavourable to the growth of vegetables. Arriving at St Leonardo, he obſerved the courſe of the eruption of water which happened in 1755.

Particular account of the eruption of water in 1755.

This water took its courſe down the weſt ſide of the mountain: and the channel which it cut for itſelf is ſtill viſible. The eruption of water from burning mountains is ſtill much leſs frequent than that of lava or half vitrified ſolid matters, aſhes, &c. though that of water, and even mixed with the ſhells of marine animals (though we are not told whether it was ſalt or not), has ſometimes been obſerved in other volcanoes, particularly Veſuvius. The eruption we now ſpeak of happened in the month of February 1755. It was preceded by an exceedingly thick black ſmoke iſſuing from the crater, intermixed with flaſhes of fire. This ſmoke gradually became thicker, and the burſts of flame more frequent. Earthquakes and ſubterraneous thunder convulſed the mountain, and ſtruck the inhabitants of the adjacent parts with the utmoſt terror. On Sunday the ſecond of March, the mountain was ſeen to emit a huge column of ſmoke, exceedingly denſe and black, with a dreadful noiſe in the bowels of the earth, accompanied alſo with violent flaſhes of lightning. From time to time there were loud cracks, like the exploſions of cannon; the mountain appeared to ſhake from its foundations; the air on that ſide next Maſcali became very dark, and loud peals of thunder were heard. Theſe ſeemed to iſſue from two caverns, conſiderably below the ſummit, on the ſide of the mountain, and were accompanied with violent blaſts of wind like a tempeſt.

Theſe terrible phenomena continued and increaſed; Ætna ſeemed ready to ſwallow up at once all thoſe materials which it had been for ſo many years diſgorging, or rather about to ſink at once into the bowels of the earth from whence it appeared to have been elevated. The proſpect was far beyond any idea that can be given by deſcription of this tremendous ſcene. The inhabitants were alarmed beyond meaſure; the ſight of the flames driven by the winds againſt the ſides of the mountain, the ſhocks of the earthquake, and the fall of rocks, ſtruck the imagination with a horror not to be conceived. During this dreadful commotion, an immenſe torrent of water was emitted from the higheſt crater of the mountain. The whole ſummit of Ætna was at that time covered with a thick coating of ſnow. Through this the boiling water directed its courſe eaſtward; and, in its paſſage, met with frightful precipices. Over theſe it daſhed with the utmoſt violence, adding its tremendous roaring to the complicated horrors of this awful ſcene. The ſnow, melting inſtantaneouſly as the boiling torrent advanced, increaſed its deſtructive power by augmenting its quantity, while the miſchievous effects of the heat were ſcarce diminiſhed, by reaſon of the immenſe quantity of boiling liquid which continued to pour from the ſummit of the mountain.

This boiling torrent having daſhed its awful cataracts from one chain of rocks to another, at length reached

Ætna. reached the cultivated plains, which it overflowed for a number of miles. Here it divided itſelf into ſeveral branches, forming as many deep and rapid rivers; which, after ſeveral other ſubdiviſions, diſcharged themſelves into the ſea.

Though the mountain continued to diſcharge water in this manner only for half an hour, the ravages of it were very terrible. Not only thoſe of common inundations, ſuch as tearing up trees, hurrying along rocks and large ſtones, took place here, but the ſtill more dreadful effects of boiling water were felt. Every cultivated ſpot was laid waſte, and every thing touched by it was deſtroyed. Even thoſe who were placed beyond the reach of the torrent, beheld with inexpreſſible horror the deſtruction occaſioned by it; and though the alarming noiſes which had ſo long iſſued from the mountain now ceaſed in a great meaſure, the ſhocks of earthquakes and the violent ſmoke which continued to iſſue from the mountains, ſhowed that the danger was not over. Two new openings were now obſerved, and two torrents of lava began to make their way through the ſnow.

On the 7th of March a dreadful noiſe was again heard in the bowels of the mountain, and a new column of very thick and black ſmoke began to iſſue from it. A horrid exploſion of ſmall ſtones ſucceeded; ſome of which were carried as far as the hills of Maſcali, and great quantities of black ſand to Meſſina, and even quite over the ſtrait to Reggio in Calabria. On the ſhifting of the wind to the northward this ſand reached as far as the plains of Agoſta. Two days after the mountain opened again, and a new torrent of lava was diſcharged; which, however, advanced very ſlowly towards the plain, moving only at the rate of a mile in a day. It continued to flow in this manner for ſix days, when every thing appeared ſo quiet, that the Canon Recupero ſet out to view the changes which had taken place.

ourſe of he current aced by ecupero. That gentleman's deſign was to trace the courſe of the dreadful torrent of water above-mentioned. This he was very eaſily enabled to do by the ravages it had made; and, by following the channel it had cut all the way from the ſea to the ſummit of the volcano, he found that this immenſe quantity of water had iſſued from the very bowels of the mountain. After iſſuing from the crater, and increaſing its ſtream by paſſing through and melting the ſnow which lay immediately below the ſummit, it deſtroyed in an inſtant a fine and extenſive foreſt of fir-trees. All of theſe were torn up by the violence of the current, though many were no leſs than 24 or 30 inches in diameter. He obſerved that the great ſtream had, in its deſcent, divided itſelf into four branches; and theſe had again ſubdivided themſelves into ſeveral ſmaller ones, eaſily diſtinguiſhable by the quantity of ſand they had depoſited. Afterwards reuniting their ſtreams, they formed many iſlands, and rivers 900 feet in breadth, and of a depth which could not eaſily be determined. Proceeding farther down, and ſtill forcing its way among the beds of old lava, the channel of the waters was widened to 1500 feet, until it was again contracted in the valleys as before. Every object which ſtood in the way of this tremendous torrent was moved from its place. Enormous rocks were not only hurried down, but ſeveral of them moved to more elevated ſituations than thoſe they formerly occupied. Whole hills of lava had been removed and broken to pieces, and their fragments ſcattered along the courſe of the river, and the valleys were filled up by vaſt quantities of ſand which the waters had depoſited. Our author obſerved, that even at the time he viſited the mountain, about ten years after the eruption, the whole ſide of it ſtill bore the marks of this deluge. Ætna.

On M. Houel's arrival at Jaci Catena, he inquired for the phyſician of the place; it being cuſtomary for ſtrangers to do ſo who want to learn any thing concerning the curioſities of the country, as the phyſicians there are generally thoſe who have any pretenſions to literature. By this guide he was ſhown a well which they call *Holy Water*. There is a flight of ſteps from the ſurface of the ground to that of the water. The well itſelf is 20 feet wide and 40 feet deep. It is ſupplied by three different ſprings, each of which is ſaid to have a peculiar taſte. The phyſician informed our author, that one of them reſembled milk in its taſte; another taſted like ſoap; and the third had the taſte of common water: but our author, after taſting each of them, could not find any remarkable difference. Account of a remarkable well.

In his way to La Trizza, our author diſcovered ſome very ancient baths with ſtoves. They had been built here on account of a ſpring of warm ſulphureous water, ſuppoſed to be excellent for the cure of cutaneous diſorders; and for which purpoſe they are ſtill made uſe of. They are now called the *Springs of St Venera*, of whom there is an image here. The fountain from which they flow is on a level with the ſurface of the ground. The water taſtes very diſagreeably of ſulphur; and depoſites a quantity of white impalpable powder, adhering to herbs and ſtones, over which it paſſes. This ſubſtance our author calls the *cream of ſulphur*; though it is probably a ſelenitic ſubſtance formed by the decompoſition of the ſulphur, and the union of its acid with ſome calcareous matter which held it in ſolution before. Ancient baths diſcovered. Springs of St Venera.

From this place our author proceeded to the ſea-port of Trizza, a ſmall place, which with the adjacent country contains only about 300 inhabitants. Off the harbour of this place is a baſaltic rock, which ſeems to be only the remains of a much larger one deſtroyed by the action of the air. All around are long ranges of baſaltes, the ſpecies of which are very various. Baſaltic rocks about Trizza.

The rocks of the Cyclops ſtand round the ſmall harbour of La Trizza; and from this view we perceive a number of rocks of very different heights. All of them appear more or leſs above water, though ſome are ſo low that they cannot be ſeen without approaching very near; and this circumſtance renders the harbour inacceſſible to veſſels of any conſiderable burden, at the ſame time that, by reaſon of the depth of the ſea, it is impoſſible either to cut or unite them by a mole. The principal of theſe rocks is the extremity of an iſland, one half of which is compoſed of lava placed on a baſaltic baſe; over this is a cruſt of pozzolana, combined with a kind of white calcareous matter of a pretty hard and compact conſiſtence; and which, by the action of the air, aſſumes the appearance of knotty porous wood. On this ſubject our author obſerves, that "the rock at ſome former period, had become ſo hard as to ſplit, and the clefts were then filled up with Rocks of the Cyclops.

Ætna. with a very hard matter which was porous on all ſides like ſcoriæ. That matter afterwards ſplit alſo; leaving large interſtices, which in their turn have been filled up with a kind of compound yellow matter. The iſland appears to have been formerly inhabited, but is at preſent deſtitute both of inhabitants and of culture, only the people of La Trizza feed a few goats upon it."

Different kinds of baſaltes. To the ſouthward of the harbour of La Trizza we obſerve ſeveral fragments of baſaltes, both in the form of needles, and in that of priſmatic columns of a very regular form, and which may be eaſily ſeparated from one another. From the poſition in which theſe fragments are diſpoſed, it appears that the maſs to which they belong muſt have ſuffered ſome very violent ſhock; otherwiſe ſuch huge rocks could never have been broken, overturned, and ſcattered in directions ſo very different from their original poſitions. In one of theſe ruins there are ſome parts harder than the reſt, which withſtand the action of the air, while the intervening ſpaces yield to it, and appear to be thus deſtroyed. In ſome others this effect is much more remarkable; becauſe the column happens to be much farther advanced towards a ſtate of diſſolution, the parts of which they conſiſt being already disjointed; and in each of thoſe which project we perceive a fiſſure: which ſhows that each of theſe parts may be divided into two. "They are indeed (ſays our author) actually divided, and diſplay a convexity iſſuing from a concavity, like a pile of hats placed one upon another, when they are removed one by one; which is a very curious ſingularity."

Promontory of the Caſtel d'Aci deſcribed. Continuing his journey ſtill ſouthward, our author arrived at the promontory of the Caſtel d'Aci. This is the moſt ſingularly curious of all that are in the neighbourhood of Ætna. The ancient maſs of it is enclosed between two bodies of lava of a more modern origin. Theſe compoſe the rocks on which Caſtel d'Aci is ſituated, and which lie under the ſoil of the adjacent country. Beyond that city are the immenſe plains of the lower part of Ætna. Theſe gradually riſe till they reach the ſummit, which is hid among the clouds. The promontory is almoſt entirely compoſed of baſaltes, the interſtices of which are filled up with a yellowiſh matter, which ſeems to be a clay nearly of the ſame nature with that formerly taken notice of in the iſland of La Trizza. It alſo covers the maſs of baſaltes, and has produced both the ſuperior and anterior parts of the promontory. Here our author ſaw a number of women employed in waſhing webs of cloth in the ſea: and takes notice of the dexterous method they have of lifting it up in folds, and packing it on their heads in bundles, without receiving any aſſiſtance. At the foot of this promontory are many curious baſaltic rocks.

Great quantity of baſaltes found on Ætna. All along the eaſtern ſide of Mount Ætna the ſoil is broken, but filled with beautiful varieties of baſaltes, highly worthy of obſervation. Indeed, according to our author's opinion, there is no volcano in Europe ſo rich as Ætna in baſaltes, nor where ſo many curious figures of it are to be ſeen.

M. Houel's journey to the great cheſnut tree. M. Houel having ſpent ſome more time in viſiting the baſaltic columns around the foot of the mountain, ſet out from Aci to viſit the famous *cheſnut tree for an hundred horſes* which we have already mentioned. In his way thither he paſſed through the villages of Fortezza, Mangamo, St Leonardo, St Matteo, and La Macchia. The landſcapes of each of theſe places by itſelf are extremely beautiful; but the country between them is a frightful wild deſert, preſenting to the eye nothing but extenſive plains of black lava, which at a diſtance have the appearance of vaſt quantities of pit-coal. The roads became rougher as they advanced; but the adjoining fields aſſumed a more ſmiling aſpect. The reaſon of this is, that the torrents of lava (by which the plains are rendered unfit for vegetation for a great number of years) have rolled rapidly down the more ſteep ſides of the mountain without deſtroying the fertility of the ſoil. Ætna.

Travelling through very difficult roads, and often incommoded with dangerous precipices, our author at laſt arrived at the celebrated cheſnut tree, which was the chief object of this journey. He obſerves, that, all over this ſide of the mountain the cheſnut trees thrive very well, and are carefully cultivated by the inhabitants. They are worked into hoops for caſks, and a conſiderable trade is carried on in this article. The great one which he came to viſit, exceeds the ſize of other trees ſo much that it cannot fail to excite the greateſt admiration. It has its name from the following circumſtance. Jean of Arragon ſpent ſome time in Sicily on her way from Spain to Naples. While here, ſhe viſited Mount Ætna, attended by her principal nobility; and happening to be overtaken by a ſtorm, they took ſhelter under this tree, whoſe branches were ſufficiently extenſive to cover them all. By others, however, this ſtory is treated as a mere fable. Great numbers of cheſnut trees. Particular account of the great tree.

According to our author's account, this cheſnut tree is 160 feet in circumference, which is leſs than Mr Brydone's account of it, but quite hollow within: which, however, affects not its verdure; for the cheſnut tree, like the willow, depends upon its bark for ſubſiſtence, and by age loſes its internal part. As the cavity of this enormous maſs is very conſiderable, the people have built a houſe in it, where they have an oven for drying nuts, almonds, and cheſnuts, &c. of which they make conſerves. They frequently ſupply themſelves with wood from the tree which encircles their houſe, ſo that it ſeems likely, in a ſhort time, to go to ruin through the thoughtleſs ingratitude of its inhabitants, to whom it gives protection. A houſe and oven built in the hollow of it.

It has been thought that this tree was compoſed of a number of others grown together; but our author is of a different opinion. For he ſuppoſes that the bark and outer part of the wood have been rent aſunder, and that by a natural motion the divided parts of the bark ſeeking to reunite, or rather to ſhelter themſelves from the action of the external air, are bent inwards ſo as to form circular arcs, which may indeed be taken for ſo many different trees, though they appear properly to belong to the ſame trunk. Is not compoſed of a number of trees grown together.

Beſides this, there is abundance of other trees in the neighbourhood very remarkable for their ſize. Our traveller was ſhown a number of young trees of the ſame ſpecies, all very beautiful and ſtraight, and almoſt as ſmooth as poliſhed marble. One of theſe was 38 feet in circumference, and there was a number of others nearly of the ſame ſize. Among theſe there were ſeven ſtanding together, which have received the name of the *ſeven brethren*. Another is denominated Other trees of vaſt dimenſion.

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minated *the ſhip*, from the general figure of its top, which has ſome ſlight reſemblance to a ſhip. Its diameter is 25 feet, ſo that the circumference cannot be leſs than 75. In theſe extenſive foreſts, however, there are cheſnut trees of every age and ſize.

now grot- deſcrib- l.

Our author's next viſit was paid to a ſnow grotto, being one of thoſe magazines where that article, ſo neceſſary in the hot climate of Sicily, is preſerved for uſe.

oreſt of nes in the ay to it.

In his way thither he viſited the foreſt of pines; which is ſo much ſurrounded by rocks and precipices, that it is ſcarce acceſſible; and vaſt numbers of the trees are dying of old age. Some of the neighbouring peaſants, however, now and then attempt to carry them off. Our author ſaw one of them at this work. It was drawn by oxen, who were yoked to it by a chain connected with the beam by an iron cramp. But the extreme roughneſs of the road made the tree leap and bound in ſuch a manner, that the poor creatures were every moment in danger of having their legs broken, or being hurried over precipices along with their driver; accidents which happen not unfrequently, and which render this occupation leſs generally practiſed than otherwiſe it would be.

The ſnow grotto is but lately formed, by the action of the waters under the beds of lava carrying away the ſtratum of pozzolana below them. It is ſituated on a mount named *Finocchio*, which, though of very conſiderable ſize, is only a protuberance on the ſide of Ætna. It has been repaired in the inſide at the expence of the knights of Malta, who have hired this as well as ſeveral other caverns in the mountain for the purpoſe of holding ſnow, which they have ſtill more occaſion for in their iſland than the inhabitants of Sicily. There are two openings above, at which they throw in the ſnow; and flights of ſteps have been cut to theſe as well as in the internal parts. A conſiderable extent of ground is levelled and encloſed with high walls above the grotto; ſo that when the wind, which at this elevation blows with great violence, carries the ſnow down from the higher parts of the mountain, it is ſtopped and detained by the walls of this encloſure. It is then thrown into the grotto, where the thickneſs of the beds of lava which cover it prevents any impreſſion from the ſummer heat. When the ſeaſon for exportation comes on, the ſnow is put into large bags, and preſſed into them as cloſe as poſſible. Thus it is rendered compact and heavy, and likewiſe runs leſs riſk of being affected by the heat. It is then carried out upon men's ſhoulders, and conveyed to the ſhore on mules. Before it is put into the bags, the lumps of ſnow are carefully wrapped up in leaves, which is another preſervative; at the ſame time that the freſh congelation of the little which melts, unites the maſſes ſo together, that our author informs us he has ſeen pieces of the ſnow preſerved in this manner which looked like the faireſt and moſt tranſparent cryſtal.

low the now is pre- ented from elting uring ex- ortation.

ccount Mount offo.

Our author's next excurſion was to Mount Roſſo, or the Red Mountain, which is one of the mouths of Ætna, and through which it diſcharges from time to time great quantities of lava, ſand, aſhes, &c. It is the moſt celebrated of all the numerous mouths which have opened on the ſide of the mountain, though it has become ſo noted only for having poured forth the matter of the great eruption in 1669, and which is the moſt remarkable of any recorded in hiſtory.

"When a new crater (ſays our author) is formed on Mount Ætna, it is always in conſequence of ſome ſhock that is powerful enough to break the arches of its caverns. Doubtleſs it is inconceivable that there ſhould be any agent endowed with ſuch force; but when ſuch a fracture is once made, it is neceſſarily very large, and the ſurface of the ground above cannot but be broken in ſeveral different places at conſiderable diſtances from one another. The matter which is diſcharged always iſſues from the principal opening and thoſe adjoining to it. None of theſe mouths, however, continue open, excepting that which is directly in the line in which the matter is diſcharged; the lava ſoon choking up thoſe which are in a more oblique direction." Ætna. New craters how formed.

Our author went down one of theſe openings with torches; but could not reach the bottom, and was obliged to return on account of the extreme cold. The deſcent was extremely difficult, and became more ſo in proportion as he advanced. This crater is of an oval form, and the opening through which he deſcended was in one extremity: but he was tempted to think that the crater which riſes above it had been formed of matter diſcharged by another mouth: or perhaps it might have had a more centrical opening, through which the ſtones, ſand, &c. which form the crater were diſcharged.

Four of the mouths of this mount appear to be compoſed of a reddiſh pozzolana, which has procured it the name of the *Red Mountain;* but when we aſcend the pyramids, or rather funnels which they form, we find them compoſed of different coloured layers of ſand. Some of theſe are of a bluiſh-gray colour, others of a fine yellow, and ſome of a kind of green formed by a mixture of gray and yellow, while others are of a red colour. A great number of ſmall cryſtals, black ſchoerls, and granites, are found among them, as well as pieces of ſcoria, which had been diſcharged by the volcano in the form of a thick and glutinous matter. All theſe mouths have internally the form of a funnel, and their ſhape is nearly that of a mutilated cone or round pyramid. This is the natural and unavoidable conſequence of the perpendicular fall of the pulverized matter which the volcano diſcharges from the orifice at the bottom. The ſides of the craters are not all of one height; the parts to the eaſt and weſt being conſiderably higher than the intermediate ſummits, becauſe the currents of the aſhes paſſed alternately from eaſt to weſt, and fell upon theſe ſides in greater quantities than on the others; which circumſtance has given to the volcano the appearance of having two ſummits.

M. Houel, having finiſhed his obſervations on Monte Roſſo, returned to the convent of Nicoloſi, which is now only a houſe for the entertainment of travellers. The Benedictines of Catana, to whom it belongs, viſit this place only when in an ill ſtate of health, as the purity of the air renders it very ſalutary to the human conſtitution. A ſolitary brother, however, reſides here to take care of the houſe, and to ſuperintend the cultivation of the neighbouring plains. Thoſe fathers once poſſeſſed an extenſive and very fertile tract of land in this neighbourhood; but the eruptions of Ætna have rendered it totally incapable of cultivation. This houſe ſtands at a very conſiderable height, being no leſs than 2,396 feet above the level of the ſea. Setting Convent of Nicoloſi deſcribed.

Ætna.

Grotto of the goats described.

ting out from this place three hours before day, our traveller directed his courſe towards the grotto of the goats. In his way thither, he paſſed over ſeveral plains of lava, ſome of them ancient and others more modern: but the roads were extremely rough and dangerous; or rather, as our author expreſſes himſelf, there was no track or path meriting the name of a road. In two hours they reached the Regione Sylvoſa, where an immenſe foreſt ſurrounds the mountain, and which has undoubtedly been planted by the hand of nature: for there the ground is ſo high, ſo full of precipices, and ſo entirely uninhabitable, that no human being could ever think of making plantations on it; nor is it to be ſuppoſed that the winds could take up ſeeds from the plains to ſow them on ſuch a lofty ſituation.

Beautiful appearance of the foreſts of Ætna.

Theſe majeſtic foreſts of Ætna afford a ſingular ſpectacle, and bear no reſemblance to thoſe of other countries. Their verdure is more lively, and the trees of which they conſiſt are of a greater height. Theſe advantages they owe to the ſoil whereon they grow; for the ſoil produced by volcanoes is particularly favourable to vegetation, and every ſpecies of plants grows here with great luxuriance. In ſeveral places, where we can view their interior parts, the moſt enchanting proſpects are diſplayed. The hawthorn trees are of an immenſe ſize. Our author ſaw ſeveral of them of a regular form, and which he was almoſt tempted to take for large orange trees cut artificially into the figures they repreſented. The beeches appear like as many ramified pillars, and the tufted branches of the oak like cloſe buſhes impenetrable to the rays of the ſun. The appearance of the woods in general is exceedingly picturesque, both by reaſon of the great number and variety of the trees, and the inequality of the ground, which makes them riſe like the ſeats in an amphitheatre, one row above another; diſpoſing them alſo in groups and glades, ſo that their appearance changes to the eye at every ſtep; and this variety is augmented by accidental circumſtances, as the ſituation of young trees among others venerable for their antiquity; the effects of ſtorms, which have often overturned large trees, while ſtems ſhooting up from their roots, like the Lernæan hydra, ſhow a number of heads newly ſprung to make up that which was cut off.

Grotto of the goats, how formed.

About three hours after the departure of our travellers from St Nicholas, they reached the grotto of the goats. It is formed by a bed of lava, which having flowed over a pile of ſand and pozzolana while in a fluid ſtate, ſettled and cooled in that ſituation; and the ſand or pozzolana being afterwards carried off by the filtration of water through the lava, a void ſpace has been left, which the torrents have gradually enlarged to its preſent ſize.

This grotto ſtands about 5054 feet above the level of the ſea, according to the calculations of M. de Sauſſure. It affords a retreat for thoſe travellers who viſit the ſummit of Ætna, who generally refreſh themſelves by taking a repaſt and making a fire at the entry, for which there is plenty of dry wood at hand; while the ſand ſerves for a bed to repoſe on. Here our author and his company ſupped, and about midnight ſet off for the ſummit. They had the advantage of the moon light; and our author adviſes all theſe who intend to viſit the top of Ætna to take ſuch a time for their journey as may enable them to enjoy this advantage. As they advanced beyond the grotto of the goats, the trees became gradually thinner. In a ſhort time they were ſo thin, that they might readily be counted; and, proceeding ſtill farther, only a very few were ſeen ſcattered here and there, whoſe beauty and ſize were diminiſhed ſeemingly in proportion to their numbers. A few clumps of trees and ſome tufts of odoriferous herbs were now only to be ſeen; and in a little time theſe alſo became thinner, aſſuming a withered or ſtunted appearance. Then they are nothing but the languiſhing remains of an abortive vegetation; and a few paces further even this diſappeared, and the eye was preſented only with barren ſand.

Ætna.

Account of the highe parts of Ætna.

Having now got above the region of the trees, they entered the third, which our author denominates the region of ſnow and ſterility. The wind became more briſk and keen as they advanced, ſo that they could ſcarce keep their hats upon their heads; and our author loſt his, though tied on with a handkerchief. Here they were frequently obliged to croſs conſiderable ſtreams of water formed by the melting of the ſnow. In general the ſurface was ſufficiently hard to bear them; but our author's mule once ſunk up to her belly, and was not extricated without great difficulty.

Snowy and barren region deſcribed.

Having at laſt overcome all difficulties, they arrived at the large plain on the ſummit of Ætna, and in the midſt of which is the crater of the volcano. It is entirely compoſed of lava, cinders, ice, and ſnow; and has been ſtyled, ironically as our author thinks, *Monte Frumente*. Here the wind continued to blow with exceſſive violence; and our author informs us, that in order to have any notion of its keenneſs, we muſt be accuſtomed to feel it on ſome very elevated ſtation, as it is impoſſible to judge from what we feel at inferior altitudes. They took ſhelter behind a lump of lava, the only one which appeared in the whole plain, and, which our author ſays, would ſeem deſigned expreſsly for the ſhelter of travellers. Here they lay, wrapped up in their cloaks, for an hour: but as ſoon as it was day, ſo that they could diſtinguiſh the place where the ſun was to riſe, they got up and advanced towards the ruins of the building known by the name of the *Philoſopher's Tower*. The wind ſtill blew ſo violently, that after an effort of four minutes they fell down exhauſted: but the extreme cold obliging them again to get up, they made a ſecond attempt; and after ſeveral intermiſſions of this kind, at laſt accompliſhed their deſign. They were ſurpriſed, however, to find nothing but the corner of a wall not more than two feet high, conſiſting of two rows of unpoliſhed ſtones; great part of it having been probably buried by the ſand and other matters diſcharged by the mountain. Here, being ſheltered from the wind, and the day advancing, they began to enjoy the glorious proſpect which every moment became more extenſive. At the riſing of the ſun, the horizon was ſerene, without a ſingle cloud. "The coaſt of Calabria (ſays our author) was as yet undiſtinguiſhable from the adjoining ſea; but in a ſhort time a fiery radiance began to appear from behind the Italian hills, which bounded the eaſtern part of the proſpect. The fleecy clouds, which generally appear early in the morning, were tinged with purple: the atmoſphere became ſtrongly illuminated, and, reflecting the rays of the riſing ſun, appeared filled with a bright effulgence

Plain on the ſumm of Ætna.

Wind exceſſively violent here.

Extenſiv proſpect

of

Etna. of flame. The immenſe elevation of the ſummit of Ætna made it catch the firſt rays of the ſun's light, whoſe vaſt ſplendour, while it dazzled the eyes, diffuſed a moſt cheriſhing and enlivening heat, reviving the ſpirits, and diffuſing a pleaſant ſenſation throughout the ſoul. But though the heavens were thus enlightened, the ſea ſtill retained its dark azure, and the fields and foreſts did not yet reflect the rays of the ſun. The gradual riſing of this luminary, however, ſoon diffuſed his light over the hills which lie below the peak of Ætna. This laſt ſtood like an iſland in the midſt of the ocean, with luminous points every moment multiplying around, and ſpreading over a wider extent with the greateſt rapidity. It was as if the univerſe had been obſerved ſuddenly ſpringing from the night of non-exiſtence. The tall foreſts, the lofty hills, and extenſive plains of Ætna, now preſented themſelves to view. Its baſe, the vaſt tracts of level ground which lie adjacent, the cities of Sicily, its parched ſhores, with the daſhing waves and vaſt expanſe of the ocean, gradually preſented themſelves, while ſome fleeting vapours, which moved ſwiftly before the wind, ſometimes veiled part of this vaſt and magnificent proſpect." In a ſhort time every thing was diſplayed ſo diſtinctly, that they could plainly recognize all thoſe places with which they were before acquainted. On the ſouth were ſeen the hills of Camerata and Trapani; on the north, the mounts Pelegrino and Thermini, with the celebrated Enna once crowned with the temples of Ceres and Proſerpine. Among theſe mountains were ſeen a great many rivers running down, and appearing like as many lines of glittering ſilver winding through a variety of rich and fertile fields, waſhing the walls of 28 cities, while their banks were otherwiſe filled with villages, hamlets, &c riſing among the ruins of the moſt illuſtrious republics of antiquity. On the ſouth and north were obſerved the rivers which bound by their courſe the vaſt baſe of Mount Ætna, and afford a delightful proſpect to the eye; while at a much greater diſtance were ſeen the iſles of Lipari, Alicudi, Felicocide, Parinacia, and Stromboli.

Having enjoyed for ſome time the beauty of this magnificent proſpect, our author ſet about making a draught of the place from which the view was taken; and at length accompliſhed it, notwithſtanding the great impediments he met with from the wind. Among the objects which he delineated on this occaſion, the Philoſopher's Tower was one. It ſeems, he ſays, not to be very ancient; neither the materials of which it conſiſts, nor the mode of architecture, bearing any reſemblance to thoſe of the Greeks and Romans. The ſurrounding plain ſeems to conſiſt entirely of a black ſand intermixed with pieces of ſcoria, which have been formerly thrown out by the volcano. Beyond that plain, which riſes gently, appears a cone, the ſummit of which is the volcanic crater. When viewed from the ſouth ſide, on which they ſtood, this crater ſeems to conſiſt of a number of ſmall hills. Into theſe it was broken by the emiſſion of the boiling torrent in the year 1755. When diſcharged from the crater, theſe waters ſpread towards the right, and at the diſtance of a mile eaſtward fell in a caſcade from a prodigious height.

hiloſo-
her's tow-
deſcri-
ed.

eſcription
the great
ater.

The violence of the wind beginning now to abate a little, the travellers ſet out for the very ſummit, in order to take a view of the great crater; in which journey (our author ſays) it would be difficult to make people, who have never engaged in ſuch enterpriſes, comprehend all the obſtacles they had to encounter. This cone (the little mountain mentioned by Sir William Hamilton) is compoſed of aſhes, ſand, and pozzolana, thrown up at different times by the volcano. The materials are ſo looſe, that the adventurous traveller ſinks about mid-leg at every ſtep, and is in conſtant terror of being ſwallowed up. At laſt, when the ſummit is reached, the ſulphureous exhalations, which are continually emitted from the pores of the mountain, threaten ſuffocation, and irritate the fauces and lungs in ſuch a manner as to produce a very troubleſome and inceſſant cough. The looſeneſs of the ſoil, which gives way under the feet, obliges the traveller, every now and then, to throw himſelf flat on his belly, that ſo he may be in leſs danger of ſinking. In this poſture our author viewed the wide unfathomable gulf in the middle of the crater; but could diſcover nothing except a cloud of ſmoke, which iſſued from a number of ſmall apertures ſcattered all around, and accompanied with a kind of noiſe. Another and more dreadful ſound, however, iſſues from the bowels of the volcano, and which, according to our author, "ſtrikes the heart with terror, ſo that all the ſtrength of reaſon is neceſſary to prevent the obſerver from flying with precipitation from ſuch a dreadful place." Several travellers who had viſited this cone before him, were ſo terrified by theſe dreadful ſounds, that they fled with the utmoſt haſte till they arrived at the foot of the mountain. Horrid noiſes iſſue from the burning gulf.

Our author compares theſe ſounds to a diſcharge of cannon in the wide abyſs; the noiſe of which is rebellowed throughout all the caverns, and produces a ſound perhaps the moſt alarming that can be imagined; and during the ſhort ſpace in which he liſtened, ſeveral of theſe diſcharges were heard to follow one another almoſt uninterruptedly.

This dreadful noiſe, our author, with very great probability, ſuppoſes to be occaſioned by the exploſions of the internal fire, or, as he calls it, the *focus* of the volcano; which, ſtriking againſt the ſides of theſe immenſe caverns, the ſounds produced are re-echoed through their cavities, and probably multiplied in an extraordinary manner; ſo that what would be only a ſlight exploſion in the open air, occaſions a ſound more tremendous than the loudeſt thunder. To ſuch as are convinced of this, and have ſufficient courage to reſiſt the firſt impreſſions which theſe ſounds muſt unavoidably occaſion, they will in a ſhort time not only appear exceedingly ſublime, but, by their variety, even ſomewhat agreeable. "They enable us (ſays our author) to form ſome conception of the ſpace through which they muſt paſs before they reach the ear, and of the vaſt extent and width of the hollows of the mountain."

Having for ſome time contemplated this awful ſpectacle, our author wiſhed to meaſure the crater by walking round it, but found this impoſſible. On the north ſide the ſurface is hard and ſmooth, the aſhes having been ſo far diſſolved by the moiſture depoſited by the ſmoke as to cement into one uniform maſs. This is ſometimes diſſolved even into a fluid ſtate, in ſuch a Impoſſible to walk round the crater.

Ætna.

manner as to run down the ſides of the cone; ſo that after ſeveral attempts, he was at laſt obliged to abandon his deſign.

Figure of the crater.

Fig. 2. exhibits a view of the crater of Ætna taken on the brink of the eaſt ſide. The fore ground (*aa*) of the figure is one diviſion of the crater. Beyond it are two eminences *b* and *c*, higher than that on which ſome human figures are repreſented. All the three form a triangle nearly equilateral; but, when viewed from any conſiderable diſtance, only two of them can be ſeen; for which reaſon the Sicilians have termed the mountain *bicorne*, or double-horned.

The ſmoke, as repreſented in the figure, iſſues from all quarters, either from chinks or holes ſcattered over the whole crater. But the ſituation of the principal mouth is in the midſt of the three eminences. Its diameter, when our author viſited this mountain, was only about 60 feet, and ſo filled with ſmoke that nothing remarkable could be diſcovered. From the height *d*, the rock ſituated on the left ſide of the print, and on which the human figures are repreſented, all the way to the rock *e* on the right, the diſtance is no more than 900 feet. Our author obſerved, that the cone is not exactly in the middle of the plain, but is ſituated more towards the north than the ſouth. He did not attempt to croſs the central valley *f*, on account of the looſeneſs of the ground, and that there was no object apparently worthy of the riſk he muſt run in ſo doing. At the neareſt view he took, it was only obſerved that there was ſnow lying in ſeveral parts of it, though the heat which otherwiſe prevailed ſeemed to be very intenſe.

The ſmoke which iſſues from the crater of Ætna is generally carried in a direction from ſouth to north; and, as it brings along with it a conſiderable quantity of water, the latter, condenſed by the cold winds, runs down the ſide of the mountain in plentiful ſtreams, and often leaves pretty permanent marks of its courſe.

Eruption of water in 1755 accounted for.

In this manner he accounts for the great eruption of water in 1755, which he ſuppoſes to have been occaſioned only by an unuſual quantity of water falling into the burning focus of the mountain, there rarefied into ſteam, and afterwards condenſed by the coldneſs of the atmoſphere.

South wind generally prevalent on the top of Ætna.

Like other travellers to Mount Ætna, this gentleman found the wind blowing from the ſouth; and he is of opinion, that a ſouth wind blows here more frequently than any other, as he did not obſerve any channels cut by the water on any other ſide than the north. He had ſeveral opportunities of making this obſervation, having frequently viſited the top of Ætna, and always paid attention to the crater. The ſand on the eaſt and weſt ſides was always looſe, while that on the north was compacted into a ſolid body. The three ſummits were of a later date than the reſt of the crater, having been probably thrown up by ſome eruption which had burſt it aſunder. The black ſpots on the fore-ground repreſent a number of hillocks about the ſize of mole-hills from which a ſulphureous vapour conſtantly iſſues, and by which the adjacent ground is tinged of an ochrey colour. This vapour iſſues from the crevices with a kind of hollow whiſtling noiſe; which, with the volcanic thunder, ſmoke, and noxious ſmell, render it very diſagreeable to ſtay here even for a few moments.

The ſmoke is repreſented in the figure preciſely as it appeared on the day that he aſcended, which was very warm. But it does not always riſe in this manner; for when the cold is very intenſe, it collects into a body, and thickens around the edge of the crater: on which occaſion it is condenſed into water, which diffuſes itſelf around the edge of the crater, and mixing with the aſhes converts them into a kind of clay. The cold on the top of this mountain is ſo intenſe, that travellers very often find their clothes inſufficient to protect them; and it is remarkable that ſuch intenſe cold is always produced by a ſouth wind. The day that our author took his draught, the wind blew faintly from the north.

Ætna.

Intenſe cold produced by a ſouth wind.

Account of the ſtrata at the foot of Mount Ætna.

The baſe of Mount Ætna, according to M. Houel's obſervations, conſiſt of alternate layers of lava and marine ſubſtances, which have been depoſited ſucceſſively one upon another. Theſe alternate layers extend to an unknown depth. They muſt needs go as far down as the level of the ſtratum of lava which was diſcharged by the volcano at its firſt origin. The laſt depoſited by the ſea is a range of calcareous mountains of a conſiderable height, and which are placed on a baſis of lava. Beneath that layer of lava is another of ſea pebbles, which are well known to be rounded by their attrition againſt one another by the motion of the waves. This layer is of a conſiderable depth, and lies upon a yelloviſh rock conſiſting of a ſpecies of indurated ſand. The river Simeto flows over this rock, which it has cut away conſiderably. That part which is at preſent the bed of the river is much higher than the baſe of Ætna that is on a level with the ſea; and not the leaſt thing occurs to ſuggeſt an idea of what has been the primary baſe of the volcano. The marine ſubſtances, already taken notice of, lie nearly in a horizontal direction, more or leſs ſo according to the nature of the ſurface on which they have been depoſited.

Great number of ſprings on Mount Ætna.

Ætna abounds very much with ſprings, fountains, and even rivers of conſiderable magnitude. Our author has computed, that if all the water flowing down the ſides of this mountain were collected, it would fill the channel of a river 36 feet broad and 6 in depth. Many of the ſprings afford fine ſalt; ſome are very pure, and others are impregnated with noxious ſubſtances; while others are remarkable for their uſe in dyeing particular colours.

Whence ſuch a large quantity of water is derived.

"It is worthy of notice (ſays our author), that ſtreams of water, ſome of them more copious, others more ſcanty, are ſeen to iſſue at all different degrees of height, from the baſe to the ſummit of the mountain. Even in ſummer, when very little rain falls for three or four months, or when perhaps for that ſpace there is no rain at all, and for three of which, at leaſt, there is not an ounce of ſnow melted; even then a great number of rivulets continue to flow down the ſides of Ætna; and at the ſame time a number of ſtreams, external and ſubterraneous, each of them ſeveral feet wide, are, according to the accounts of the country people, plentifully ſupplied with water.

"As the trifling quantity of ſnow which is melted here even in the midſt of ſummer, and the ſtill ſmaller quantity depoſited by the clouds, would be totally inſufficient to ſupply thoſe ſtreams, and muſt be all abſorbed by the earth for the ſupport of vegetation, thoſe ſtreams muſt proceed from ſome other cauſe, whoſe effects are more copious and permanent.

Fig. 1.

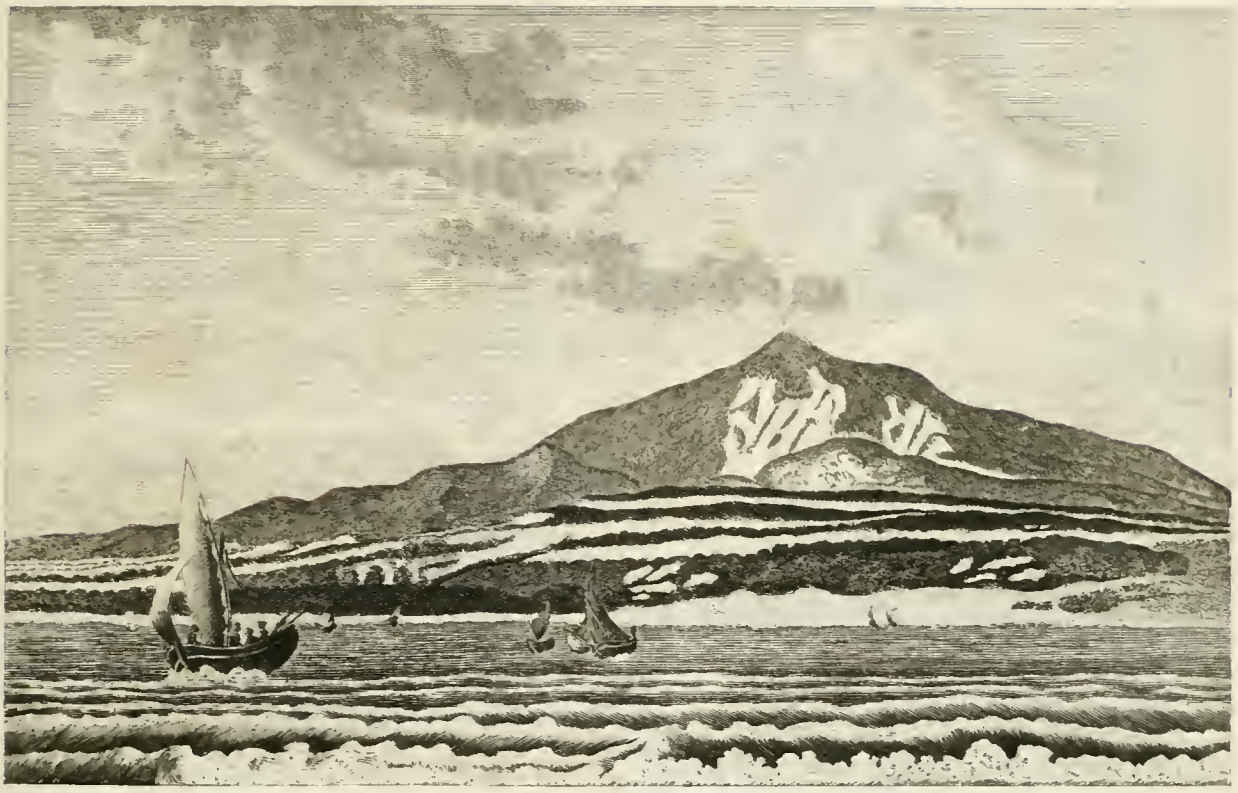

Fig. 2.

J. Hall & Pupil, Hall's sculptor, fecit.

Ætna. Produced by the internal evaporation of the mountain.

nent. This cauſe is the evaporation of thoſe aqueous particles which ariſe from the conſtant ebullition at the bottom of the volcanic focus. Theſe iſſuing out at the great crater, and at innumerable chinks in the ſides of the mountain, are ſoon condenſed by the cold of that elevated region of the atmoſphere, and, percolating through the earth, give birth to thoſe numerous ſtreams in queſtion.

"A volcano, according to my ideas, cannot ſubſiſt without water; nor can water occupy a place in any volcanic focus without being changed into vapour. But before that water can make its appearance, except in the form of ſmoke, it muſt have filled the whole volcanic cavern, and muſt have been forcibly preſſed by the action of the fire againſt its ſides: it muſt next have condenſed, and aſſumed the form of water; in which ſtate it muſt have penetrated through the inclined layers of ſand and pozzolano which intervene betwixt the different ſtrata of lava; for theſe ſtrata lie one above another, and are full of chinks, in ſuch a manner as to preſent to the eye an appearance pretty much reſembling that of the inſide of a tiled roof."

Eruptions of Ætna more frequent anciently than now.

It has been a queſtion, Whether the eruptions of Mount Ætna were more frequent in ancient than in modern times? At firſt it ſeems impoſſible to give a preciſe anſwer to ſuch a queſtion; but when we conſider, that the matter in the volcanic focus was then greater in quantity than at preſent, in proportion to the ſpace which it occupied; that the cavities were then ſooner filled with vapour; and that the centre of the focus was then leſs remote, we will not heſitate to pronounce, that in earlier times the eruptions were more frequent as well as more copious.

Signs of an approaching eruption.

The firſt ſymptom of an approaching eruption is an increaſe of the ſmoke in fair weather: after ſome time, a puff of black ſmoke is frequently ſeen to ſhoot up in the midſt of the white, to a conſiderable height. Theſe puffs are attended with conſiderable exploſions: for while Veſuvius was in this ſtate, Sir William Hamilton went up to its top, which was covered with ſnow: and perceiving a little hillock of ſulphur, about ſix feet high, which had been lately thrown up, and burnt with a blue flame on the top, he was examining this phenomenon, when ſuddenly a violent report was heard, a column of black ſmoke ſhot up with violence, and was followed by a reddiſh flame. Immediately a ſhower of ſtones fell; upon which he thought proper to retire. Phenomena of this kind, in all probability, precede the eruptions of Ætna in a much greater degree.—The ſmoke at length appears wholly black in the daytime, and in the night has the appearance of flame; ſhowers of aſhes are ſent forth, earthquakes are produced, the mountain diſcharges volleys of red-hot ſtones to a great height in the air. The force by which theſe ſtones are projected, as well as their magnitude, ſeems to be in proportion to the bulk of the mountain. Signior Recupero aſſured Mr Brydone, that he had ſeen immenſely large ones thrown perpendicularly upwards to the height of 7000 feet, as he calculated from the time they took to arrive at the earth after beginning to deſcend from their greateſt elevation. The largeſt ſtone, or rather rock, that was ever known to be emitted by Veſuvius, was 12 feet long and 45 in circumference. This was thrown a quarter of a mile; but much larger ones have been thrown out by Mount Ætna, almoſt in the proportion in which the latter exceeds Veſuvius in bulk. Along with theſe terrible ſymptoms, the ſmoke that iſſues from the crater is ſometimes in a highly electrified ſtate. In this caſe, the ſmall aſhes which are continually emitted from the crater, are attracted by the ſmoke, and riſe with it to a great height, forming a vaſt, black, and to appearance denſe, column; from this column continual flaſhes of forked or zig-zag lightning iſſue, ſometimes attended with thunder, and ſometimes not, but equally powerful with ordinary lightning. This phenomenon was obſerved by Sir William Hamilton in the ſmoke of Veſuvius, and has alſo been taken notice of in that of Ætna; and where this electrified ſmoke hath ſpread over a tract of land, much miſchief hath been done by the lightning proceeding from it. Ætna. Thunder and lightning from the ſmoke.

When theſe dreadful appearances have continued ſometimes four or five months, the *lava* begins to make its appearance. This is a ſtream of melted mineral matters, which in Veſuvius commonly boils over the top, but very ſeldom does ſo in Ætna; owing to the great weight of the lava, which long before it can be raiſed to the vaſt height of Mount Ætna, burſts out through ſome weak place in its ſide. Upon the appearance of the lava, the violent eruptions of the mountain generally, though not always, ceaſe; for if this burning matter gets not ſufficient vent, the commotions increaſe to a prodigious degree.—In the night-time the lava appears like a ſtream of fire, accompanied with flame; but in the day-time it has no ſuch appearance: its progreſs is marked by a white ſmoke, which by the reflection of the red-hot matter in the night aſſumes the appearance of flame.

We ſhall cloſe this article with an enumeration of all the different eruptions from Mount Ætna which are found upon record.

List of eruptions from the earlieſt period.

1. The firſt mentioned in hiſtory, is that of which Diodorus Siculus ſpeaks, but without fixing the period at which it happened. That eruption, ſays he, obliged the Sicani, who then inhabited Sicily, to forſake the eaſtern, and retire to the ſouthern, part of the iſland. A long time after that, the Sicilians, a people of Italy, migrated into Sicily, and took up their abode in that part of the iſland which had been left deſert by the Sicani.

2. The ſecond eruption known to have iſſued from this volcano, is the firſt of the three mentioned by Thucydides; of none of which he fixes the date, mentioning only in general, that from the arrival of the firſt Greek colonies that ſettled in Sicily (which was in the 11th Olympiad, and correſponds to the 734th year before the Chriſtian era), to the 88th Olympiad, or the year 425 before Chriſt, Ætna at three different times diſcharged torrents of fire. This ſecond eruption happened, according to Euſebius, in the days of Phalaris, in the 565th year before the Chriſtian era. The aſſertion of Euſebius is confirmed by a letter from that tyrant to the citizens of Catania, and the anſwer of the Catanians (if, after Bentley's Diſſertations againſt their authenticity, any credit be due to the Epiſtles of Phalaris). But Diodorus gives both theſe pieces.

3. The third, which is the ſecond of the three mentioned by Thucydides, happened in the 65th Olympiad,

Ætna piad, in the 477th year before the Chriſtian era, when Xantippus was archon at Athens. It was in this ſame year the Athenians gained their boaſted victory over Xerxes's general Mardonius near Platæa. Both the eruption of the volcano and the victory of the Athenians are commemorated in an ancient inſcription on a marble table which ſtill remains. An ancient medal exhibits a repreſentation of an aſtoniſhing deed to which that eruption gave occaſion. Two heroic youths boldly ventured into the midſt of the flames to ſave their parents. Their names, which well deſerved to be tranſmitted to future ages, were Amphinomus and Anapius. The citizens of Catania rewarded ſo noble a deed with a temple and divine honours. Seneca, Silius Italicus, Valerius Maximus, and other ancient authors, mention the heroiſm of the youths with juſt applauſe.

4. The fourth eruption, the third and laſt of thoſe mentioned by Thucydides, broke out in the 88th Olympiad, in the 425th year before the Chriſtian era. It laid waſte the territory of Catania.

5. The fifth is mentioned by Julius Obſequens and Oroſius, who date it in the conſulſhip of Sergius Fulvius Flaccus and Quintus Calpurnius Piſo, nearly 133 years before the Chriſtian era. It was conſiderable; but no peculiar facts are related concerning it.

6. In the conſulſhip of Lucius Æmilius Lepidus and Lucius Aurelius Oreſtes, in the 125th year before the Chriſtian era, Sicily ſuffered by a violent earthquake. Such a deluge of fire ſtreamed from Ætna as to render the adjoining ſea into which it poured abſolutely hot. Oroſius ſays, that a prodigious quantity of fiſhes were deſtroyed by it. Julius Obſequens relates, that the inhabitants of the iſles of Lipari ate ſuch a number of thoſe fiſhes, as to ſuffer, in conſequence of it, by a diſtemper which proved very generally mortal.

7. Four years after the laſt mentioned, the city of Catania was deſolated by another eruption, not leſs violent. Oroſius relates, that the roofs of the houſes were broken down by the burning aſhes which fell upon them. It was ſo dreadfully ravaged, that the Romans found it neceſſary to grant the inhabitants an exemption from all taxes for the ſpace of ten years, to enable them to repair it.

8. A ſhort time before the death of Cæſar, in the 43d year before Jeſus Chriſt, there was an eruption from Mount Ætna. Livy mentions it. It was not diſtinguiſhed by any thing extraordinary. It was afterwards conſidered as an omen of the death of Cæſar.

9. Suetonius, in the life of Caligula, mentions an eruption from Mount Ætna which happened in the 40th year after the Chriſtian era. The emperor fled on the very night on which it happened, from Meſſina, where he at that time happened to be.

10. Carrera relates, that in the year 253, there was an eruption from Mount Ætna.

11. He ſpeaks of another in the year 420; which is alſo mentioned by Photius.

12. In the reign of Charlemagne, in the year 812, there was an eruption from Ætna. Geoffroy of Viterbo mentions it in his Chronicle.

13. In the year 1169, on the 4th February, about day-break, there was an earthquake in Sicily, which was felt as far as Reggio, on the oppoſite ſide of the ſtrait. Catania was reduced by it to ruins; and in that city more than 15,000 ſouls periſhed. The biſhop, with 44 monks of the order of St Benedict, were buried under the ruins of the roof of the church of St Agatha. Many caſtles in the territories of Catania and Syracuſe were overturned; new rivers burſt forth, and ancient rivers diſappeared. The ridge of the mountain was obſerved to ſink in on the ſide next Taormino. The ſpring of Arethuſa, ſo famous for the purity and ſweetneſs of its waters, then became muddy and brackiſh. The fountain of Ajo, which riſes from the village of Saraceni, ceaſed to flow for two hours; at the end of which the water guſhed out more copiouſly than before. Its waters aſſumed a blood colour, and retained it for about an hour. At Meſſina, the ſea, without any conſiderable agitation, retired a good way within its ordinary limits; but ſoon after returning, it roſe beyond them, advanced to the walls of the city, and entered the ſtreets through the gates. A number of people who had fled to the ſhore for ſafety were ſwallowed up by the waves. Ludovico Aurelio relates, that the vines, corn, and trees of all ſorts, were burnt up, and the fields covered over with ſuch a quantity of ſtones as rendered them unfit for cultivation. Ætna.

14. Twelve years after this, in the year 1181, a dreadful eruption iſſued from Ætna on the eaſt ſide. Streams of fire ran down the declivity of the mountain, and encircled the church of St Stephen, but without burning it.

Nicolas Speciale, who relates, though he did not ſee, this event, was witneſs to another conflagration on Ætna 48 years after this, in the year 1329, on the 23d of June, of which he has given a deſcription.

15. On that day, ſays he, about the hour of veſpers, Ætna was ſtrongly convulſed, and uttered dreadful noiſes; not only the inhabitants of the mountain, but all Sicily, were ſtruck with conſternation and alarm. On a ſudden, a terrible blaze of fire iſſued from the ſouthern ſummit, and ſpread over the rocks of Mazarra, which are always covered with ſnow. Together with the fire, there appeared a great deal of ſmoke. After ſunſet, the flames and the ſtones that iſſued out with them were ſeen to touch the clouds. The fire making way for itſelf with the moſt furious impetuoſity, burnt up or reduced to ruins all thoſe ſtructures which the piety of former times had conſecrated to the Deity. The earth yawning, ſwallowed up a great many ſprings and rivulets. Many of the rocks on the ſhore of Maſcali were ſhaken and daſhed into the ſea. A ſucceſſion of theſe calamities continued till the 15th of July, when the bowels of Ætna were again heard to rebellow. The conflagration of Mazarra ſtill went on unextinguiſhed. The earth opened near the church of St John, called *Il Paparineeca;* on the ſouth ſide fire iſſued from the gap with great violence: to add to the horrors of the day, the ſun was obſcured from morning to evening with clouds of ſmoke and aſhes, as entirely as in an eclipſe. Nicolas Speciale went towards the new-opened crater, to obſerve the fire and the burning ſtones which were iſſuing from the volcano. The earth rebellowed and tottered under his feet; and he ſaw red-hot ſtones iſſue four times ſucceſſively in a very ſhort ſpace from the crater, with a thundering noiſe, the like of which, he ſays, he had never before heard.

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Ætna. In a few days after this, all the adjacent fields were burnt up by a ſhower of fire and ſulphureous aſhes; and both birds and quadrupeds being thus left deſtitute of food, died in great numbers. A great quantity of fiſhes likewiſe died in the rivers and the contiguous parts of the ſea. "I cannot think (ſays he) that either Babylon or Sodom was deſtroyed with ſuch awful ſeverity."—The north winds, which blew at the time, carried the aſhes as far as Malta. Many perſons of both ſexes died of terror.

16. Scarce had four years elapſed after this terrible event, when Ætna made a new exploſion, and diſcharged vollies of ſtones, cauſing the neighbouring fields to tremble. This happened in the year 1333.

17. Forty-eight years after this, on the 25th of Auguſt 1381, an eruption from Ætna ſpread its ravages over the confines of the territory of Catania, and burnt up the olive yards in the neighbourhood of that city.

18. In the year 1444, 63 years after the laſt eruption, a torrent of lava iſſued from Ætna and ran towards Catania. The mountain ſhook; and the ſhocks were ſo violent, that ſeveral huge maſſes of rock were broken from its ſummit, and hurled into the abyſs with a tremendous noiſe.

19. After this Ætna was ſcarce at reſt for 18 months or two years. On Sunday the 25th of September 1446, about an hour after ſunſet, an eruption iſſued from the place called *La Pietra di Mazarra*. This eruption was ſoon over.

20. On the following year, 1447, on the 21ſt of September, there was another, with a good deal of fire; but this eruption was likewiſe of ſhort duration.

21. Ætna now ceaſed to emit fire, and that for a conſiderable time. The neighbouring inhabitants not only aſcended to the ſummit of the mountain, but even, if we may credit accounts, went down into the fiery gulf, and believed the volcanic matter to be now exhauſted: But on the 25th of April 1536, near a century from the ſlight eruption in 1447, a ſtrong wind aroſe from the weſt, and a thick cloud, reddiſh in the middle, appeared over the ſummit of the mountain. At the very ſame inſtant a large body of fire iſſued from the abyſs, and fell with the noiſe and rapidity of a torrent along the eaſtern ſide of the mountain, breaking down the rocks, and deſtroying the flocks and every other animal that was expoſed to its fury. From the ſame crater, on the ſummit of the mountain, there iſſued at the ſame time a ſtream of fire more terrible than the other, and held its courſe towards the weſt. It ran over Bronte, Adrans, and Caſtelli. It conſiſted entirely of ſulphur and bitumen. On the ſame day the church of St Leon, which ſtood in a wood, was firſt demoliſhed by the ſhocks of the earthquake, and its ruins after that conſumed by the fire. Many chaſms were opened in the ſides of the mountain; and from thoſe iſſued fire and burning ſtones, which darted up into the air with a noiſe like that produced by a ſmart diſcharge of artillery. Francis Negro de Piazza, a celebrated phyſician, who lived at Lentini, wiſhing to have a nearer view of the eruptions, and to make ſome obſervations which he thought might be of conſequence, was carried off and burnt to aſhes by a volley of the burning ſtones. This conflagration of Ætna laſted ſome weeks. Ætna.

22. In leſs than a year, on the 17th of April 1537, the river Simeto ſwelled ſo amazingly as to overflow the adjacent plains, and carry off the country people and their cattle and other animals. At the ſame time, the country around Paterno, the neighbouring caſtles, and more than 500 houſes, were deſtroyed by the ravages of the river; and moſt of the wood was torn up by the roots by violent blaſts of wind. Theſe ravages of the elements were occaſioned by Ætna, which on the 11th of the following month was rent in ſeveral places, diſcloſing fiery gulfs, and pouring out a deluge of fire in more terrible torrents than thoſe of the preceding year. They directed their courſe towards the monaſtery of St Nicholas d'Arena; deſtroyed the gardens and vineyards; and proceeding onwards towards Nicoloſi, burnt Montpellieri and Fallica, and deſtroyed the vineyards and moſt of the inhabitants. When the conflagration ceaſed, the ſummit of the mountain ſunk inwards with ſuch a noiſe, that all the people in the iſland believed the laſt day to be arrived, and prepared for their end by extreme unction. Theſe dreadful diſturbances continued through the whole year, more eſpecially in the months of July and Auguſt, during which all Sicily was in mourning. The ſmoke, the noiſe, and the ſhocks of the earthquake, affected the whole iſland; and if Filotes may be believed, who relates this event, many of the Sicilians were ſtruck deaf by the noiſe. Many ſtructures were demoliſhed; and among others the caſtle of Corleone, though more than 25 leagues diſtant from the volcano.

23. During the ſucceeding 30 years there was no diſturbance of this nature. At the end of that ſpace, Sicily was alarmed by a new eruption from the mountain. Ætna diſcharged new ſtreams of fire, and covered the adjacent country with volcanic aſhes, which entirely ruined the hopes of the huſbandman.

24. In the year 1579, Ætna renewed its ravages; but no particular account of the damage which it did upon this occaſion has been tranſmitted to us.

25. Twenty-five years had elapſed, when Ætna, in the month of June 1603, flamed with new fury. Peter Carrera affirms, that it continued to emit flames for the ſpace of 33 years, till 1636, without interruption, but not always with the ſame violence. In 1607, the ſtreams of lava which flowed from it deſtroyed the woods and vineyards on the weſt ſide of the mountain. In 1609, they turned their courſe towards Aderno, and deſtroyed a part of the foreſt del Pino, and a part of the wood called *la Sciambrita*, with many vineyards in the diſtrict Coſterna. Theſe torrents of lava continued to flow for three months. In the year 1614, a new effort of the ſubterraneous fire opened another crater, from which fire was diſcharged on Randazzo, in the diſtrict called *il Piro*. The fire continued to flame for 10 or 12 years longer.

26. The ſame Peter Carrera relates, that a dreadful conflagration happened in the year 1664, of which he himſelf was witneſs. It happened on the 13th of December, and laſted without interruption, but with different degrees of violence, till the end of May 1678. But in 1669 the inhabitants of Nicoloſi were obliged

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Ætna. to forſake their houſes, which tumbled down ſoon after they left them. The crater on the ſummit of Ætna had not at this time a threatening aſpect, and every thing there continued quiet till the 25th of March: but on the 8th of that month, an hour before night, the air was obſerved to become dark over the village la Pedara and all that neighbourhood; and the inhabitants of that country thought that an almoſt total eclipſe was taking place. Soon after ſunſet, frequent ſhocks of earthquakes began to be felt; theſe were at firſt weak, but continued till day-break to become more and more terrible. Nicoloſi was more affected than any other tract of country on that ſide of Ætna; about noon every houſe was thrown to the ground; and the inhabitants fled in conſternation, invoking the protection of heaven. On the 10th of March a chaſm ſeveral miles in length, and five or ſix feet wide, opened in the ſide of the mountain; from which, about two hours before day, there aroſe a bright light, and a very ſtrong ſulphureous exhalation was diffuſed through the atmoſphere.

About 11 in the forenoon of the ſame day, after dreadful ſhocks of earthquake, a crater was opened in the hill called *des Noiſettes*, from which there iſſued huge volumes of ſmoke, not accompanied with fire, aſhes, or ſtones, but with loud and frequent claps of thunder, diſplaying all the different phenomena with which thunder is at different times attended. And what was very remarkable, the chaſm was formed on the ſouth ſide, between the top and the bottom of the mountain. On the ſame day another chaſm was formed two miles lower, from which iſſued a great deal of ſmoke, accompanied with a dreadful noiſe and earthquake. Towards the evening of the ſame day, four other chaſms were opened towards the ſouth, in the ſame direction, accompanied during their formation with the ſame phenomena, and extending all the way to the hill called *la Puſara*.

About 12 paces beyond that, another of the ſame kind was formed. On the ſucceeding night, a black ſmoke, involving a quantity of ſtones, iſſued from this laſt chaſm; it diſcharged at the ſame time flakes of a dark earth-coloured ſpongy matter, which became hard after they fell. There iſſued from the ſame gulf a ſtream of lava, which held its courſe into a lake called *la Hardia*, ſix miles from Montpellieri, and on its way thither deſtroyed many dwelling-houſes and other buildings in the neighbouring villages.

On the next day, March 12th, this ſtream of fire directed its courſe towards the tract of country called *Malpaſſo*, which was inhabited by 800 people: in the ſpace of 20 hours it was entirely depopulated and laid waſte. The lava then took a new direction, in which it deſtroyed ſome other villages.

The mount of Montpellieri was next deſtroyed with all the inhabitants upon it.

On the 23d of the ſame month the ſtream of fire was in ſome places two miles broad. It now attacked the large village of Mazzalucia; and on the ſame day a vaſt gulf was formed, from which were diſcharged ſand or aſhes, which produced a hill with two ſummits, two miles in circumference and 150 paces high. It was obſerved to conſiſt of yellow, white, black, gray, red, and green ſtones.

The new mount of Nicoloſi continued to emit aſhes for the ſpace of three months; and the quantity diſcharged was ſo great as to cover all the adjoining tract of country for the ſpace of 15 miles: ſome of theſe aſhes were conveyed by the winds as far as Meſſina and Calabria; and a north wind ariſing, covered all the ſouthern country about Agoſta, Lentini, and even beyond that, in the ſame manner. Ætna.

While at that height on Nicoloſi ſo many extraordinary appearances were paſſing, the higheſt crater on the ſummit of Ætna ſtill preſerved its uſual tranquillity.

On the 25th of March, about one in the morning, the whole mountain, even to the moſt elevated peak, was agitated by a moſt violent earthquake. The higheſt crater of Ætna, which was one of the loftieſt parts of the mountain, then ſunk into the volcanic focus; and in the place which it had occupied, there now appeared nothing but a wide gulf more than a mile in extent, from which there iſſued enormous maſſes of ſmoke, aſhes, and ſtones. At that period, according to the hiſtorian of this event, the famous block of lava on Mount Frumento was diſcharged from the volcanic focus.

In a ſhort time after, the torrent of fire, which ſtill continued to flow, directed its courſe towards Catania with redoubled noiſe, and accompanied with a much greater quantity of aſhes and burning ſtones than before. For ſeveral months many moſt alarming ſhocks of earthquakes was felt; and the city was threatened with deſtruction by the torrent of fire. In vain they attempted to turn or divert its courſe; the lava roſe over the walls, and entered by an angle near the Benedictine convent on the 11th of June following. This awful event is related by Francis Monaco, Charles Mancius, Vincent Auria, and Thomas Thedeſchi.

Lord Winchelſea's account of the eruption in 1669.

A deſcription of the lava iſſuing from Mount Ætna in 1669 was ſent to the court of England by Lord Winchelſea, who at that time happened to be at Catania in his way home from an embaſſy at Conſtantinople. Sir W. Hamilton gives the following extract of it. "When it was night, I went upon two towers in divers places; and I could plainly ſee, at ten miles diſtance, as we judged, the fire begin to run from the mountain in a direct line, the flame to aſcend as high and as big as one of the greateſt ſteeples in your Majeſty's kingdoms, and to throw up great ſtones into the air; I could diſcern the river of fire to deſcend the mountain of a terrible fiery or red colour, and ſtones of a paler red to ſwim thereon, and to be ſome as big as an ordinary table. We could ſee this fire to move in ſeveral other places, and all the country covered with fire, aſcending with great flames in many places, ſmoking like to a violent furnace of iron melted, making a noiſe with the great pieces that fell, eſpecially thoſe that fell into the ſea. A cavalier of Malta, who lives there, and attended me, told me, that the river was as liquid, where it iſſues out of the mountain, as water, and came out like a torrent with great violence, and is five or ſix fathom deep, and as broad, and that no ſtones ſink therein."

The account given in the Philoſophical Tranſactions is to the ſame purpoſe. We are there told, that the lava is "nothing elſe than diverſe kinds of metals and minerals, rendered liquid by the fierceneſs of the fire in the bowels of the earth, boiling up and guſhing forth

Ætna. forth as the water doth at the head of ſome great river; and having run in a full body for a ſtone's caſt or more, began to cruſt or curdle, becoming, when cold, thoſe hard porous ſtones which the people call *ſciarri*. Theſe, though cold in compariſon of what firſt iſſues from the mountain, yet retained ſo much heat as to reſemble huge cakes of ſea-coal ſtrongly ignited, and came tumbling over one another, bearing down or burning whatever was in their way.—In this manner the lava proceeded ſlowly on till it came to the ſea, when a moſt extraordinary conflict enſued betwixt the two adverſe elements. The noiſe was vaſtly more dreadful than the loudeſt thunder, being heard through the whole country to an immenſe diſtance; the water ſeemed to retire and diminiſh before the lava, while clouds of vapour darkened the ſun. The whole fiſh on the coaſt were deſtroyed, the colour of the ſea itſelf was changed, and the tranſparency of its waters loſt for many months.

While this lava was iſſuing in ſuch prodigious quantity, the merchants, whoſe account is recorded in the Philoſophical Tranſactions, attempted to go up to the mouth itſelf; but durſt not come nearer than a furlong, leſt they ſhould have been overwhelmed by a vaſt pillar of aſhes, which to their apprehenſion exceeded twice the bigneſs of St Paul's ſteeple in London, and went up into the air to a far greater height; at the mouth itſelf was a continual noiſe, like the beating of great waves of the ſea againſt rocks, or like diſtant thunder, which ſometimes was ſo violent as to be heard 60, or even 100 miles off; to which diſtance alſo part of the aſhes was carried. Some time after, having gone up, they found the mouth from whence this terrible deluge iſſued to be only a hole about 10 feet diameter. This is alſo confirmed by Mr Brydone; and is probably the ſame through which Sir William Hamilton deſcended into the ſubterranean caverns already mentioned.

27. Some years after this conflagration, a new burning gulf opened in the month of December 1682 on the ſummit of the mountain, and ſpread its lava over the hill of Mazarra.

28. On the 24th of May 1686, about ten in the evening, a new eruption burſt out from the ſummit of the mountain, on the ſide contiguous to the hill del Bue. Such a quantity of inflamed matter was thrown out as conſumed woods, vineyards, and crops of grain, for four leagues round. It ſtopped its courſe in a large valley near the caſtle of Maſcali. Several people from the neighbourhood had aſcended a hill between the wood of Catania and the confines of Cirrita, to obſerve the progreſs of the lava: but the hill, on a ſudden, ſunk inwards, and they were buried alive.

29. Ætna was now long quiet; for no leſs a ſpace of time indeed than one half of the preſent age. In the year 1755 its eruptions were renewed. It opened near Mount Lepra, and emitted as uſual fire and ſmoke; after which it remained quiet only for eight years.

30. In the year 1763, there was an eruption which continued three months, but with intervals. Ætna was at firſt heard to rebellow. Flames and clouds of ſmoke were ſeen to iſſue out, ſometimes ſilver coloured, and at other times, when the rays of the ſun fell upon them, of a purple radiance: at length they were carried off by the winds, and rained, as they were driven before them, a ſhower of fire all the way to Catania and beyond it. An eruption ſoon burſt out; the principal torrent divided into two branches, one of which ran towards the eaſt, and fell into a deep and extenſive valley. Ætna.

The flames which iſſued from this new crater afforded a noble ſpectacle. A pyramid of fire was ſeen to riſe to a prodigious height in the air, like a beautiful artificial fire-work, with a conſtant and formidable battery, which ſhook the earth under thoſe who were ſpectators of the ſcene. Torrents of melted matter running down the ſides of the mountain, diffuſed a light bright as day through the darkneſs of night.

At ſunriſing the burning lava was obſerved to have run round ſome oaks that were ſtill ſtanding unburnt. Their leaves were all withered. Some birds had fallen from their branches, and been burnt to death. Some people caſt wood upon the lava, and it was immediately burnt. This lava continued hot, and exhaled ſmoke for two years. For five years after this, no ſnow appeared on the ſummit of Ætna.

31. In the year 1764 a new crater was opened at a great diſtance from Mount Ætna.

32. In the year 1766 another was opened at the grotto of Paterno: fire, ſmoke, and an inconſiderable torrent of lava iſſued out of it.

33. On the 27th of January 1780 a new opening was formed two miles under the laſt-mentioned crater. On the 28th of February, and the 14th of March, the earthquake was renewed on the north ſide, and accompanied with terrible noiſes.

Between the 6th of April and the 7th of May the convulſions were again renewed, accompanied with noiſe as before; a quantity of pumice ſtones and fine ſand was diſcharged from it.

On the 18th of May the ſhocks were renewed: on the 23d a new crater was formed on the ſide of Mount Frumento on the ſummit of Ætna: and from it a torrent of lava diſcharged, which ſpread through the valley of Laudunza. It was 200 paces in breadth. Two other chinks were opened in the mountain near Paterno, and very near one another. The lava iſſuing from them proceeded, in the ſpace of ſeven days, ſix miles; on the 25th it had run nine miles.

A new crater was likewiſe opened on the 25th; from which a quantity of red-hot ſtones continued to iſſue for half an hour, and fell at a very great diſtance: there proceeded likewiſe from it a ſtream of lava; which, in the ſame ſpace of time, ran over a tract of country two miles in extent.

Several parts of thoſe ſtreams of lava were obſerved to be cool on the ſurface, and formed into ſolid maſſes, but melted again by a new ſtream of burning lava, which however did not melt the old lava.

34. The laſt eruption happened in 1787. From the 1ſt to the 10th of July, there were ſigns of its approach. On the 11th, after a little calm, there was a ſubterraneous noiſe, like the ſound of a drum in a cloſe place, and it was followed by a copious burſt of black ſmoke. It was then calm till the 15th, when the ſame prognoſtics recurred. On the 17th, the ſubterraneous noiſe was heard again: the ſmoke was more abundant, ſlight ſhocks of an earthquake followed, and the lava flowed from behind one of the two little mountains which form Account of the late eruption. 1787.

Ætna. the double head of Ætna. On the 18th, while the ſpectators were in anxious expectation of a more ſevere eruption, all was quiet, and continued ſo more than 12 hours: ſoon after they perceived ſome new ſhocks, accompanied with much noiſe; and the mountain threw out a thick ſmoke, which, as the wind was weſterly, ſoon darkened the eaſtern horizon: two hours afterwards a ſhower of fine black brilliant ſand deſcended: on the eaſt ſide it was a ſtorm of ſtones; and, at the foot of the mountain, a deluge of flaſhes of fire, of ſcoria and lava.

Theſe appearances continued the whole day: at the ſetting of the ſun the ſcene changed. A number of conical flames roſe from the volcano; one on the north, another on the ſouth, were very conſpicuous, and roſe and fell alternately. At three in the morning, the mountain appeared cleft, and the ſummit ſeemed a burning maſs. The cones of light which aroſe from the crater were of an immenſe extent, particularly the two juſt mentioned. The two heads ſeemed to be cut away: and at their ſeparation was a cone of flame, ſeemingly compoſed of many leſſer cones. The flame ſeemed of the height of the mountain placed on the mountain; ſo that it was probably two miles high, on a baſe of a mile and a half in diameter. This cone was ſtill covered with a very thick ſmoke, in which there appeared very brilliant flaſhes of lightning, a phenomenon which Ætna had not before afforded. At times, ſounds like thoſe from the exploſion of a large cannon were heard ſeemingly at a leſs diſtance than the mountain. From the cone, as from a fountain, a jet of many flaming volcanic matters was thrown, which were carried to the diſtance of ſix or ſeven miles: from the baſe of the cone a thick ſmoke aroſe, which, for a moment, obſcured ſome parts of the flame, at the time when the rivers of lava broke out. This beautiful appearance continued three quarters of an hour. It began the next night with more force; but continued only half an hour. In the intervals, however, Ætna continued to throw out flames, ſmoke, ignited ſtones, and ſhowers of ſand. From the 20th to the 22d, the appearances gradually ceaſed. The ſtream of lava was carried towards Bronte and the plain of Lago.

After the eruption, the top of the mountain on the weſtern ſide was found covered with hardened lava, ſcoria, and ſtones. The travellers were annoyed by ſmoke, by ſhowers of ſand, mephitic vapours, and exceſſive heat. They ſaw that the lava which came from the weſtern point divided into two branches, one of which was directed towards Libeccio; the other, as we have already ſaid, towards the plain of Lago. The lava on the weſtern head of the mountain, had from its various ſhapes been evidently in a ſtate of fuſion; from one of the ſpiracula, the odour was ſtrongly that of liver of ſulphur. The thermometer, in deſcending, was at 40 degrees of Fahrenheit's ſcale; while near the lava, in the plain of Lago, it was 140 degrees. The lava extended two miles; its width was from 13½ to 21 feet, and its depth 13¼ feet.

Theſe are the moſt remarkable circumſtances we have been able to collect, that might ſerve to give an adequate idea of this famous mountain. Many things, however, concerning the extent, antiquity, &c. of the lavas, remain to be diſcuſſed, as well as the opinions of philoſophers concerning the origin of the internal fire which produces ſo much miſchief: but the conſideration of theſe belongs to the general article VOLCANO, to which the reader is referred. Ætolarcha Ætolia

ÆTNA ſalt, *Sal Ætnæ*, a name given by ſome authors to the ſal ammoniac which is found on the ſurface and ſides of the openings of Ætna, and other burning mountains, after their eruptions; and ſometimes on the ſurface of the ferruginous matter which they throw out. This ſalt makes a very various appearance in many caſes: it is ſometimes found in large and thick cakes; ſometimes only in form of a thin powder, ſcattered over the ſurface of the earth and ſtones. Some of this ſalt is yellow, ſome white, and ſome greeniſh.

ÆTOLARCHA, in Grecian antiquity, the principal magiſtrate or governor of the Ætolians.

ÆTOLIA, a country of ancient Greece, comprehending all that tract now called the *Deſpotat*, or *Little Greece*. It was parted on the eaſt by the river Evenus, now the Fidari, from the Locrenſes Ozolæ; on the weſt, from Acarnania, by the Achelous: on the north, it bordered on the country of the Dorians and part of Epirus; and, on the ſouth, extended to the bay of Corinth.

The Ætolians were a reſtleſs and turbulent people; ſeldom at peace among themſelves, and ever at war with their neighbours; utter ſtrangers to all ſenſe of friendſhip or principles of honour; ready to betray their friends upon the leaſt proſpect of reaping any advantage from their treachery: in ſhort, they were looked upon by the other ſtates of Greece no otherwiſe than as outlaws and public robbers. On the other hand, they were bold and enterpriſing in war; inured to labour and hardſhips; undaunted in the greateſt dangers; jealous defenders of their liberties, for which they were, on all occaſions, willing to venture their lives, and ſacrifice all that was moſt dear to them. They diſtinguiſhed themſelves above all the other nations of Greece, in oppoſing the ambitious deſigns of the Macedonian princes; who, after having reduced moſt of the other ſtates, were forced to grant them a peace upon very honourable terms. The conſtitution of the Ætolian republic was copied from that of the Achæans, and with a view to form, as it were, a counter alliance; for the Ætolians bore an irreconcileable hatred to the Achæans, and had conceived no ſmall jealouſy at the growing power of that ſtate. The Cleomenic war, and that of the allies, called the *ſocial war*, were kindled by the Ætolians in the heart of Peloponneſus, with no other view but to humble their antagoniſts the Achæans. In the latter, they held out, with the aſſiſtance only of the Eleans and Lacedemonians for the ſpace of three years, againſt the united forces of Achaia and Macedon; but were obliged at laſt to purchaſe a peace, by yielding up to Philip all Acarnania. As they parted with this province much againſt their will, they watched all opportunities of wreſting it again out of the Macedonian's hand; for which reaſon they entered into an alliance with Rome againſt him, and proved of great ſervice to the Romans in their war with him; but growing inſolent upon account of their ſervices, they made war upon the Romans themſelves. By that warlike nation they were overcome, and granted a peace on the following ſevere terms: 1. The majeſty of the Roman people

Ætolia. people shall be revered in all Ætolia. 2. Ætolia shall not suffer the armies of such as are at war with Rome to pass through her territories, and the enemies of Rome shall be likewise the enemies of Ætolia. 3. She shall, in the space of 100 days, put into the hands of the magistrates of Corcyra all the prisoners and deserters she has, whether of the Romans or their allies, except such as have been taken twice, or during her alliance with Rome. 4. The Ætolians shall pay down in ready money, to the Roman general in Ætolia, 200 Euboic talents, of the same value as the Athenian talents, and engage to pay 50 talents more within the six years following. 5. They shall put into the hands of the consul 40 such hostages as he shall choose; none of whom shall be under 12, or above 40 years of age: the prætor, the general of the horse, and such as have been already hostages at Rome, are excepted out of this number. 6. Ætolia shall renounce all pretensions to the cities and territories which the Romans have conquered, though these cities and territories had formerly belonged to the Ætolians. 7. The city of Oenis, and its district, shall be subject to the Acarnanians.

After the conquest of Macedon by Æmilius Paulus, they were reduced to a much worse condition; for not only those among them who had openly declared for Perseus, but such as were only suspected to have favoured him in their hearts, were sent to Rome, in order to clear themselves before the senate. There they were detained, and never afterwards suffered to return into their native country. Five hundred and fifty of the chief men of the nation were barbarously assassinated by the partisans of Rome, for no other crime but that of being suspected to wish well to Perseus. The Ætolians appeared before Æmilius Paulus in mourning habits, and made loud complaints of such inhuman treatment; but could obtain no redress: nay, ten commissioners, who had been sent by the senate to settle the affairs of Greece, enacted a decree, declaring that those who were killed had suffered justly, since it appeared to them that they had favoured the Macedonian party. From this time those only were raised to the chief honours and employments in the Ætolian republic who were known to prefer the interest of Rome to that of their country; and as these alone were countenanced at Rome, all the magistrates of Ætolia were the creatures and mere tools of the Roman senate. In this state of servile subjection they continued till the destruction of Corinth, and the dissolution of the Achæan league; when Ætolia, with the other free states of Greece, was reduced to a Roman province, commonly called the *province of Achaia*. Nevertheless, each state and city was governed by its own laws, under the superintendency of the prætor whom Rome sent annually into Achaia. The whole nation paid a certain tribute, and the rich were forbidden to possess lands anywhere but in their own country.

In this state, with little alteration, Ætolia continued under the emperors, till the reign of Constantine the Great, who, in his new partition of the provinces of the empire, divided the western parts of Greece from the rest, calling them *New Epirus*, and subjecting the whole country to the *præfectus prætorii* for Illyricum. Under the successors of Constantine, Greece was parcelled out into several principalities, especially after the taking of Constantinople by the Western princes. At that time, Theodorus Angelus, a noble Grecian, of the imperial family, seized on Ætolia and Epirus. The former he left to Michael his son, who maintained it against Michael Palæologus, the first emperor of the Greeks, after the expulsion of the Latins. Charles, the last prince of this family, dying in 1430 without lawful issue, bequeathed Ætolia to his brother's son, named also *Charles*; and Acarnania to his natural sons Memmon, Turnus, and Hercules. But, great disputes arising about this division, Amurath II. after the reduction of Thessalonica, laid hold of so favourable an opportunity, and drove them all out in 1432. The Mahometans were afterwards dispossessed of this country by the famous prince of Epirus, George Castriot, commonly called *Scanderbeg*; who, with a small army, opposed the whole power of the Ottoman empire, and defeated these barbarians in 22 pitched battles. That hero, at his death, left great part of Ætolia to the Venetians; but, they not being able to make head against such a mighty power, the whole country was soon reduced by Mahammed II. whose successors hold it to this day.

AFER, Domitius, a famous orator, born at Nismes, flourished under Tiberius, and the three succeeding emperors. Quintilian makes frequent mention of him, and commends his pleadings. But he disgraced his talents, by turning informer against some of the most distinguished personages in Rome. Quintilian, in his youth, cultivated the friendship of Domitius very assiduously. He tells us that his pleadings abounded with pleasant stories, and that there were public collections of his witty sayings, some of which he quotes. He also mentions two books of his "*On Witnesses*." Domitius was once in great danger from an inscription he put upon a statue erected by him in honour of Caligula, wherein he declared that this prince was a second time consul at the age of 27. This he intended as an encomium, but Caligula taking it as a sarcasm upon his youth, and his infringement of the laws, raised a process against him, and pleaded himself in person. Domitius, instead of making a defence, repeated part of the emperor's speech with the highest marks of admiration; after which he fell upon his knees, and, begging pardon, declared, that he dreaded more the eloquence of Caligula than his imperial power. This piece of flattery succeeded so well, that the emperor not only pardoned, but also raised him to the consulship. Afer died in the reign of Nero, A. D. 59.

AFFA, a weight used on the Gold Coast of Guinea. It is equal to an ounce, and the half of it is called *eggeba*. Most of the blacks on the Gold Coast give these names to these weights.

AFFECTION, in a general sense, implies an attribute inseparable from its subject. Thus magnitude, figure, weight, &c. are affections of all bodies; and love, fear, hatred, &c. are affections of the mind.

Affection. Affection, signifying *a settled bent of mind towards a particular being or thing*, occupies a middle space between *disposition* on the one hand, and *passion* on the other *. It is distinguishable from Disposition, which being a branch of one's nature, originally, must exist before there can be an opportunity to exert it upon any particular object; whereas Affection can never be original,

* See *Disposition* and *Passion*.

Afferers
Affinity

ginal, because, having a special relation to a particular object, it cannot exist till the object have once at least been presented. It is also distinguishable from Passion, which, depending on the real or ideal presence of its object, vanishes with it: whereas Affection is a lasting connection; and, like other connections, subsists even when we do not think of the person. A familiar example will illustrate this. There may be in one person's mind a disposition to gratitude, which, through want of an object, happens never to be exerted; and which therefore is never discovered even by the person himself. Another, who has the same disposition, meets with a kindly office that makes him grateful to his benefactor: An intimate connection is formed between them, termed *affection*; which, like other connections, has a permanent existence, though not always in view. The affection, for the most part, lies dormant, till an opportunity offer for exerting it: in that circumstance, it is converted into the passion of gratitude; and the opportunity is eagerly seized of testifying gratitude in the warmest manner.

AFFECTION, among *Physicians*, signifies the same as disease. Thus the hysteric *affection* is the same with the hysteric disease.

AFFERERS, or AFFERORS, in *Law*, persons appointed in courts-leet, courts baron, &c. to settle, upon oath, the fines to be imposed upon those who have been guilty of faults arbitrarily punishable.

AFFETTUOSO, or *Con Affetto*, in the *Italian Music*, intimates that the part to which it is added ought to be played in a tender moving way, and consequently rather slow than fast.

AFFIANCE, in *Law*, denotes the mutual plighting of troth between a man and woman to marry each other.

AFFIDAVIT, signifies an oath in writing, sworn before some person who is authorized to take the same.

AFFINITY, among *Civilians*, implies a relation contracted by marriage; in contradistinction to consanguinity, or relation by blood.—Affinity does not found any real kinship; it is no more than a kind of fiction, introduced on account of the close relation between husband and wife. It is even said to cease when the cause of it ceases: hence a woman who is not capable of being a witness for her husband's brother during his lifetime, is allowed for a witness when a widow, by reason the affinity is dissolved. Yet with regard to the contracting marriage, affinity is not dissolved by death, though it be in every thing else.

There are several degrees of affinity, wherein marriage was prohibited by the law of Moses: thus, the son could not marry his mother, nor his father's wife (Lev. xviii. 7. et seq.): the brother could not marry his sister, whether she were so by the father only or by the mother only, and much less if she was his sister both by the same father and mother: the grandfather could not marry his grand-daughter, either by his son or daughter. No one could marry the daughter of his father's wife, nor the sister of his father or mother; nor the uncle his niece; nor the aunt her nephew; nor the nephew the wife of his uncle by the father's side. The father-in law could not marry his daughter-in-law; nor the brother the wife of his brother, while living; nor even after the death of his brother, if he left children. If he left not children, the surviving brother was to raise up children to his deceased brother, by marrying his widow. It was forbidden to marry the mother and the daughter at one time, or the daughter of the mother's son, or the daughter of her daughter, or two sisters together. It it true the patriarchs before the law married their sisters, as Abraham married Sarah, who was his father's daughter by another mother; and two sisters together, as Jacob married Rachel and Leah; and their own sisters by both father and mother, as Seth and Cain. But these cases are not to be proposed as examples: because in some they were authorized by necessity, in others by custom; and the law as yet was not in being. If some other examples may be found, either before or since the law, the Scripture expressly disapproves of them, as Reuben's incest with Bilhah his father's concubine, and the action of Amnon with his sister Tamar; and that of Herod-Antipas, who married Herodias his sister-in-law, his brother Philip's wife, while her husband was yet living. Affinity

AFFINITY is also used to denote conformity or agreement: Thus we say, the *affinity* of languages, the *affinity* of words, the *affinity* of sounds, &c.

AFFINITY, in *Chemistry*, is a term employed to express that peculiar propensity which the particles of matter have to unite and combine with each other exclusively, or in preference to any other connection.

The attractions between bodies at insensible distances, and which of course are confined to the particles of matter, have been distinguished by the name of *affinity*, while the term *attraction* has been more commonly confined to cases of sensible distance. And as the particles of matter are of two kinds, either *homogeneous* or *heterogeneous*, so there are two kinds of affinity.

"Homogeneous affinity urges the homogeneous particles towards each other, and keeps them at insensible distances from each other; and consequently is the cause why bodies almost always exist united together, so as to constitute masses of sensible magnitude. This affinity is usually denoted by the term *cohesion*, and sometimes by *adhesion* when the surfaces of bodies are only referred to. Homogeneous affinity is nearly universal; as far as is known, caloric and light only are destitute of it.

Heterogeneous affinity urges heterogeneous particles towards each other, and keeps them at insensible distances from each other, and of course is the cause of the formation of new integrant particles composed of a certain number of heterogeneous particles. These new integrant particles afterwards unite by cohesion, and form masses of compound bodies. Thus an integrant particle of water is composed of particles of hydrogen and oxygen, urged towards each other, and kept at an insensible distance by heterogeneous affinity; and a mass of water is composed of an indefinite number of integrant particles of that fluid, urged towards each other by homogeneous affinity. Heterogeneous affinity is universal, as far as is known; that is to say, there is no body whose particles are not attracted by the particles of some other body; but whether the particles of all bodies have an affinity for the particles of all other bodies, is a point which we have no means of ascertaining. It is, however, exceedingly probable, and has been generally taken for granted; though it

is

Affirmation || Afforage.

is certainly aſſuming more than even analogy can warrant." (*Thomſon's Chemiſtry.*)

AFFIRMATION, in *Logic*, the aſſerting the truth of any propoſition.

AFFIRMATION, in *Law*, denotes an indulgence allowed to the people called *Quakers:* who, in caſes where an oath is required from others, may make a ſolemn affirmation that what they ſay is true; and if they make a falſe affirmation, they are ſubject to the penalties of perjury. But this relates only to oaths taken to the government, and on civil occaſions; for Quakers are not permitted to give their teſtimony in any criminal caſe, &c.

AFFIRMATION is alſo uſed for the ratifying or confirming the ſentence or decree of ſome inferior court: Thus we ſay, the houſe of lords affirmed the decree of the chancellor, or the decree of the lords of ſeſſion.

AFFIRMATIVE, in *Grammar*. Authors diſtinguiſh affirmative particles; ſuch as, *yes*.—The term *affirmative* is ſometimes alſo uſed ſubſtantively. Thus we ſay, the affirmative is the more probable ſide of the queſtion: there were ſo many votes, or voices, for the affirmative.

AFFIX, in *Grammar*, a particle added at the cloſe of a word, either to diverſify its form or alter its ſignification. We meet with *affixes* in the Saxon, the German, and other northern languages; but more eſpecially in the Hebrew, and other oriental tongues. The Hebrew *affixes* are ſingle ſyllables, frequently ſingle letters, ſubjoined to nouns and verbs; and contribute not a little to the brevity of that language. The oriental languages are much the ſame as to the *radicals*, and differ chiefly from each other as to *affixes* and *prefixes*.

AFFLATUS, literally denotes a blaſt of wind, breath, or vapour, ſtriking with force againſt another body. The word is Latin, formed from *ad* "to," and *flare* "to blow." Naturaliſts ſometimes ſpeak of the afflatus of ſerpents. Tully uſes the word figuratively, for a divine inſpiration; in which ſenſe, he aſcribes all great and eminent accompliſhments to a divine afflatus. The Pythian prieſteſs being placed on a tripod or perforated ſtool, over a holy cave, received the divine afflatus, as a late author expreſſes it, in her belly; and being thus inſpired, fell into agitations, like a phrenetic; during which ſhe pronounced, in hollow groans and broken ſentences, the will of the deity. This afflatus is ſuppoſed, by ſome, to have been a ſubterraneous fume, or exhalation, wherewith the prieſteſs was literally inſpired. Accordingly, it had the effects of a real phyſical diſeaſe; the paroxyſm of which was ſo vehement, that Plutarch obſerves it ſometimes proved mortal. Van Dale ſuppoſes the pretended enthuſiaſm of the Pythia to have ariſen from the fumes of aromatics.

AFFLICTION is not itſelf, in propriety of medical ſpeech, a diſeaſe, but it is the cauſe of many: for whatever excites envy, anger, or hatred, produces diſeaſes from tenſe fibres; as whatever excites fear, grief, joy, or delight, begets diſeaſes from relaxation.

AFFORAGE, in the French cuſtoms, a duty paid to the lord of a diſtrict, for permiſſion to ſell wine, or other liquors, within his ſeigniory. Afforage is alſo uſed for the rate or price of proviſions laid and fixed by the provoſt or ſheriffs of Paris.

Afforeſting || Afghans.

AFFORESTING, AFFORESTATIO, the turning ground into foreſt. The Conqueror, and his ſucceſſors, continued afforeſting the lands of the ſubject for many reigns; till the grievance became ſo notorious, that the people of all degrees and denominations were brought to ſue for relief; which was at length obtained, and commiſſions were granted to ſurvey and perambulate the foreſt, and ſeparate all the new afforeſted lands, and reconvert them to the uſes of their proprietors, under the name and quality of *purlieu* or *pourallee land*.

AFFRAY, or AFFRAYMENT, in *Law*, formerly ſignified the crime of affrighting other perſons, by appearing in unuſual armour, brandiſhing a weapon, &c. but at preſent, *affray* denotes a ſkirmiſh or fight between two or more.

AFFRONTEE, in *Heraldry*, an appellation given to animals facing one another on an eſcutcheon; a kind of bearing which is otherwiſe called *confrontee*, and ſtands oppoſed to *addorſee*.

AFFUSION, the act of pouring ſome fluid ſubſtance on another body. Dr Grew gives ſeveral experiments of the luſtation ariſing from the affuſion of divers menſtruums on all ſorts of bodies. Divines and church hiſtorians ſpeak of baptiſm by affuſion; which amounts to much the ſame with what we now call *ſprinkling*.

AFGHANS, in *Hiſtory*, a people who inhabit a province of CABUL or CABULISTAN, in the northern parts of India. They boaſt of being deſcended of Saul the firſt king of Iſrael, and that their great anceſtor was raiſed from the rank of a ſhepherd, not on account of his princely qualities, but becauſe his ſtature was exactly equal to the length of a rod which the angel Gabriel had given to the prophet Samuel as the meaſure of the ſtature of him whom God had deſtined to fill the throne of Iſrael.

Saul, whoſe deſcent, according to ſome of them, was of Judah, and according to others of Benjamin, had, they ſay, two ſons, Berkia and Irmia, who ſerved David, and were beloved by him. The ſons of Berkia and Irmia were Afghan and Ulbec, who, during the reigns of David and Solomon, diſtinguiſhed themſelves, the one for ſtrength of body, and the other for learning. The ſtrength of Afghan, we are told, ſtruck terror even into the demons and genii.

This hero uſed frequently to make excurſions to the mountains, where his progeny, after his death, formed eſtabliſhments, lived in a ſtate of independence, fortified themſelves, and exterminated infidels. When Mahomet appeared upon earth, his fame reached the Afghans, who fought him in multitudes under their leaders Khalid and Abdul Reſpid, ſons of Walid; and the prophet honouring them with this reception—"Come, O *Muluc*, or Kings!" they aſſumed the title of *Melic*, which they retain to this day.

The Afghans are ſometimes called *Solaimani*, either becauſe they were formerly the ſubjects of Solomon king of Iſrael, or becauſe they inhabit the mountains of Solomon. They are likewiſe called Patans, a name derived from the Hindû verb *paitna*, "to ruſh," which was given to them by a ſultan, in conſequence of the alacrity with which they had attacked and conquered his enemies. The province which they occupy at preſent was formerly called Roh; and hence is derived the

name

Afghans
Africa.

name of the Rohillas. The city which was eſtabliſhed in it by the Afghans was called by them Paithwer or Paither, and is now the name of the whole diſtrict. The ſects of the Afghans are very numerous, and they are Muſſulmans, partly of the Sunni, and partly of the Schiek perſuaſion.

They are divided into four claſſes. The firſt is the *pure* claſs, conſiſting of thoſe whoſe fathers and mothers were Afghans. The ſecond claſs conſiſts of thoſe whoſe fathers were Afghans and mothers of another nation. The third claſs contains thoſe whoſe mothers were Afghans and fathers of another nation. The fourth claſs is compoſed of the children of women whoſe mothers were Afghans and fathers and huſbands of a different nations. Perſons who do not belong to one of theſe claſſes are not called Afghians.

This people have at all times diſtinguiſhed themſelves by their courage. They have conquered for their own princes and for foreigners, and have always been conſidered as the ſtrength and ſupport of the army in which they ſerved. As they have been applauded for virtues, they have alſo been reproached for vices, having ſometimes been guilty of treachery, and of acting the baſe part even of aſſaſſins.

Sir William Jones ſeems to have had no doubt but the Afghans are deſcendants of Iſrael. "We learn (ſays he) from Eſdras, that the ten tribes, after a wandering journey, came to a country called Arſareth, where we may ſuppoſe they ſettled: now the Afghans are ſaid by the beſt Perſian hiſtorians to be deſcended from the Jews. They have traditions among themſelves of ſuch a deſcent; and it is even aſſerted, that their families are diſtinguiſhed by the names of Jewiſh tribes, although, ſince their converſion to Iſlam, they ſtudiouſly conceal their origin from all whom they admit not to their ſecrets. The Puſhto language, of which I have ſeen a dictionary, has a manifeſt reſemblance to the Chaldaic; and a conſiderable diſtrict under their dominion is called Hazareh or Hazaret, which might eaſily have been changed into the word uſed by Eſdras. I ſtrongly recommend an inquiry into the literature and hiſtory of the Afghans." (*Aſiatic Reſearches.*)

AFRANIUS, Lucius, a Latin comic poet, who lived about a century before Chriſt. He wrote comedies in imitation of Menander; and is commended by Tully and Quintilian for his acute genius and fluent ſtyle. Some fragments of his works only are now extant.

AFRICA, (derived according to Bochart from a Punic word ſignifying *ears of corn*), was repreſented by the ancients as one of the three great diviſions or continents of which they believed the world to conſiſt.—By them it was alſo called *Libya*. Since the diſcovery of America, it has been conſidered by the moderns as one of the four quarters of the globe.

Excepting at its north-eaſt corner, called the *Iſthmus of Suez*, which is a neck of land, about ſixty miles over, that unites it to Aſia, Africa is entirely ſurrounded by water. On the north it is bounded by the Mediterranean ſea, which divides it from Europe. Its whole weſtern coaſt is waſhed by the waters of the Atlantic ocean, by which it is divided from America; and on the eaſt, the Red ſea and the Indian ocean ſeparate it from Aſia. From the Mediterranean ſea on the north, to the Cape of Good Hope, which conſtitutes its ſouthern extremity, is no leſs than 4300 miles. Its broadeſt part, from Cape Verd, in the Atlantic ocean, to Cape Guarda-fui, near the ſtraits of Babel-Mandel, at the mouth of the Red ſea, is 3500 miles from weſt to eaſt. In ſhape it ſomewhat reſembles a triangle, of which the Mediterranean ſea and the Atlantic ocean form two ſides, while the third ſide conſiſts of the Red ſea and the Indian ocean. Africa.

The greater part of this vaſt peninſula has in all ages remained unknown to the other inhabitants of the world. The general aſpect however of its ſituation, repreſents it as well ſituated for maintaining a commercial intercourſe with the other quarters of the globe. It ſtands as it were in the centre between Europe, Aſia, and America; and therefore has a much nearer communication with each of them than they can have with one another. It is oppoſite to Europe, on its northern boundary, the Mediterranean ſea, for almoſt 1000 miles in a line from eaſt to weſt; the diſtance ſeldom 100 miles, never 100 leagues. It is oppoſite to Aſia the whole length of the Red ſea; the diſtance ſometimes only 15 miles, ſeldom 50 leagues. Its coaſt, for about 2000 miles, lies oppoſite to America, at the diſtance of from 500 to 700 leagues, including the iſlands; whereas America is nowhere nearer Europe than 1000 leagues, and excepting at its north-weſt corner, where it is yet little known, is not nearer to Aſia than 2500 leagues. Africa little known.

The knowledge of the ancients concerning Africa ſeems to have been, in a great degree, limited to the countries adjoining to the Mediterranean or to the Red ſea. The ideas, however, which Herodotus entertained of this great continent are by no means incorrect upon the whole: and it has been reſerved for our own times to verify a part of the deſcription which he has given of the interior of Africa. Previous to his time, the whole ſea coaſt of this continent had been explored by the conductors of an expedition fitted out by Necho, one of the kings of Egypt. It is to be obſerved that this Necho took Sidon, and reduced Phœnicia and Paleſtine. He muſt therefore have poſſeſſed conſiderable maritime power: Nor was he leſs powerful by land; for he marched through Paleſtine and Syria to attack the Aſſyrians near the Euphrates, and, in his way, defeated and ſlew Joſiah the king of Judah, who oppoſed his march at Megiddo (2 Kings xxiii. 29.) Having defeated the Aſſyrians (or Babylonians) he placed a ſtrong garriſon in Carchemiſh, a fortified city on the Euphrates which he had taken; and, in his return, he took poſſeſſion of Jeruſalem, called Cadytis by Herodotus. This enterpriſing prince employed a body of Phœnician mariners to circumnavigate Africa, an undertaking which they accompliſhed with ſucceſs. The following is the ſhort narrative given by Herodotus of this remarkable tranſaction: "Except in that particular part which is contiguous to Aſia, the whole of Africa is ſurrounded by the ſea. The firſt perſon who has proved this, was, as far as we are able to judge, Necho king of Egypt. When he had deſiſted from his attempt to join by a canal the Nile with the Arabian gulf, he diſpatched ſome veſſels, under the conduct of Phœnicians, with directions to paſs by the Columns of Hercules, and, after penetrating the Northern ocean, to return to Egypt. Theſe Phœnicians, taking their courſe from the Red ſea, entered into the Southern ocean. On the approach of autumn they Expedition of Necho king of Egypt againſt Phœnicia. Circumnavigates Africa. Herodotus' account of it.


AFRICA
MEDITERRANEAN SEA
NORTH ATLANTIC OCEAN
SOUTH ATLANTIC OCEAN
INDIAN OCEAN
SARRA OR THE DESART
NEGROLAND OR LOWER ETHIOPIA
UPPER GUINEA
UPPER ETHIOPIA
ABISSINIA
NUBIA
EGYPT
TRIPOLI
BARBARY
MOROCCO
ALGIERS
ARABIA
CONGO
BENGUELA
CAFRERIA
HOTTENTOTS
MADAGASCAR
ZANGUEBAR
MONOMOTAPA
MONOEMUGI
Equinoctial Line
Tropic of Cancer
Tropic of Capricorn
St. Helena I.
C. of Good Hope
Long. West from London
Long. East from London

Africa. they landed at Libya, and planted some corn in the place where they happened to find themselves: when this was ripe, and they had cut it down, they again departed. Having thus consumed two years, in the third they passed the Columns of Hercules, and returned to Egypt. Their relation may obtain attention from others, but to me it seems incredible; for they affirmed that, having sailed round Africa, *they had the sun on their right hand*. Thus was Africa, for the first time known."

Many of the most eminent of the ancient historians and geographers regarded this account of the circumnavigation of Africa as altogether fabulous, chiefly in consequence of the story concerning the appearance assumed by the great celestial bodies in the course of the voyage, which was then unintelligible, from the imperfect state of the science of astronomy. But the very circumstances which, among the ancients, excited a doubt about the existence or success of such a voyage, must now be regarded as affording the most satisfactory internal evidence of the veracity of the ancient Phœnician navigators.

The Carthaginians were the rivals of the Egyptians in commerce, and must undoubtedly have explored a great part of the coast of Africa; but, according to the usual cautious and monopolizing spirit of commercial states, it is probable that they concealed their discoveries from other nations. As almost no monuments of their literature now exist, we are deprived of the means of investigating the full extent of their geographical knowledge. One important document has, however, reached our times, which demonstrates the enterprising spirit of that people. This is, an apparently abridged journal of a voyage to the western coast of Africa, undertaken by Hanno the Carthaginian, about 30 or 40 years after the expedition above mentioned under Necho king of Egypt. Herodotus does not seem to have been informed of this undertaking of Hanno; nor does Pliny appear to have seen the journal of the voyage, though he is no stranger to its contents.

Voyage of Hanno. Hanno is said to have deposited, at his return, the journal of his voyage in the temple of Saturn; which may perhaps account for the means of its preservation. It begins by stating, that "it was decreed by the Carthaginians that Hanno should undertake a voyage beyond the Pillars of Hercules, and found Libyphœnician cities. He sailed, accordingly, with 60 ships of 50 oars each, and a body of men and women to the number of 30,000, and provisions and other necessaries." From the extent of this plan of colonization, or rather of establishing permanent garrisons, upon the western coasts of Africa, it is evident that these coasts must, in some measure, have been previously examined. Major Rennel, who has investigated the subject with great accuracy, with a reference to the journal of the voyage, is of opinion that the Carthaginian or Libyphœnician cities founded by Hanno, were all situated to the south of the strait of Gibraltar, and to the northward of the river Senegal; and that all of them, excepting one at Cernè, now called Arguin, were placed to the north of Cape Bojador. To the southward of Cernè, Hanno during his voyage made two expeditions; but it does not appear that he made any attempt to fix an establishment beyond the limits now mentioned. On his first expedition, he seems to have sailed into the river Senegal, as may be supposed from the description given; for it is said to be "large and broad, and full of crocodiles and river horses." During the same voyage, Hanno made a second expedition southward, apparently for the sake of discovery. He appears to have doubled Cape Verd, and to have sailed across the mouth of the Gambia. His voyage is said to have terminated at a place which he calls the Southern Horn, supposed to be either at Sierra Leona, or, at a little distance to the south of it, at Sherbro. It is evident, from the general style of the journal, that the Carthaginians, at the time of this voyage, were altogether unacquainted with the interior state of the country on this western quarter of Africa. Excepting the mere description of the coast, and its windings and bays, every thing is marvellous, and apparently fabulous. They talk of having caught two women covered with hair, whose skins they brought to Carthage, meaning, in all probability, two monkeys of some of the unknown species which abound in the country of the Negroes. They also talk of streams of fire, and of rivers of fire which seemed to be running into the sea. At one place, during the night, they saw a country which was on fire: and afterwards they saw another country full of fires; in the middle of which was a lofty fire, larger than the others, which seemed to touch the stars. When day came, they discovered this elevated fire to be a large hill, which they called *the chariot of the gods*. These wonders have been explained to us by later travellers; who remark that it is the custom, at certain seasons of the year, in the country of the Negroes, to set fire to the dry grass; and that on these occasions, during the night, the whole territory seems to be a sheet of flame.

Africa. Description of Africa by Herodotus. With regard to Africa in general, Herodotus describes it in this summary way: "All that part of Libya towards the northern sea (Mediterranean), from Egypt to the promontory of Soloeis (now Cape Cantin on the coast of Morocco) which terminates the third division of the earth, is inhabited by the different nations of the Libyans; that district alone excepted in possession of the Greeks and Phœnicians. The remoter parts of Libya beyond the sea coast, and the people who inhabit its borders, are infested by various beasts of prey.—The country *yet more distant* is a parched and *immeasurable desert*." Here this ancient historian clearly distinguishes three belts or regions parallel to the Mediterranean, the northernmost of which we must conceive to have been that which extended along the sea coast, and was bounded on the south by Mount Atlas, and other ridges. The middle one is now called the Country of Dates, because the inhabitants chiefly live on that fruit; and the third is the great African desert. Beyond these, however, Herodotus had heard of a fourth region, belonging to the negroes; for, in another place he divides the inhabitants of Africa generally into two races (with the exception of strangers, viz. the Phœnicians and the Greeks). The natives (says he) are the Africans and Ethiopians, one of which possesses the northern, and the other the southern part of Africa."—By these nations are evidently intended the Moors and the Negroes, which two classes are as distinct at the present day as they were in ancient times.

This author, whose account of the ancient nations will always be a matter of much curiosity, because he has justly been called *the Father of History*, as being the earliest authentic historian whose writings have

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been tranſmitted to us, gives a detailed account of the tribes that in his time inhabited the northern coaſt of Africa, upon the borders of the Mediterranean; beginning with Egypt and proceeding weſtward to the leſſer Syrtis, mentioning only in general terms, the reſt of the country to the promontory of Soloeis, (Cape Cantin), which was erroneouſly regarded by him as the moſt weſterly point of the coaſt of Africa. The people of this coaſt he repreſents generally as Nomades, from Egypt weſtward to the lake Tritonis, by which he means the leſſer Syrtis, or gulf of Kabes; and the country, he ſays juſtly, is low and ſandy. The country farther to the weſt, called *Africa Proper*, or *Numidia* by the Romans, including the preſent ſtates of Morocco, Algiers, and Tunis, he deſcribes as mountainous and interſperſed with wood, and infeſted by wild beaſts and ſerpents of an enormous ſize. Within this tract, however, he repreſents the inhabitants as huſbandmen who cultivate the ground and live in houſes. Mount Atlas is mentioned by him in the ſame magnificent terms in which all the ancient writers ſpeak of it. "At every approach it appears round and ſteep, and ſo lofty that its ſummit can never be diſtinguiſhed by reaſon of the clouds that envelope it."

Egypt was, in the days of Herodotus, a rich and populous ſtate, from which the Greeks had derived a great part of their arts and of their religion. Beginning from Egypt and proceeding weſtward, he enumerates the Africans in the following manner. The firſt are the *Adyrmachidæ*, whoſe manners were in every reſpect Egyptian, that is to ſay, civilized. He imputes to them, however, a barbarous cuſtom, that their king poſſeſſed the privilege of ſleeping the firſt night with every new married woman. They inhabited the coaſt between Egypt and the port of Pleunos, adjoining to what is now called the *deſert of Barca*. Next to the Adyrmachidæ were the *Gilligammæ*, who occupied the coaſt as far as the iſland of Aphrodiſias, ſuppoſed to be near Derna. The *Aſbyſtæ* were a ſmall inland tribe, ſituated between the Gilligammæ on the eaſt, and the Auſchicæ on the weſt, having no communication with the ſea. They were accounted remarkable beyond all the Africans for the uſe of chariots drawn by four horſes; and, it is to be obſerved, that Herodotus ſays the Greeks borrowed from Africa the cuſtom of harneſſing four horſes to a chariot. The *Auſchicæ*, who bordered on the weſt of the Aſbyſtæ extended from above Barca to the neighbourhood of the Heſperides on the ſea coaſt. The *Cabales*, an inconſiderable tribe, occupied the coaſt oppoſite to the centre of the Auſchicæ, and extended themſelves along the coaſt near Tauchira, a town belonging to Barca.

Inhabitants of Africa according to Herodotus.

The province of Cyrenaica, (now Kairoan or Kurin), was ſituated within the tract of the Nomades. It was the moſt elevated part of it, and wonderfully fertile. It contained the firſt Grecian colony, and was alſo named *Libya Pentapolis*, from its having five towns of note in it, Cyrene, Barce, Ptolemais, Berenice, and Tauchira; all of which not only ſtill exiſt as towns or villages, but it is remarkable that their names are ſcarcely altered, being called *Kurin*, *Barca*, *Tollamata*, *Bernic*, and *Taukera*. The celebrated gardens of the Heſperides were ſituated upon this coaſt on the weſtern border of the deſert of Barca.

The *Naſamones*, according to Herodotus, were the moſt powerful of the Nomadic tribes upon this coaſt. They bordered upon the greater Syrtis, now called the *gulf of Sort*. He ſays, that during the ſummer ſeaſon they leave their cattle on the coaſt, and go up into the country to gather dates at a place called *Augela*, which will be afterwards noticed. The Naſamones are ſaid to have ſeized upon the territories of the Pſylli. Theſe were a people who poſſeſſed the reputation of being able to charm ſerpents, and to cure the wounds occaſioned by their ſtings. Cato is ſaid by Plutarch to have carried ſome of the Pſylli with him for that purpoſe, in his memorable march round the greater Syrtis. It is certain that, in modern times, in Egypt, Abyſſinia, and India, certain perſons are believed to poſſeſs the power of completely ſubduing ſerpents of the moſt venomous kinds, ſo as to have them entirely under their command. They are ſaid to ſeize on them with their naked hands, without apprehenſion of miſchief, and this, not only on ſerpents they have already been accuſtomed to, but on ſuch as they never ſaw before.

Beyond the Naſamones to the ſouthward, Herodotus mentions the *Garamantes*, whom he repreſents as a numerous nation, ſituated ten journeys from Augela, between the Naſamones and the Macæ. The *Macæ* appear to have been the next tribe upon the coaſt after the Naſamones. The preſent towns of Meſurata and Lebida are ſituated within the territory that belonged to them. The *Gindanes*, *Lotophagi*, and *Machlyes*, in the order here mentioned, occupied the remainder of the ſpace between the Macæ and the lake Tritonis, or gulf of Kabes; for Herodotus appears to have underſtood by the lake Tritonis, either the gulf alone, or the gulf and an adjoining lake *collectively*, which in his time very probably had a communication, though they are now ſeparated by a neck of land, and the lake receives the name of *Lowdeah*. It is to be obſerved, that the Lotophagi derived their name from the fruit of a tree or ſhrub called the *lotus*, upon which they ſubſiſted, ſuppoſed to be the *rhamnus lotus* of Linnæus. It is not only found in this territory, but alſo upon the whole northern coaſt of Africa, and on many ſpots of the deſert, and even in the country of the Negroes. To the weſtward of the lake Tritonis, Herodotus mentions the *Auſes*, the *Maxyes*, the *Zaveces*, and the *Zygantes*; which laſt appear to have been the inhabitants of the province that contained the city of Carthage: of the territories of this laſt ſtate Herodotus gives no deſcription, though he ſays, that he is able to name all the nations that inhabit the country as far as the Atlantes, beyond which he knows nothing. Some other poſitions in the north of Africa that were known in the times of Herodotus, will be afterwards mentioned.

With regard to the interior of Africa, the knowledge of Herodotus was very indiſtinct. He mentions Ethiopia in a way that in ſome meaſure correſponds with Nubia, and Abyſſinia: "Ethiopia, (ſays he), "which is the extremity of the habitable world, is contiguous to Arabia on the ſouth weſt. It produces gold in great quantities, elephants with their prodigious teeth, trees and ſhrubs of every kind, as well as ebony. Its inhabitants are alſo remarkable for their ſize, their beauty, and their length of life." To Ethiopia, however, he gives a wide extent, ſo as to include

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clude the whole region inhabited by men of a black complexion, as he calls it, the "extremity of the habitable world." The remoteſt ſource of the Nile was unknown in his days; and after all the efforts that have been made for its diſcovery, it may be regarded as having hitherto been viſited by no European. He ſuppoſes, however, that the courſe of the Nile, "without reckoning that part of it which flows through Egypt, was known to the extent of four months journey, partly by land, partly by water;" but beyond this its courſe was unknown, though he ſays "it is certain that the Nile riſes in the weſt." The moſt remarkable fact, however, mentioned by Herodotus concerning the inveſtigation of the interior of Africa, conſiſts of the adventures of certain *Naſamones* who came from the neighbourhood of Cyrene, now called *Kairin*. He ſays that they made an expedition into the interior of Africa, with a view to extend their diſcoveries beyond all preceding adventurers. No attempt is made to ſtate the diſtance to which they penetrated; but it muſt have been very great: "firſt proceeding through the region which was inhabited, they next came to that which was infeſted by wild beaſts; leaving which, they directed their courſe weſtward through the deſert, and were finally taken priſoners by black men of a diminutive ſtature, and carried to a city waſhed by a great river, which flowed from weſt to eaſt, and abounded in crocodiles." Of this great river nothing farther was ever diſcovered by the ancients. Herodotus thought that it was probably the Nile, and Pliny calls it the river Niger, or the river of the blacks or Ethiopians.

The Romans were not a commercial people, and troubled themſelves little about the diſcoveries of the Egyptians and Carthaginians whom they vanquiſhed. The fertile diſtricts, however, in the north of Africa adjoining to the ſhores of the Mediterranean, formed the chief granary of the empire during its moſt proſperous period. Beyond theſe diſtricts they puſhed their conqueſts only ſo far as was neceſſary to ſecure their poſſeſſions againſt the barbarians of the deſert. Both Auguſtus and Nero, however, ſent perſons to attempt to diſcover the ſource of the Nile, but without ſucceſs; and the Romans were never remarkable for inveſtigating the ſtate of foreign countries when they had no ſcheme of conqueſt in view. In the decline of the Roman empire A. D. 426, Bonifacius, the governor of Africa, revolted, and called in the aid of Genſeric, the chief of a horde of barbarians called *Vandals*, who had penetrated from the north of Europe into Spain. Theſe barbarians croſſed the ſtraits of Gibraltar, and ſoon became maſters of the country. About a century thereafter; their deſcendants, in a fertile and enervating climate, having loſt their military character, were vanquiſhed by the celebrated Beliſarius under Juſtinian, then at the head of the eaſtern diviſion of the Roman empire. At a later period, when Mahomet had rouſed his countrymen to war and conqueſt, under the influence of a furious fanaticiſm, Egypt and the reſt of the north of Africa were overrun by the Arabs, or, as they are called, the *Saracens*, A. D. 647. In a few centuries thereafter, the empire of the Saracens in Africa, where they were called *Moors*, was gradually divided into a variety of petty ſtates called the *States of Barbary*, which acknowledged rather a nominal than a real dependence upon the Turkiſh empire.

ruption of ie Vanals into frica.

errun the Saens.

Africa.

The reſt of Africa was forgotten till the fifteenth century, when the diſcovery of the mariners compaſs enabled the Europeans to extend their maritime enterpriſes to all the quarters of the globe, with a facility that was formerly unknown. In theſe enterpriſes the Portugueſe took the lead. They had never failed along the weſtern coaſt of Africa, beyond Cape Non, in 27° north latitude till A. D. 1412, when they ventured 160 miles farther to Cape Bojador, whoſe rocky cliffs ſtretching out to a conſiderable diſtance into the Atlantic ocean, intimidated them from advancing farther. In 1419, when attempting to double this cape, they diſcovered the Madeira iſles. Afterwards in 1433, they paſſed Cape Bojador, penetrated between the tropics, and diſcovered the river Senegal and the Cape de Verd iſles ſituated between 14° and 18° north latitude. In 1471, they croſſed the equator, and were aſtoniſhed to find that the torrid zone contained fertile and populous regions, inſtead of being burnt up by perpetual heat as had been formerly believed. In 1484, the Portugueſe navigators, now become ambitious of the reputation of diſcoverers of new countries, penetrated 1500 miles beyond the equator; and two years thereafter Bartholomew de Diaz diſcovered the Cape of Good Hope. In 1497, this cape, being the ſouthern extremity of Africa, was paſſed by Vaſquez de Gama.

Diſcoveries by the Portugueſe.

Of the Madeira iſles.

Cape de Verd iſles.

Of the Cape of Good Hope.

At this time the European nations were faſt emerging from barbariſm. The feudal ariſtocracies, by which they had been kept in a ſtate of perpetual anarchy, were gradually ſubdued by different princes, and a few powerful ſtates or monarchies were raiſed upon their ruins. Theſe ſtates enjoying greater domeſtic tranquillity, were become capable of directing the energy and ſuperior intelligence, which began to prevail in the European character, to enterpriſes requiring united and ſucceſſive efforts. The diſcoveries of the Portugueſe, by pointing out a very fertile region in the centre of Africa, in which gold and ivory could be obtained in exchange for the manufactures of Europe, and in which ſettlements could be eaſily formed, would in all probability have directed to this quarter the whole activity of the moſt enterpriſing of the European ſtates, had not other events diverted them to different quarters. The events now alluded to, were the diſcovery of America by Columbus in 1492, and the eaſy communication with the Eaſt Indies, opened up by the diſcovery of the paſſage round the Cape of Good Hope. Hence it has happened, that during theſe three centuries Africa has been much neglected; and, in the moſt enterpriſing period of the hiſtory of the world, the European nations, though the moſt enterpriſing of mankind, have left in a great meaſure unexplored this immenſe continent, though ſituated in their vicinity, and abounding in valuable productions. A few factories for the purpoſe of procuring ſlaves have been eſtabliſhed by the Engliſh, French, and Spaniards, upon the weſtern coaſt, to the north of the equator. From thence to the tropic of Capricorn, the Portugueſe have a few ſettlements, upon the eaſt and the weſt coaſt, for the ſame purpoſe; and the Dutch ſettlement at the Cape of Good Hope,

Cauſes that interrupted the diſcoveries in Africa.

European ſettlements.

Africa. Hope, is the only eſtabliſhment at all worthy of the name of a European colony, retaining the language and ſomewhat of the manners of the parent ſtate.

What is known of the interior of Africa, is chiefly the reſult of the efforts of particular travellers, who have penetrated into different quarters of that great continent, impelled by the ambition of extending the limits of human knowledge; or it is the fruit of the exertions of a private ſociety of perſons of rank in England, inſtituted in 1788, bearing the name of the *African Aſſociation*, who have employed, at their expence, various individuals to enter Africa at different points, and to proceed by ſuch routes as have been thought moſt likely to lead to important diſcoveries.

African Aſſociation.

We ſhall now give a conciſe account of the great continent of Africa, ſo far as a knowledge of it has been obtained from theſe different ſources. In the ſtatement now to be given, however, we ſhall avoid taking any farther notice of that fertile ſtripe of territory on the north of Africa, which borders upon the Mediterranean ſea, or upon the Atlantic ocean, ſouthward to the mountains of Atlas, conſtituting the ſtates of Egypt, Tripoli, Tunis, Algiers, Fez, and Morocco. Neither ſhall we take any notice of the country of Abyſſinia at the head of the Nile, or of the Dutch ſettlement of the Cape of Good Hope, as each of theſe will be ſeparately diſcuſſed under their proper names.

Diviſions of Africa. Africa, to the ſouth of the ſtates on the Mediterranean and of Morocco, conſiſts of two great diviſions, the *Sahara*, or great deſert, which is the country of the Moors or Arabs; and *Nigritia*, *Negroland* or the country of the Negroes or Æthiopians. The limits of theſe two diviſions, though not in all caſes accurately defined, depend on the ſoil and climate, and appear to have remained permanent from the days of Herodotus.

Sahara, or great deſert. The Sahara, or great deſert, extends from the ſouth of Morocco and of the ſtates on the Mediterranean, commonly called the Barbary States, to the rivers Senegal and Niger, or to a line drawn acroſs the continent of Africa, from Cape Verd to the Red ſea. Beyond the Sahara or deſert, to the ſouthward, is the country of the Negroes.

The Sahara preſents a ſurface equal in extent to nearly one half of Europe. It is upwards of 800 miles in breadth from north to ſouth, and more than double that extent in length from the Atlantic ocean on the weſt, to the frontiers of Abyſſinia on the eaſt. Its general deſcription is that of a vaſt wilderneſs of lifeleſs ſand, parched by the intolerable heat of an almoſt vertical ſun. Its chief varieties conſiſt of immenſe plains covered with naked pebbles, or of barren rocks towering towards an unclouded and burning ſky. The ſterility of the ſoil is rather marked than alleviated by ſome ſcattered plants, and by the verdure of a few valleys in which water either ſtagnates or ſprings up.

This general deſcription, however, of the great African wilderneſs, is by no means to be underſtood as univerſal or without exception. The deſert is here and there interſperſed with ſpots of aſtoniſhing fertility, which are crowded with inhabitants. Every thing in the climate of Africa is in extremes. No cold is indeed experienced in that vaſt continent; but barrenneſs and fertility of ſoil border upon each other with a degree of ſuddenneſs, of which, in the temperate climates of Europe, we have no conception. The traveller paſſes in an inſtant from burning ſands to a rich landſcape, in which flocks and herds, and towns and villages abound. The ſame vicinity of a tropical ſun which renders the wilderneſs intolerable, rears up all vegetable productions in the utmoſt luxuriance and perfection, in every ſpot in which water and a tolerable depth of ſoil are to be found. Theſe ſequeſtered ſituations in this great deſert were called *Oaſes*, or *Iſlands*, by the ancients. Under the Roman empire it was not unuſual to baniſh ſtate criminals to an iſland in the great Libyan deſert. The continent of Africa, like that of South America, is higheſt on its weſtern ſide, and its greater rivers the Senegal, the Gambia, and the Niger, riſe in a chain of mountains ſituated nearer to the Atlantic than the Indian ocean. As the Sahara extends towards the eaſt, and alſo towards the ſhores of the Mediterranean on the north, its iſlands abound moſt in theſe regions. But the leſſer iſlands are not always permanent. A furious wind from the deſert, bringing along with it an immenſe quantity of ſand, ſometimes overwhelms a whole fertile diſtrict, and reduces it to barrenneſs. We ſhall here take notice, however, of ſuch of the ſequeſtered iſlands of this deſert as are now known to be moſt important.

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Oaſes, iſlands or fertile ſpots in the deſert. The ancients mention very particularly under the name of Oaſis three ſituations, called *the Greater Oaſis*, *the Leſſer Oaſis*, and *the Oaſis of Ammon*. Of theſe the Greater Oaſis is at preſent the beſt known to the Egyptians and the Arabs, becauſe the caravans from Cairo to Darfur paſs along it. It is named *Al-Wah*, or *the Oaſis*, by way of excellence. It appears to conſiſt of a number of detached fertile ſpots or iſlands, extending in a line parallel to the courſe of the Nile, and of the mountains that border the valley of Upper Egypt. The iſlands of the Greater Oaſis are ſeparated from each other by deſerts of from two to 14 hours travelling. The whole extent of the chain is about 100 Engliſh miles, but by far the greateſt part of it is deſert. The whole Oaſis is ſubject to Egypt, and has ever been reckoned an appendage to it, being diſtant from it about 90 miles. This Oaſis contains abundance of date trees, and plenty of good water. The principal village in it is called *Chagré*, and is ſituated in 26° 25′ N. Lat. and 29° 40′ E. Long.

The Leſſer Oaſis does not lie in any of the tracks of the caravans, and is therefore little known. It is underſtood, however, to begin at the diſtance of about 40 miles to the northward of the Greater Oaſis, and to proceed to a conſiderable diſtance in a direction towards the north. It is called by the neighbouring Arabs *Al Wah-el-Gherbi*, which appears to mark poverty or inferiority, perhaps in compariſon with the other. It conſiſts, like the Greater Oaſis, of a chain of narrow iſlands running parallel to the Nile.

Temple Jupiter Ammon. The third Oaſis contained the celebrated temple and oracle of Jupiter Ammon, which was viſited by Alexander the Great. Though in its dimenſions it is perhaps leſs than the two former Oaſes, it is undoubtedly the greateſt, ſo far as hiſtorical importance is concerned. In the time of Herodotus, the ſtate or kingdom of Ammon occupied a conſiderable ſpace betwixt Egypt on the eaſt and the deſert of Barca on the weſt, and between the Nomadic tribes along the coaſt of the Mediterranean on the north, and the great

Libyan

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Libyan deſert on the ſouth.—As the ancient Perſians worſhipped one ſupreme deity whom they repreſented by the ſun, and as they had a regular and well diſciplined prieſthood, they were taught to regard with indignation the idolatry of the Greeks. Hence the Perſian monarch Cambyſes ſent an army againſt the Ammonians, with orders to burn the temple from whence the oracles of Jupiter were delivered. The expedition was unſucceſsful, the army having been overwhelmed with ſand, or left by their guides to periſh in the deſert; ſo that no remnant of them ever returned.—The poſition of the Oaſis of Ammon has lately been aſcertained by our countryman Mr Brown, who travelled into that quarter with a view to its diſcovery. It appears to correſpond with the modern Siwah, in 29° 12′ N. Lat. and 26° 18′ E. Long. As a building of ſuch antiquity muſt be an object of great curioſity, we ſhall tranſcribe Mr Brown's deſcription of the ſmall part of the temple that remains, the reſt having been deſtroyed by the modern inhabitants of the country to build their houſes and garden walls. "It is a ſingle apartment," ſays Mr Brown, "built of many ſtones of the ſame kind as thoſe of which the pyramids conſiſt, and covered originally with ſix large and ſolid blocks that reach from one wall to the other. The length I found 32 feet in the clear, the height about 18, the width 15. A gate ſituated at one extremity forms the principal entrance, and two doors alſo near that extremity open oppoſite to each other. The other end is quite ruinous; but, judging from circumſtances, it may be imagined that the building has never been much larger than it now is. There is no appearance of any other edifice having been attached to it, and the leſs ſo, as there are remains of ſculpture on the exterior of the walls. In the interior are three rows of emblematical figures, apparently deſigned to repreſent a proceſſion; and the ſpace between them is filled with hieroglyphic characters, properly ſo called. The ſoffit is alſo adorned in the ſame manner; but one of the ſtones which formed it is fallen within, and breaks the connection. The other five remain entire. The ſculpture is ſufficiently diſtinguiſhable; and even the colours in ſome places remain."

Mr Brown's deſcription of the temple.

Mr Horneman, a native of Germany, a traveller employed by the African Aſſociation, has ſtill more recently viſited Siwah on his way from Cairo to Fezzan along with a caravan, in which he travelled under the character of a Mahometan merchant. He ſeems to think, that the total circumference of the ruins of the ancient temple of Jupiter Ammon may be ſeveral hundred yards, though in many places the outward wall has been entirely carried away. He ſeems to have meaſured the outſide of the ſame building whoſe inſide appears to have been meaſured by Mr Brown, and accordingly deſcribes the length as from 30 to 36 feet, the width 24, and the height 27; but he was interrupted in taking his meaſurements by the jealouſy of the natives. He alſo deſcribes the ceiling as formed of vaſt blocks of ſtone of four feet in breadth, and three feet in depth, which extend acroſs the whole building; and this roof ſeems to have preſerved this part of the fabric entire, as the preſent barbarous inhabitants dare not attempt to demoliſh the walls, leſt they themſelves ſhould be overwhelmed by the fall of the ſtones which form the roof. One of theſe ſtones of the roof has fallen in, and is broken; "but the people, ſays Mr Horneman, have not been able to remove the large fragments fallen from the roof, which their anceſtors were enabled to bring from the quarry, and to raiſe entire to the ſummit of the edifice: ſuch are the viciſſitudes of art, of knowledge, and of human powers and means, as well as of human happineſs and fortunes."

Mr Horneman's.

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The fertile part of the territory of Siwah appears to be about 18 miles in circumference, containing ſeveral ſmall villages beſides Siwah the capital. It is an independent ſtate, acknowledging the Grand Seignior as lord paramount, but paying no tribute. It affords abundance of vegetable productions, with corn and oil; and is copiouſly ſupplied with water from ſprings and ſmall ſtreams, but none of them flow beyond its territory. They are either evaporated on approaching the ſurrounding deſert, or, if they reach it, are loſt in the ſterile ſand. Its government is veſted in about 32 wealthy citizens, who aſſume the title of *ſcheiks*. Juſtice is adminiſtered according to ancient uſage and general notions of equity. Fines, which are paid in dates, conſtitute the puniſhment. The dreſs of the men conſiſts of a white cotton ſhirt and breeches, and a large piece of callico cloth ſtriped white and blue, manufactured at Cairo, which is thrown over the left ſhoulder, and is called *melaye*. On their heads they wear a cap of red worſted or cotton, which is the diſtinction of a Muſſulman, no Jew or Chriſtian being permitted to uſe it. The women of Siwah wear wide blue ſhifts, uſually of cotton, which reach to the ancles, and a melaye, above deſcribed, which they wrap round their head, and which falls over the body like a cloak. They plait their hair into three treſſes one above the other, and faſten little bells to the loweſt. They wear ear-rings and necklaces of glaſs beads. Thoſe of the higher claſs wear round their necks a ſolid ring of ſilver thicker than the collar uſually worn by criminals in ſome parts of the continent of Europe. There are many catacombs in the neighbourhood of Siwah, which formed the burying places of the ancient inhabitants, which ſhow great labour and neatneſs of work.

State of Siwah.

Government.

Dreſs.

The ſame traveller, Mr Horneman, on his way towards Fezzan, paſſed through Augila, an iſland or oaſis in the deſert, that was well known in the days of Herodotus. It is ſituated in 33° 3′ N. Lat. and 22° 46′ E. Long. The territory contains three towns, Augila the capital, Mojabra, and Meledila. Many of the inhabitants engage in the caravan trade. Thoſe who do ſo, very frequently have three houſes, one at Cairo, one in the territory of Augila, and a third in Fezzan, with a wife and family eſtabliſhment at each. The country is level, and the ſoil ſandy, but being well watered it is tolerably fertile. After a march of 16 days from Augila, Mr Horneman reached Temiſſa, in the territory of the important oaſis Fezzan, of which we ſhall now give ſome account upon the authority of the journal which he has very recently tranſmitted to Europe.

Oaſis of Augila.

Fezzan, the country of the ancient Garamantes of Herodotus, called by Pliny *Phazania Regio*, is upwards of 1100 miles weſt from Grand Cairo, and conſiſts of an extenſive plain amidſt a ſurrounding wilderneſs of ſand and of naked rocks.

Oaſis of Fezzan.

The greateſt length of the cultivated part of Fezzan

Africa. is about 300 Engliſh miles from north to ſouth, and its greateſt breadth from eaſt to weſt is 200 miles. It contains 101 towns and villages, of which Mourzouk is the capital, ſituated according to Rennel, in 27° 48′ N. Lat. and 15° 3′ E. Long. The principal towns to the northward of the capital are Sochna, Sibha, Hun, and Wadon; Gatron to the ſouth; and Quila to the eaſt. The climate is never temperate. During ſummer the heat is intenſe, and the ſouth wind is ſcarcely ſupportable even by the natives. A penetrating north wind prevails during winter, which drives to the fire even the natives of a northern country. Tempeſts of wind are frequent, which whirl up the ſand and duſt ſo as to give a tinge of yellow to the atmoſphere. Rain falls ſeldom, and in ſmall quantities. There is no river, nor even a rivulet deſerving notice, throughout the whole country. The ſoil is what in Europe would be called a light ſand, covering calcareous rock or earth, and ſometimes a bottom of clay.

Productions of Fezzan. Dates are the ſtaple produce of Fezzan, and in the weſtern parts ſome ſenna of a good quality is cultivated. Pot herbs are plentiful. Wheat and barley are ſuited to the ſoil and to the climate: but from the indolence of the people, and the oppreſſion of the government, enough is not raiſed for the ſupply of the inhabitants, and they rely for a part of their ſubſiſtence on importations from the north. Horned cattle are only found in the moſt fertile diſtricts. They are employed in drawing water from the wells, and are only ſlaughtered in caſes of extreme neceſſity. The goat is the ordinary domeſtic animal, though ſheep are bred in the ſouthern parts. The wool is manufactured into coarſe cloths, and along with the meat the ſkin is roaſted and eaten. Horſes are few. Aſſes are the beaſts of general uſe, whether for draught or burden. Camels are exceſſively dear, and only kept by the chief people.

Mechanics of Fezzan. There are no other tradeſmen in Fezzan than ſhoemakers and ſmiths, the latter of whom work every metal; and the ſame man forges ſhoes for the ſultan's horſe, and makes rings for his princeſſes. The value of the woollen cloth, which is manufactured by the women, may be eſtimated from this circumſtance, that the weavers ſhuttle is unknown, and that the woof is inſerted into the warp thread by thread, and the whole worked ſolely by the hand. Hence it happens, that though the commerce of Fezzan is conſiderable, it conſiſts merely of foreign merchandiſe, brought by caravans from various quarters, which are here diſpoſed

Trade. of as at a centrical market. Cairo ſends ſilks, calicoes, woollen cloths, glaſs, imitations of coral, beads, and Eaſt India goods. From Tripoli, a caravan brings paper, falſe corals, fire arms, ſabres, knives, cloths called *abbés*, and red worſted caps. From Bornou, on the ſouth-eaſt, copper is imported in great quantities, and the caravans from the ſouth or weſt bring ſlaves of both ſexes, oſtrich feathers, zibette, tigers ſkins, and gold, partly in duſt, partly in native grains, to be manufactured into ornaments for the people of interior Africa. The ſmaller caravans of the tribes of the deſert import oil, butter, fat, and corn, and thoſe from the more ſouthern diſtricts bring ſenna, oſtrich feathers, and camels for the ſlaughter-houſe.

Government. Fezzan is governed by a ſultan, deſcended from the family of the ſhereefs; but he pays 4000 dollars annually, as a tribute to the baſha of Tripoli; and in his correſpondence with that baſha, he aſſumes only the Africa. title of ſcheik, inſtead of ſultan. The throne is hereditary, but the eldeſt prince of the family ſucceeds, though a brother or a nephew, to the excluſion of the children of the laſt ſultan, if they are younger. This law gives riſe to many civil wars between the ſons of their ſultans and the collateral branches of the family.

Palace and harem. The ſultan's houſe or palace is within the fortreſs of Mourzouk. He has no other inmates than eunuchs. His harem is contiguous. It conſiſts of about 40 ſlaves, who are often ſold and replaced by others if they have no children, and of a ſultana, who muſt be of the family of the ſhereefs of Wadan or Zuila. The ſultan never enters the harem, but any female whom he wiſhes to ſee is conducted to his apartment.

Ceremonies. The ſultan gives audience three times a-day, in a particular apartment, ſeated on an old-faſhioned elbow chair, raiſed ſome ſteps, which forms his throne. Perſons introduced kiſs the hand of the ſultan, then raiſe it ſo as to touch their foreheads, and then kneel before him. The ſultan goes on Fridays to the great moſque on horſeback, and on other days of ſolemnity he rides on a plain near the town, attended by his courtiers, who exhibit their ſkill in equeſtrian exerciſes and in ſhooting. His official attendants conſiſt of two miniſters, and of a number of black and a few white ſlaves, termed Mamelukes. All the intereſt and power reſt with theſe Mamelukes, who are moſtly Europeans, or their immediate deſcendants. The apparel of the Dreſs of the ſultan. ſultan, on days of ceremony, conſiſts of the Tripolitan dreſs, over which he wears a large white embroidered ſhirt, made after the faſhion of the Negroes. His turban extends a full yard from the front to the hinder part, and is two thirds of a yard in breadth. His re- Revenue. venues conſiſt of aſſeſſments on all cultivated lands, and of arbitrary requiſitions, which are collected by his ſlaves in an oppreſſive manner, if they are not bribed. He alſo derives an income from duties on foreign trade, from certain territorial domains, and from ſalt pools and natron lakes. The preſent ſultan has added to his treaſures by predatory expeditions againſt the weaker tribes in the neighbourhood of his country. The chief booty upon theſe occaſions conſiſts of men and women, who are ſold as ſlaves. The princes of the royal family are ſupported from certain territories allotted to them, together with a weekly diſtribution of corn from the ſultan's ſtores, and occaſional exactions from the people.

The clergy, and the cadi or chief judge, are ſupported by the produce of certain woods and gardens; and they poſſeſs great authority with the people. The dignity of cadi is hereditary in a certain family; but the ſultan, upon every vacancy, appoints to the office that individual of the family who can beſt read and write, accompliſhments which here ſeem to be ſomewhat unuſual, and therefore much valued.

Population. The population of Fezzan amounts to about 70,000 or 75,000 ſouls. In the ſouthern diſtricts they have mixed with the natives of the deſert, whom they reſemble; but the original Fezzanians are a people of ordinary ſtature, of a deep brown complexion, with ſhort black hair and regular features. They poſſeſs little energy Character. either of mind or body. Almoſt their only food conſiſts of dates, or of a kind of farinaceous pap, with no butcher's meat. The men who can afford it are much addicted

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addicted to drunkenneſs. They uſe a very intoxicating liquor prepared from dates. The women have a great fondneſs for dancing, which they practiſe publicly, not only in the day time but after ſunſet. The amuſement is thus deſcribed by Mr Horneman: "Two or three men ſtand together with their tambourins; the women immediately form a circle round the men, beat a tune, and thoſe in the circle accompany it with ſinging and clapping of hands. A girl then advances dancing towards the drummers; the men, as ſhe approaches near them, join in the dance, and preſs towards her; on which ſhe makes ſome ſteps backwards, and then falls on her back with her body and limbs ſtiff and perfectly ſtraight; when the women behind catch her in the fall, a few ſpans from the ground, and toſs her in the air, whence ſhe deſcends on her feet. The men then reſume their ſtation in the centre, and a ſecond female dancer repeats the ſport, which is ſucceſſively engaged in by each briſk damſel of the circle."

Habits and amuſements.

Dancing.

Muſical inſtruments

In Fezzan there are great numbers of looſe women, and alſo of ſinging girls whoſe ſong is Sudanic, that is derived from the country of the Negroes. Their muſical inſtrument is called *rhababe;* it is an excavated hemiſphere, made from a ſhell of the gourd kind, and covered with leather; to this a long handle is fixed, on which is ſtretched a ſtring of horſe hairs longitudinally, cloſed and compact as one cord, about the thickneſs of a quill. This is played with a bow.

Diſeaſes.

Various ſorts of venereal diſorders prevail in Fezzan; but it is worthy of remark, that, for the cure of all the ſpecies, they only uſe ſalts and the fruit *handal* (colycinth) as powerful cathartics; the ſores, if any, are at the ſame time waſhed with a ſolution of ſoda; and theſe remedies ſeldom fail. Other maladies prevalent there are the ague and hæmorrhoids, for neither of which have they any other remedy than amulets, conſiſting of certain ſentences of the Koran written on a ſlip of paper, which the patient wears about his neck, and in bad caſes is made to ſwallow. It is ſaid, however, that their knowledge of ſurgery is ſufficient to enable them to cure a ſimple fracture.

Empire of Caſſina.

South from Fezzan a variety of other iſlands are ſcattered, which have been united by conqueſt under one chief, and receive the name of the empire of Caſſina or Kaſſeena. The territories of this empire, therefore, conſiſt of a conſiderable quantity of land of amazing fertility, interſperſed with arid waſtes, where the rays of the ſun, reflected from the ſand or the rocks, produce the moſt intenſe and ſuffocating heat. Caſſina, the capital, is ſituated in N. Lat. 16° 20′. W. Long. 11° 45′. Agadez, which is an iſland, or province as it may be called, of the empire of Caſſina, ſends annually a caravan of 1000 camels to certain ſalt lakes in the deſert, at a place called Domboo; and the ſalt is diſtributed among the other iſlands or provinces of this empire.

Trade in ſalt.

Bornou.

A ſimilar empire, as travellers are pleaſed to call it, conſiſting of a number of fertile ſpots of this immenſe deſert, is called Bornou. Mathan, the capital, is ſituated in N. Lat. 24° 32′. E. Long. 22° 57′. It is ſurrounded by a ditch, and a wall 14 feet in height. The king is ſaid to be more powerful than the emperor of Morocco. His dominions extend beyond the deſert into the fertile country of the Negroes, of which he poſſeſſes a large portion. He is elected by three of the principal chiefs; but the choice is reſtricted to the royal family. The military force of the ſtate conſiſts of cavalry armed with the ſabre, the pike, and the bow. Fire arms are not unknown, but they are too difficult to be procured.

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Beſides theſe, there is a variety of other diſtricts in this deſert, of which ſome ſlight intelligence has been obtained; ſuch as Gadamis, north-weſt from Fezzan, about N. Lat. 32°; ſouth-eaſt from which is another iſland, called *Tuat*, at the diſtance about 400 miles. On the ſouth-eaſt of Fezzan is Tibeſti, at the diſtance of 200 miles: eaſtward of which, and 500 miles from the Nile, is Bardoa. Zegzeg and Kuar are in the ſame vicinity. Farther to the ſouth is Bergoo and Darfoor. This laſt lies to the ſouthward of the general latitude of the great deſert. It has of late years been made known by Mr Brown, the firſt diſcoverer of the Oaſis of Ammon. He penetrated into Darfoor in 1792, and remained there a conſiderable time. Its chief town, Cobbé, is ſituated in 14° 11′ N. Lat. and 28° 8′ E. Long. and the country contains about 200,000 inhabitants, conſiſting of native tribes of a deep black complexion and woolly hair, though with features different from thoſe of the Negroes, and of Arabs of various tribes. The wild animals are, the lion, the leopard, the hyæna, the wolf, and the wild buffalo. The domeſtic animals are, the camel, the ſheep, the goat, and horned cattle. Conſiderable quantities of grain of different ſorts are reared, and, as the country is within the tropics, after the periodical rains the fertility is very ſudden and great. The people are very barbarous. The practice of polygamy is not only eſtabliſhed, but the intercourſe of the ſexes is totally deſtitute of delicacy or decency. The moſt ſevere labours of the field are left to the women; and the houſes, which are of clay covered with thin boards, are chiefly built by them. Salt is the general medium of commerce at Darfoor, as gold duſt is in many other places of Africa. This territory is governed by a chief, who calls himſelf ſultan, and aſſumes the moſt extravagant titles. He appears in public on a ſplendid throne, while an officer proclaims, "See the buffalo, the offspring of a buffalo, the bull of bulls, the elephant of ſuperior ſtrength, the powerful ſultan Abd-el-rachman-el-raſhid. May God preſerve thy life! O maſter, may God aſſiſt, and render thee victorious!"

Darfoor.

Sultan of Darfoor.

Extraordinary titles.

Theſe iſlands of the African deſert are too little known to render valuable any attempt at a more minute deſcription of them. They all reſemble each other in the fertility of their ſoil and the barbarous ſtate of their inhabitants, who are Mahometans, unleſs where they approach the country of the Negroes. Though they maintain towards each other the maxims of apparent hoſpitality, yet a Chriſtian is everywhere odious; and they account it meritorious to perſecute or enſlave him. Their language is chiefly a dialect of the Arabic, and their literature is in a great meaſure confined to reading the Koran. Their only intercourſe with other nations is carried on by the caravans which periodically traverſe theſe immenſe deſerts: and the ſmaller iſlands that are neglected by the caravans are ſometimes abſolutely forgotten by the reſt of the world for many years; and their inhabitants, left to themſelves and to their native ignorance, at laſt imagine

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gine, that except their own little territory, the whole earth reſembles the great deſert which they ſee around them.

Tribe of Monſelemines in Weſtern Africa.

It is to be obſerved, that the Sahara, or great wilderneſs, does not on its weſtern boundary all at once attain its utmoſt degree of barrenneſs. Immediately to the ſouth of Morocco and of the mountains called Mount Atlas, is a conſiderable extent of territory inhabited by a tribe called the *Monſelemines*. In their manners, they differ conſiderably from the Moors on the coaſts of the Mediterranean, and alſo from the Moors or Arabs of the deſert. Their civil government is republican, as they chooſe new chiefs every year, who are accountable to the aged men of the community. It is probable, however, that order is preſerved among them chiefly by the influence of their prieſts, who are greatly reſpected; and the influence of the high prieſt amounts almoſt to deſpotic power. The people are chiefly engaged in a ſort of paſtoral life, to which agriculture is occaſionally united. They have alſo villages in which various tradeſmen reſide, chiefly weavers, ſhoemakers, ſmiths, and potters, who have no cattle: But ſome opulent perſons reſiding in the towns have flocks and herds of cows, horſes, camels, ſheep, and goats, beſides poultry, kept by ſlaves at a diſtance in the country. The ſoil poſſeſſes conſiderable fertility, and produces the neceſſaries of life with little cultivation. The plains abound with date, fig, and almond trees; and grapes are cultivated. Oil, wax, and tobacco, are alſo produced, and ſold in the villages. Their agriculture is very rude. The chiefs of families, or ſmall tribes, chooſe the ground moſt fit for cultivation. Its ſurface is ſlightly turned over with a kind of paddle, for the plough is unknown; and then the ſeed is ſown upon it. The ſpot is then deſerted by the inhabitants, who wander in all directions with their cattle, and do not return till harveſt, when the corn is cut down and threſhed. Magazines are then formed, conſiſting of holes in the earth, into which the corn is put. Planks are laid over it, which are covered with a layer of earth, made level with the ſoil, to prevent its being diſcovered by enemies. Theſe magazines belong to every chief of a family or tribe, in proportion to the number of men he employed in the common labour.

Government.

Productions.

Rude agriculture.

Wars.

The Monſelemines are almoſt conſtantly engaged in war againſt the emperor of Morocco. They are extremely jealous of their independence and freedom; and their country is the retreat of all the diſcontented Moors. No ſooner does the emperor of Morocco take the field againſt them, than the whole inhabitants of the country diſtricts mount their horſes; and, while a part of them eſcort the women and ſlaves, and cattle, to places of ſafety, or even into the deſert if they are cloſe preſſed, the reſt of them occupy the paſſes of the mountains, and meet the enemy. During peace, parties of them often undertake to eſcort caravans, by which means there is preſerved among them a conſiderable military ſpirit. In other reſpects, they bear a great reſemblance to the ancient Arabs. They permit polygamy, but their women are not ſo much ſecluded from ſociety as among the Moors on the ſea-coaſt. Their children are brought up with care; and are not conſidered as men till they exhibit ſome proofs of their courage. Jews are permitted to live among them in their villages, but they are not allowed to cultivate the earth, or to carry arms. Chriſtians are much hated; but a Chriſtian ſlave is better treated than among the other Arabs, becauſe the avarice of the Monſelemines is greater than their fanaticiſm. As their ſlaves conſtitute their riches, they treat them tolerably well from a principle of prudence.

Manners.

To the ſouth of the country of the Monſelemines, upon the coaſt of the Atlantic, is the wandering tribe of *Wadelims*; to the ſouth of whom are the *Labdeſſebas*: And next to theſe are the *Traſarts*, who border with the country of the Negroes. Eaſtward along the northern frontier of the Negroes lie the Mooriſh ſtates of *Jaffnoo*, *Ludamar*, and others. With the exception of theſe ſmall ſtates, it is to be obſerved, that the great deſert, or Sahara, reaching from the Atlantic ocean to the frontiers of Abyſſinia, and from the vicinity of the Mediterranean to the country of the Negroes, is poſſeſſed by two great Mooriſh nations called the *Tuarick* and the *Tibbo*. Of theſe the Tuarick is the moſt powerful: It conſiſts of the whole deſert weſtward from the meridian of Fezzan. The deſert, of Sahara, eaſtward from the ſame meridian belongs to the Tibbo. The manners and character of the whole of theſe tribes, whether great or ſmall, is nearly or altogether ſimilar. The deſert which they inhabit is parched and uncultivated. Many places of it have the appearance of being capable of cultivation, as ſhrubs grow in various ſituations; and palms, or dates, riſe at diſtant intervals. But the flying ſand is the great obſtacle to cultivation, by rendering the reſult of it uncertain. The ſand drifts with every gale, and is at times accumulated into high mountains, which diſappear as the winds blow. Thus it is ſhifted about with every change of the blaſt, excepting when the air is entirely ſtagnant. When the ſand ſhower becomes formidable, the Moors are obliged to load their camels, turn their backs to the gale, and haſten away, to avoid being buried alive.

Tuarick and Tibbo.

As water is very ſcarce in the deſert, the Arabs or Moors form large holes for refervoirs to collect the rain water, which, though it ſoon becomes putrid and diſguſting, is the only drink of man or beaſt. From the ſcarcity of water, they have few horned cattle; and their flocks conſiſt chiefly of ſheep, goats, and camels, animals which are patient of thirſt. None but the wealthieſt Arabs, who poſſeſs numerous herds, are able to maintain horſes, as it is often neceſſary to give them milk to drink inſtead of water. The urine of the camels is carefully preſerved to waſh the veſſels uſed to contain food; and the Arabs are frequently under the neceſſity of drinking it, mixed with milk, for the purpoſe of allaying thier thirſt. As their riches conſiſt of their herds and flocks, they attend them with the greateſt care. If a beaſt be ſick, it is attended with more anxiety than a man; but if it ſeem likely to die, they kill and eat it. If it die before its blood be ſhed, it is accounted unclean, and is never eaten.

Animals of the deſert.

The Sahara or deſert, abounds in antelopes, wild boars, leopards, apes, and ſerpents. The Arabs or Moors are expert hunters, and, as the leopard's ſkin is an article of commerce, that animal from being frequently attacked, learns to keep at a diſtance from their habitations. Hunting the oſtrich is a favourite amuſement. It is undertaken by about twenty horſemen who

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who advance in a line againſt the wind, at the interval of a quarter of a league behind each other. As ſoon as the foremoſt perceives an oſtrich, he ruſhes upon it. The oſtrich cannot fly; but with the aſſiſtance of its wings, it runs in the direction of the wind, and, though it may avoid a few of the Arabs ſucceſſively, cannot eſcape the whole number. In their hordes, the Moors or Arabs lodge by families in tents covered with a cloth of camels hair, which the women ſpin and weave. The furniture of the tent conſiſts of two large ſacks of leather, in which they keep their clothes and pieces of old iron, a few goat ſkins for holding milk and water, two large ſtones for grinding their barley, a mattreſs of oſier which ſerves for a bed, a carpet for a covering, a ſmall kettle and ſome wooden diſhes, with pack ſaddles for their camels. They often aſſociate to convey ſalt, which abounds in the deſert, into the country of the Negroes; for which, in return, they bring back proviſions and blue cotton cloth and ſlaves. They alſo aſſociate for war and for hunting; and in moſt caſes, where the property acquired conſiſts of goods which can be packed up into parcels, they divide it into ſhares, which they cover up, and fix upon a woman, a child, or a ſtranger, who knows nothing of the contents of the various parcels, to diſtribute them by hazard to the different aſſociates of the enterpriſe.

Hunting the oſtrich.

The Arabs live in tents.

Furniture.

Trade.

War.

Diviſion of ſpoil.

Artificers.

The only artificers among the Moors of the deſert, are ſmiths, or a kind of tinkers, who go among them from the country of the Monſelemines to mend their broken veſſels, or repair their arms, and are paid in ſkins, goats and camels hair, or oſtrich feathers, according to agreement. All of them are more attentive to their arms than to their dreſs; the latter of which often conſiſts only of a long blanket which they wrap round them, with a cloak of camels hair, and more frequently of goats ſkins. They wear looſe frocks or ſhirts, however, of blue cotton cloth, if they can procure them from the Negroes, by whom this cloth is manufactured. Their arms conſiſt of daggers and clubs, with ſabres and muſkets if they can obtain them. To this general deſcription of poverty, however, ſome of the Moors of the great inland nation or tribe of Tuarick form an exception, in that part of the deſert which borders upon Fezzan, where they have an opportunity of acquiring wealth by engaging in the caravan trade. Mr Horneman ſaw at Fezzan many individuals of the Hagara, one of the tribes of the Tuarick, and deſcribes them thus: "The Hagara are yellowiſh, like the Arabs; near Soudan, there are tribes entirely black. The clothing of this nation conſiſts of wide dark blue breeches, a ſhort narrow ſhirt of the ſame colour, with wide ſleeves, which they bring together and tie on the back of their neck, ſo that their arms are at liberty. They wind a black cloth round their head in ſuch a manner, that at a diſtance it appears like a helmet, for their eyes only are ſeen. Being Mahometans, they cut off their hair, but leave ſome on the top of the head, round which thoſe who wear no cap contrive to fold their black cloth, ſo that it appears like a tuft on their helmet. Round their waiſt they wear a girdle of a dark colour. From ſeveral cords which fall from their ſhoulders hangs a Koran in a leather pouch, and a row of ſmall leather bags containing amulets. They always carry in their hands a ſmall lance neatly worked, about five feet long. Above the left elbow, on the upper part of the arm, they wear their national badge, a thick black or dark-coloured ring of horn or ſtone. Their upper dreſs is a Soudanian (Negro) ſhirt, over which a long ſword hangs from the ſhoulder. The travelling merchants of this nation carry fire arms, though others uſe only the ſword, the lance, and the knife, which they carry on their left arm; but the handle is finely worked; for they have the art of giving to copper as bright a colour as the Engliſh artiſts, and this art they keep very ſecret. They carry on a commerce between Soudan, (i. e. Nigritia), Fezzan and Gadamis. Their caravans give life to Mourzouk, which without them is a deſert; for they, like the Soudanians (Negroes) love company, ſong, and muſic. The Tuarick are not all Mahometans. In the neighbourhood of Soudan and Tombuctoo live the Tagama, who are white, and of the Pagan religion."

Dreſs.

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Hoſpitality is the moſt remarkable virtue of the Moors, or Arabs of the deſert. The chief of a horde is by cuſtom bound or entitled to entertain all ſtrangers; but every tent contributes to his ſtock of proviſions. When a ſtranger reaches an Arab horde, the firſt perſon who perceives him points out the tent of the chief. If the maſter is not preſent, the wife or the ſlave comes forth to meet him, and brings him milk to drink. His camels are then unloaded and his effects ranged around him. His arms are depoſited near thoſe of the maſter of the tent. The Arab, who in the field is a rapacious plunderer, in his tent is generous and hoſpitable; and the perſon of an enemy is inviolable, though he ſhould have killed the near kinſman of its maſter. All this, however, is chiefly to be applied to perſons of their own religion; for towards Chriſtians and Jews, their fanaticiſm renders them extremely intolerant. A Jew, more eſpecially, if diſcovered, can ſcarcely eſcape alive from among them.

Hoſpitality.

Polygamy is allowed among the Arabs of the deſert, as among other Mahometans; but it is very effectually reſtrained by the poverty of the people. Divorce is permitted at the will of either party; but if a male child is born, the marriage becomes indiſſoluble. In the education of children force is never employed. The prieſts, who are the teachers, inſtruct them to read the Arabic characters and ſentences of the Koran; but if the child become weary of the ſchool, he quits or returns to it at pleaſure, without being reproached.

Manners.

Education.

Property deſcends by inheritance in equal ſhares to the male children; but the females have no ſhare, and are obliged to reſide with their eldeſt brother. The chief of the horde becomes the guardian of the children who are left orphans. Property is ill ſecured by their cuſtoms. If a thief is caught in the fact he may be puniſhed; but if he eſcape with his booty, it cannot afterwards be claimed.

Mode of ſucceſſion to property.

The abſtinence and hardſhips which the Moors of the deſert are frequently under the neceſſity of encountering, and their habits of predatory war againſt paſſing caravans, or hoſtile tribes, bellow upon them an evident ſuperiority over the more peaceful tribes of Negroes who inhabit the fertile regions of the ſouth. They poſſeſs alſo the knowledge of writing, and of the Arabic language, which inſpires them with no ſmall confidence of the importance of their own character

Character of the Moors.

and

Africa. and accomplishments. Hence, they assume a haughtiness of gait, and a ferocity of aspect, which distinguishes them no less than their complexion from the Negroes in their neighbourhood. Such is the presumption resulting from these sentiments, that though a small party of Negroes would never risk themselves in the desert, one or two Moors will travel with impunity through all Africa, and plunder the Negroes by whom they have been entertained.

As the equator passes almost through the centre of Africa, by far the largest portion of that great continent is situated within the torrid zone, and is possessed by the Ethiopians and Negroes, who are called by the Arabs *Biled-al Soudan*, or *Biled al-Abiad*, the land of blacks, or the land of slaves. In all countries within the tropics, excessive rains fall twice every year about the time of the vernal and of the autumnal equinoxes. Periodical rains. At these periods every river is swelled into a mighty flood, and if the country be level it is completely inundated. From this circumstance, along with the heat of the climate, arises the extreme fertility of the middle regions of the globe.

Though the *Sahara*, or great Africa desert, extends a few degrees beyond the tropic of Cancer, yet its boundaries begin to be ill defined; fertile spots become more frequent: and at last, in the latitude of the Cape de Verd isles, and in the neighbourhood of the first rivers, the Senegal and the Niger, the gum forests mark the commencement of the land of the Negroes. Negroeland. About 600 miles from the western coast, in the mountains of Kong, the river Senegal takes its rise, and River Senegal. flows westward into the Atlantic ocean. The same mountains are the source of the great river of the Ethiopians, the Niger, the knowledge of which, from Niger. the time of Herodotus, seems to have been lost by the European nations, and has only been recently restored in consequence of the intrepid and persevering exertions of our countryman Mungo Park, who had been employed by the African Association to endeavour to discover whether its existence ought to be regarded as a reality or as an error of the ancient geographers. It runs eastward; but its termination, as will be afterwards noticed, is still unknown.

To the south of these rivers, all Africa belongs to various nations of Negroes, among whom considerable varieties of appearance and of character exist. In general, however, they are distinguished by short woolly hair, flat noses, thick lips, and black complexion, while their intellectual powers have been supposed by some to be inferior to those of the civilized European or Asiatic nations. Some modern writers, however, such as Bruce and Volney, are of opinion, that the elements of the arts and sciences came originally from Upper Egypt and Abyssinia, and the ancients appear to have ascribed to the Ethiopians the commencement of civilization among mankind. "The Thebans (says Diodorus) consider themselves as the most ancient people on the earth; and assert, that with them originated philosophy and the science of the stars. Their situation, it is true, is infinitely favourable to astronomical observation, and they have a more accurate division of time into months and years than other nations." The same opinion he attributes to the Ethiopians. "The Ethiopians conceive themselves to be of greater antiquity than any other nation; and it is probable that, born under the sun's path, its warmth may have ripened them sooner than other men. They suppose themselves also to be the inventors of divine worship, of festivals, of solemn assemblies, of sacrifices, and every other religious practice. They affirm that the Egyptians are one of their colonies; and that the Delta, which was formerly sea, became land by the conglomeration of the earth of the higher country, which was washed down by the Nile. They have, like the Egyptians, two species of letters, hieroglyphics and the alphabet; but among the Egyptians, the first was known only to the priests, and by them transmitted from father to son, whereas both species are common among the Ethiopians." "The Ethiopians (says Lucian) were the first who invented the science of the stars, and gave names to the planets, not at random, and without meaning, but descriptive of the qualities which they conceived them to possess; and it was from them that this art passed in an imperfect state to the Egyptians."

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But though the antiquity of the civilization of Egypt cannot be disputed, there is little reason to believe that the middle regions of Africa ever exhibited the human character in a higher state of cultivation than it now possesses there. In all ages its inhabitants were engaged No traces of former refinement found in Africa. in the barbarous practice of selling each other into slavery to distant nations. No remains of ancient magnificence are to be found in their country, nor any instruments of art which mark the genius of an improved people. Even the plough is still unknown, and the ingenuity of man is only exerted to supply his most simple wants.

A great part of the country of the Negroes receives among Europeans the name of Guinea, a term as old Ancient name. as the time of Ptolemy, who applies it to the maritime districts, though this name is said to be utterly unknown to the natives of the country themselves, excepting where they have learned it from European traders. It would appear, however, to have originated from one of the central states or empires of Africa, upon the banks of the Niger, which though once possessed of great power, has now fallen into decay, and is lost in the empire of Tombuctoo, and some neighbouring states.

The middle regions of Africa bring to maturity all Productions of the middle regions. the tropical productions or fruits in their utmost perfection and abundance. With the slightest cultivation, rice, maize, millet, sugar, cotton, indigo, &c. are raised, along with some fruits peculiar to itself, among which may be mentioned the shea-tree, from which the vegetable butter is prepared, which forms a principal article of commerce in all the interior districts. The shea tree is said to resemble the American oak; the Vegetable butter. butter is prepared from the kernel of the fruit. This kernel resembles a Spanish olive, and is enclosed in a sweet pulp under a thin green rind. It is dried in the sun, and then boiled in water. Travellers tell us that the butter produced from it is white, firm, and better flavoured than that of milk. If this account of it be correct, which we have no reason to doubt, measures ought certainly to be taken for conveying this tree to the European settlements in the West Indies, and for cultivating it there, as it would undoubtedly be very valuable when reared in the vicinity of the *bread fruit tree*, which has lately been brought from Otaheite.

Various

Africa.

Various ſpecies of wild beaſts inhabit this country, as lions, leopards, hyænas, elephants, buffaloes, wild boars, rhinoceroſes, with great variety of the ſpecies of deer, and various kinds of monkeys. Innumerable ſpecies of ſnakes are alſo to be found here; one of the moſt remarkable of which, called the *ſinyacki*, is of a pale green colour with black ſpots, about a foot in length, and as thick as a man's finger. It poſſeſſes the power of ejecting a ſubtile vapour into the eyes of any animal that approaches within the diſtance of two or three feet, ſo as to occaſion extreme pain for ſeveral days, and even incurable blindneſs. Another ſpecies of ſnake, ſaid to be found alſo in Ceylon, grows here to the enormous ſize of 50 feet in length; the colour of the back is dark gray, with lines of a duſky yellow: part of the belly is of a lighter colour and ſpotted: it lurks, in moiſt ſituations, wreathed into curls, which include a ſpace of about five feet diameter, and give it at a diſtance ſome reſemblance to the mouth of a well. Over theſe curious rings it rears its head and part of its body, and remains immoveable till ſome animal approach within its reach, when it darts upon it; and, if the animal is large, twiſts its body round it, and with an immenſe force cruſhes all its bones; and having lubricated it with ſaliva, ſwallows it entire. After having devoured in this manner a large animal, the ſnake remains as if lifeleſs for many days during the proceſs of digeſtion, and in this ſituation may be eaſily deſtroyed. The cameleon is alſo found in this country, along with an immenſe variety of reptiles. Of theſe, ants are the moſt formidable and deſtructive to man. They differ in ſize from an inch in length to a minuteneſs that is almoſt imperceptible to the naked eye. They ſometimes burſt from their neſts in ſuch innumerable myriads as to deſtroy every thing on the ſurface of the earth, and to oblige the natives to deſert their habitations. They often extinguiſh fires by their numbers, and form bridges of their own dead bodies over ſhallow waters which impede their progreſs.—One ſpecies forms ſwarms like bees, and erects round pyramids of clay which becomes extremely hard. Theſe pyramids are uſually eight or ten feet high. Their interior conſiſts of galleries ſuited to the ſize of the animal, interwoven like a labyrinth, having a ſmall opening as a door or entry to the dwelling.

Wild animals.

Snakes very deſtructive,

and of immenſe ſize.

The cameleon.

Immenſe myriads of ants.

Monſtrous ſpiders alſo exiſt in this country, a ſingle thread of whoſe web, it is ſaid, will ſupport a weight of ſeveral ounces.

Spiders.

The natives of this country have too little art or induſtry to take much advantage of the metals with which the earth is ſuppoſed in many places to abound. In ſome ſituations, however, they produce iron of a tolerable quality, but gold is the chief object of their ſearch. It does not appear, however, that they have ever wrought the mines of it which they have diſcovered to any depth, and it is chiefly procured from the ſands of the rivers or of torrents after violent rains. It is then collected in ſome diſtricts in conſiderable quantities, and forms an important article of commerce. Women chiefly engage in this employment, and an individual may collect in general during the dry ſeaſon, as much as is equal to the value of two ſlaves. The gold obtained is either uſed in commerce or wrought into ornaments for the women. The ſtandard of value is called *mankalli*, which is equal in value to about 10s.

Metals.

Iron and gold.

Africa.

In general, however, it may be remarked, with regard to all the natural productions of this continent, whether animal, vegetable, or mineral, that they ſtill remain in great obſcurity, and preſent a vaſt field for the inveſtigation of the natural hiſtorian.

Natural productions little known.

The general character of the Negroes, who are the inhabitants of theſe fertile regions, is that of extreme levity. It is ſaid, that they will dance for almoſt 24 hours together, and they do not ſuffer their gaiety to be diſturbed by events, which, in other countries, are productive of much unhappineſs. They do not appear to want the feelings of humanity, nor are they more deſtitute of ſagacity than other men and women of an equal degree of education; but the general fertility of their country, which ſupplies them with food in conſequence of the exertion of a very ſlight degree of induſtry, and the little occaſion they have for clothing amidſt the heat of their climate, produces an indolent and general habit of ſeeking preſent pleaſure, and of baniſhing from their minds all care for the future.

Character of the Negroes.

The kind of government that exiſts among the Negro nations is by no means uniform. In many diſtricts the country is governed by an immenſe multitude of independent petty chiefs, who are engaged in frequent wars with each other. In other places the talents of individual chieftans have been able to reduce conſiderable tracts of territory under their dominion. In ſuch caſes, in conſequence of the internal tranquillity produced by the extenſion of the prince's power, flouriſhing towns have grown up. Thus upon the Niger ſtands the town of Sego the capital of Bambara, which was viſited by Mungo Park, and which lies in N. Lat. 14° 10′, and W. Long. 2° 26′, containing about 30,000 inhabitants. Two hundred miles below this upon the ſame river ſtands Tombuctoo, the great centre of the commerce of Fezzan, Cairo, and the countries on the north of Africa, with the land of the Negroes. Farther down the ſame river ſtands Houſſa, which is underſtood to be a city of ſtill greater extent. Many of the Negro towns are fortified with ditches and walls, built like the houſes of the natives of clay and ſtone. The trenches are ſometimes flanked with ſquare towers like a regular fortification, and the walls are very high.

Government.

Town of Sego.

Tombuctoo.

Houſſa.

Domeſtic ſlavery prevails in a very great degree among all the Negro ſtates. As the tropical rains ſometimes fail or are deficient in quantity, the ſcorching heat of the ſun burns up the face of the country, and produces a moſt frightful barrenneſs. On theſe occaſions it is not uncommon for parents to ſell their children, and even themſelves, for bread. A freeman may alſo loſe his liberty by being taken priſoner in war, or on account of the real or ſuppoſed crimes of murder and ſorcery. He alſo forfeits it in conſequence of inſolvency. From theſe cauſes domeſtic ſlavery prevails to ſuch a degree, that in many places three-fourths of the natives are ſlaves. Theſe ſlaves, however, form in ſome meaſure a part of the community; and, by the cuſtom of the country, the maſter cannot ſell one who is born his ſlave, without accuſing him of a crime, a circumſtance, which, in conſequence

Slavery.

Africa. of the ſlave trade, at times gives riſe to much diſſenſion, and to wars which reſemble, in ſome meaſure, the ſanguinary conteſts which exiſted in various countries in Europe, during the feudal times, between the villains and their lords. Thus, in 1785, a general inſurrection took place in many diſtricts on the weſtern coaſt: the ſlaves attacked their maſters, maſſacred great numbers of them, ſet fire to the ripe rice, blockaded the towns, and obliged them to ſue for peace.

Arts in a rude ſtate. Few arts have been brought to much perfection by the Negroes, becauſe the diviſion of labour has been little known among them. The ſame individual ſpins, weaves, ſews, hunts, fiſhes; forms baſkets, fiſhing-tackle, inſtruments of agriculture; makes ſoap, dyes cloth with indigo, and makes canoes. In all theſe, the neatneſs of the work excites the aſtoniſhment of ſtrangers, who know the diverſity of occupations in which the ſame individuals engage, and the imperfection of the tools with which they labour. They are no ſtrangers, however, to that ordinary diviſion of labour to which nature herſelf ſeems to have given riſe in conſequence of the diſtinction of the ſexes. The women ſpin, and the men weave the cotton cloth of which their dreſſes are compoſed. The cotton is prepared for ſpinning by rolling it with an iron ſpindle upon a ſmooth ſtone or board. The thread is well twiſted though coarſe, but the loom is ſo narrow that the web is only about four inches broad. The women dye this cloth with the leaves of indigo, pounded freſh, and mixed with a ſtrong alkaline ley, formed by the lixiviation of wood aſhes. The colour thus produced is a rich and durable blue with a purple gloſs.

Weaving.

Dyeing.

The workers in metals and the manufacturers of leather appear to be almoſt the only inſtances of what may be called a ſeparate profeſſion exiſting among the Negroes. The manufacturers of leather ſeparate the hair by ſteeping the hides in a mixture of wood aſhes and water, and uſe the pounded leaves of a tree called *goo*, as we do the oak bark, for the purpoſe of tanning. They dye the ſkins of ſheep and goats red with powdered millet ſtalks, and yellow with a root which abounds in their country. The manufacturers of iron ſmelt that metal in ſome of the interior diſtricts; but it is generally hard and brittle. They form their weapons and tools of it, however, with conſiderable ingenuity. In ſmelting gold they uſe fixed alkaline ſalt, obtained by waſhing with water the aſhes of burned corn ſtalks, and evaporating the ley to dryneſs. It muſt alſo be remarked, that, in the interior of the country, Mungo Park found a negro who manufactured gunpowder from nitre collected from the reſervoirs of water frequented by the cattle, and ſulphur ſupplied by the Moors, who obtain it from the Mediterranean. He pounded the ingredients in a wooden mortar, and granulated it; but the grains were unequal, and the ſtrength of the gunpowder was very inferior to that of Europe.

Tanning.

Gunpowder.

The only neceſſary of life in which the country of the Negroes appears to be extremely deficient is ſalt, which is the more wanted among them in conſequence of their ſubſiſting chiefly upon vegetable food. A child cries for a piece of ſalt as for a great delicacy; and it is a proverbial expreſſion of a man's riches, to ſays, that he eats ſalt to his food. This important article they receive from the great deſert by caravans of trading Moors. They alſo receive arms, hardware, glaſſes, and trinkets of all ſorts, on the weſtern coaſt from the Europeans, and, in the interior, from the caravans of Cairo, Fezzan, and Morocco. For theſe they give in return, gold, ivory, and ſlaves. With regard to the ivory, the Negroes cannot comprehend for what reaſon it is ſo much valued by ſtrangers. It is in vain to tell them that ſhips are built, and long voyages undertaken, to procure it to make handles for knives. They are ſatisfied that a piece of wood might ſerve the purpoſe as well, and imagine that it is applied to ſome important uſe which is concealed from the Negroes, leſt they ſhould raiſe the price of it. The trade of the Negroes is conducted by barter; and to adjuſt the value of their different articles of commerce, they appeal to a nominal ſtandard, conſiſting of a certain quantity of any commodity for which there is a great demand. Thus on the Gambia, that quantity of ivory or of gold-duſt which is eſtimated as equal in value to a bar of iron, is denominated a *bar* of ivory, or a *bar* of gold-duſt.

Africa. Trade.

Medium of commerce

A marvellous ſtory has, in all ages, been told of a ſtrange mode of conducting commerce that exiſts among certain African tribes who live in the wildeſt mountainous diſtricts: they are ſaid to engage annually in trade, but at the ſame time to ſeclude themſelves from all perſonal intercourſe with the traders who viſit them: They traffic chiefly in gold-duſt, which they bring to particular places, and there leave it upon the approach of the traders, who depoſite quantities of goods which they are willing to give for the gold-duſt, and thereafter retire. The natives then approach and carry off the goods, or the gold-duſt, according as they think fit to accept or reject the bargain. From the days of Herodotus down to our own times, this ſtory has been repeated by various writers, and in particular by Wadſtrom, upon the authority of the chevalier de la Touch, vice-governor of Goree, in 1788, who is ſaid to have viſited the diſtricts inhabited by theſe inviſible traders.

Singular mode of trading.

The knowledge of the Negroes with regard to all ſpeculative ſubjects, is extremely limited. Their notions of geography and aſtronomy, like thoſe of other rude nations, are altogether puerile. They regard the earth as a vaſt plain, the boundaries of which are covered with clouds and darkneſs. The ſea is a great river of ſalt water; beyond which is the land of the white people; and at a ſtill greater diſtance, is the land to which the ſlaves are carried, which is inhabited by giants, who are cannibals. Eclipſes are aſcribed to enchantment, or to the interpoſition of a great cat, which puts its paw between the moon and the earth. They divide the year by moons, and calculate the years by the number of rainy ſeaſons. They ſeem to believe in one God, who has power over all things; but their religious opinions are extremely undefined, ſo that it is in vain to expect to find among them any ſyſtem of belief that is either univerſally received or even conſiſtently adhered to by the ame individuals. They in general ſeem to think, that the god of the blacks or Negroes is different from the god of the whites: When they are pleaſed with their own condition and their country, they repreſent the black deity as a good being, and the white deity as a kind of devil, who ſends the white people to makes ſlaves of the

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Religio opinion

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the Negroes: But when they are in ill humour, they complain of their black deity as miſchievous and cruel; while they ſay that the white deity gives his people the Europeans brandy and fine clothes, and other good things which are denied to the Negroes. Their notions of a future ſtate are of the ſame fluctuating nature. They have a confuſed idea that the exiſtence of the human mind does not terminate with this life; and they ſeem to venerate the ſpirits of the dead, regarding them as protectors, and placing victuals at the graves of their anceſtors upon ſtated occaſions. In general, however, they regard death with great horror; and in Whidah it was a law, than no perſon, on pain of death, ſhould mention it in preſence of the king. Some of them have a notion of a future ſtate as connected with rewards and puniſhments of their conduct in this life. They imagine that the deceaſed are conveyed to a mighty river in the interior regions of Africa, where God judges of their paſt lives, and particularly of the regularity with which they have celebrated the new moons, which among the Negroes are kept as feſtivals; and of the fidelity with which they have adhered to their oaths. If the judgement is in their favour, they are gently wafted over the great river to a happy country, reſembling in deſcription the paradiſe of Mahomet, where they enjoy plenty of all thoſe things which they were accuſtomed to value in this world: But if the judgement is unfavourable, they are plunged into the river, and never heard of more. They alſo believe, like the vulgar of moſt other countries, that the ghoſts of perſons who have been guilty of great and unexpiated crimes, find no reſt after death, but haunt or wander about thoſe places in which their crimes were committed. The Aſiatic doctrine of the tranſmigration of the ſouls of men after death into the bodies of other animals, is alſo entertained by ſome of them.

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The opinions of the Negroes concerning the creation of man are not more fixed or definite than their ideas of his future exiſtence. In general, they aſcribe his original creation to the deity; but ſome of them pretend that he emerged, they know not how, from the caves and holes of the earth, or was produced by a monſtrous ſpider. A curious fiction upon this ſubject is alſo ſaid to prevail in ſome of the Negro ſtates:—That God originally created both black men and white men; that he meant to beſtow one gift upon each of them, gold or wiſdom; that he gave the black men their choice, and that they preferred gold, and left wiſdom or ingenuity to the whites; that God was offended with them on account of this improper choice, and ordained them to be ſlaves for ever to the white men.

provi- ce.

They alſo believe in a divine providence which ſends rain to give fertility to the earth and the trees, and to waſh down gold from the mountains. Accordingly, they pray fervently to God to give them thoſe things upon which they ſet the greateſt value, ſuch as rice and yams, and gold, and ſlaves, and health, and activity. At the ſame time, from their inaccuracy of thinking upon this ſubject, they readily ſay, when converſed with, that it is not God but the earth that gives them rice; that their cattle produce young without the aſſiſtance of God; and that, if they did not labour for themſelves, they might ſtarve before God would help them.

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From this looſe and inaccurate mode of reaſoning, the religion of the Negroes ſits very light upon them. They ſeem to have a ſort of prieſts, who perform ſome ceremonies at the new moons, and on certain occaſions, ſuch as, at marriages, or on giving names to young children; but theſe prieſts having no ſettled ſyſtem of doctrine, and not being united into a diſciplined body, poſſeſs very little influence. Hence it is extremely eaſy to induce the Negroes to adopt the religion of any more intelligent people. Accordingly, the Moors have made many converts among them; and ſome of the moſt conſiderable Negro ſtates upon the northern frontier, that is, upon the Senegal and the Niger, are Mahometan.

Superſti- tion.

But though the Negroes have little ſpeculative religion, they have much ſuperſtition, as appears from the great uſe which they make of what are called *fetiches*, or charms termed *obi* by the Africans in our Weſt India iſlands. The fetiche conſiſts of any natural object, which chances to catch hold of the fancy of a Negro. One ſelects the tooth of a dog, of a tiger, or of a cat, or the bone of a bird; while another fixes on the head of a goat, a monkey, or parrot, or even upon a piece of red or yellow wood, or a thorn branch. The fetiche thus choſen, becomes to its owner a kind of divinity, which he worſhips, and from which he expects aſſiſtance on all occaſions. In honour of his fetiche, it is common for a Negro, to deprive himſelf of ſome pleaſure, by abſtaining from a particular kind of meat or drink. Thus one man eats no goats fleſh, another taſtes no beef, and a third no brandy or palm wine. By a continual attention to his fetiche, a Negro ſo far impoſes upon himſelf, as to repreſent it to his imagination as an intelligent being, or ruling power, inſpecting his actions, rewarding his virtues, and puniſhing his crimes. Hence he covers it up carefully whenever he performs any action that he accounts improper. The importance or value of a fetiche is always eſtimated according to the ſucceſs of its owner, and the remarkable proſperity of an individual brings his fetiche ſo much into faſhion, as to induce others to adopt it. On the contrary, when a Negro ſuffers any great misfortunes, he infallibly attributes it to the weakneſs of his fetiche, which he relinquiſhes, and adopts another that he hopes will prove more powerful. A fortunate fetiche is uſually adopted by the whole family of its poſſeſſor, to which it becomes an object of reverence, or a guardian like the houſehold gods, *dii lares* and *penates*, of the ancient Romans. Sometimes a whole tribe or a large diſtrict has its fetiche, which is regarded as a kind of palladium upon which the ſafety of their country depends. Thus at Acra the national fetiche was a lake, which the people accounted ſacred. This lake was converted into a ſalt pit by the Portugueſe, and the natives regarded this profanation as the cauſe of the conqueſt of their country by a neighbouring tribe called the *Aquamboans*. Thus alſo at Whidah, although the people believe in one ſupreme god, they worſhip as their national fetiche a kind of ſerpent of monſtrous ſize, which they call the *grandfather of the ſnakes*. They ſay that it formerly deſerted ſome other country, on account of its wickedneſs, and came to them, bringing good fortune and proſperity along with it. From this account of the fetiches of the Negroes, the intelligent reader will naturally remark that even idolatry itſelf remains in an

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imperfect ſtate among the people; and he will obſerve the difference between the poliſhed ſuperſtition of ancient Greece and Rome, and the vulgar and unadorned credulity of theſe rude and artleſs tribes. In the vicinity of their ſettlements, the Moors have prevailed with the illiterate Negroes, to adopt as fetiches or charms, certain ſentences of the Koran, which they write out and ſell to them, under the name of *ſaphies*. Mungo Park, when travelling among them, ſometimes ſold ſaphies, which uſually conſiſted of the Lord's prayer.

Singular cuſtoms.

Among the Negroes ſome ſingular cuſtoms prevail, which are not unworthy of notice, on account of their having ſome ſimilarity to certain practices that have ſubſiſted among other nations. Perſons accuſed of any crime, more eſpecially of poiſoning, are frequently required to prove their innocence, by drinking what is called the *red water*. This is a poiſonous liquor formed from the roots of certain plants, and the barks of trees, of a very narcotic quality. The accuſed is placed on a high chair, and ſtript of his clothes, having only a quantity of plantain leaves wrapt round his waiſt. He then, in preſence of the whole village, eats a little rice, and drinks about an Engliſh gallon of the red water, which is extremely apt to find the accuſed perſon guilty. If he eſcape unhurt, however, and without vomiting, he is judged innocent. Much dancing and ſinging takes place on account of his eſcape, and he is allowed to demand that ſome puniſhment be inflicted on his accuſers on account of the defamation. Among the ſuperſtitious cuſtoms of the Negroes, may be mentioned the practice of circumciſion, which is univerſal among them. It is not regarded as a religious rite, but as a kind of charm for preventing barrenneſs. It is not performed till the age of puberty.

Secret ſocieties of men.

In ſeveral Negro ſtates certain ſecret ſocieties or fraternities exiſt, which poſſeſs great political influence, and in ſome places abſolute power. One of theſe ſocieties, called the ſociety of the *Belli*, is appropriated to men, to the excluſion of women. It ſupports itſelf by the uſe of myſtical ſymbols, a pretence to the knowledge of important ſecrets, and by ſubjection to an imaginary being called the *Belli*, who is ſaid to be capable of changing his form at pleaſure. This ſociety monopolizes all public offices, to the excluſion of the uninitiated. The young men are introduced into it by a noviciate which laſts ſome years. A ſpace is marked out of eight or nine miles in circumference in a fertile ſpot, in which huts are built, and proviſions raiſed. The young men reſort thither, and are taught by inſtructors pitched upon by the ſociety, to fight, to fiſh, to hunt, and to ſing certain ſongs peculiar to the fraternity; they alſo receive new names as a mark of their new birth, and certain ſcars are imprinted upon their bodies, with heated inſtruments of iron, to point them out as belonging to the fraternity. On returning home after their initiation, they are received with great ceremony by their relations, as perſons now introduced into public life.

Of women.

There is a kind of counterpart of this aſſociation, though of leſs political importance, called the ſociety of the *Neſſoge* or *Sandi*, which is confined to females. In a remote wood, which men are prohibited to approach, a number of huts are conſtructed, and the young marriageable girls are conducted thither during the night. They remain in this ſolitude, under the care of certain matrons during four months, and are taught a variety of religious cuſtoms and ſuperſtitions. When their noviciate is expired, they return by night to their villages, where they are received by all the women both old and young quite naked, who parade about with them, playing upon ſome rude muſical inſtruments till daybreak. If any man ſhould approach this proceſſion, he would ſuffer death, or be compelled to redeem himſelf by a very heavy fine.

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There is a third kind of ſociety, which is much more univerſal than thoſe now mentioned, and ſeems to exiſt in all the Negro ſtates. This ſociety does not appear to have any ſpecial name, but it conducts the myſteries of a ſtrange imaginary being, called *Mumbo Jumbo*. As the practice of polygamy exiſts very univerſally among the Negroes, they often find great difficulty in preſerving the peace of their families amidſt a variety of rival wives. When the huſband finds his authority altogether contemned, he has recourſe to the aſſiſtance of *Mumbo Jumbo*. The dreſs of this ſtrange miniſter of juſtice uſually hangs upon a tree in a foreſt in the neighbourhood of every Negro village. It is made of bark, and forms a figure of about eight or nine feet high, with a tuft of ſtraw on its head. When Mumbo is about to appear, he announces his approach in the evening by diſmal ſcreams from the adjacent woods, and as ſoon as it is dark he enters the village and proceeds immediately to the public place, where all the inhabitants both male and female are obliged to aſſemble at his call; for this phantom has abſolute power. Nobody muſt appear covered in its preſence, and every perſon is bound implicitly to execute its commands. As the women know that the viſit is intended againſt ſome of them, they can have no great reliſh for the ſolemnity, but they dare not refuſe to attend. The ceremony commences with ſongs and dances. Theſe continue till midnight, when Mumbo Jumbo fixes upon the individual on whoſe account he comes. She is immediately ſeized by his command, ſtripped naked, tied to a poſt, and ſcourged with Mumbo's rod, to the great entertainment of the whole aſſembly, and eſpecially of the reſt of the women, who are always loudeſt in their deriſion and cenſure of the culprit. The ſociety that conducts the appearance of this myſterious perſonage make uſe of a peculiar or cant language, which is not underſtood by the uninitiated. They pretend that Mumbo Jumbo is a wild man, or ſome ſtrange being that knows every body's thoughts. They bind themſelves by oaths never to reveal their ſecrets to a woman or a boy. The fraternity is ſo powerful, that when one of the Negro kings was weak enough to reveal the ſecret of Mumbo Jumbo's character to a favourite wife, who communicated it to the other females of the houſehold, he and his whole family were immediately aſſaſſinated, in the preſence, and by the command, of Mumbo Jumbo; and nobody dared to diſpute the propriety of their puniſhment.

Strange myſteries.

Like all rude nations, the different tribes of Negroes are implicit believers in witchcraft and magic, and in the exiſtence of various kinds of ſorcerers. Theſe ſorcerers they regard with the utmoſt terror and abhorrence. They believe that ſome of them have power to controul the ſeaſons, and to prevent the rice from arriving at maturity. Others of them are ſuppoſed to ſuck

Magic & ſorcery.

Africa. ſuck the blood of men and beaſts, and to occaſion all kinds of diſeaſes. When they ſuſpect a perſon to have died in conſequence of ſorcery, they interrogate the corpſe, which they believe gives anſwers in the affirmative, by forcibly impelling forward the perſons who bear it, and in the negative by a rolling motion. If an anſwer is given in the affirmative, they inquire concerning the murderer, beginning with the relations of the deceaſed and naming the ſuſpected perſons. When the guilty perſon is named, they ſay, that the corpſe impels the bearers forward; and upon the authority of this evidence, the perſon accuſed is ſeized and ſold into ſlavery, and ſometimes alſo his whole family. It is evident that a trial of this kind may be ſo managed, as on all occaſions to ſecure the condemnation of the accuſed perſon. Accordingly, in proportion to the demand for ſlaves, accuſations of ſorcery are more frequently brought forward againſt their ſubjects by the Negro chiefs. Theſe accuſations, however, are ſometimes alſo brought againſt perſons of importance, who cannot be ſold on account of their rank, or againſt aged perſons, whom nobody will purchaſe. In theſe caſes, the perſon convicted is compelled to dig his own grave; and being placed at the foot of it, one from behind ſtrikes him a violent blow upon the back of the head or neck, which cauſes him to fall upon his face into the grave. Some looſe earth is then thrown upon him; a ſtake of hard wood is driven through his body, and the grave is filled up.

Tenacious of their cuſtoms. Of theſe and all their other cuſtoms, the Negroes are extremely tenacious; and this tenacity of their cuſtoms, down to the minuteſt trifles, forms the principal obſtacle to their civilization or improvement. Thus it is the cuſtom to cut the rice, ſix or eight inches below the ear, by two or three ſtalks at a time, according as they can be graſped between the thumb of the right hand and a knife, which is held in the ſame hand. The ſtalks are leiſurely transferred to the left hand, and when it is almoſt full, they are tied like a noſegay and put into a baſket. A Negro chief who had ſeen the Engliſh mode of reaping, ſaid, that it would coſt an African his life, ſhould he attempt to introduce it into his country, as he would be accuſed of intending to overturn the ancient cuſtoms, and would be compelled to drink the red water. By means of their cuſtoms, alſo, property is rendered leſs valuable than in other countries, which operates as a diſcouragement to induſtry. Their agriculture is carried on in concert by the inhabitants of every diſtrict, who ſhare in common the products of their harveſt. Hence the idea of excluſive property is rendered very vague, while the unlimited exerciſe of the law or cuſtom of hoſpitality, renders the poſſeſſion of it uncertain; as the induſtrious are forced to ſhare their wealth with the indolent. Begging is not reckoned diſgraceful; and if a perſon has been negligent in providing the neceſſaries of life, he has only to diſcover where proviſions are to be found, and he muſt obtain a ſhare; for if he enter a houſe during a repaſt, the maſter, by cuſtom, cannot avoid inviting him to partake. As domeſtic ſlavery, however, and the traffic in ſlaves, conſtitutes a moſt profitable branch of the African cuſtoms, it is not wonderful that their chiefs adhere to them with peculiar obſtinacy.

The labours of the field performed in common. Hoſpitality unlimited. Encourages indolence.

With regard to the private or domeſtic economy of the Negroes, it may be obſerved, that their houſes Africa. conſiſt uſually of a circular wall, built of mud, or of clay and ſtone, about four feet high, with a conical roof of bamboos, covered or thatched with hay. As houſes of this ſtructure cannot well be divided into ſeparate apartments; where there is a plurality of wives, each has a hut appropriated to herſelf, and the whole huts belonging to a family are ſurrounded by a fence of bamboos formed into a kind of wicker work. A number of theſe encloſures, with intermediate paſſages or ſtreets, which have no regular arrangement, form a town or village. The furniture of their houſes uſually conſiſts of a bed, formed of a frame of canes, covered with a bullock's ſkin or with a mat, and of one or two wooden ſtools, and a few wooden diſhes and pots for dreſſing food. The dreſs of both ſexes is formed Houſes. Dreſs. of cotton cloth; that of the men uſually conſiſts of a looſe ſhirt or frock with wide ſleeves, together with drawers or trowſers, which reach to the middle of the leg. Some of the Negroes add to theſe a cap and ſandals. The dreſs of the women conſiſts of two pieces of cloth, each of which is about ſix feet long, and three feet broad. The one is wrapt round the waiſt and hangs down to the ankles, and the other is negligently thrown over the ſhoulders.

The ſtate of the women, as among other barbarous State of nations, is by no means favourable. It is in general women. accounted altogether unneceſſary for a lover to make propoſals to his intended bride. She is conſidered as the property of her father, from whom he purchaſes her, and to whom he generally pays a price equal to the value of about two ſlaves. When he has agreed with the parents, therefore, with whom he eats a few nuts to ratify the contract, the propoſed bride muſt give her conſent, or remain for ever unmarried; for if ſhe is given to another, the lover is entitled to ſeize her for a ſlave. On the day of marriage the bride is con- Marriages. ducted with great ceremony to the houſe of the bridegroom, who muſt furniſh abundance of liquor and refreſhments to her attendants. On approaching the houſe, the bride is covered all over with a robe of white cotton, and is carried on the back of a woman to the houſe of her huſband. She is then placed amidſt a circle of matrons, who give her many inſtructions about her future life. The day is concluded with dances, ſongs, and feaſting, and the validity of the marriage is confirmed by exhibiting tokens of virginity according to the Moſaic law.

A man is allowed to have as many wives as he can Polygamy. afford to purchaſe, and they are treated in a great meaſure as ſlaves, being in general compelled to take the whole charge of the agriculture abroad, as well as of the preparation of food for the family at home. When the huſbands, however, are contented with one or two wives, inſtances of conjugal infidelity are uncommon; but when they have a greater number, they are often under the neceſſity of overlooking the accidental gallantries of their wives, in conſequence of the impoſſibility of ſubjecting them to rigid confinement in the ſimple ſtate of ſociety in which they live. The Negro women ſuckle their children till they are able to walk, and ſometimes till they are three years old, and during that period have no connection with their huſbands.

After this account of the Negroes in general, we

ſhall

Africa.

Particular tribes. Mandingoes.

shall proceed to take notice of some of the more remarkable tribes into which they are divided, and with which we have been made acquainted by the latest travellers. Of these the tribe of *Mandingoes* is the most important. They derive their name from a district in the interior of Africa, called *Manding*. This territory is situated in the most elevated northern tract of the country of the Negroes, near the sources of the rivers Senegal and Gambia, which flow into the Atlantic on the west, and of the Niger, which proceeds towards the east. Kamaliah, which is one of its towns, and was visited by Mr Park, lies in 12° 46′ N. Lat. Though Manding is in so high a level, and abounds in gold, it is not mountainous or barren. The tribe that has issued from it, and assumes the name of *Mandingoes*, forms by far the most numerous race of Negroes through the whole western quarter of the continent of Africa. Their territories intermingle in various situations with the possessions of other states, and they even form the bulk of the population where other tribes enjoy the sovereign power. Their language is by far the most universally understood of all the Negro tongues, and it appears to be more polished than any other. The Mandingoes are a tall slender race, of a colour moderately black. Their eyes are remarkably small, and they wear their beards. They are more industrious, and engage more extensively in commerce than the other Negroes, so that they are frequently employed as agents in making bargains by persons of other tribes. In the character of travelling merchants, and instructors of youth, they have insinuated themselves into all the Negro countries, where they are distinguished by wearing more regularly than others a red or white cotton cap, and sandals. Some of them who have learned to read and write Arabic, and who profess Mahometanism, erect schools in the Pagan villages, and instruct the youth gratis. They assume a great appearance of sanctity, abstain from strong liquors, and pretend to the power of counteracting magic. Thus they acquire a most extensive influence, and few affairs of importance are transacted without their advice. In almost every district, troops of Mandingo merchants are to be met with; and as their intellectual powers are more developed than those of the other Negroes, they have been able to extend their language, as a kind of learned tongue, second only to the Arabic, along the Senegal and the Niger.

Language polished, and extensively known.

Industrious as merchants,

and instructors of youth.

In most of the Mandingo towns there are two public buildings; a mosque for public prayers, and what is called the *bentang*, which is a large stage formed of interwoven bamboos erected under a spreading tree. At the bentang all public affairs are transacted, and idle persons assemble to smoke tobacco, and hear news. In every village there is a magistrate, who preserves public order, levies the duties on merchants, and presides at the palavers or courts held by the old men, where justice is administered. At these courts civil questions between parties are debated. In the Pagan states the decisions are pronounced according to the customs of their fathers; but where Mahometanism is more generally received, which is usually the case among the Mandingoes, the Koran is the rule of judgement, or the *Sharra*, which contains a digest of Mahometan laws both civil and criminal. Certain Mahometan Negroes, who make the laws of the prophet their particular study, are frequently retained in causes, as professional pleaders, and they are said to exhibit great dexterity in perplexing the judges.

Courts of justice.

Africa.

The Pagan Mandingoes believe in one God, the creator of all things; but they consider him as of a nature too much exalted above human affairs, to give much attention to their prayers. They address him, however, at the new moons, and imagine every new moon to be a new creation. They fancy that certain subordinate spirits rule the world, and that these spirits are influenced by enchantments and fetiches. They believe in a future state, but most of them admit that they know nothing about it. Their funerals consist of a tumultuous procession, in which they make dismal howlings; and after burying the body beside some large tree, the solemnity terminates in a revel of drinking, and at last of dancing and singing.

Religion.

Next to the Mandingoes, the *Foulahs* are the most numerous race of Negroes on the western quarter of the continent of Africa. Their original country is called *Fooladoo*. It is a small state, situated near the sources of the Senegal and the Niger. From thence they have emigrated in powerful clans, and have acquired extensive territories, especially along these rivers, and along the Gambia. The Foulahs also possess the sovereignty of various insulated tracts southwards, towards Sierra Leona. Besides the fixed settlements in which they enjoy the sovereignty, they have introduced themselves in many places along the banks of the Gambia, and to the southward along what is called the gulf of Guinea, to a great distance, into the greater part of the Negro states, in the character of shepherds and cultivators of the ground. They obtain admission by paying a tax or rent to the chiefs of the territory for whatever lands they occupy, and emigrate at pleasure. In consequence of this mode of life, the sovereignty frequently fluctuates in the small states, between them and the Mandingoes, and other tribes, according to the proportion of the population, which often alters, from the emigrations of the Foulahs.

Foulahs.

The features of the Foulahs are very different from those of the other Negroes. They have a Roman nose, a thin face, and small features, with long glossy soft hair, so as to resemble in a great degree the East Indian Lascars. Their complexion is by no means of the permanent jetty colour of the other Negroes, but varies with the districts they inhabit, approaching to yellow in the vicinity of the Moors, and deepening into a moderate black towards the equator. Their stature is of the middle size, their form graceful, and their air insinuating. Their women are well shaped, and have regular features; but neither men nor women are so robust in their make as the other Negroes. Hence, they are accounted by the Negroes an intermediate race between themselves and the Moors; but the Foulahs consider themselves as superior to the Negroes, and class themselves among white nations. Their natural disposition is mild and humane, and they are extremely hospitable where the Mahometan religion has not taught them to treat infidels with reserve. They support with great care the aged and infirm of their own tribe, and frequently relieve the necessities of persons of other tribes. There are few instances of one Foulah being insulted by another, and they never sell their countrymen for slaves; on the contrary, if a Foulah

Features.

Character.

Africa. Foulah have the misfortune to be enſlaved, his whole clan or village contributes to pay his ranſom.

Occupations. The Foulahs engage more extenſively than the other Negroes in the raiſing of corn, and the breeding of cattle, but eſpecially in the latter occupation. Hence, the Mandingoes frequently entruſt their cattle to the care of the Foulahs. They render them tractable by familiarity; feed them by day in the woods and open meadows, and ſecure them by night in folds, which they fence very ſtrongly. Not ſatisfied with this precaution, the herdſmen, whoſe huts are erected in the middle of the fold, keep fires during the night burning around the folds, for the protection of the cattle againſt wild beaſts, and to ſhow that they are in a ſtate of preparation againſt robbers. From the neceſſity of guarding their cattle they become intrepid hunters, and kill lions, tigers, elephants, and other wild beaſts, with poiſoned arrows, or with muſkets which they purchaſe from the whites upon the coaſt. To poiſon their arrows, they boil the leaves of a particular ſhrub in water, and dip in the black juice a cotton thread, which they faſten round the barbs of the arrow.

From the milk of their cattle the Foulahs make conſiderable quantities of butter; but like all the Negro nations, they are entirely ignorant of the art of preſerving milk by making it into cheeſe. This art is probably prevented from being introduced by the heat of the climate, and by the extreme ſcarcity of ſalt, which can be obtained in no other way but by purchaſing it from the ſea coaſt, or from caravans of trading Arabs, who bring it on the backs of camels from the great deſert. They entertain a ſingular ſuperſtition, that to boil the milk of a cow prevents her from having any more. Hence, they will ſell no milk to any perſon whom they have once diſcovered to have boiled it.

Amuſements. Like the other Negro tribes, the Foulahs are exceſſively fond of dancing. They have alſo a ſtrong paſſion for muſic, and their chiefs account a practical ſkill in it a moſt reſpectable accompliſhment. Their national airs have a peculiar character, and are tender and pleaſing.

Though the Foulahs do not enſlave each other, they do not heſitate to make war upon the neighbouring tribes for the purpoſe of obtaining ſlaves, chiefly with a view of ſelling them to the Europeans upon the coaſt for fire-arms and gunpowder. Such at leaſt is the account of the matter, which was obtained in 1794 by Meſſrs Watt and Winterburn, who viſited Foota-jallo, an extenſive Foulah kingdom in the interior of Sierra Leona. This kingdom extends about 300 miles from eaſt to weſt, and 200 from north to ſouth. Temboo, the capital, contains 7000 inhabitants. The power of their king is in a great meaſure arbitrary. On an emergency, he can bring to the field 16,000 cavalry. The markets and all kinds of trade are regulated by him and his officers. The ſoil is in many places extremely fertile, producing rice and maize, which are cultivated by the women, and carried to market by the men. In general, however, the ground is dry and ſtony, but affords paſture for all kinds of cattle. Their women dig a ſpecies of iron ſtone from mines of conſiderable depth. The ore is afterwards manufactured into a very malleable metal. In this kingdom of Foota-jallo there are ſchools in every town; and the majority of the people can read. The Mahometan religion is profeſſed, but the mild character of the Foulahs prevents it from exhibiting that aſpect of intolerance towards ſtrangers which characterizes the profeſſors of this religion in other countries. Africa.

On the weſtern coaſt, a great part of the diſtrict between the rivers Senegal and Gambia, or, as it is often called, *Senegambia*, is inhabited by a nation called the *Jaloffs*, which differs conſiderably from the other tribes of the Negroes. Their ſtature is tall and robuſt, and, though their complexion is of the deepeſt black, their noſes are not ſo much depreſſed, nor their lips ſo protuberant, as thoſe of the Mandingoes. They excel their neighbours in the manufacture and dying of cotton cloth, which they form of a finer thread and a broader web. They uſe their toes with the ſame dexterity as their fingers in many operations. Hence when they perceive a pair of ſciſſars, a knife, or a toy which they covet, they turn their backs upon it, and, having engaged the owner in converſation, they ſeize it artfully with their toes, and throw it into a pouch which they wear behind. In this way, ſtrangers trading in their towns are amazed to find their goods vaniſhing before their eyes, while they cannot perceive the thief. The Jaloffs are very warlike, and equal the Moors in the management of horſes; but, as they are divided into a number of petty ſtates, which are continually engaged in war with each other, they have little power as a nation. In the ſucceſſion to their leaders or chiefs, they follow the female line as the ſureſt; and therefore, the eldeſt ſon of the eldeſt ſiſter of the chief is preferred. Jaloffs.

On the coaſt to the ſouth of the river Gambia, there exiſts a rude but induſtrious tribe, called the *Feloops*, who have little intercourſe with their neighbours. They poſſeſs conſiderable energy of character, and have reſiſted ſucceſsfully the attacks of the Mandingoes, even when aſſiſted by the Portugueſe. They are very faithful in friendſhip, and their enmity is equally permanent, as they tranſmit their family feuds from generation to generation. When a man is killed in a quarrel, his eldeſt ſon procures his ſandals, which he wears, on the anniverſary of the murder of his father, till he can revenge his death. In thoſe parts of their country in which the Europeans have committed any ravages, they give no quarter to a white man. They ſell to the Europeans, however, rice, goats, poultry, wax, and honey. Feloops.

Beſides theſe, a variety of tribes inhabit the ſame coaſt, and are known to Europeans under the appellation of *Nalloes*, *Biafaras*, *Biſſagoes*, *Balantes*, *Papels*, and *Banyans*, of whom it is unneceſſary to take particular notice, as they appear to be diſtinguiſhed by no peculiarity from the other Negro tribes.

Proceeding eaſtward in the country between the Senegal and the Gambia is *Bambouk*, a region of conſiderable extent. The natives were originally termed *Malinkups*; but, by intermingling with the Mandingoes, they have gradually ſo much aſſimilated to that people, as to loſe the character of a diſtinct tribe. The country is mountainous, but is unwholeſome and full of minerals. It abounds in mines of gold, ſilver, copper, tin, and iron, but is neither well ſuited for agriculture nor for paſturage. The working of the mines is regulated by the caprice or the wants of the Bamboulk. Mines of gold &c.

Africa

chiefs of the different diſtricts. The miners are indolent and unſkilful: They never penetrate beyond 10 feet in depth, though the quantity of gold increaſes with the depth of the mine. They regard gold as a capricious and malevolent being, who delights in deluding the miners; on which account they never attempt to recover a vein when it diſappears. The government of Bambouk fluctuates, like that of many of the Negro ſtates, between monarchy and ariſtocracy, and the power of the king or ſupreme chief is extremely limited.

The frontiers of the Negro kingdoms uſually conſiſt of a wild or deſert tract. Thus the kingdom of Woolli, which is on the north-weſt of Bambouk, is ſeparated on its eaſtern boundary, by a wilderneſs filled with wild beaſts, from the kingdom of Bondou, which lies to the north of Bambouk. Fattecondi is the capital of Bondou, at which the king reſides. The king cauſed Major Houghton, an Engliſh traveller employed by the African Aſſociation, to be plundered; and he begged from Mr Mungo Park his blue coat, which that traveller was under the neceſſity of giving him, to avoid bad uſage. His revenues, however, are conſiderable. His authority is firmly eſtabliſhed, and his power is formidable to his neighbours. He was ſo well pleaſed with obtaining Mr Park's blue coat, adorned as it was with yellow buttons, that, on the following day he preſented to him ſomewhat more than half an ounce of gold, exempted his baggage from examination by the tax-gathers, and allowed him to pay a viſit to the women of his ſeraglio. The country at large is covered with wood, and, as it is in an elevated ſituation, and conſequently ſomewhat leſs expoſed than elſewhere to the burning heat of the climate, it is abundantly fertile. The frontier town of the kingdom eaſtward is called *Joag*. It contains 2000 inhabitants, is ſurrounded by a high wall with holes for muſkets, and is in 14° 25′ N. Lat. and 9° 12′ W. Long.

To the north-eaſt of Bondou is the Mandingo kingdom of Kaſſon, in which this peculiar cuſtom or ſuperſtition prevails, that no woman is allowed to eat an egg. Kooniakary, the capital, lies in N. Lat. 14° 34′, about 59½ geographical miles to the eaſt of Joag. To the ſouth-eaſt of Kaſſon is the kingdom of Kaarta, which is bordered on the eaſt by Bambara, between which and Kaarta there are very frequent wars; a circumſtance which renders travelling through theſe and other Negro ſtates not a little difficult. The people are induſtrious: The cultivation of corn is carried on to a great extent, eſpecially in Bambara. They are Mahometans, without the intolerant fanaticiſm of that religion; and accordingly, they are hoſpitable to ſtrangers, though of a different faith. The neighbourhood of the Moors, however, renders the country unſafe; and, to guard againſt their incurſions, the Negroes, when employed in agriculture, are under the neceſſity of carrying their arms to the field.

Sego.

Sego, the capital of Bambara, lies in N. Lat. 14° 10′, and W. Long. 2° 26′; and contains about 30,000 inhabitants. It was here that Mungo Park at laſt beheld the long-ſought majeſtic river Niger glittering to the morning ſun, as broad as the Thames at Weſtminſter, and flowing ſlowly from weſt to eaſt. This river is here called the *Joliba* by the natives. From the times of the Naſamonian explorers prior to the days of Herodotus, during 2300 years, no certain intelligence concerning this river had been obtained by the European nations, and its very exiſtence had been doubted by the moſt intelligent writers. Mr Park is the only European traveller who ſince that period can boaſt of having reached it. Sego conſiſts of four diſtinct towns; two of which are on the north and two on the ſouthern part of the Niger. They are ſurrounded by high mud walls. The houſes are of a ſquare form; they are built of clay, and have flat roofs. The ſtreets are narrow; and, as the Moors form a conſiderable proportion of the inhabitants, their moſques appear in every quarter. The language, however, is a dialect of the Mandingo. The authority of the Negro king of Bambara is not a little reſtrained here by the influence of the Moors; and, to avoid giving offence to their intolerant ſpirit, he was under the neceſſity of ſending Mr Park immediately out of the city to a village in the neighbourhood. The weather was ſtormy, but ſome Negro women conducted him into a hut, gave him food, and thereafter began to their accuſtomed labour of ſpinning cotton. During their work they amuſed themſelves with a ſong, compoſed upon the occaſion, which one of them ſung to a plaintive air. The tranſlation of the ſong is in theſe terms: "The wind roared and the rains fell; the poor white man, faint and weary, came and ſat under our tree. He has no mother to bring him milk, no wife to grind his corn. *Chorus.* Let us pity the white man, no mother has he," &c.

The current money of this place conſiſts of cowries, a kind of ſhells (*cypræa moneta Lin.*) which are alſo employed in the ſame way in Bengal. A man and his horſe can ſubſiſt during 24 hours upon the proviſions that 100 of them will purchaſe. The king of Bambara preſented Mr Park with 5000 cowries, and deſired him to leave the neighbourhood of his capital, that he might not be deſtroyed by the Moors. This traveller perſevered in advancing eaſtward down the river to another town called *Silla*, ſituated in N. Lat. 14° 48′, and W. Long. 1° 24′, about 1090 Britiſh miles eaſt of Cape Verd. This formed the utmoſt limit to which he was able to advance, and therefore remains the boundary of our certain knowledge of the countries in that direction. He learned, however, that Silla ſtands within 200 miles of the city of Tombuctoo, which is upon the ſame river, and had long been an object of ſearch of the Portugueſe, the French, and Engliſh. He was informed, that the country is very populous in that direction. He was alſo told, that about two days journey below Silla, where he ſtopped, there is a larger town than Sego, called *Jenné*, which ſtands on a ſmall iſland in the Niger; and that two days journey below Jenné, the river expands into a large lake called *Dibbie*, from which the water iſſues in two large branches, inſulating a fertile and ſwampy country called *Ginbala*; and that the two great branches of the river reunite at Kabra, which is one day's journey to the ſouth of the city of Tombuctoo, of which it is the port. The government of Tombuctoo is ſaid to be in the hands of the Moors; and that place is the principal emporium of the Mooriſh commerce in Africa. Below Tombuctoo, to the eaſtward, is the Negro city of Houſſa, the capital of a great kingdom, and poſſeſſed of extenſive commerce. The Niger paſſes to the ſouth of Houſſa at the diſtance of two days journey; but Mr

Silla.

Africa. Park could learn nothing further concerning its courſe, as the traders who arrive at Tombuctoo and Houſſa from the coaſt can ſay nothing more of it, than that *it runs towards the riſing of the ſun to the end of the world.* Any farther intelligence that has hitherto been obtained, concerning Soudan or Nigritia to the eaſtward of the route of Mr Park, is extremely uncertain, being merely the reſult of inquiries made by Mr Horneman among the merchants of Fezzan during his reſidence there. In the preſent imperfect ſtate of our knowledge, however, this information is entitled to attention. He obſerves, that "the Houſſa are certainly Negroes, but not quite black; they are the moſt intelligent people in the interior of Africa; they are diſtinguiſhed from their neighbours by an intereſting countenance; their noſe is ſmall and not flattened; and their ſtature is not ſo diſagreeable as that of the Negroes, and they have an extraordinary inclination for pleaſure, dancing, and ſinging. Their character is benevolent and mild. Induſtry and art, and the cultivation of the natural productions of the land, prevail in their country; and in this reſpect they excel the Fezzanians, who get the greateſt part of their clothes and houſehold implements from the Soudanians. They can dye in this country any colours but ſcarlet. The culture of their land is as perfect as that of the Europeans, although the manner of doing it is very troubleſome. In ſhort, ſays Mr Horneman, we have very unjuſt ideas of this people, not only with reſpect to their cultivation and natural abilities, but alſo of their ſtrength and the extent of their poſſeſſions, which are by no means ſo inconſiderable as they have been repreſented. Their muſic is imperfect, compared to the European; but the Houſſanian women have ſkill enough to affect their huſbands thereby even to weeping, and to inflame their courage to the greateſt fury againſt their enemies. The public ſingers are called *Kadanka.*"

oudan and Nigritia.

Houſſa.

The ſame traveller informs us, that to the eaſtward of Houſſa are ſituated the dominions of the ſultan of Bornou. The people are blacker than the Houſſanians, and completely Negroes. They are ſtrong, patient of labour, and phlegmatic. Their food is a paſte made of flour and fleſh, and their liquor is an intoxicating but nouriſhing kind of beer. Their beſt natural production is copper. The low country of Wangara is ſaid to be ſubject to Bornou. It is periodically overflowed by the Niger; but the courſe of that river farther eaſtward is not known. Mr Horneman was informed that it has at leaſt a periodical communication with the longer branch of the Nile, called the *Bahr Abiad* or White river, which riſes in the mountains Al Komeri, or mountains of the Moon, about the ſeventh degree of N. Lat. To the eaſtward of Wangara, at the diſtance of about ſix degrees of longitude is the country of Dartoor already mentioned; beyond which lies Kordafan, another barbarous ſtate; and ſtill farther to the eaſtward is the country of Abyſſinia, in which the ſhorter branch of the Nile, the *Bahr Azrac* or Blue river, takes its riſe, which was viſited and traced to its ſource by our countryman Mr Bruce. That traveller conſidered the Bahr Azrac as the Nile, whereas in truth it is only one of its tributary ſtreams.

Bornou.

Dartoor.

The belt or ſtripe of territory of which we have hitherto taken notice is ſituated between the 12th and 17th degrees of N. Lat. To the ſouthward of this line the interior of Africa is ſtill unknown, as it has hitherto been viſited by no European traveller. We only know that it contains various nations or tribes of Negroes, of different characters and degrees of civilization. It may be obſerved, however, that to the ſouth of Tombuctoo and Houſſa lies the kingdom of Gago, near a ridge of mountains which run from weſt to eaſt, and give riſe to many ſtreams that flow northward into the Niger. It produces much gold, and the people are warlike. Their armies are compoſed of cavalry; and no warrior is permitted to take an enemy priſoner before he has obtained, by the mutilation of perſons whom he has ſlain, an hundred bloody trophies, ſimilar to thoſe which, in the Jewiſh hiſtory, David is ſaid to have won from the Philiſtines and preſented to King Saul as the price of his daughter Michal (1 Samuel xviii. 25.) In Gago, when the general takes the field he ſpreads a buffalo's hide upon the ground; and, pitching a ſpear at each ſide, he cauſes the ſoldiers to march over it till a hole be worn through the hide, when the army is underſtood to be ſufficiently numerous. The king is abſolute; but, when they are offended with his conduct, his ſubjects ſometimes rebel and ſend him a preſent of parrots eggs, with a meſſage, importing that "his ſubjects, conſidering that he muſt be fatigued with the trouble of government, are of opinion that it is time for him to indulge in a little ſleep." If the rebellion appear too formidable to be reſiſted, his majeſty takes the hint, and deſires his women to ſtrangle him; upon which he is immediately ſucceeded by his ſon. Africa. Gago.

To the ſouth of Gago, and near to the gulf of Guinea, is the kingdom of Dahomy. The capital, called Abomy, ſtands in N. Lat. 7° 57′. The country is fertile and cultivated, bearing every kind of grain, as well as indigo, cotton, and ſugar. The character of the people is ſtrongly marked, and ſome of their cuſtoms are ſingular. In their wars they are bold, and even ferocious; but towards ſtrangers they are hoſpitable, without any mixture of rudeneſs. Their king poſſeſſes abſolute power in the moſt complete ſenſe of the word. All children, whether male or female, are conſidered as his property. They are early ſeparated from their parents, and receive a ſort of public education, with a view to deſtroy from their minds all family connections. The king's dwelling occupies a ſpace of about a mile ſquare. It conſiſts of a multitude of huts formed of mud walls with bamboo roofs; and the whole is encloſed by a mud wall of 20 feet in height. The entrance of the king's apartment is paved with human ſkulls, and the ſide walls are ornamented with the jaw bones of men. On the thatched roofs numerous human ſkulls are ranged on wooden ſtakes; and he declares war by announcing that his houſe wants thatch. He has commonly about 3000 females immured in this dwelling; and about 500 are appropriated to each of the principal officers. When a man wants a wife he muſt purchaſe her from the king or ſome of theſe officers. He muſt firſt lay down the price, which is 20,000 cowries; and muſt then be contented with the wife that is allotted to him. At his acceſſion the king proclaims that he knows nobody, and is not inclined to make any new acquaintance; that he will adminiſter juſtice rigorouſly and impartially, but will liſten to no repreſentations againſt his will; and that he will receive no preſents except from his officers, who approach him Dahomy.

Africa. with the moſt abject ſubmiſſion. His whole ſubjects acknowledge themſelves his ſlaves, and admit his right to the abſolute diſpoſal of their property and perſons. Their character is nevertheleſs active and intrepid; and they ſacrifice themſelves in war without heſitation, in obedience to his commands. Thus the Dahomans appear to form a ſort of exception to the general mildneſs of the Negro character.

In addition to what has been here ſtated concerning the black inhabitants of the ſouthern regions of Africa, it may be remarked, that a French traveller, Vaillant, proceeding northward from the Cape of Good Hope, has made repeated efforts to inveſtigate the character and ſtate of the natives in that quarter. He has extended his reſearches into what is called the *country of the Caffres*, far beyond the limits that had been reached by any other traveller, and has given us the names of various African tribes under the appellation of *Gueſſiquas*, *Nimiquas*, *Koraquas*, *Kahobiquas*, and *Houzouanas*. Theſe tribes differ conſiderably in their features and make of body from the general Negro race, which we have already deſcribed. In their moral and intellectual character, however, they are not a little inferior: Their wants are extremely few, and are ſupplied by their flocks and herds without the neceſſity of agriculture; and their lives paſs away in a routine of liſtleſs inactivity, or of ſimple and unintereſting occupations, the detail of which would afford little amuſement or inſtruction.

European eſtabliſhments. We have already mentioned, that the European nations, during theſe three laſt centuries, have eſtabliſhed ſmall ſettlements or garriſons upon different parts of the Negro coaſt, chiefly for the purpoſe of obtaining ſlaves by trading with the natives. The number of people that are annually exported from that country, in conſequence of this trade, by Europeans or Moors, is very great. The Europeans have frequently carried from the weſt coaſt above 100,000 ſlaves a year; and the caravans of Egypt and Fezzan carry off about 20,000 annually. The very great extent to which this traffic is carried on the weſtern coaſt, undoubtedly gives riſe to many abuſes among the native ſtates in that neighbourhood, and is productive of frequent wars among them. Unfortunately, the nations of Europe have hitherto made few efforts to compenſate theſe evils by any attempts to introduce their arts, their civilization, or their ſcience, among the natives. Till lately, the Portugueſe were the only nation that attempted the improvement of the Negroes. They did not confine themſelves to garriſons or trading factories, but formed conſiderable colonies on the coaſts. They attempted to inſtruct the natives in the better cultivation of their ſoil; and introduced their own religion among them. It is even ſaid, that in Loango, Congo, Angola, and Benguela, they have been ſo ſedulous in the converſion of the Negroes, that they have made them better Chriſtians than themſelves. It is worthy of notice, as a fact of ſome importance in natural hiſtory, that ſuch of the deſcendants of the Portugueſe in theſe climates as have adopted the manners of the Negroes, and their modes of life, are hardly to be diſtinguiſhed in colour from the darkeſt Negroes. From the weakneſs of the parent ſtate, the Portugueſe ſettlements, in many places, are greatly decayed; and their efforts for the civilization of the natives have not been ſufficiently extenſive or perſevering: ſtill, however, they are ſaid to carry on the ſlave-trade with more mildneſs and humanity than other nations. The ſlaves are catechiſed and baptized before they are ſhipped; which tends to diminiſh the terrors attending tranſportation. The ſlave-ſhips of the Portugueſe are never crowded, and they are chiefly navigated by black mariners. Africa.

Slave trade.

In 1779, a Swediſh ſociety formed the project of ſettling a European colony on the weſtern coaſt of Africa, with the view of diſſeminating the general principles of civilization. This project was, at a later period, eagerly preſſed by Charles Berns Wadſtrom, a native of that country, but without ſucceſs. Afterwards the Danes eſtabliſhed a ſmall colony with the ſame view, near the mouth of the river Volta, under the ſuperintendence of Doctor Iſert. In the mean time, the univerſity of Cambridge in England, in 1785, propoſed, as the ſubject of a prize-eſſay, a queſtion concerning the lawfulneſs of the ſlavery and commerce of the human ſpecies. The prize was won by Mr J. Clarkſon; and the queſtion began to attract public notice: Vaſt numbers of pamphlets were written; and in a few years the whole nation intereſted itſelf in the ſubject, and the ſlave-trade became an object of popular indignation. Some legiſlative attempts were made towards its abolition, which were probably fruſtrated by the convulſive ſtate into which Europe was plunged by the French revolution. In the mean time, as early as 1783, Doctor H. Smeathman had propoſed a ſpecific plan for the colonization of Africa. This plan was not immediately attended to; but in the year 1787, after the ſubject had aſſumed a greater degree of importance, an attempt was made to carry it into execution, by ſending about four hundred blacks and ſixty whites, chiefly people of abandoned characters, collected about London, to Sierra Leona. In conſequence of the kind of perſons choſen as coloniſts, this firſt attempt did not ſucceed. But in July 1791, a number of perſons who had contributed money for the purpoſe of making a ſettlement with a view to the inſtruction and civilization of the Africans, were incorporated by act of parliament under the name of the *Sierra Leona Company*. At the termination of the American war, many black loyaliſts had been conveyed to Nova Scotia, which they diſliked, in conſequence of the ſterility of the lands allotted to them, and the ſeverity of the climate. The new Sierra Leona Company made propoſals to theſe blacks to form a ſettlement upon the coaſt of Africa, to which they were to be conveyed at the expence of the Company. The propoſal was accepted by 1200 blacks, who arrived at Sierra Leona in March 1792. After experiencing conſiderable difficulties, the colony began to enjoy tolerable proſperity, and received ambaſſadors from the neighbouring Negro ſtates; but on the 28th September 1794 a French ſquadron ſuddenly plundered and deſtroyed the colonial town. This ſquadron had been fitted out for the purpoſe of diſturbing the trade of the Engliſh ſlave-factories on the coaſt, and is ſaid to have been inſtigated by an American ſlave captain, who had taken ſome offence at the governor, to make the attack now mentioned. The damage was repaired. The ſettlement has ſince been viſited by various miſſionaries from different religious ſects in Britain, with the Sierra Leona.

Africa || Afwestad.

the view of extending the Chriſtian religion. The colony, however, ſtill languiſhes. It has been engaged in ſome unfortunate conteſts with the natives; and it has lately been found neceſſary to aſſiſt the Company with the public money. It ſeems doubtful how far it is likely ever to fulfil the purpoſe for which it was inſtituted, chiefly in conſequence of the difficulty of maintaining a very ſteady intercourſe with the country which founded it, and from the unfavourable nature of the climate to the health of the natives of Europe. Without ſuch an intercourſe, it is nearly impoſſible for any infant colony to preſerve its own civilization, and much leſs to confer it upon others. The firſt coloniſts, from the neceſſity of engaging in agriculture, ſoon forget the arts and the ſciences of the parent ſtate; and unleſs new ſettlers, from time to time, revive among them, and keep up the improvements of their anceſtors, the whole ſettlement is apt to ſink into a ſemibarbarous ſtate, or into a reſemblance of the natives of the country into which they have come. This has been the fate of moſt of the Portugueſe colonies that were intended for the civilization of the Africans; and muſt prove the deſtiny of our own ſettlement of Sierra Leona, unleſs the ordinary courſe of events ſhall be counteracted by extraordinary efforts.

AFRICAN COMPANY. See COMPANY.

African Aſſociation. See ASSOCIATION.

AFRICANUS, JULIUS, an excellent hiſtorian of the third century, the author of a chronicle which was greatly eſteemed, and in which he reckons 5500 years from the creation of the world to Julius Cæſar. This work, of which we have now no more than what is to be found in Euſebius, ended at the 221ſt year of the vulgar æra. Africanus alſo wrote a letter to Origen on the hiſtory of Suſanna, which he reckoned ſuppoſititious: and we have ſtill a letter of his to Ariſtides, in which he reconciles the ſeeming contradictions in the two genealogies of Chriſt recorded by St Matthew and St Luke.

AFSLAGERS, perſons appointed by the burgomaſters of Amſterdam to preſide over the public ſales made in that city. They muſt always have a clerk of the ſecretary's office with them, to take an account of the ſale. They correſpond to our brokers, or auctioneers.

AFT, in the ſea language, the ſame with ABAFT.

AFTERBIRTH, in *Midwifery*, ſignifies the membranes which ſurround the infant in the womb, generally called the ſecundines. See MIDWIFERY.

AFTERMATH, in *Huſbandry*, ſignifies the graſs which ſprings or grows up after mowing.

AFTERNOON, the latter half of the artificial day, or that ſpace between noon and night.

AFTER-PAINS, in *Midwifery*, exceſſive pains felt in the groin, loins, &c. after the woman is delivered.

AFTER-SWARMS, in the management of bees, are thoſe which leave the hive ſome time after the firſt has ſwarmed. See BEE.

AFWESTAD, a large copper-work belonging to the crown of Sweden, which lies on the Dala, in the province of Dalecarlia, in Sweden. It looks like a town, and has its own church. Here they make copper plates; and have a mint for ſmall ſilver coin, as well as a royal poſt-houſe. E. Long. 14. 10. N. Lat. 58. 10.

AGA, in the Turkiſh language, ſignifies a great lord or commander. Hence the aga of the janizaries is the commander in chief of that corps; as the general of horſe is denominated *ſpachiclar aga*. The aga of the janizaries is an officer of great importance. He is the only perſon who is allowed to appear before the Grand Signor without his arms acroſs his breaſt in the poſture of a ſlave. Eunuchs at Conſtantinople are in poſſeſſion of moſt of the principal poſts of the ſeraglio: The title *aga* is given to them all, whether in employment or out. This title is alſo given to all rich men without employ, and eſpecially to wealthy landholders.

Aga || Aganippe.

We find alſo *agas* in other countries. The chief officers under the khan of Tartary are called by this name. And among the Algerines, we read of *agas* choſen from among the *boluk baſhis* (the firſt rank of military officers), and ſent to govern in the chief towns and garriſons of that ſtate. The *aga* of Algiers is the preſident of the divan, or ſenate. For ſome years, the *aga* was the ſupreme officer; and governed the ſtate in place of the baſhaw, whoſe power dwindled to a ſhadow. But the ſoldiery riſing againſt the *boluk baſhis*, or *agas*, maſſacred moſt of them, and transferred the ſovereign power to the caliph, with the title of *Dey* or King.

AGADES, a kingdom and city of Negroland in Africa. It lies nearly under the tropic of Cancer, between Gubur and Cano. The town ſtands on a river that falls into the Niger; it is walled, and the king's palace is in the midſt of it. The king has a retinue, who ſerve as a guard. The inhabitants are not ſo black as other Negroes, and conſiſt of merchants and artificers. Thoſe that inhabit the fields are ſhepherds or herdſman, whoſe cottages are made of boughs, and are carried about from place to place on the backs of oxen. They are fixed on the ſpot of ground where they intend to feed their cattle. The houſes in the city are ſtately, and built after the Barbary faſhion. This kingdom was, and may be ſtill, tributary to the king of Tombuctoo. It is well watered; and there is great plenty of graſs, cattle, ſenna, and manna. The prevailing religion is the Mahometan, but it is not rigidly practiſed. N. Lat. 26. 10. E. Long. 9. 10.

AGALLOCHUM, a very fragrant medicinal wood brought from the Eaſt Indies. See EXCÆCARIA, BOTANY *Index*.

AGALMATA, in antiquity, a term originally uſed to ſignify any kind of ornaments in a temple; but afterwards for the ſtatues only, which were moſt conſpicuous.

AGAMEMNON, the ſon of Atreus by Erope, was captain general of the Trojan expedition. It was foretold to him by Caſſandra, that his wife Clytemneſtra would be his death: yet he returned to her; and accordingly was ſlain by Ægiſthus, who had gained upon his wife in his abſence, and by her means got the government into his own hands.

AGAN, in *Geography*, one of the Ladrone iſlands. The circumnavigator, Magellan, was aſſaſſinated here in the year 1525.

AGANIPPIDES, in ancient poetry, a deſignation given to the Muſes, from a fountain of Mount Helicon, called *Aganippe*.

AGANIPPE, in antiquity, a fountain of Bœotia,

Agape || Agard.

at Mount Helicon, on the borders between Phocis and Bœotia, facred to the Muſes, and running into the river Permeſſus; (Pliny, Pauſanias.) Ovid ſeems to make *Aganippe* and *Hippocrene* the ſame. Serenus more truly diſtinguiſhes them, and aſcribes the blending them to poetical licenſe.

AGAPE, in eccleſiaſtical hiſtory, the love-feaſt, or feaſt of charity, in uſe among the primitive Chriſtians; when a liberal contribution was made by the rich to feed the poor. The word is Greek, and ſignifies *love*. St Chryſoſtom gives the following account of this feaſt, which he derives from the apoſtolical practice. He ſays, "The firſt Chriſtians had all things in common, as we read in the Acts of the Apoſtles; but when that equality of poſſeſſions ceaſed, as it did even in the Apoſtles time, the *agape*, or love-feaſt, was ſubſtituted in the room of it. Upon certain days, after partaking of the Lord's ſupper, they met at a common feaſt; the rich bringing proviſions, and the poor who had nothing being invited." It was always attended with receiving the holy ſacrament; but there is ſome difference between the ancient and modern interpreters as to the circumſtance of time, viz. whether this feaſt was held before or after the communion. St Chryſoſtom is of the latter opinion; the learned Dr Cave of the former.—Theſe love-feaſts, during the three firſt centuries, were held in the church without ſcandal or offence; but, in after times, the heathens began to tax them with impurity. This gave occaſion to a reformation of theſe *agapæ*. The kiſs of charity, with which the ceremony uſed to end, was no longer given between different ſexes; and it was expreſsly forbidden to have any beds or couches, for the conveniency of thoſe who ſhould be diſpoſed to eat more at their eaſe. Notwithſtanding theſe precautions, the abuſes committed in them became ſo notorious, that the holding of them (in churches at leaſt) was ſolemnly condemned, at the council of Carthage, in the year 307.

AGAPETÆ, in eccleſiaſtical hiſtory, a name given to certain virgins and widows, who, in the ancient church, aſſociated themſelves with, and attended on, eccleſiaſtics, out of a motive of piety and charity.

In the primitive days there were women inſtituted DEACONESSES; who, devoting themſelves to the ſervice of the church, took up their abode with the miniſters, and aſſiſted them in their functions. In the fervour of the primitive piety, there was nothing ſcandalous in theſe ſocieties: but they afterwards degenerated into libertiniſm; inſomuch, that St Jerome aſks, with indignation, *unde agapetarum peſtis in eccleſias introiit?* This gave occaſion to councils to ſuppreſs them.—St Athanaſius mentions a prieſt, named Leontius, who, to remove all occaſion of ſuſpicion, offered to mutilate himſelf, to preſerve his beloved companion.

AGARD, ARTHUR, a learned Engliſh antiquarian, born at Toſton in Derbyſhire in the year 1540. His fondneſs for Engliſh antiquities induced him to make many large collections; and his office as deputy chamberlain of the exchequer, which he held 45 years, gave him great opportunities of acquiring ſkill in that ſtudy. Similarity of taſte brought him acquainted with Sir Robert Cotton, and other learned men, who aſſociated themſelves under the name of *The Society of Antiquarians*, of which ſociety Mr Agard was a conſpicuous member. He made the Doomſday book his peculiar ſtudy; and compoſed a work purpoſely to explain it, under the title of *Tractatus de uſu et obſcuribus verbis libri de Domeſday*: he alſo compiled a book for the ſervice of his ſucceſſors in office, which he depoſited with the officers of the king's receipt, as a proper index for ſucceeding officers. All the reſt of his collections, containing at leaſt twenty volumes, he bequeathed to Sir Robert Cotton; and died in 1615.

Agarie || Agate.

AGARIC, FEMALE. See BOLETUS, BOTANY *Index*.

AGARIC *Mineral*, a marly earth, reſembling the vegetable of that time in colour and texture. It is found in the fiſſures of rocks, and on the roofs of caverns; and is ſometimes uſed as an aſtringent in fluxes, hemorrhagies, &c.

AGARICUS, MUSHROOM. See AGARICUS, BOTANY *Index*.

AGATE, or ACHAT, (among the Greeks and Latins, Αχατης and *Achates*, from a river in Sicily, on the banks of which it was firſt found), a very extenſive genus of the ſemipellucid gems.

Theſe ſtones are variegated with veins and clouds, but have no zones like thoſe of the onyx. They are compoſed of cryſtal debaſed by a large quantity of earth, and not formed, either by repeated incruſtations round a central nucleus, or made up of plates laid evenly on one another; but are merely the effect of one ſimple concretion, and variegated only by the diſpoſition given by the fluid they were formed in to their differently coloured veins or matters.

Agates are arranged according to the different colours of their ground. Of thoſe with a *white* ground there are three ſpecies. (1.) The *dendrachates*, *mocoa ſtone*, or *arboreſcent agate*. This ſeems to be the ſame with what ſome authors call the achates with roſemary in the middle, and others achates with little branches of black leaves. (2.) The *dull milky-looking agate*. This, though greatly inferior to the former, is yet a very beautiful ſtone. It is common on the ſhores of rivers in the Eaſt Indies, and alſo in Germany and ſome other parts of Europe. Our lapidaries cut it into counters for card-playing, and other toys of ſmall value. (3.) The *lead-coloured agate*, called the *phaſſachates* by the ancients.

Of the agates with a *reddiſh* ground there are four ſpecies. (1.) An impure one of a fleſh-coloured white, which is but of little beauty in compariſon with other agates. The admixture of fleſh-colour is but very ſlight; and it is often found without any clouds, veins, or other variegations; but ſometimes it is prettily veined or variegated with ſpots of irregular figures, having fimbriated edges. It is found in Germany, Italy, and ſome other parts of Europe; and is wrought into toys of ſmall value, and often into the German guhflints. It has been ſometimes found with evident ſpecimens of the perfect moſſes bedded deep in it. (2.) That of a pure blood colour, called *hæmachates*, or the *bloody agate*, by the ancients. (3.) The clouded and ſpotted agate, or a pale fleſh colour, called by the ancients the *carnelian achates* or *ſardachates*. (4.) The red-lead coloured one, variegated with yellow, called the *coral agate*, or *coralla-achates*, by the ancients.

Of the agates with a *yellowiſh* ground there are only two known ſpecies; the one of the colour of yellow wax, called *cerachates* by the ancients; the other a very

Agate. very elegant ſtone, of a yellow ground, variegated with white, black, and green, called the *leonina*, and *leonteſeres*, by the ancients.

Laſtly, Of the agates with a *greeniſh* ground, there is only one known ſpecies, called by the ancients *jaſpachates*.

Of all theſe ſpecies there are a great many varieties; ſome of them having upon them natural repreſentations of men and different kinds of animals, &c. Thoſe repreſentations are not confined to the agates whoſe ground is of any particular colour, but are occaſionally found on all the different ſpecies. Velſchius had in his cuſtody a fleſh coloured agate, on one ſide of which appeared a half moon in great perfection, repreſented by a milky ſemicircle; on the other ſide, the phaſes of *veſper*, or the evening ſtar: whence he denominated it an *aphrodiſian agate*. An agate is mentioned by Kircher *, on which was the repreſentation of a heroine armed; and one in the church of St Mark in Venice has the repreſentation of a king's head adorned with a diadem. On another, in the muſeum of the prince of Gonzaga, was repreſented the body of a man with all his clothes in a running poſture. A ſtill more curious one is mentioned by De Boot †, wherein appears a circle ſtruck in brown, as exactly as if done with a pair of compaſſes, and in the middle of the circle the exact figure of a biſhop with a mitre on: but inverting the ſtone a little, another figure appears; and if it is turned yet further, two others appear, the one of a man, and the other of a woman. But the moſt celebrated agate of this kind is that of Pyrrhus, wherein were repreſented the nine Muſes, with their proper attributes, and Apollo in the middle playing on the harp ‡. In the emperor's cabinet is an oriental agate of a ſurpriſing bigneſs, being faſhioned into a cup, whoſe diameter is an ell, abating two inches. In the cavity is found delineated in black ſpecks, B. XRISTOR. S. XXX. Other agates have alſo been found, repreſenting the numbers 4191, 191; whence they were called *arithmetical* agates, as thoſe repreſenting men or women have obtained the name of *anthropomorphous*.

* *Ephem. German.* dec. i. an. 1. obſ. 151.

† *De gem.* l. ii. c. 95.

‡ *Pliny*, l. xxxvii. c. 3.

Great medicinal qualities were formerly attributed to the agate, ſuch as reſiſting poiſons, eſpecially thoſe of the viper, ſcorpion, and ſpider; but they are now very juſtly rejected from medicinal practice. The oriental ones are all ſaid to be brought from the river Gambay. A mine of agates was ſome time ago diſcovered in Tranſylvania, of divers colours; and ſome of a large ſize, weighing ſeveral pounds.

Agates may be ſtained artificially with ſolution of ſilver in ſpirit of nitre, and afterwards expoſing the part to the ſun; and though theſe artificial colours diſappear on laying the ſtone for a night in aquafortis, yet a knowledge of the practicability of thus ſtaining agates, muſt render theſe curious figures above mentioned ſtrongly ſuſpected of being the work not of nature, but of art. Some account for theſe phenomena from natural cauſes. Thus Kircher, who had ſeen a ſtone of this kind in which were depicted the four letters uſually inſcribed on crucifixes, I. N. R. I. apprehends that ſome real crucifix had been buried under ground, among ſtones and other rubbiſh, where the inſcription happening to be parted from the croſs, and to be received among a ſoft mould or clay ſuſceptible of the impreſſion of the letters, came afterwards to be petrified. In the ſame manner he ſuppoſes the agate of Pyrrhus to have been formed. Others reſolve much of the wonder into fancy, and ſuppoſe thoſe ſtones formed in the ſame manner with the *camaieux* * or Florentine ſtones. Agate.

* See *Camaieux*.

The agate is uſed for making cups, rings, ſeals, handles for knives and forks, hilts for ſwords and hangers, beads to pray with, ſmelling boxes, patch-boxes, &c. being cut or ſawed with no great difficulty. At Paris none have a right to deal in this commodity except the wholeſale mercers and goldſmiths. The ſword cutlers are allowed to ſell it, but only when made into handles for couteaux de chaſſe, and ready ſet in. The cutlers have the ſame privilege for their knives and forks.

Conſiderable quantities of theſe ſtones are ſtill found near the river Achates in Sicily. There are found in ſome of theſe the ſurpriſing repreſentations above mentioned, or others ſimilar to them. By a dexterous management of theſe natural ſtains, medals have been produced, which ſeem maſterpieces of nature: for this ſtone bears the graver well; and as pieces of all magnitudes are found, they make all ſorts of work of it. The high altar of the cathedral of Meſſina is all over encruſted with it. The lapidaries pretend that the Indian agates are finer than the Sicilian; but Father Labat * informs us, that in the ſame quarries, and even in the ſame block, there are found pieces much finer than others, and theſe fine pieces are ſold for Indian agates in order to enhance their prices.

* *Voyage d'Ital.* tom. v. p. 156.

AGATE, among *antiquaries*, denotes a ſtone of this kind engraven by art. In this ſenſe, agates make a ſpecies of antique gems; in the workmanſhip whereof we find eminent proofs of the great ſkill and dexterity of the ſculptors. Several agates of exquiſite beauty are preſerved in the cabinets of the curious; but the facts or hiſtories repreſented on theſe antique agates, however well executed, are now become ſo obſcure, and their explications ſo difficult, that ſeveral diverting miſtakes and diſputes have ariſen among thoſe who undertook to give their true meaning.

The great agate of the apotheoſis of Auguſtus, in the treaſury of the holy chapel, when ſent from Conſtantinople to St Lewis, paſſed for a triumph of Joſeph. An agate, which was in the French king's cabinet †, had been kept 700 years with great devotion, in the Benedictine abbey of St Evre at Toul, where it paſſed for St John the Evangeliſt carried away by an eagle, and crowned by an angel; but the Heatheniſm of it having been lately detected, the religious would no longer give it a place among their relicks, but preſented it in 1684 to the king. The antiquaries found it to be the apotheoſis of Germanicus. In like manner the triumph of Joſeph was found to be a repreſentation of Germanicus and Agrippina, under the figures of Ceres and Triptolemus. Another was preſerved, from time immemorial, in one of the moſt ancient churches of France, where it had paſſed for a repreſentation of paradiſe and the fall of man; there being found on it two figures repreſenting Adam and Eve, with a tree, a ſerpent, and a Hebrew inſcription round it, taken from the third chapter of Geneſis, "The woman ſaw that the tree was good," &c. The French academiſts, inſtead of our firſt parents, found Jupiter and Minerva repreſented by the two figures: the inſcription was of

† *Hiſt. Acad. R. Inſcrip.* tom. i. p. 337—344.

Agathias || Agde.

a modern date, written in a rabbinical character, very incorrect, and poorly engraven. The prevailing opinion was, that this agate represented simply the worship of Jupiter and Minerva at Athens.

AGATE is also the name of an instrument used by gold-wire drawers; so called from the agate in the middle of it which forms its principal part.

AGATHIAS, or, as he calls himself in his epigrams, AGATHIUS, distinguished by the title of *Scholasticus*, a Greek historian in the 6th century under Justinian. He was born at Myrina, a colony of the ancient Æolians, in Asia the Less, at the mouth of the river Phythicus. He was an advocate at Smyrna. Though he had a taste for poetry, he was yet more famous for his history, which begins with the 26th year of Justinian's reign, where Procopius ends. It was printed in Greek and Latin by Vulcanius, at Leyden, 1594, in 4to; and at Paris at the king's printing house, 1660, in folio.

AGATHO, the Athenian, a tragic and comic poet, was the disciple of Prodicus and Socrates, and applauded by Plato in his Dialogues for his virtue and beauty. His first tragedy obtained the prize; and he was crowned in the presence of upwards of 30,000 persons in the 4th year of the 90th Olympiad. There is nothing now extant of his works, excepting a few quotations, in Aristotle, Athenæus, and others.

AGATHOCLES, the famous tyrant of Sicily, was the son of a potter at Reggio. He was a thief, a common soldier, a centurion, a general, and a pirate, all in regular succession. He defeated the Carthaginians several times in Sicily, and was once defeated himself. He first made himself tyrant of Syracuse, and then of all Sicily; after which he vanquished the Carthaginians again both in Sicily and Africa. But at length having ill success, and being in arrears with his soldiers, they mutinied, forced him to fly his camp, and cut the throats of his children, whom he left behind. Recovering himself again, he relieved Corfu, besieged by Cassander; burnt the Macedonian fleet; returned to Sicily; murdered the wives and children of those who had murdered his: afterwards meeting with the soldiers themselves, he put them all to the sword; and, ravaging the seacoast of Italy, took the city of Hipponium. He was at length poisoned by his grandson Archagathus, in the 72d year of his age, 290 years before Christ, having reigned 28 years.

AGATHYRNA, or AGATHYRNUM, AGATHYRSA, or AGATHYRSUM, in *Ancient Geography*, a town of Sicily; now *St Marco;* as old as the war of Troy, being built by Agathyrnus, son of Æolus, on an eminence. The gentilitious name is *Agathyrnæus;* or, according to the Roman idiom, *Agathyrnensis.*

AGAVE, AMERICAN ALOE, in *Botany*. See BOTANY *Index.*

AGDE, a city of France, in the department of Herault, formerly the province of Languedoc, in the territory of Agadez, with a bishop's see. The diocese is small, but is one of the richest countries in the kingdom. It produces fine wool, wine, oil, corn, and silk. It is seated on the river Herault, a mile and a quarter from its mouth, where it falls into the gulf of Lyons, and where there is a fort built to guard its entrance. It is well peopled; the houses are built of black stone, and there is an entrance into the city by four gates. The greatest part of the inhabitants are merchants or seamen. The public buildings are but mean: the cathedral is small, and not very handsome: the bishop's palace is an old building, but convenient. The city is extended along the river, where it forms a little port, wherein small craft may enter. There is a great concourse of pilgrims and other devout people to the chapel of Notre Dame de Grace. It is a little without the city, between which and the chapel there are about thirteen or fourteen oratories, which they visit with naked feet. The convent of the Capuchins is well built, and on the outside are lodgings and apartments for the pilgrims who come to perform their *neuvaine* or nine days devotion. The chapel, which contains the image of the Virgin Mary, is distinct from the convent. E. Long. 3. 28. N. Lat. 43. 19.

Age.

AGE, in the most general sense of the word, signifies the duration of any being, from its first coming into existence to the time of speaking of it, if it still continues; or to its destruction, if it has ceased to exist some time before we happen to mention it.

Among the ancient poets, this word was used for the space of 30 years; in which sense, *age* amounts to much the same with *generation*. Thus, Nestor is said to have lived *three ages* when he was 90 years old.—By ancient Greek historians, the time elapsed since the beginning of the world is divided into three periods, which they called *ages*. The first reaches from the creation to the deluge which happened in Greece during the reign of Ogyges; this they called the *obscure* or *uncertain* age, because the history of mankind is altogether uncertain during that period. The second they call the *fabulous* or *heroic* age, because it is the period in which the fabulous exploits of their gods and heroes are said to have been performed. It began with the Ogygian deluge, and continued to the first Olympiad; where the third or *historical* age commenced.—This division, however, it must be observed, holds good only with regard to the Greeks and Romans, who had no histories earlier than the first Olympiad; the Jews, Egyptians, Phœnicians, and Chaldees, not to mention the Indians and Chinese, who pretend to much higher antiquity, are not included in it.

The interval since the first formation of man has been divided by the poets into four *ages*, distinguished by the epithets of *golden*, *silver*, *brazen*, and *iron*. During the *golden* age, Saturn reigned in heaven, and justice and innocence in this lower world. The earth then yielded her productions without culture; men held all things in common, and lived in perfect friendship. This period is supposed to have lasted till the expulsion of Saturn from his kingdom. The *silver* age commenced when men began to deviate from the paths of virtue; and, in consequence of this deviation, their lives became less happy. The *brazen* age commenced on a farther deviation, and the *iron* age took place in consequence of one still greater. A late author, however, reflecting on the barbarism of the first ages, will have the order which the poets assign to the four ages inverted; the first being a time of rudeness and ignorance, more properly denominated an *iron* than a *golden* age. When cities and states were founded, the *silver* age commenced; and since arts and sciences, navigation and commerce, have been cultivated, the *golden* age has taken place.

Age. In ſome ancient northern monuments, the *rocky* or *ſtony* age correſponds to the *brazen* age of the Greeks. It is called *rocky*, on account of Noah's ark, which reſted on Mount Ararat; whence men were ſaid to be deſcended or ſprung from mountains: or from Deucalion and Pyrrha reſtoring the race of mankind, by throwing ſtones over their heads. The northern poets alſo ſtyle the fourth age of the world the *aſken* age, from a Gothic king Madenis, or Mannus, who on account of his great ſtrength was ſaid to be made of aſh, or becauſe in his time people began to make uſe of weapons made of the wood.

Among the Jews, the duration of the world is alſo divided into three ages. 1. The *ſeculum inane*, or *void age*, was the ſpace of time from the creation to Moſes. 2. The *preſent* age, denotes all the ſpace of time from Moſes to the coming of the Meſſiah; and, 3. The *age to come*, denotes the time from the coming of the Meſſiah to the end of the world.

Various other diviſions of the duration of the world into *ages* have been made by hiſtorians.—The Sibylline oracles, wrote, according to ſome, by Jews acquainted with the prophecies of the Old Teſtament, divide the duration of the world into ten *ages*; and according to Joſephus, each age contained ſix hundred years. It appears, by Virgil's fourth eclogue, and other teſtimonies, that the age of Auguſtus was reputed the end of thoſe ten *ages*, conſequently as the period of the world's duration.

By ſome, the ſpace of time commencing from Conſtantine, and ending with the taking of Conſtantinople by the Turks in the 15th century, is called the *middle age*: but others chooſe rather to date the middle age from the diviſion of the empire made by Theodoſius at the cloſe of the 4th century, and extend it to the time of the emperor Maximilian I. in the beginning of the 16th century, when the empire was firſt divided into circles.—The *middle* is by ſome denoted the *barbarous* age, and the latter part of it the *loweſt* age. Some divide it into the *non-academical* and *academical* ages. The firſt includes the ſpace of time from the 6th to the 9th century, during which ſchools or academies were loſt in Europe. The ſecond from the 9th century, when ſchools were reſtored, and univerſities eſtabliſhed, chiefly by the care of Charlemagne.

The ſeveral *ages* of the world may be reduced to three grand epochs, viz. the *age* of the law of nature, called by the Jews the *void age*, from Adam to Moſes; the *age* of the Jewiſh law, from Moſes to Chriſt; and the *age* of grace, from Chriſt to the preſent year.

Age is alſo frequently uſed in the ſame ſenſe with *century*, to denominate a duration of 100 years.

Age likewiſe ſignifies a certain period of the duration of human life; by ſome divided into four ſtages, namely, infancy, youth, manhood, and old age; the firſt extending to the 15th year, the ſecond to the [illegible]th, the third to the 50th, and the fourth to the end of life; by others divided into infancy, childhood, youth, manhood, and old age.

Age, in *Law*, ſignifies a certain period of life, when perſons of both ſexes are enabled to do certain acts. Thus, one at twelve years of age of [illegible]t to take the oath of allegiance to the king in a [illegible]; at fourteen he may marry, chooſe his guardian, and claim his lands held in ſoccage. Twenty-one is called *full age*, a man or woman being then capable of acting for themſelves, of managing their affairs, making contracts, diſpoſing of their eſtates, and the like.

Age of a Horſe. See Horse.

Age of Trees. Theſe after a certain age waſte. An oak at a hundred years old ceaſes to grow. The uſual rule for judging of the age of wood, is by the number of circles which appear in the ſubſtance of a trunk or ſtock cut perpendicularly, each circle being ſuppoſed the growth of a year; though ſome reject this method as precarious, alledging, that a ſimple circle is ſometimes the produce of ſeveral years; beſides that, after a certain age, no new circles are formed.

Age-prior, in *Law*, is when an action being brought againſt a perſon under age, for lands deſcended to him, he, by motion or petition, ſhows the matter to the court, praying the action may be ſtaid till his full age, which the court generally agrees to.

AGELNOTH, Egelnoth, or Æthelnoth, in Latin *Achelnotus*, archbiſhop of Canterbury, in the reign of Canute the Great, ſucceeded Livingus in that ſee in the year 1020. This prelate, ſurnamed the *Gebd*, was ſon of Earl Agiimer, and at the time of his election dean of Canterbury. After his promotion he went to Rome and received his pall from Pope Benedict VIII. In his way thither, as he paſſed through Pavia, he purchaſed, for an hundred talents of ſilver and one of gold, St Auguſtin's arm, which was kept there as a relic; and ſent it over to England as a preſent to Leofric earl of Coventry. Upon this return, he is ſaid to have raiſed the ſee of Canterbury to its former luſtre. He was much in favour with King Canute, and employed his intereſt with that monarch to good purpoſes. It was by his advice the king ſent over large ſums of money for the ſupport of the foreign churches; and Malmſbury obſerves, that this prince was prompted to acts of piety, and reſtrained from exceſſes, by the regard he had for the archbiſhop. Agelnoth, after he had ſat 17 years in the ſee of Canterbury, departed this life on the 29th of October 1038, and was ſucceeded by Eadſius, King Harold's chaplain. This archbiſhop was an author, having written, 1. A Panegyric on the bleſſed Virgin Mary. 2. A Letter to Earl Leofric concerning St Auguſtin. 3. Letters to ſeveral perſons.

Agelnoth or Aſgen.

AGEMA, in Macedonian antiquity, was a body of ſoldiers not unlike the Roman legion.

AGEMOGLANS, Agiamoglans, or Azamoglans, in the *Turkiſh Polity*, are children purchaſed from the Tartars, or raiſed every third year, by way of tribute, from the Chriſtians tolerated in the Turkiſh empire. Theſe, after being circumciſed and inſtructed in the religion and language of their tyrannical maſters, are taught the exerciſes of war, till they are of a proper age for carrying arms; and from this corps the janizaries are recruited. With regard to thoſe who are thought unfit for the army, they are employed in the loweſt offices of the ſeraglio. Their appointments alſo are very ſmall, not exceeding ſeven aſpers and a half per day, which amount to about threepence-halfpenny of our money.

AGEN, a city of France, on the river Garonne, the capital of Agenois, in the province of Guienne, now the department of the Garonne, and the ſee of a biſhop. The gates and old walls, which are yet remaining, ſhow that

Agenda || Agentes.

that this city is very ancient, and that its former circuit was not ſo great as the preſent. The palace, wherein the preſidial holds his ſeſſions at this day, was heretofore called the caſtle of Montravel, and is ſeated without the walls of the old city, and on the ſide of the foſſé. There are likewiſe the ruins of another caſtle, called *La Sagne*, which was without the walls, cloſe by a brook. Though the ſituation of Agen is convenient for trade and commerce, the inhabitants are ſo extremely indolent that there is very little; of which the neighbouring cities take the advantage. It is ſeated on the bank of the river Garonne, in a pleaſant country; but is itſelf a very mean and diſagreeable place, the houſes being ill-built, and the ſtreets narrow, crooked, and dirty. E. Long. 0. 30. N. Lat. 44. 12.

AGENDA, among philoſophers and divines, ſignifies the duties which a man lies under an obligation to perform: thus we meet with the *agenda* of a Chriſtian, or the duties he ought to perform; in oppoſition to the *credenda*, or things he is to believe.

AGENDA, among merchants, a term ſometimes uſed for a memorandum-book, in which is ſet down all the buſineſs to be tranſacted during the day, either at home or abroad.

AGENDA, among eccleſiaſtical writers, denotes the ſervice or office of the church. We meet with *agenda matutina et veſpertina*, "the morning and evening prayers;" *agenda diei*, "the office of the day," whether feaſt or faſt; *agenda mortuorum*, called alſo ſimply *agenda*, "the ſervice of the dead."

AGENDA, is alſo applied to certain church-books, compiled by public authority, preſcribing the order and manner to be obſerved by the miniſters and people in the principal ceremonies and devotions of the church. In which ſenſe *agenda* amounts to the ſame with what is otherwiſe called *ritual*, *liturgy*, *acaloutthia*, *miſſal*, *formulary*, *directory*, &c.

AGENHINE, in our old writers, ſignifies a gueſt that has lodged at an inn for three nights, after which time he was accounted one of the family; and if he offended the king's peace, his hoſt was anſwerable for him. It is alſo written HOGENHINE and HOGENHYNE.

AGENOIS, in *Geography*, a country of France, in the department of the Garonne, formerly the province of Guienne. It contains about one hundred and twenty ſquare leagues; is fertile and healthy; and, according to Cæſar, was inhabited by the Nitiobriges. It conſtituted part of the kingdom of Aquitania; was held by the counts of Toulouſe, and ſucceſſively by the Engliſh and French.

AGENORIA, in mythology, the goddeſs of courage and induſtry, as *Vacuna* was of indolence.

AGENT, in a general ſenſe, denotes any active power or cauſe. Agents are either natural or moral. Natural agents are ſuch inanimate bodies as have a power to act upon other bodies in a certain and determinate manner; as gravity, fire, &c. Moral agents, on the contrary, are rational creatures, capable of regulating their actions by a certain rule.

AGENT, is alſo uſed to denote a perſon intruſted with the management of an affair, whether belonging to a ſociety, company, or private perſon.

AGENTES in rebus, one of the ranks of officers in the court of the Conſtantinopolitan emperors, whoſe buſineſs was to collect and convey the corn both for the army and houſehold; to carry letters and meſſages from court to all parts of the empire; to regulate couriers, and their vehicles; to make frequent journeys and expeditions through the provinces, in order to inſpect any motions, diſturbances, or machinations tending that way, and to give early notice thereof to the emperor.

Agel. || Ageſilaus.

The *agentes in rebus*, are by ſome made ſynonymous with our poſt-maſters, but their functions were of great extent. They correſpond to what the Greeks call *πυξοφοροι*, and the Latins *veredarii*.

There were various orders or degrees of *agentes in rebus*; as *tribuni*, *primiceriі*, *ſenatores*, *ducenariі*, *biarchi*, *circitores*, *equites*, *tyrones*, &c. through all which they roſe *gradatim*. Their chief, who reſided at Conſtantinople, was denominated *princeps*; which was a poſt of great dignity, being reckoned on a level with that of proconſul. They were ſettled in every part of the empire; and are alſo ſaid to have ſerved as interpreters.

AGER, in Roman antiquity, a certain portion of land allowed to each citizen. See AGRARIAN LAW.

AGER PICENUS, or *Picenum*, in *Ancient Geography*, a territory of Italy to the ſouth-eaſt of Umbria, reaching from the Apennines to the Adriatic. The people are called *Picentes* (Cicero, Livy,) diſtinct from the Picentini on the Tuſcan ſea, though called by Greek writers *Πικεντινοι*. This name is ſaid to be derived from the bird *picus*, under whoſe conduct they removed from the Sabines, of whom they were a colony.

AGERATUM, BASTARD HEMP-AGRIMONY, in *Botany*. See BOTANY *Index*.

AGESILAUS, king of the Lacedæmonians, the ſon of Archidamus, was raiſed to the throne in oppoſition to the ſuperior claim of his nephew Leotychides. As ſoon as he came to the throne, he adviſed the Lacedæmonians to anticipate the king of Perſia, who was making great preparations for war, and to attack him in his own dominions. He was himſelf choſen for this expedition; and gained ſo many advantages over the enemy, that if the league which the Athenians and the Thebans formed againſt the Lacedæmonians had not obliged him to return home, he would have carried his victorious arms into the very heart of the Perſian empire. He gave up, however, all theſe triumphs readily, to come to the ſuccour of his country, which he happily relieved by his victory over the allies in Bœotia. He obtained another near Corinth; but to his great mortification, the Thebans afterward gained ſeveral over the Lacedæmonians. Theſe misfortunes at firſt raiſed a clamour againſt him. He had been ſick during the firſt advantages which the enemy gained; but as ſoon as he was able to act in perſon, his valour and prudence prevented the Thebans from reaping the advantages of their victories; ſo that it was generally believed had he been in health at the beginning, the Lacedæmonians would have ſuſtained no loſſes, and that all would have been loſt had it not been for his aſſiſtance. It cannot be denied but he loved war more than the intereſt of his country required; for if he could have lived in peace, he had ſaved the Lacedæmonians ſeveral loſſes, and they would not have been engaged in many enterpriſes which in the end contributed much to weaken their power. He died in the

third

Ageſilaus || Agger.

third year of the 104th Olympiad, being the 84th year of his age and 41ſt of his reign, and was ſucceeded by his ſon Archidamus. Ageſilaus would never ſuffer any picture or ſculpture to be made of him, and prohibited it alſo by his will: this he is ſuppoſed to have done from a conſciouſneſs of his own deformity; for he was of a ſhort ſtature, and lame of one foot, ſo that ſtrangers uſed to deſpiſe him at the firſt ſight. His fame went before him into Egypt, and there they had formed the higheſt idea of Ageſilaus. When he landed in that country, the people ran in crowds to ſee him: but great was their ſurpriſe when they ſaw an ill dreſſed, ſlovenly, mean-looking little fellow, lying upon the graſs: they could not forbear laughing, and applied to him the fable of the mountain in labour. He was, however, the firſt to jeſt upon his own perſon; and ſuch was the gaiety of his temper, and the ſtrength with which he bore the roughеſt exerciſes, that theſe qualities made amends for his corporeal defects. He was remarkable for plainneſs and frugality in his dreſs and mode of life. "This (ſays Cornelius Nepos) is eſpecially to be admired in Ageſilaus: when very great preſents were ſent him by kings, governors, and ſtates, he never brought any of them to his own houſe; he changed nothing of the diet, nothing of the apparel of the Lacedæmonians. He was contented with the ſame houſe in which Euriſthenes, the founder of his family, had lived: and whoever entered there, could ſee no ſign of debauchery, none of luxury; but on the contrary, many of moderation and abſtinence; for it was furniſhed in ſuch a manner, that it differed in nothing from that of any poor or private perſon." Upon his arrival in Egypt, all kinds of proviſions were ſent to him; but he choſe only the moſt common, leaving the perfumes, the confections, and all that was eſteemed moſt delicious, to his ſervants. Ageſilaus was extremely fond of his children, and would often amuſe himſelf by joining in their diverſions: one day when he was ſurpriſed riding upon a ſtick with them, he ſaid to the perſon who had ſeen him in this poſture, "Forbear talking of it till you are a father."

AGGA, or AGGONNA, a Britiſh ſettlement on the Gold coaſt of Guinea. It is ſituated under the meridian of London, in 6 degrees of N. Lat.

AGGER, in the ancient military art, a work of fortification, uſed both for the defence and the attack of towns, camps, &c. In which ſenſe it is the ſame with what was otherwiſe called *vallum*, and in later times *aggeſtum*; and among the moderns *lines*, ſometimes *cavaliers*, *terraſſes*, &c. The agger was uſually a bank, or elevation of earth or other matter, bound and ſupported with timber; having ſometimes turrets on the top, wherein the workmen, engineers, and ſoldiery, were placed. It was alſo accompanied with a ditch, which ſerved as its chief defence. The uſual materials of which it was made were earth, boughs, faſcines, ſtakes, and even trunks of trees, ropes, &c. variouſly croſſed, and interwoven ſomewhat in the figure of ſtars; whence they were called *ſtellati axes*. When theſe were wanting, ſtones, bricks, tiles, ſupplied the office: on ſome occaſions, arms, utenſils, pack ſaddles, were thrown in to fill it up. We even read of aggers formed of the carcaſes of the ſlain; ſometimes of dead bones mixed with lime; and even with the heads of ſlaughtered citizens. For want of due binding, or ſolid materials, aggers have ſometimes tumbled down, with infinite miſchief to the men. The beſiegers uſed to carry on a work of this kind nearer and nearer towards the place, till at length they reached the very wall. The methods taken on the other ſide to defeat them were, by fire, eſpecially if the agger were of wood; by ſapping and undermining, if of earth; and in ſome caſes, by erecting a counter agger.

Aggerhuys || Aggregate.

The height of the agger was frequently equal to that of the wall of the place. Cæſar tells us of one he made, which was 30 feet high and 330 feet broad. Beſides the uſe of aggers before towns, the generals uſed to fortify their camps with ſuch works; for want of this precaution, armies have often been ſurpriſed and ruined.

There were vaſt aggers made in towns and places on the ſea-ſide, fortified with towers, caſtles, &c. Thoſe made by Cæſar and Pompey at Brunduſium, are famous. Sometimes aggers were even built acroſs arms of the ſea, lakes, and moraſſes; as was done by Alexander before Tyre, and by M. Antony and Caſſius.—The wall of Severus, in the north of England, may be conſidered as a grand agger, to which belong ſeveral leſſer ones.

AGGER, in ancient writers, likewiſe denotes the middle part of a military road, raiſed into a ridge, with a gentle ſlope on either ſide, to make a drain for the water, and keep the way dry.

The term is alſo uſed for the whole road, or military way. Where highways were to be made in low grounds, as between two hills, the Romans uſed to raiſe them above the adjacent land, ſo as to make them of a level with the hills. Theſe banks they called *aggeres*. Bergier mentions ſeveral in Gallia Belgica, which were thus raiſed, ten, fifteen, or twenty feet above ground. —They are ſometimes alſo called *aggeres calceati*; and now generally known by the name *chauſſees* or *cauſeways*.

AGGERHUYS, a city of Norway, capital of the province of the ſame name, ſubject to Denmark, and ſituated in E. Long. 28. 35. N. Lat. 59. 30.

AGGERS-HERRED, a diſtrict of Chriſtianſand, and a dioceſe of Norway. It conſiſts of three juridical places: namely, Aſcher, Weſt Barm, and Agger.

AGGLUTINANTS, in *Pharmacy*, a general name for all medicines of a glutinous or viſcid nature; which, by adhering to the ſolids, were ſuppoſed to contribute to repair their loſs.

AGGLUTINATION, in a general ſenſe, denotes the joining two or more things together, by means of proper glue or cement.

AGGLUTINATION, among *Phyſicians*, implies the action of reuniting the parts of a body, ſeparated by a wound, cut, &c. It is alſo applied to the action of ſuch internal medicines as are ſuppoſed to be of an agglutinating quality.

AGGREGATE, in a general ſenſe, denotes the ſum of ſeveral things added together, or the collection of them into one whole. Thus a houſe is an aggregate of ſtones, wood, mortar, &c. It differs from a mixed or compound; for, in the latter, the union is more intimate than between the parts of an aggregate.

AGGREGATE, in *Botany*, is a term uſed to expreſs thoſe flowers which are compoſed of parts or florets, ſo united, by means either of the receptacle or calyx,

Aggregation || Agincourt.

that no one of them can be taken away without deſtroying the form of the whole. They are oppoſed to ſimple flowers, which have no ſuch common part. See BOTANY *Index*.

AGGREGATION, in phyſics, ſpecies of union, whereby ſeveral things which have no natural dependence or connexion with one another are collected together, ſo as in ſome ſenſe to conſtitute one. Thus, a heap of ſand, or a maſs of ruins, are bodies by aggregation.

AGHER, a town of Ireland, ſituated in the ſouthern part of Ulſter, not far from Clogher.

AGHRIM, a town of Ireland, in the county of Wicklow, and province of Leinſter, ſituated about 31 miles ſouth-weſt of Wicklow.

AGHRIM, in Galway; a ſmall village, diſtant about 32 miles from Dublin, and rendered memorable by a deciſive battle fought there, and at Kilcommodon-hill, the 12th of July 1691, between General Ginkle and Monſieur St Ruth, the commanders under King William III. and James II. when St Ruth, the general of the Iriſh army, with 7000 of his men, was ſlain; but of the Engliſh only 600. The victory was the more conſiderable, as the Engliſh army conſiſted of no more than 18,000 men; whereas the Iriſh were computed at 20,000 foot and 5000 horſe and dragoons. They loſt likewiſe nine pieces of braſs cannon; all their ammunition, tents, and baggage; moſt of their ſmall arms, which they threw away to expedite their flight; with 11 ſtandards, and 32 pair of colours.

AGIADES, in the Turkiſh armies, a kind of pioneers employed in fortifying camps, ſmoothing of roads, and the like offices.

AGILITY, an aptitude of the ſeveral parts of the body to motion. The improving of agility was one of the chief objects of the inſtitution of games and exerciſes. The athletæ made particular profeſſion of the ſcience of cultivating and improving agility. Agility of body is often ſuppoſed peculiar to ſome people; yet it ſeems leſs owing to any thing peculiar in their frame and ſtructure than to practice.

AGINCOURT, a village of the French Netherlands, ſituated in E. Long. 2. 10. N. Lat. 50. 35.; famous on account of the victory obtained by Henry V. of England over the French, in 1415.

The army of Henry, after landing in France, was by various accidents reduced to 10,000 men, of whom not a few were ſick, or ſlowly recovering from ſickneſs; —they had to traverſe a long tract of country, inhabited by exaſperated enemies, from whom they were to procure proviſions, lodging, guides, intelligence, and every thing they wanted;—that country was defended by many ſtrong towns, interſected by deep rivers, and guarded by an army of 100,000 or (according to ſome contemporary writers) 140,000 men.

Henry, undaunted by all theſe dangers and difficulties, departed from Harfleur, marching his army in three lines, with bodies of cavalry on the wings. He proceeded by very eaſy journeys, that he might not fatigue his troops, or diſcourage them by the appearance of a flight; obſerving the ſtricteſt diſcipline, and paying generouſly for every thing he received; which induced the country people to bring proviſions to his camp, in ſpite of all the commands they had received to the contrary. To keep his men in ſpirits, and from repining, the king fared as ill as the meaneſt ſoldier, always appearing with a cheerful countenance, and addreſſing them in the moſt friendly and encouraging language. They arrived at the village of Agincourt in the county of St Pol, on the evening of October 24th; and there beheld the whole French army, at a ſmall diſtance, directly in their route. The king took an attentive view of it from an eminence; and being fully convinced that it was impoſſible to proceed any further on his way to Calais without a battle, and equally impoſſible to return to Harfleur with ſo great an army in his rear, reſolved to hazard an action next morning, as the only means of preſerving himſelf and his little army from deſtruction. Agincourt.

The Engliſh army lodged that night in the villages of Agincourt, Maiſoncelle, and ſome others; where they met with better accommodation than they had been accuſtomed to for ſome time paſt, and ſpent part of their time in mutual exhortations to fight bravely in the approaching battle. The king, overhearing ſome of his nobles expreſſing a wiſh, that the many brave men who were idle in England were preſent to aſſiſt them, is ſaid to have cried out—"No! I would not have one man more:—if we are defeated, we are too many—if it ſhall pleaſe God to give us the victory, as I truſt he will, the ſmaller our number the greater our glory." The moon happening to ſhine very bright, Henry, with ſome of his beſt officers, carefully examined the ground, and pitched upon a field of battle, admirably calculated to preſerve a ſmall army from being ſurrounded by a great one. It was a gentle declivity from the village of Agincourt, of ſufficient extent for his ſmall army, defended on either ſide by hedges, trees, and bruſh-wood. Having placed guards and kindled fires on all ſides, the king and his army betook themſelves to reſt; except ſuch as were of a more ſerious turn of mind, who, conſidering that as the laſt night of their lives, ſpent it in devotion.

The French, exulting in their numbers, confident of victory, and abounding in proviſions, ſpent the night in noiſy feſtivity, and in forming fanciful ſchemes about the diſpoſal of their priſoners and their booty. It was in general reſolved to put all the Engliſh to the ſword, except the king and the chief nobility, who were to be taken priſoners for the ſake of their ranſoms.

On the morning of Friday the memorable 25th of October, A. D. 1415, the day of Criſpin and Criſpianus, the Engliſh and French armies were ranged in order of battle, each in three lines, with bodies of cavalry on each wing. The conſtable d'Albert, who commanded the French army, fell into the ſnare that was laid for him, by drawing up his army in the narrow plain between the two woods. This deprived him, in a great meaſure, of the advantage he ſhould have derived from the prodigious ſuperiority of his numbers; obliged him to make his lines unneceſſarily deep, about 30 men in file; to crowd his troops, particularly his cavalry, ſo cloſe together, that they could hardly move or uſe their arms; and, in a word, was the chief cauſe of all the diſaſters that followed. The French, it is ſaid, had a conſiderable number of cannon of different ſizes in the field; but we do not hear that they did any execution, probably for want of room. The firſt line of the French army, which conſiſted of 8000 men.

at-arms

Agincourt. at arms on foot mixed with 4000 archers, with 500 men at-arms mounted on each wing, was commanded by the conſtable d'Albert, the dukes of Orleans and Bourbon, and many other nobles; the dukes of Alençon, Brabant, and Bar, &c. conducted the ſecond line; and the earls of Marle, Damartine, Fauconberg, &c. were at the head of the third line. The king of England employed various arts to ſupply his defect of numbers. He placed 200 of his beſt archers in ambuſh, in a low meadow, on the flank of the firſt line of the French. His own firſt line conſiſted wholly of archers, four in file; each of whom, beſides his bow and arrows, had a battle-axe, a ſword, and a ſtake pointed with iron at both ends, which he fixed before him in the ground, the point inclining outwards, to protect him from cavalry. This was a new invention, and had a happy effect. That he might not be encumbered, he diſmiſſed all his priſoners, on their word of honour to ſurrender themſelves at Calais, if he obtained the victory; and lodged all his baggage in the village of Agincourt, in his rear, under a ſlender guard. The command of the firſt line was, at his earneſt requeſt, committed to Edward duke of York, aſſiſted by the Lords Beaumont, Willoughby, and Fanhope; the ſecond was conducted by the king, with his youngeſt brother Humphry duke of Glouceſter, the earls of Oxford, Marſhal, and Suffolk; and the third was led by the duke of Exeter, the king's uncle. The lines being formed, the king, in ſhining armour, with a crown of gold adorned with precious ſtones on his helmet, mounted on a fine white horſe, rode along them, and addreſſed each corps with a cheerful countenance and animating ſpeeches. To inflame their reſentment againſt their enemies, he told them, that the French had determined to cut off three fingers of the right hand of every priſoner: and to rouſe their love of honour, he declared, that every ſoldier in that army who behaved well, ſhould from henceforth be deemed a gentleman, and entitled to bear coat armour.

When the two armies were drawn up in this manner, they ſtood a conſiderable time gazing at one another in ſolemn ſilence. But the king, dreading that the French would diſcover the danger of their ſituation and decline a battle, commanded the charge to be ſounded, about ten o'clock in the forenoon. At that inſtant, the firſt line of the Engliſh kneeled down, and kiſſed the ground; and then ſtarting up, diſcharged a flight of arrows, which did great execution among the crowded ranks of the French. Immediately after, upon a ſignal being given, the archers in ambuſh aroſe, and diſcharged their arrows on the flank of the French line, and threw it into ſome diſorder. The battle now became general, and raged with uncommon fury. The Engliſh archers, having expended all their arrows, threw away their bows, and, ruſhing forward, made dreadful havock with their ſwords and battle-axes. The firſt line of the enemy was, by theſe means, defeated; its leaders being either killed or taken priſoners. The ſecond line, commanded by the duke d'Alençon, (who had made a vow either to kill or take the king of England, or to periſh in the attempt), now advanced to the charge, and was encountered by the ſecond line of the Engliſh, conducted by the king. This conflict was more cloſe and furious than the former. The duke of Glouceſter, wounded and unhorſed, was protected by his royal brother till he was carried off the field. The duke d'Alençon forced his way to the king, and aſſaulted him with great fury; but that prince brought him to the ground, where he was inſtantly diſpatched. Diſcouraged by this diſaſter, the ſecond line made no more reſiſtance; and the third fled without ſtriking a blow; yielding a complete and glorious victory to the Engliſh, after a violent ſtruggle of three hours duration.

Agio || Agis.

The king did not permit his men to purſue the fugitives to a great diſtance, but encouraged them to take as many priſoners as they could on or near the field; in which they were ſo ſucceſsful, that, in a little time, his captives were more numerous than his ſoldiers. A great proportion of theſe priſoners were men of rank and fortune; for many of the French nobleſſe being on foot, and loaded with their heavy armour, could not make their eſcape. Among theſe were the dukes of Orleans and Bourbon, the marſhal Boucicaut, the counts d'Eu, Vendome, Richemont, and Harcourt; and 7000 barons, knights, and gentlemen. The French left dead on the field of battle, the conſtable d'Albert, the three dukes of Alençon, Brabant, and Bar, the archbiſhop of Sens, one marſhal, 13 earls, 92 barons, 1500 knights, and a far greater number of gentlemen, beſides ſeveral thouſands of common ſoldiers. Even the French hiſtorians acknowledge, that the loſs of the Engliſh was inconſiderable: thoſe of our own cotemporary writers who make it the greateſt, affirm, that it did not exceed 100, and that the duke of York and the earl of Suffolk were the only great men who fell on that ſide in this memorable action.

AGIO, in commerce, is a term chiefly uſed in Holland, and at Venice, to ſignify the difference between the value of bank ſtock and the current coin. The agio in Holland is generally three or four per cent. and at Rome it is from 15 to 25 per cent. but at Venice the agio is fixed at 20 per cent.

AGIOSYMANDRUM, a wooden inſtrument uſed by the Greek and other churches under the dominion of the Turks, to call together aſſemblies of the people. The *agioſymandrum* was introduced in the place of bells, which the Turks prohibited their Chriſtian ſubjects the uſe of, leſt they ſhould make them ſubſervient to ſedition.

AGIS, king of Lacedæmon, was deſcended from Ageſilaus II. in a right line. He projected the reformation of his kingdom, by the reſtoring of the laws of Lycurgus; but he fell under the weight of an enterpriſe that could not but be diſagreeable to all thoſe who had great poſſeſſions, and had been long accuſtomed to the ſweets of a voluptuous life. Agis being in the flower of his age, and having a very refined deſire of glory, practiſed the ancient diſcipline firſt in his own perſon: his clothes and his table were according to the manners of former times; which is ſo much the more to be admired, becauſe Ageſiſtrata his mother and Archidamia his grandmother had brought him up voluptuouſly. When he ſounded his people's minds, he found the younger ſort oppoſed his project leſs than thoſe who had enjoyed a relaxation of diſcipline ſeveral years. The greateſt difficulty was expected to ariſe from the women. They had at that time more credit than ever; for their power is never greater than when luxury is in faſhion. Ageſilaus's mother did not at all

reliſh the propoſed reformation. She muſt have loſt her riches, which gave her a ſhare in a thouſand ſorts of intrigues; ſo ſhe oppoſed the deſign at once, and treated it as a chimera. But her brother Ageſilaus, whom Agis had engaged in his intereſts, knew how to manage her in ſuch a manner, that ſhe promiſed to ſecond the enterpriſe. She endeavoured to gain the women: but inſtead of ſuffering themſelves to be perſuaded, they applied to Leonidas the other king of Lacedæmon, and humbly beſought him to fruſtrate the deſigns of his colleague. Leonidas durſt not oppoſe it openly, for fear of irritating the people; to whom the reformation was agreeable, becauſe they found their account in it. He contented himſelf with countermining it by intrigues, and ſowing ſuſpicions as if Agis had aſpired to tyranny, by pulling down the rich and raiſing the poor. Agis did not fail to propoſe his new laws to the ſenate, relating to the diſcharge of debts, and a new diviſion of the lands. Leonidas, being ſupported by the rich, oppoſed this project ſo ſtrongly, that there was one voice more againſt it than for it. He paid dear for his ſucceſs in this affair. Lyſander, one of the Ephori, who had been the grand promoter of the reformation, called him to account; alleged the celeſtial ſigns; and put to death Cleombrotus, a prince of the royal blood and ſon-in-law to Leonidas, to make ſure of the kingdom. Leonidas being frightened at this, took refuge in a temple; whither his daughter, the wife of Cleombrotus, followed him. He was ſummoned; and becauſe he did not appear, he was degraded of his dignity, which was conferred on Cleombrotus. He obtained leave to retire to Tegæa. The new Ephori had Lyſander and Mandroclidas tried for innovation: theſe perſuaded the two kings to unite and turn out theſe Ephori. The thing was brought about; but not without a great uproar in the city. Ageſilaus, one of the Ephori that ſucceeded thoſe who were juſt turned out, would have cauſed Leonidas to be killed on the way to Tegæa, if Agis had not ſent him a ſtrong guard. The reformation might then have been eſtabliſhed, if Ageſilaus had not found means to elude the good intentions of the two kings. Whilſt this was tranſacting, the Achaians aſked aſſiſtance; which was given them, and Agis had the command of the troops. He acquired a good deal of reputation in this campaign. At his return, he found his affairs ſo embroiled by the ill conduct of Ageſilaus, that it was impoſſible for him to maintain himſelf. Leonidas was recalled to Lacedæmon: Agis retired into one temple and Cleomenes into another. The wife of the latter behaved herſelf in ſuch a manner that ſhe became the admiration of every body. Leonidas was contented with baniſhing his ſon-in-law; after which he applied himſelf entirely to the ruin of Agis. One of the Ephori, who had no mind to return what Ageſiſtrata had lent him, was the principal inſtrument of the misfortune of this family. Agis never went out of his ſanctuary but to bathe. One day, as he was returning from thence to the temple, he was ſeized by that Ephorus and carried to priſon. Then he was brought to his trial and condemned to death, and delivered to the executioner. His mother and grandmother uſed all the intreaty and importunity imaginable, that, as he was king of Lacedæmon, he might at leaſt be permitted to plead his cauſe before the people. But they were apprehenſive leſt his words would make too great an impreſſion, and therefore they ordered him to be ſtrangled that very hour. The Ephorus who was in debt to Ageſiſtrata permitted that princeſs to go into the priſon; which he granted likewiſe to Agis's grandmother: but he gave orders to ſtrangle them one after another. Ageſiſtrata died in a manner that was extremely to her honour. The wife of Agis, who was a princeſs of great fortune and prudence, and one of the fineſt ladies in Greece, was forced away from her apartment by King Leonidas, and obliged to marry his ſon, who was then very young, and hardly fit for marriage. Agiſtment, Agitator.

AGISTMENT, AGISTAGE, or AGISTATION, in *Law*, the taking in other people's cattle to graze at ſo much per week. The term is peculiarly uſed for the taking cattle to feed in the king's foreſts, as well as for the profits ariſing from that practice.—It is alſo uſed, in a metaphorical ſenſe, for any tax, burden, or charge; thus, the tax levied for repairing the banks of Romney-marſh was called *agiſtamentum*.

AGISTOR, or AGISTATOR, an officer belonging to foreſts, who has the care of cattle taken in to be grazed, and levies the monies due on that account. They are generally called *queſt takers* or *gift-takers*, and are created by letters-patent. Each royal foreſt has four agiſtors.

AGISYMBA, in *Ancient Geography*, a diſtrict of Libya Interior, according to Agathemerus, ſituated to the ſouth-eaſt of the Æthiopes Anthropophagi; the parallel paſſing through which, at 16° to the ſouth of the equator, was the utmoſt extent of the knowledge of the ancients to the ſouth (Ptolemy).

AGITATION, the act of ſhaking a body, or toſſing it backwards and forwards.

AGITATION, in *Phyſic*, is often uſed for an inteſtine commotion of the parts of a natural body. Fermentation and effervescence are attended with a briſk agitation of the particles.

AGITATION is one of the chief cauſes or inſtruments of mixtion: by the agitation of the parts of the blood and chyle, in their continual circulation, ſanguification is in a good meaſure effected. Butter is made out of milk by the ſame means: in which operation, a ſeparation is made of the oleous parts from the ſerous, and a conjunction of the oleous together. Digeſtion itſelf is only ſuppoſed to be an inſenſible kind of agitation.

AGITATION is reputed one of the ſymptoms of inſpiration. Petit informs us *, that in the laſt century, there aroſe in a church of Italy, for the ſpace of a year, a vapour of an extraordinary kind, which put all the people into trembling and agitations, and unleſs they got away betimes, ſet them a dancing, with ſtrange contortions and geſticulations. This ſeems to verify what has been related of the temple of Delphi.

* *Petit de Sibylla*, l. *Nouv. Re. Lett.* tom. viii. p. 111

AGITATION is alſo uſed in *Medicine* for a ſpecies of exerciſe popularly called *ſwinging*. Maurice prince of Orange found this method a relief againſt the ſevere pains of the gout and ſtone. Bartholine mentions fits of the toothach, deafneſs, &c. removed by vehement agitations of the body.

AGITATOR, in antiquity, a term ſometimes uſed for a charioteer, eſpecially thoſe who drove in the circus at the cutule games.

AGITATORS,

Agitators || Agnoetæ

AGITATORS, in the Engliſh hiſtory, certain officers ſet up by the army in 1647, to take care of its intereſts. —Cromwell joined the agitators, only with a view to ſerve his own ends; which being once accompliſhed, he found means to get them abolithed.

AGLAIA, the name of the youngeſt of the three Graces, eſpouſed to Vulcan.

AGLIONBY, JOHN, an Engliſh divine, chaplain in ordinary to King James I. was born in Cumberland, and admitted a ſtudent at Oxford in 1583. He was a man of univerſal learning, and had a very conſiderable hand in the tranſlation of the New Teſtament appointed by King James I. in 1604. He died in 1609.

AGMEN, in antiquity, properly denotes a Roman army in march: in which ſenſe, it ſtands contradiſtinguiſhed from *acies*, which denoted the army in battle array; though, on ſome occaſions, we find the two words uſed indifferently for each other. The Roman armies, in their marches, were divided into *primum agmen*, anſwering to our van-guard; *medium agmen*, our main-guard; and *poſtremum agmen*, the rear-guard. The order of their march was thus: After the firſt ſignal with the trumpets, &c. the tents were taken down, and the baggage packed up; at the ſecond ſignal the baggage was to be loaded on the horſes and carriages; and, at the third ſignal, they were to begin their march. Firſt came the *extraordinarii*; then the auxiliaries of the firſt wing, with their baggage; theſe were followed by the legions. The cavalry marched either on each ſide or behind.

AGNATE, in *Law*, any male relation by the father's ſide.

AGNEL, an ancient French gold coin, firſt ſtruck under the reign of St Louis, worth about twelve ſols ſix deniers. The agnel is alſo called ſometimes *mouton d'or*, and *agnel d'or*. The denomination is ſuppoſed to have ariſen from the figure of a lamb (*agnus*), or ſheep, ſtruck on one ſide.

AGNES, SAINT, in *Geography*, one of the Scilly iſles, on the weſt of England, which is of ſmall extent, but well cultivated, and fertile in corn and graſs. On the moſt elevated part of the iſland ſtands the light-houſe, built of ſtone, which is 51 feet high. The whole inhabitants conſiſt of about 50 families. It is ſituated in N. Lat. 49. 56. W. Long. 6. 46.

AGNO, a river of Naples, which, taking its riſe in the mountainous parts of Terra di Lavora, waſhes the town of Acerra; and, paſſing between Capua and Averſa, falls into the Mediterranean, about ſeven miles north of Puzzuoli.

AGNOETÆ (from ἀγνοέω, to be *ignorant* of), in church hiſtory, a ſect of ancient heretics, who maintained that Chriſt, conſidered as to his human nature, was ignorant of certain things, and particularly of the time of the day of judgement. Eulogius, patriarch of Alexandria, aſcribes this hereſy to certain ſolitaries in the neighbourhood of Jeruſalem, who built their opinion upon the text Mark xiii. 32. "Of that day and hour knoweth no man, no not the angels who are in heaven, neither the Son, but the Father only."—The ſame paſſage was made uſe of by the Arians; and hence the orthodox divines of thoſe days were induced to give various explications thereof. Some allege, that our Saviour here had no regard to his divine nature, but only ſpoke of his human. Others underſtand it thus, That the knowledge of the day of judgement does not concern our Saviour conſidered in his quality of Meſſiah, but God only: which is the moſt natural ſolution.

Agnomen || Agon.

AGNOMEN, in Roman antiquity, a kind of fourth or honorary name, given to a perſon on account of ſome extraordinary action, virtue, or other accompliſhment. Thus the agnomen *Africanus* was bellowed upon Publius Cornelius Scipio, on account of his great achievements in Africa.—The agnomen was the third in order of the three Roman names: thus, in Marcus Tullius Cicero, Marcus is the prænomen, Tullius the nomen, and Cicero the *agnomen*.

AGNUS, or LAMB, in *Zoology*, the young of the ovis or ſheep. See OVIS.

AGNUS Caſtus, in *Botany*, the trivial name of a ſpecies of the vitex. See VITEX, BOTANY *Index*. The Greeks call it ἄγνος, *chaſte*; to which has ſince been added the reduplicative *caſtus*, q. d. chaſte, chaſte. It was famous among the ancients as a ſpecific for the preſervation of chaſtity. The Athenian ladies, who made profeſſion of chaſtity, lay upon leaves of *agnus caſtus* during the feaſts of Ceres.—From the time of Dioſcorides the ſeeds of *agnus caſtus* have been much celebrated for their antiaphrodiſiac virtue. Modern writers aſcribe to them an oppoſite effect; but they are ſeldom uſed in practice.

AGNUS Dei, in the church of Rome, a cake of wax ſtamped with the figure of a lamb ſupporting the banner of the croſs. Theſe being conſecrated by the pope with great ſolemnity, and diſtributed among the people, are ſuppoſed to have great virtues; as, to preſerve thoſe who carry them worthily, and with faith, from all manner of accidents; to expel evil ſpirits, &c. The name literally ſignifies *Lamb of God*; this being ſuppoſed an image or repreſentation of the Lamb of God who took away the ſins of the world. They cover it up with a piece of ſtuff cut in form of a heart, and carry it very devoutly in their proceſſions.—The Romiſh prieſts and religious derive conſiderable pecuniary advantage from ſelling theſe *Agnus Dei's* to ſome, and preſenting them to others. The pope provides a regular ſupply, by conſecrating once in ſeven years: they are diſtributed by the maſter of the wardrobe, and received by the cardinals and other prelates, with great reverence, in their caps and mitres.—This ceremony they pretend to derive from an ancient cuſtom of the church, wherein part of the paſchal taper conſecrated on Holy Thurſday was diſtributed among the people, to perfume their houſes, fields, &c. in order to drive away devils, and to preſerve them from ſtorms and tempeſts. The *Agnus Dei* is forbidden to be brought into England under pain of incurring a *præmunire*; 13 Eliz. cap. 2.

AGNUS Dei is alſo a popular name for that part of the maſs wherein the prieſt, ſtriking his breaſt three times, rehearſes, with a loud voice, a prayer beginning with the words *Agnus Dei*.—It is ſaid to have been firſt brought into the miſſal by Pope Sergius I.

AGOGE, among ancient muſicians, a ſpecies of modulation, wherein the notes proceed by continuous degrees.

AGON, among the ancients, implied any diſpute or conteſt, whether it had regard to bodily exerciſes or the accompliſhments of the mind; and therefore poets, muſicians,

Agon ‖ Agonothe-ta.

muſicians, painters, &c. had their agones, as well as the athletæ. Games of this kind were celebrated at moſt of the heathen feſtivals with great ſolemnity, either annually, or at certain periods of years. Among the latter were celebrated at Athens, the *agon gymnicus*, the *agon Nemeus* inſtituted by the Argives in the 53d Olympiad, and the *agon Olympius* inſtituted by Hercules 430 years before the firſt Olympiad.—The Romans alſo, in imitation of the Greeks, inſtituted conteſts of this kind. The emperor Aurelian eſtabliſhed one under the name of *agon ſolis*, the conteſt of the ſun; Dioclefian another, which he called *agon capitolinus*, which was celebrated every fourth year, after the manner of the Olympic games. Hence the years, inſtead of *luſtra*, are ſometimes numbered by *agones*.

AGON alſo ſignified one of the miniſters employed in the heathen ſacrifices, and whoſe buſineſs it was to ſtrike the victim. The name is ſuppoſed to have been derived from hence, that ſtanding ready to give the ſtroke, he aſked, *Agon*? or *Agone*? Shall I ſtrike.

AGONALES, an epithet given to the SALII.

AGONALIA, in Roman antiquity, feſtivals celebrated in honour of Janus or the god Agonius, whom the Romans invoked before undertaking any affair of importance.

AGONALIS CIRCUS, now *La Piazza Navona*, a long, large, beautiful ſtreet in the heart of Rome, adorned with fountains, and the obeliſk of Caracalla, ſtill retaining the form of that circus. The reaſon of the name *Agonalis* is either unknown or doubtful. Ovid ſeems to derive it from the *agones*, or ſolemn games, there celebrated; ſuppoſed to have been the *Ludi Apollinares*, or *Actiaci*, inſtituted by Auguſtus; whence the circus was called *Apollinaris*; alſo *Alexandrinus*, from the emperor Alexander Severus, who either encloſed or repaired it.

AGONISMA, in antiquity, denotes the prize given to the victor in any combat or diſpute.

AGONISTARCHA, from ἀγὼν "combat," and ἄρχος "chief," in *antiquity*, ſeems to have been much the ſame with *agonotheta*; though ſome ſuggeſt a difference, making it the office of the former to preſide at and direct the private exerciſes of the athletæ, which they went through by way of practice, before they made their appearance on the public theatres or amphitheatres.

AGONISTICI, in church hiſtory, a name given by Donatus to ſuch of his diſciples as he ſent to fairs, markets, and other public places, to propagate his doctrine; for which reaſon they were alſo called *Circutores*, *Circelliones*, *Catropitæ*, *Coropitæ*, and at Rome *Montenſes*. They were called *Agoniſtici*, from the Greek ἀγὼν, "combat," in regard they were ſent as it were to fight and ſubdue the people to their opinions.

AGONIUM, in Roman antiquity, was uſed for the day on which the *rex ſacrorum* ſacrificed a victim, as well as for the place where the games were celebrated, otherwiſe called *agon*.

AGONOTHETA, or AGONOTHETES, in Grecian antiquity, was the preſident or ſuperintendant of the ſacred games; who not only defrayed the expence attending them, but inſpected the manners and diſcipline of the athletæ, and adjudged the prizes to the victors.

AGONY, any extreme pain. It is alſo uſed for the pangs of death. Much of the terror of death conſiſts in the pangs and convulſions wherewith the agony ſeems attended; though we have reaſon to believe that the pain in ſuch caſes is ordinarily not extremely acute; a courſe of pain and ſickneſs having uſually ſtupified and indiſpoſed the nerves for any quick ſenſations. However, various means have been thought of for mitigating the agony of death. Lord Bacon conſiders this as part of the province of a phyſician; and that not only where ſuch a mitigation may tend to a recovery, but alſo when, there being no further hope of a recovery, it can only tend to make the paſſage out of life more calm and eaſy. Complacency in death, which Auguſtus ſo much deſired, is certainly no ſmall part of happineſs. Accordingly, the author laſt cited ranks *euthanaſia*, or the art of dying eaſily, among the deſiderata of ſcience; and does not even ſeem to diſapprove of the courſe Epicurus took for that end,

Agonyclit ‖ Agrarian

——*Hinc ſtygias ebrius hauſit aquas.*

Opium has been applied for this purpoſe, with the applauſe of ſome, but the condemnation of more.

AGONYCLITÆ, or AGONYCLITES, in church hiſtory, a ſect of Chriſtians, in the 7th century, who prayed always ſtanding, as thinking it unlawful to kneel.

AGORÆUS, in heathen antiquity, an appellation given to ſuch deities as had ſtatues in the market-places; particularly Mercury, whoſe ſtatue was to be ſeen in almoſt every public place.

AGORANOMUS, in Grecian antiquity, a magiſtrate of Athens, who had the regulation of weights and meaſures, the prices of proviſions, &c.—The *agoranomi*, at Athens, were ten in number, five belonging to the city, and as many to the Piræus; though others make them 15 in all, of whom they aſſign 10 to the city. To theſe a certain toll or tribute was paid by all who brought any thing to ſell in the market.

AGOUTI, or AGUTI. See MUS.

AGRA, the capital town of a province of the ſame name, in Hindoſtan, and in the dominions of the Great Mogul. It is looked upon as the largeſt city in theſe parts, and is in the form of a half moon. A man on horſeback can hardly ride round it in a day. It is ſurrounded with a wall of red ſtone, and with a ditch 100 feet wide. The palace is prodigiouſly large, and the ſeraglio commonly contains above 1000 women. There are upwards of 800 baths in this town; but that which travellers moſt admire, is the mauſoleum of one of the Mogul's wives, which was 20 years in building. The indigo of Agra is the moſt valuable of all that comes from the Eaſt Indies. This town is ſeated on the river Jemma, about 50 miles above its confluence with the Tehemel, and is 300 miles N. E. of Surat. E. Long. 76. 44. N. Lat. 26. 43.

AGRARIAN LAWS, among the Romans, thoſe relating to the diviſion and diſtribution of lands; of which there were a great number; but that called the *Agrarian Law*, by way of eminence, was publiſhed by Spurius Caſſius, about the year of Rome 268, for dividing the conquered lands equally among all the citizens, and limiting the number of acres which each citizen might enjoy.—The Roman lands were of ſeveral kinds; ſome conquered from the enemies, and not yet brought to the public account; others brought indeed

Agrela || Agricola.

deed to the public, but clandeſtinely uſurped by private great men; laſtly, others purchaſed with the public money, in order to be divided. Agrarian laws, either for dividing lands taken from the enemy, or the public lands, or thoſe purchaſed with the public money, were eaſily paſſed without diſturbance; but thoſe whereby private rich men were to be deprived of their lands, and the common people put in poſſeſſion of what had been held by the nobility, were never attempted without great diſturbances.

Several have pleaded for the neceſſity of agrarian laws among us: but no author has entered ſo deeply into the ſubject as Mr Harrington in his *Oceana;* which the reader may conſult.

AGREDA, a town of Spain, in Old Caſtile, near the frontiers of Arragon, and about three leagues ſouth-weſt of Taracon.

AGRIA, called by the Germans *Eger*, is a ſmall but ſtrong town in Upper Hungary, and is a biſhop's ſee. It is ſituated on a river of the ſame name, and has a citadel called *Eriaw*. It was beſieged by the Turks in 1552, with 70,000 men: but they loſt 8000 in one day, and were obliged to raiſe the ſiege, though the garriſon conſiſted only of 2000 Hungarians, aſſiſted by the women, who performed wonders on this occaſion. However, it was afterwards taken by Mahomet III. in 1596; but was retaken by the emperor in 1687: ſince which time it has continued under the dominion of the houſe of Auſtria. It is 47 miles north-eaſt of Buda, and 55 ſouth-weſt of Caſſovia. E. Long. 20. 10. N. Lat. 48. 10.

AGRICOLA, Cnæus Julius, born at Frejus in Provence, was, in Veſpaſian's time, made lieutenant to Vettius Bolanus in Britain; and upon his return, was ranked by that emperor among the patricians, and made governor of Aquitania. This poſt he held three years; and upon his return was choſen conſul, and afterward appointed governor of Britain, where he greatly diſtinguiſhed himſelf. He reformed many abuſes occaſioned by the avarice or negligence of former governors, put a ſtop to extortion, and cauſed juſtice to be impartially adminiſtered. Veſpaſian dying about this time, his ſon Titus, knowing the great merit of Agricola, continued him in the government. In the ſpring, he marched towards the north, where he made ſome new conqueſts, and ordered forts to be built for the Romans to winter in. He ſpent the following winter in concerting ſchemes to bring the Britons to conform to the Roman cuſtoms. He thought the beſt way of diverting them from riſing and taking arms, was to ſoften their rough manners, by propoſing to them new kinds of pleaſure, and inſpiring them with a deſire of imitating the Roman manners. Soon after this, the country was adorned with magnificent temples, porticoes, baths, and many other fine buildings. The Britiſh nobles had at length their ſons educated in learning; and they who before had the utmoſt averſion to the Roman language, now began to ſtudy it with great aſſiduity: they wore likewiſe the Roman habit; and, as Tacitus obſerves, they were brought to conſider thoſe things as marks of politeneſs, which were only ſo many badges of ſlavery. Agricola, in his third campaign, advanced as far as the Tweed; and in his fourth, he ſubdued the nations betwixt the Tweed and the friths of Edinburgh and Clyde, into which the rivers Glotta and Bodotria diſcharge themſelves; and here he built fortreſſes to ſhut up the nations yet unconquered. In his fifth, he marched beyond the friths; where he made ſome new acquiſitions, and fixed garriſons along the weſtern coaſts, over againſt Ireland. In his ſixth campaign he paſſed the river Bodotria; ordering his fleet, the firſt which the Romans ever had in thoſe parts, to row along the coaſts, and take a view of the northern parts. In the following ſpring, the Britons raiſed an army of 30,000 men; and the command was given to Galgacus, who, according to Tacitus, made an excellent ſpeech to his countrymen on this occaſion. Agricola likewiſe addreſſed his men in very ſtrong and eloquent terms. The Romans gained the victory, and 10,000 of the Britons are ſaid to have been killed. This happened in the reign of the emperor Domitian; who, growing jealous of the glory of Agricola, recalled him, under pretence of making him governor of Syria. Agricola died ſoon after; and his death is ſuſpected to have been occaſioned by poiſon given him by that emperor. Tacitus the hiſtorian married his daughter, wrote his life, and laments his death in the moſt pathetic manner. Agricola.

Agricola, *George*, a German phyſician, famous for his ſkill in metals. He was born at Glaucha, in Miſnia, the 24th of March 1494. The diſcoveries which he made in the mountains of Bohemia, gave him ſo great a deſire of examining accurately into every thing relating to metals, that though he had engaged in the practice of phyſic at Joachimſtal by advice of his friends, he ſtill proſecuted his ſtudy of foſſils with great aſſiduity; and at length removed to Chemnitz, where he entirely devoted himſelf to this ſtudy. He ſpent in purſuit of it the penſion he had of Maurice duke of Saxony, and part of his own eſtate; ſo that he reaped more reputation than profit from his labours. He wrote ſeveral pieces upon this and other ſubjects; and died at Chemnitz the 21ſt of November 1555, a very firm Papiſt. In his younger years he ſeemed not averſe to the Proteſtant doctrine; and he highly diſapproved of the ſcandalous traffic of indulgences, and ſeveral other things in the church of Rome. The following lines of his were poſted up in the ſtreets of Zwickaw, in the year 1719:

Si nos injecta ſalvebit ciſtula nummo,
Heu nimium infelix tu mihi, pauper, eris!
Si nos, Chriſte, tua ſervatos morte beâſti,
Tam nihil infelix tu mihi, pauper, eris.

If wealth alone ſalvation can procure,
How ſad a ſtate for ever waits the poor!
But if thou, Chriſt, our only ſaviour be,
Thy merits ſtill may bleſs ev'n poverty!

In the latter part of his life, however, he had attacked the Proteſtant religion: which rendered him ſo odious to the Lutherans, that they ſuffered his body to remain unburied for five days together; ſo that it was obliged to be removed from Chemnitz to Zeits, where it was interred in the principal church.

Agricola, *John*, a Saxon divine, born at Eiſleben in 1492. He went as chaplain to Count Mansfeld, when that nobleman attended the elector of Saxony to the diet of Spire in 1526, and that of Augſbourg in 1530. He was of a reſtleſs, ambitious temper, rivalled and wrote

Agricola. wrote againſt Melancthon, and gave Count Mansfeld occaſion to reproach him ſeverely. He obtained a profeſſorſhip at Wittemberg, where he taught particular doctrines, and became founder of the ſect of Antinomians; which occaſioned warm diſputes between him and Luther, who had before been his very good friend. But though he was never able to recover the favour either of the elector of Saxony or of Luther, he received ſome conſolation from the fame he acquired at Berlin: where he became preacher at court; and was choſen in 1548, in conjunction with Julius Phlug and Michael Heldingus, to compoſe the famous *Interim*, which made ſo much noiſe in the world. He died at Berlin in 1566. Agricola.

AGRICULTURE.

1 Definition. AGRICULTURE in general, or in the abſtract, may be defined to be, The art of making the earth to produce in large quantities, and in the greateſt perfection of which their nature is capable, thoſe vegetables which are neceſſary to the ſubſiſtence, or uſeful for the accommodation, of mankind. Agriculture differs from gardening in this reſpect, that the gardener is chiefly occupied in rearing ſmall quantities of the nicer and more delicate vegetables, which are rather valued as objects of luxury than as articles of food; whereas the agriculturiſt labours upon a larger ſcale, with a view to ſupply himſelf and his countrymen with the neceſſaries of life.

2 Differs from gardening.

3 Is a ſeparate art. In civilized ſocieties agriculture, or the cultivation of the ſoil, becomes a ſeparate buſineſs or employment; and agriculturiſts, or the perſons engaged in agriculture, receive the appellation of *farmers* or *huſbandmen*.

4 Includes the rearing of cattle. To enable the agriculturiſt or huſbandman to conduct his buſineſs with ſucceſs, it is neceſſary that he ſhould not confine his attention to the mere cultivation of the ſoil, or the rearing of vegetables. The vegetables which are capable of affording a comfortable ſubſiſtence to the human conſtitution are few in number; and it has been found by experience, that they cannot be profitably ſown and reproduced year after year upon the ſame ſpot of ground. Hence it becomes neceſſary at times to rear upon it graſſes or other vegetables which are unfit for affording nouriſhment to man. But although men cannot eat graſs, they may, nevertheleſs, contrive to obtain ſubſiſtence from it in an indirect manner. They may give it to cattle, whoſe ordinary and natural food it is; and having thus, as it were, converted the graſs into the fleſh of animals, they can devour theſe animals; and in this way, obtain a richer and more ſtimulating food than any vegetable production can poſſibly afford: It is therefore a part of the buſineſs of the huſbandman to rear and to feed thoſe animals which are uſed as food in the ſociety of which he is a member, that he may be enabled at all times to derive profit from the portion of territory that he cultivates. It is alſo neceſſary towards conducting his operations with ſucceſs, that he ſhould rear and feed other animals, not as a ſource of human ſubſiſtence, but for the ſake of the ſervices which they are capable of affording; for it has pleaſed the beneficent Contriver of this world, to place upon it beings of a ſubordinate nature, capable of aſſiſting mankind in their labours without being degraded by the ſtate of ſervitude in which they are placed. To the cultivators of the ſoil, theſe animals, from their ſtrength and patience of labour, are particularly uſeful, and even abſolutely neceſſary in our cold and barren climates. They muſt therefore be fed and lodged with the greateſt care.

5 Importance of the art. Hence, the employment of the huſbandman is of an extenſive nature, requiring much foreſight, and a conſiderable knowledge of the relations that ſubſiſt between the moſt important objects in nature—the ſoil, the ſeaſons, the animals, and the plants, ſo far as they are connected with the ſubſiſtence of mankind. It is by bringing to perfection this art that man becomes truly the lord of the univerſe. He ſubdues by his operations every part of the ſurface of the earth, and acquires over the animals which inhabit it, a ſolid right of dominion or of property, in conſequence of having reared, and afforded them ſubſiſtence by his ſkill and his labour. He uſes them indeed as food; but before he can do ſo, he muſt firſt beſtow upon them ſubſiſtence, attend to their multiplication, and to their health and welfare. As they poſſeſs no foreſight, the purpoſe to which they are deſtined, is to them no evil.

It is only in proportion to the degree in which this important art of agriculture has flouriſhed, that nations have been, or ever can be, permanently proſperous. Every improvement that is made in it is a moral benefit conferred upon mankind; for by increaſing the quantity of human food, or facilitating the production of it, one of two things muſt always happen: Either the number of our ſpecies will be increaſed, that is to ſay, a greater multitude of rational and intelligent beings will exiſt in the creation; or a greater number of thoſe who already exiſt, will find leiſure for the improvement of their intellectual characters by ſtudying and carrying to perfection the ſciences and arts. Thus, the ſtrength of nations is increaſed in proportion to the degree in which their ſoil is ſkilfully cultivated, and their independence is ſecured by finding upon the ſpot which they inhabit all that is neceſſary for their ſubſiſtence.

6 Its advantages to thoſe who practiſe it. It is a fortunate circumſtance, that the art of the huſbandman, which is the foundation of all others, and at all times indiſpenſable to human exiſtence, is in every reſpect conducive to the welfare of thoſe engaged in it. The practice of it beſtows health upon the body; and by the variety of occupations which it affords, it alſo beſtows a conſiderable degree of reflection upon the minds of the loweſt perſons occupied in it; while, at the ſame time, it prevents their acquiring that ſpirit of artifice and of cunning, which in all countries is apt to degrade the character of thoſe engaged in the inferior branches of commercial employment. Nor does it fail, in all ranks and conditions of life, to produce a more candid and liberal character than any other employment,

ployment. No Britiſh huſbandman has ever refuſed, or even heſitated to allow to be communicated to the public every branch of his art, and every improvement which he and his forefathers may have made in it; whereas, in all the branches of manufacture or of commerce, every tranſaction, as far as poſſible, is covered with a myſterious veil of ſecrecy, and every improvement, as far as poſſible, is concealed by its inventor, and ſometimes undoubtedly periſhes with him.

7 Hiſtory. The antiquity of this art is undoubtedly beyond that of all others; for we are informed by Scripture, that Adam was ſent from the garden of Eden *to till the ground;* and, this being the caſe, he certainly muſt have known how to do ſo.—It would be ridiculous, however, to imagine that he was acquainted with all the methods of plowing, harrowing, fallowing, &c. which are now made uſe of; and it would be equally ſo to ſuppoſe, that he uſed ſuch clumſy and unartful inſtruments as wooden hooks, horns of oxen, &c. to dig the ground, which were afterwards employed for this purpoſe by certain ſavages: but as we know nothing of the particular circumſtances in which he was ſituated, we can know as little concerning his method of agriculture.

The prodigious length of life which the antediluvians enjoyed, muſt have been very favourable to the advancement of arts and ſciences, eſpecially agriculture, to which it behoved them to apply themſelves in a particular manner, in order to procure their ſubſiſtence. It is probable, therefore, that even in the antediluvian world, arts and ſciences had made great progreſs, nay, might be farther advanced in ſome reſpects than they are at preſent. Of this, however, we can form no judgement, as there are no hiſtories of thoſe times, and the Scripture gives us but very ſlight hints concerning theſe matters.

No doubt, by the terrible cataſtrophe of the flood, which overwhelmed the whole world, many ſciences would be entirely loſt, and agriculture would ſuffer; as it was impoſſible that Noah or his children could put in practice, or perhaps know, all the different methods of cultivating the ground that were formerly uſed. The common methods, however, we cannot but ſuppoſe to have been known to him and his children, and by them tranſmitted to their poſterity: ſo that as long as mankind continued in one body without being diſperſed into different nations, the arts, agriculture eſpecially, would neceſſarily advance; and that they did ſo, is evident from the undertaking of the tower of Babel. It is from the diſperſion of mankind conſequent upon the confuſion of tongues, that we muſt date the origin of ſavage nations. In all ſocieties where different arts are cultivated, there are ſome perſons who have a kind of general knowledge of moſt of thoſe practiſed through the whole ſociety, while others are in a manner ignorant of every one of them. If we ſuppoſe a few people of underſtanding to ſeparate from the reſt, and become the founders of a nation, it will probably be a civilized one, and the arts will begin to flouriſh from its very origin; but, if a nation is founded by others whoſe intellects are in a manner callous to every human ſcience (and of this kind there are many in the moſt learned countries), the little knowledge or memory of arts that was among the original founders will be loſt, and ſuch a people will continue in a ſtate of barbariſm for many ages, unleſs the arts be brought to them from other nations.

From this, or ſimilar cauſes, all nations of equal antiquity have not been equally ſavage, nor is there any ſolid reaſon for concluding that all nations were originally unſkilled in agriculture; though, as we know not the original inſtruments of huſbandry uſed by mankind when living in one ſociety, we cannot fix the date of the improvements in this art. Different nations have always been in a different ſtate of civilization; and agriculture, as well as other arts, has always been in different degrees of improvement among different nations at the ſame time.

From the earlieſt accounts of the eaſtern nations, we have reaſon to think, that agriculture has at all times been underſtood by them in conſiderable perfection; ſeeing they were always ſupplied not only with the neceſſaries, but the greateſt luxuries of life.

As ſoon as the deſcendants of Abraham were ſettled in Paleſtine, they generally became huſbandmen, from the chiefs of the tribe of Judah to the loweſt branch of the family of Benjamin. High rank or birth did not at that time make any diſtinction, for agriculture was conſidered as the moſt honourable of all employments; witneſs the illuſtrious examples of Gideon, Saul, and David.

The Chaldeans, who inhabited the country where agriculture had its birth, carried that valuable art to a degree of excellence unknown in former times. They cultivated their lands with great aſſiduity, and ſeem to have found out ſome means of reſtoring fertility to an exhauſted ſoil, by having plentiful harveſts in ſucceſſion; on which account they were not obliged, as their predeceſſors had been, to change their ſituations, in order to obtain a ſufficiency for themſelves and their numerous flocks and herds.

The Egyptians, who, from the natural fertility of their country by the overflowing of the Nile, raiſed every year vaſt quantities of corn, were ſo ſenſible of the bleſſings reſulting from agriculture, that they aſcribed the invention of that art to Oſiris. They alſo regarded Iſis, their ſecond deity, as the diſcoverer of the uſe of wheat and barley, which before grew wild in the fields, and were not applied by that people to the purpoſes of food. Their ſuperſtitious gratitude was carried ſo far, as to worſhip thoſe animals which were employed in tillage; and even the produce of their lands, as leeks, onions, &c.

The divine honours paid to Bacchus in India were derived from the ſame ſource, he being conſidered in that country as the inventor of planting vineyards, and the other arts attendant upon agriculture.

It is alſo related of the ancient Perſians, on the moſt reſpectable authority, that their kings laid aſide their grandeur once every month to eat with huſbandmen. This is a ſtriking inſtance of the high eſtimation in which they held agriculture; for at that time arts were practiſed among that people in great perfection, particularly thoſe of weaving, needle-work, and embroidery. The precepts of their religion taught by their ancient magi, or prieſts, included the practice of agriculture. The *ſaint* among them was obliged to work out his ſalvation by purſuing all the labours of agriculture: And it was a maxim of the Zendaveſta, that he who ſows the ground with care and diligence, acquires a greater

degree of religious merit, than he could have gained by the repetition of ten thouſand prayers.

The Phœnicians, ſo well known in Scripture by the name of *Philiſtines*, were alſo remarkable for their attention to, and ſkill in agriculture. But finding themſelves too much diſturbed and confined by the incurſions and conqueſts of the Iſraelites, they ſpread themſelves throughout the greateſt part of the Mediterranean iſlands, and carried with them their knowledge in the arts of cultivation.

Mago, a famous general of the Carthaginians, is ſaid to have written no leſs than 28 books on the ſubject; which Columella tells us were tranſlated into Latin by the expreſs order of the Roman ſenate. We are informed by the ancient writers, that Ceres was born in Sicily, where ſhe firſt invented the arts of tillage and of ſowing corn. For this eſſential ſervice, ſhe was, agreeably to the ſuperſtition of thoſe ages, deified and worſhipped as the goddeſs of plenty. The truth of this is, that in the time of Ceres, the iſland, through her endeavours and the induſtry of the people, became very fruitful in corn; and agriculture was there eſteemed ſo honourable an employment, that even their kings did not diſdain to practiſe it with their own hands.

But time, which at firſt gave birth to arts, often cauſed them to be forgotten when they were removed from the place of their origin. The deſcendants of Noah, who ſettled in Europe, doubtleſs carried their knowledge of agriculture with them into the regions which they ſucceſſively occupied. But thoſe who took poſſeſſion of Greece were ſuch an uncivilized race, that they fed on roots, herbs, and acorns, after the manner of beaſts. Pelaſgus had taught them the culture of the oak, and the uſe of acorns as food; for which ſervice, we are told, divine honours were paid him by the people.

The Athenians, who were the firſt people that acquired any tincture of politeneſs, taught the uſe of corn to the reſt of the Greeks. They alſo inſtructed them how to cultivate the ground, and to prepare it for the reception of the ſeed. This art, we are told, was taught them by Triptolemus. The Greeks ſoon perceived that bread was more wholeſome, and its taſte more delicate, than that of acorns and the wild roots of the fields; accordingly they thanked the gods for ſuch an unexpected and beneficial preſent, and honoured their benefactor.

As the arts of cultivation increaſed, and the bleſſings they afforded became generally experienced, the people ſoon preferred them to whatever the ravages of conqueſt, and the cruel depredations of ſavage life, could procure. And accordingly we find, that the Athenian kings, thinking it more glorious to govern a ſmall ſtate wiſely, than to aggrandize themſelves, and enlarge the extent of their dominions by foreign conqueſts, withdrew their ſubjects from war, and moſtly employed them in cultivating the earth. Thus, by continued application, they brought agriculture to a conſiderable degree of perfection, and ſoon reduced it to an art.

Heſiod was the firſt we know of among the Greeks who wrote on this intereſting ſubject. According to the cuſtom of the oriental authors, he wrote in poetry, and embelliſhed his poem with luxuriant deſcription and ſublime imagery. He calls his poem *Works and Days*, becauſe agriculture requires exact obſervations on times and ſeaſons.

Xenophon has alſo, in his Oeconomics, remarked, that agriculture is the nurſing mother of the arts. For, ſays he, "where agriculture ſucceeds proſperouſly, there the arts thrive; but where the earth neceſſarily lies uncultivated, there the other arts are deſtroyed."

Other eminent Greek writers upon agriculture were, Democritus of Abdera, Socraticus, Archytas Tarentinus, Ariſtotle, and Theophraſtus, from whom the art received conſiderable improvements.

The ancient Romans eſteemed agriculture ſo honourable an employment, that the moſt illuſtrious ſenators of the empire, in the intervals of public concerns, applied themſelves to this profeſſion; and ſuch was the ſimplicity of thoſe ages, that they aſſumed no appearance of magnificence and ſplendour, or of majeſty, but when they appeared in public. At their return from the toils of war, the taking of cities, and the ſubduing of hoſtile nations, their greateſt generals were impatient till they were again employed in the arts of cultivation.

Regulus, when in Africa, requeſted of the ſenate to be recalled, leſt his farm might ſuffer, for want of proper cultivation, in his abſence; and the ſenate wrote him for anſwer, that it ſhould be taken care of at the public expence, while he continued to lead their armies.

Cato the cenſor, after having governed extenſive provinces, and ſubdued many warlike nations, did not think it below his dignity to write a Treatiſe on Agriculture. This work (as we are told by Servius) he dedicated to his own ſon, it being the firſt Latin treatiſe written on this important ſubject; and it has been handed down to us in all its purity, in the manner that Cato wrote it.

Varro compoſed a treatiſe on the ſame ſubject, and on a more regular plan. This work is embelliſhed with all the Greek and Latin erudition of that learned author, who died 28 years before the commencement of the Chriſtian æra. Virgil who lived about the ſame time, has, in his Georgics, adorned this ſubject with the language of the Muſes, and finely illuſtrated the precepts and rules of huſbandry left by Heſiod, Mago, and Varro.

Columella, who flouriſhed in the reign of the emperor Claudius, wrote 12 books on huſbandry, replete with important inſtruction.

From this period to that of the reign of Conſtantine Poganatus, huſbandry continued in a declining ſtate; but that wiſe emperor cauſed a large collection of the moſt uſeful precepts relating to agriculture to be extracted from the beſt writers, and publiſhed them under the title of *Geoponics*. It has been aſſerted, that he made this collection with his own hand; and the truth of the aſſertion is not improbable, as it is well known, that after he had conquered the Saracens and the Arabians, he not only practiſed and encouraged, but ſtudied the arts of peace, fixing his principal attention on agriculture, as their beſt foundation.

After the death of Conſtantine, however, the increaſing attention of the people to commerce, and the ignorance and groſs ſuperſtition of the ages which ſucceeded, ſeem to have rendered agriculture an almoſt neglected

glected ſcience. The irruptions of the northern nations ſoon aboliſhed any improved ſyſtem. Theſe innumerable and enterpriſing barbarians, who overran all Europe, were originally ſhepherds or hunters, like the preſent Tartars and the ſavages of America. They contented themſelves with poſſeſſing, without labour or trouble, thoſe vaſt countries rendered deſerts by their own ravages, cultivating only a very ſmall ſpot near their habitations; and in this trifling huſbandry only the meaneſt ſlaves were employed: ſo that the art itſelf, which formerly was thought worthy of the ſtudy of kings, was now looked upon as mean and ignoble; a prejudice which is ſcarcely effaced at preſent, or at leaſt but very lately.—During this period, therefore, we find no veſtiges of any thing tolerably written on the ſubject. No new attempts were made to revive it, or to improve it, till the year 1478. when Creſcenzio publiſhed an excellent performance on the ſubject at Florence. This rouſed the ſlumbering attention of his countrymen, ſeveral of whom ſoon followed his example. Among theſe, Tatti, Steffano Auguſtino Gallo, Sanſovino, Lauro, and Tarello, deſerve particular notice.

At what time agriculture was introduced into Britain, is uncertain. When Julius Cæſar firſt invaded this iſland, it was not wholly unknown That conqueror was of opinion, that agriculture was firſt introduced by ſome of thoſe colonies from Gaul which had ſettled in the ſouthern parts of Britain, about 100 years before the Roman invaſion*.

*æ ſar de ell. Gall. b. v. c. 12.

It is not to be expected that we can now be acquainted with many of the practices of theſe ancient huſbandmen. It appears, however, that they were not unacquainted with the uſe of manures, particularly marl. This we have on the authority of Pliny†, who tells us, that it was peculiar to the people of Gaul and of Britain; that its effects continued 80 years; and that no man was ever known to marl his field twice, &c.—It is highly probable, too, that lime was at this time alſo uſed as a manure in Britain, it being certainly made uſe of in Gaul for this purpoſe at the time of Julius Cæſar's invaſion.

Plin. at. Hiſt. . xvii. p. 6.

The eſtabliſhment of the Romans in Britain produced great improvements in agriculture, inſomuch that prodigious quantities of corn were annually exported from the iſland; but when the Roman power began to decline, this, like all the other arts, declined alſo, and was almoſt totally deſtroyed by the departure of that people. The unhappy Britons were now expoſed to frequent incurſions of the Scots and Picts, who deſtroyed the fruits of their labours, and interrupted them in the exerciſe of their art. After the arrival of the Saxons in the year 449, they were involved in ſuch long wars, and underwent ſo many calamities, that the huſbandmen gradually loſt much of their ſkill, and were at laſt driven from thoſe parts of their country which were moſt proper for cultivation.

After the Britons retired into Wales, though it appears from the laws made relative to this art, that agriculture was thought worthy of the attention of the legiſlature, yet their inſtruments appear to have been very unartful. It was enacted that no man ſhould undertake to guide a plough who could not make one; and that the driver ſhould make the ropes of twiſted willows, with which it was drawn. It was uſual for ſix or eight perſons to form themſelves into a ſociety for fitting out one of theſe ploughs, providing it with oxen and every thing neceſſary for ploughing; and many minute and curious laws were made for the regulation of ſuch ſocieties. If any perſon laid dung on a field with the conſent of the proprietor, he was by law allowed the uſe of that land for one year. If the dung was carried out in a cart in great abundance, he was to have the uſe of the land for three years. Whoever cut down a wood, and converted the ground into arable, with the conſent of the owner, was to have the uſe of it for five years. If any one folded his cattle, for one year, upon a piece of ground belonging to another, with the owner's conſent, he was allowed the uſe of that field for four years.

Thus, though the Britons had in a great meaſure loſt the knowledge of agriculture, they appear to have been very aſſiduous in giving encouragement to ſuch as would attempt a revival of it; but, among the Anglo-Saxons, things were not at preſent in ſo good a ſtate. Theſe reſtleſs and haughty warriors, having contracted a diſtaſte and contempt for agriculture, were at pains to enact laws to prevent its being followed by any other than women and ſlaves. When they firſt arrived in Britain, they had no occaſion for this art, being ſupplied by the natives with all the neceſſaries of life. After the commencement of hoſtilities, the Saxons ſubſiſted chiefly by plunder: but having driven out or extirpated moſt of the ancient Britons, and divided their lands among themſelves, they found themſelves in danger of ſtarving, there being now no enemy to plunder: and therefore they were obliged to apply to agriculture.

The Saxon princes and great men, who, in the diviſion of the lands, had received the greateſt ſhares, are ſaid to have ſubdivided their eſtates into two parts, which were called the *in-lands* and the *out-lands*. The inlands were thoſe which lay moſt contiguous to the manſion-houſe of their owner, which he kept in his own poſſeſſion, and cultivated by his ſlaves, under the direction of a bailiff, for the purpoſe of raiſing proviſions for the family. The out lands were thoſe at a greater diſtance from the houſe, and were let to the *ceorls*, or farmers of thoſe times, at very moderate rents. By the laws of Ina king of the Weſt Saxons, who reigned in the end of the ſeventh and beginning of the eighth century, a farm conſiſting of ten hides, or plough-lands, was to pay the following rent: "Ten caſks of honey; three hundred loaves of bread; twelve caſks of ſtrong ale; thirty caſks of ſmall ale; two oxen; ten wedders; ten geeſe; twenty hens; ten cheeſes; one caſk of butter; five ſalmon; twenty pounds of forage; and one hundred eels." From this low rent, the imperfection of agriculture at that time is eaſily diſcoverable; but it is ſtill more ſo from the low prices at which land was then ſold. In the ancient hiſtory of the church of Ely, publiſhed by Dr Gale, there are accounts of many purchaſes of lands by Ædelwold the founder of that church, and by other benefactors, in the reign of Edgar the Peaceable, in the tenth century. By a compariſon of theſe accounts it appears, that the ordinary price of an acre of the beſt land in that part of England, in thoſe times, was no more than 16 Saxon pennies, or about four ſhillings of our money: a very trifling price, even in compariſon with that of other commodities at the ſame time: for, by

comparing other accounts, it appears, that four ſheep were then equal in value to an acre of the beſt land, and one horſe of the ſame value with three acres. The frequent and deplorable famines which afflicted England about this time, are further inſtances of the wretched ſtate of agriculture. In 1043, a quarter of wheat ſold for 60 Saxon pennies (15 of our ſhillings), at that time equal in value to ſeven or eight pounds of our money now.

The invaſion of the Normans, in 1066, contributed very much to the improvement of agriculture; for, by that event, many thouſands of huſbandmen from Flanders, France, and Normandy, ſettled in Britain, obtained eſtates or farms, and cultivated them after the manner of their country. The implements of huſbandry, uſed at this time, were of the ſame kind with thoſe employed at preſent; but ſome of them were leſs perfect in their conſtruction. The plough, for example, had but one ſtilt or handle, which the ploughman guided with one hand, having in his other hand an inſtrument which ſerved both for cleaning and mending the plough, as well as for breaking the clods. The Norman plough had two wheels; and in the light ſoil of Normandy was commonly drawn by one or two oxen; but, in England, a greater number was often neceſſary. In Wales, the perſon who conducted the oxen in the plough walked backwards. Their carts, harrows, ſcythes, ſickles, and flails, from the figures of them ſtill remaining, appear to have been nearly of the ſame conſtruction with thoſe that are now uſed. In Wales, they did not uſe a ſickle for reaping their corns, but an inſtrument like the blade of a knife, with a wooden handle at each end.—Their chief manure next to dung, ſeems ſtill to have been marl. Summer fallowing of lands deſigned for wheat, and ploughing them ſeveral times, appear to have been frequent practices of the Engliſh farmers in this period.

We are, after all, very much in the dark with reſpect to the ſtate and progreſs of agriculture in Great Britain previous to the fourteenth century. That it was pretty generally practiſed, eſpecially in the eaſtern, ſouth, and midland parts of England, is certain; but of the mode, and the ſucceſs, we are left almoſt totally ignorant. In the latter end of the fifteenth century, however, it ſeems to have been cultivated as a ſcience, and received very great improvement.

At this time our countryman Fitzherbert, judge of the common-pleas, ſhone forth with diſtinguiſhed eminence in the practical parts of huſbandry. He appears to have been the firſt Engliſhman who ſtudied the nature of ſoils and the laws of vegetation with philoſophical attention. On theſe he formed a theory confirmed by experiments, and rendered the ſtudy pleaſing as well as profitable, by realizing the principles of the ancients, to the honour and advantage of his country. Accordingly, he publiſhed two treatiſes on this ſubject: the firſt, entitled *The Book of Huſbandry*, appeared in 1534; and the ſecond, called *The Book of Surveying and Improvements*, in 1539. Theſe books, being written at a time when philoſophy and ſcience were but juſt emerging from that gloom in which they had long been buried, were doubtleſs replete with many errors; but they contained the rudiments of true knowledge, and revived the ſtudy and love of an art, the advantages of which were obvious to men of the leaſt reflection. We therefore find that Fitzherbert's books on agriculture ſoon raiſed a ſpirit of emulation in his countrymen; and many treatiſes of the ſame kind ſucceſſively appeared, which time has however deprived us of, or at leaſt they are become ſo very ſcarce as only to be found in the libraries of the curious.

About the year 1600, France made ſome conſiderable efforts to revive the arts of huſbandry, as appears from ſeveral large works, particularly *Les Moyens de devenir Riche;* and the *Coſmopolite*, by Bernard de Paliſſy, a poor porter, who ſeems to have been placed by a fortune in a ſtation for which nature never intended him; *Le Theatre d'Agriculture*, by Deferres; and *L'Agriculture et Maiſon Ruſtique*, by Meſſrs Etienne, Liebault, &c.

Nearly in the ſame period, the ſkilful practice of huſbandry became more prevalent among this people and the Flemings than the publiſhing of books on the ſubject. Their intention ſeemed to be that of carrying on a private lucrative employment, without inſtructing their neighbours. Whoever therefore became deſirous of copying their method of agriculture, was obliged to viſit that country, and make his own remarks on their practice.

The principal idea they had of huſbandry was, by keeping the lands clean and in fine tilth, to make a farm reſemble a garden as nearly as poſſible.

Such an excellent principle, at firſt ſetting out, led them of courſe to undertake the culture of ſmall farms only, which they kept free from weeds, continually turning the ground, and manuring it plentifully and judiciouſly. When they had by this method brought the ſoil to a proper degree of cleanlineſs, health, and ſweetneſs, they chiefly cultivated the more delicate graſſes, as the ſureſt means of obtaining a certain profit upon a ſmall eſtate, without the expence of keeping many draught horſes and ſervants. A few years experience was ſufficient to convince them, that ten acres of the beſt vegetables for feeding cattle, properly cultivated, would maintain a larger ſtock of grazing animals than forty acres of common farm graſs on land badly cultivated. They alſo found, that the beſt vegetables for this purpoſe were lucerne, ſaintfoin, trefoil of moſt kinds, field-turnips, &c.

The grand political ſecret of their huſbandry, therefore, conſiſted in letting farms on improvement. They are ſaid alſo to have diſcovered nine ſorts of manure; but what they all were, we are not particularly informed. We find, however, that marl was one of them; the uſe and virtues of which appear alſo to have been well known in this kingdom two hundred years ago, although it was afterwards much neglected. They were the firſt people among the moderns who ploughed in green crops for the ſake of fertilizing the ſoil; and who confined their ſheep at night in large ſheds built on purpoſe, the floors of which were covered with ſand or virgin earth, &c. which the ſhepherd carted away each morning to the compoſt dunghill.

In England, during the civil wars, though the operations and improvements in huſbandry ſuffered ſome temporary checks, there flouriſhed ſeveral excellent writers on the ſubject, and the art itſelf received conſiderable encouragement. Sir Hugh Platt was one of the moſt ingenious huſbandmen of the age in which he lived; yet ſo great was his modeſty, that all his works

except

except his Paradiſe of Flora, ſeem to be poſthumous. He held a correſpondence with moſt of the lovers and patrons of agriculture and gardening in England; and ſuch was the juſtice and modeſty of his temper, that he always named the author of every diſcovery communicated to him. Perhaps no man in any age diſcovered, or at leaſt brought into uſe, ſo many new kinds of manure. This will be evident to thoſe who read his account of the compoſt and covered dunghills, and his judicious obſervations on the fertilizing qualities lodged in ſalt, ſtreet dirt, and the ſullage of ſtreets in great cities, clay, fullers earth, mooriſh earths, dunghills made in layers, fern, hair, calcination of all vegetables, malt duſt, willow tree earth, ſoapers aſhes, urine, marl, and broken potherds.

Gabriel Plattes may be ſaid to have been an original genius in huſbandry. He began his obſervations at an earlier period, in the reign of Queen Elizabeth, and continued them down to the Commonwealth. But notwithſtanding the great merit of this writer, and the eſſential ſervice he had rendered his country by his writings, the public ungratefully ſuffered him to ſtarve and periſh in the ſtreets of London; nor had he a ſhirt on his back when he died.

Samuel Hartlib, a celebrated writer on agriculture in the laſt century, was highly eſteemed and beloved by Milton, and other great men of his time. In the preface to his work entitled his *Legacy*, he laments that no public director of huſbandry was eſtabliſhed in England by authority; and that we had not adopted the Flemiſh method of letting farms upon improvement. This remark of Hartlib's procured him a penſion of 100l. a year from Cromwell; and the writer afterwards, the better to fulfil the intention of his benefactor, procured Dr Beatti's excellent annotation on the Legacy, with other valuable papers from his numerous correſpondents.

The time in which Hartlib flouriſhed ſeems to have been an era when the Engliſh huſbandry roſe to great perfection, compared with that of former ages; for the preceding wars had impoveriſhed the country gentlemen, and of courſe made them induſtrious. They found the cultivation of their own lands to be the moſt profitable ſtation they could fill. But this wiſe turn was not of long continuance. At the Reſtoration, they generally became infected with that intoxication and love of pleaſure which ſucceeded. All their induſtry and knowledge were exchanged for neglect and diſſipation; and huſbandry deſcended almoſt entirely into the hands of common farmers.

Evelyn was the firſt writer who inſpired his countrymen with a deſire of reviving the ſtudy of agriculture; and he was followed by the famous Jethro Tull. The former, by his admirable treatiſes on earth and on planting, and the latter, by ſhowing the ſuperior advantages of the drill huſbandry, excited numbers to bring their theory to the teſt of fair experiment.

Many valuable and capital improvements have ſince that period been made in Engliſh huſbandry: and theſe great men have been ſucceeded by a variety of writers, many of whom have done eſſential ſervice, by enlightening the minds of their countrymen, and exciting them to emulation.

About the middle of the laſt century, Ireland began to make a conſiderable figure in the art of huſbandry. It muſt indeed be confeſſed, that the Iriſh had very ſtrong prejudices in favour of a wretched method of agriculture, till Blyth opened their eyes by his excellent writings. Since that time, a ſpirit of improvement has more or leſs been promoted, and in many inſtances carried on with great zeal, by the nobility, clergy, and gentry of that kingdom. In proof of this, it will be ſufficient to obſerve, that the Tranſactions of the Dublin Society for encouraging Huſbandry are now cited by all foreigners in their memoirs relating to that ſubject. And the obſervations of that diſcerning and judicious writer Arthur Young, Eſq. in his Tour through that kingdom, ſhow, that in many reſpects improvements there have of late years made a progreſs nearly as rapid as in England.

After the peace of Aix-la-Chapelle, moſt of the nations of Europe, by a ſort of tacit conſent, applied themſelves to the ſtudy of agriculture, and continued to do ſo, more or leſs, amidſt the univerſal confuſion that ſucceeded.

The French found, by repeated experience, that they could never maintain a long war, or procure a tolerable peace, unleſs they could raiſe corn enough to ſupport themſelves in ſuch a manner as not to be obliged to ſubmit to harſh terms on the one hand, or to periſh by famine on the other. This occaſioned the king to give public encouragement to agriculture, and even to be preſent at the making of ſeveral experiments. The great, and the rich of various ranks and ſtations, followed his example; and even the ladies were candidates for a ſhare of fame in this public-ſpirited and commendable undertaking.

During the hurry and diſtreſſes of France in the war of 1756, conſiderable attention was paid to agriculture. Prize queſtions were annually propoſed in their rural academies, particularly thoſe of Lyons and Bourdeaux; and many judicious obſervations were made by the Society for improving agriculture in Britanny.

After the concluſion of that war in 1763, matters were carried on there with great vigour. The univerſity of Amiens made various propoſals for the advancement of huſbandry; and the marquis de Tourbilly (a writer who proceeded chiefly on experience) had the principal direction of a georgical ſociety eſtabliſhed at Tours.

The ſociety at Rouen alſo deſerves notice; nor did the king and his miniſters think it unworthy their attention. There ſoon exiſted about fifteen ſocieties in France, eſtabliſhed by royal approbation, for the promoting of agriculture; and theſe had twenty co operating ſocieties belonging to them.

About this time vigorous exertions began to be made in Ruſſia to introduce the moſt approved ſyſtem of huſbandry which had taken place in other parts of Europe. The late empreſs ſent ſeveral gentlemen into Britain and other countries to ſtudy agriculture, and gave it all poſſible encouragement in her own dominions.

The art of agriculture has alſo been for many years publicly taught in the Swediſh, Daniſh, and German univerſities, where the profeſſors may render effectual ſervice to their reſpective countries, if they underſtand the practical as well as the ſpeculative part, and can converſe with as much advantage with the farmer as with Virgil and Columella.

Even

Even Italy has not been totally inactive. The Neapolitans of this age have condeſcended to recur to the firſt rudiments of revived huſbandry, and begun to ſtudy anew the Agricultural Syſtem of Creſcenzio, firſt publiſhed in 1478. The people of Bergamo have purſued the ſame plan, and given a new edition of the Ricordo d'Agriculturæ de Tarello, firſt publiſhed in 1577. The duchy of Tuſcany has imbibed the ſame ſpirit of improvement. A private gentleman, above 40 years ſince, left his whole fortune to endow an academy of agriculture. The firſt eccleſiaſtic in the duchy was preſident of this ſociety, and many of the chief nobility were members.

His Sardinian majeſty alſo ſent perſons to learn the different modes of practice in foreign countries; and made ſome ſpirited attempts to eſtabliſh a better method of agriculture among his ſubjects.

In Poland, alſo, M. de Bieluſki, grand marſhal of the crown, made many ſucceſsful attempts to introduce the new huſbandry among his countrymen; and procured the beſt inſtruments for that purpoſe from France, England, and other parts of Europe.

The Hollanders are the only people now in Europe who ſeem to look upon agriculture with indifference. Except the ſingle collateral inſtance of draining their fens and moraſſes, they have ſcarcely paid any attention to it; and even this ſeems to have proceeded more from the motive of ſelf-preſervation, than any love of, or diſpoſition to, huſbandry.

In the year 1759, a few ingenious and public-ſpirited men at Berne in Switzerland eſtabliſhed a ſociety for the advancement of agriculture and rural economics. In that ſociety were many men of great weight in the republic, and moſt of them perſons of a true caſt for making improvements in huſbandry, being enabled to join the practice with the theory.

Nor muſt we here omit to mention, that the juſtly celebrated Linnæus and his diſciples have performed great things in the north of Europe, particularly in diſcovering new kinds of profitable and well-taſted food for cattle. About the ſame time, Sweden beſtowed ſucceſsful labours on a ſoil which had before been looked upon as cold, barren, and incapable of melioration. Of this the Stockholm Memoirs will be a laſting monument.

Denmark, and many of the courts in Germany, followed the ſame example. Woollen manufactures were encouraged, and his Daniſh majeſty ſent three perſons into Arabia Felix to make remarks, and bring over ſuch plants and trees as would be uſeful in huſbandry, building, and rural affairs.

The duchy of Wirtemburg, alſo, a country by no means unfertile, but even friendly to corn and paſturage, has contributed its aſſiſtance towards the improvement of agriculture, having more than 50 years ſince publiſhed 14 economical relations at Stutgard.

Neither muſt we forget the very aſſiduous attention of the learned in Leipſic and Hanover to this important object. During the rage and devaſtation of a long war, they cultivated the arts of peace; witneſs the *Journal d'Agriculture* printed at Leipſic, and the *Recueils d'Hanover* printed in that city.

Even Spain, conſtitutionally and habitually inactive on ſuch occaſions, in ſpite of all their natural indolence, and the prejudices of bigotry, invited Linnæus, with the offer of a large penſion, to ſuperintend a college founded for the purpoſe of making new inquiries into the hiſtory of nature and the art of agriculture.

Among the Japaneſe, agriculture is in great repute; and among the Chineſe it is diſtinguiſhed and encouraged by the court beyond all other ſciences. The emperor of China yearly, at the beginning of ſpring, goes to plough in perſon, attended by all the princes and grandees of the empire. The ceremony is performed with great ſolemnity; and is accompanied with a ſacrifice, which the emperor, as high-prieſt, offers to Chang-Ti, to enſure a plentiful crop in favour of his people.

But, without any improper partiality to our own country, we are fully juſtified in aſſerting, that Britain alone exceeds all modern nations in huſbandry; and from the ſpirit which for the laſt twenty years has animated many of our nobility and gentry, to become the liberal patrons of improvement, there is reaſon to hope that this moſt uſeful of arts will, in a few years, be carried to a greater pitch of perfection than it has ever yet attained in any age or country.—The Royal Society, the Bath Society, and the Society of Arts, &c. in particular, have been ſignally uſeful in this reſpect; and the other aſſociations, which are now eſtabliſhed in many parts of the kingdom, co-operate with them in forwarding their laudable deſign.

It is, not however, to the exertion of public ſocieties, excellent and honourable as they are, that all our modern improvements in agriculture owe their origin. To the natural genius of the people have been added the theory and practice of all nations in ancient and modern times. This accumulated maſs of knowledge has been arranged, divided, and ſubdivided; and after paſſing the teſt of practical experiments, the eſſential and moſt valuable parts of it have been preſerved, improved, and amply diffuſed in the works of Lord Kames, Mr Young, Stillingfleet, Dr Hunter, Anderſon, Dickſon, Ellis, Randal, Liſle, Marſhal, Mortimer, Duhamel, Bradley, Kent, Mills, and a few other writers upon this great art of rendering mankind happy, wealthy, and powerful.

The board of agriculture.

We alſo remark with much ſatisfaction that the Britiſh government has of late years thought fit to rendder the improvement of agriculture an object of public attention and encouragement, by the inſtitution of a *board of agriculture*.—About the year 1790, Sir John Sinclair, Bart. invited the clergy of the church of Scotland to tranſmit to him deſcriptions of the ſtate of their different pariſhes, with a view to the publication of what is called a *Statiſtical Account of Scotland*. The whole members of this body having readily complied with his requeſt, a work in 20 volumes octavo was compiled from the materials afforded by them, containing an account of the agriculture, manufactures, and population of the country. The ſame gentleman, about that period, was alſo active in obtaining the inſtitution of a private ſociety, called *The Britiſh Wool Society*, which was very ſucceſsful in calling the attention of the public to the improvement of that important article of national growth and manufacture. By theſe patriotic exertions, having acquired a conſiderable ſhare of popularity, he was encouraged on 15th May 1793, to make a motion in the houſe of commons, of which he

he was a member, for an addreſs to the crown, recommending the inſtitution of a board of agriculture. The chancellor of the exchequer, Mr Pitt, on perceiving that the propoſal was acceptable to the majority of the houſe, gave it a decided ſupport, and on the 17th May, to which the debate had been adjourned, the motion, was carried for an addreſs to his majeſty to inſtitute ſuch a board, at an expence not exceeding 3000l.—In conſequence of this application, a charter paſſed the great ſeal, incorporating the members of adminiſtration for the time, with the archbiſhops of Canterbury and York, and all their ſucceſſors in office, together with certain other noblemen and gentlemen, into a board or ſociety, by the name of the *Board* or *Society for the encouragement of Agriculture and internal improvement*, under the patronage of the crown; with power to the members to elect office-bearers and ſucceſſors to themſelves: and in the mean time Sir John Sinclair was appointed to be the firſt preſident, to continue in office till 25th March following; Sir John Caul, Bart. was appointed to be the firſt treaſurer, and Arthur Young, Eſq. ſo well known for his agricultural publications, was appointed ſecretary.

9 Commencement of its ſittings.

The regular ſittings of the board did not commence till 23d January 1794, ſince which time it has continued to exert a very conſiderable degree of activity in eſtabliſhing an extenſive foreign correſpondence, and in procuring and publiſhing every kind of uſeful domeſtic agricultural intelligence, ſome ſpecimens of which we ſhall afterwards have occaſion to notice. This board, ſoon after its inſtitution, alſo employed perſons of known reputation to prepare agricultural ſurveys of every county in the iſland of Great Britain.—Many of theſe ſurveys have been publiſhed, and form treatiſes upon this important art, which, for extent of intelligence and ability of execution, have not been exceeded in any age or country. The board has alſo obtained parliamentary rewards to ſome individuals for important diſcoveries, and has offered premiums for eſſays or treatiſes upon ſubjects connected with the purpoſe of its inſtitution, which have produced a great variety of valuable and ingenious diſquiſitions.

THEORY OF AGRICULTURE.

IN an art that is ſo neceſſary to mankind, and that has been ſo univerſally practiſed, it might perhaps be expected, that the principles upon which its operations depend, would have been by this time completely and accurately inveſtigated, and conſequently that a correct theory of agriculture could eaſily be exhibited. This, however, is by no means the caſe; and it is not a little ſingular, that, in this moſt uſeful of all arts, the theory ſhould ſtill be more defective than in almoſt any ſcience with which we are acquainted. It is fortunate, however, for the human race, that in moſt caſes, or at leaſt in all important arts, they ſucceed better in practice than in ſpeculation. During many ages, various artiſts were accuſtomed to extract the moſt ordinary, but moſt uſeful metals, from the ſtate of ore or earth in which nature produces them, and to reduce them back from their metallic form and luſtre, to a ſtate of ore or earth again. Theſe artiſts were unacquainted with the principles upon which the ſucceſs of their operations depended; and it is only within theſe few years that ſome ingenious chemiſts have ſucceſsfully inveſtigated the nature of theſe proceſſes, and have explained what they have called the oxygenation and diſoxygenation of metals. The ſame thing has happened in agriculture. Men have often cultivated the ground well, while they have ſpeculated ill concerning the mode of doing ſo.

10 The theory of agriculture is defective.

11 Difficulty of forming

Various reaſons render it ſtill more difficult to form a complete theory of agriculture, than of chemiſtry, mechanics, or other arts. In agriculture, an experiment cannot be made in an inſtant, or even in an hour, or in a day or two. A whole ſeaſon muſt paſs away before a ſingle experiment can be performed, and after all, as in other arts, the inquirer after truth may be miſled by ſome unobſerved circumſtances. Some fact, quite foreign to the experiment itſelf, ariſing out of the peculiar ſtate of the ſoil, or of the train of ſeaſons, may produce plentiful crops for a year or two, though, in ordinary circumſtances, no ſuch effect would follow; and the ingenious contriver of the experiment, who thought he had made an important diſcovery, may afterwards derive from it only diſappointment and mortification. But human life is too ſhort to admit of a very great variety of agricultural experiments to be performed by the ſame individual. After a few ſeaſons, he muſt leave his place to be occupied by a new inquirer, poſſeſſed of a different character and of different views. Unfortunately, till of late years, it was not uſual for huſbandmen to publiſh, and thus to immortalize and diffuſe over whole nations, the reſult of their private experience and reflections. Scattered over the face of great countries, and having little intercourſe with foreigners, or even with each other, they knew little of what was done by men engaged in the ſame profeſſion, though at no great diſtance.—In this way, the benefit of local diſcoveries was not communicated to the world at large, nor was an opportunity afforded of eradicating local prejudices and erroneous practices. As the ſtate of this valuable profeſſion is now rapidly altering in theſe reſpects, there is little doubt that we are faſt approaching towards a period at which it will be poſſible to exhibit a clear and correct theory of agriculture, or to arrange under a few ſimple heads the rules or principles upon which the practice of the art depends.—What we are now to offer, is not to be conſidered as perfect, nor even as poſſeſſing any near approximation towards a perfect theory of the huſbandman's art; but merely, ſuch a general ſtatement of its principles as reſults from the degree of information hitherto collected upon the ſubject.

12 What it ought to contain.

A theory, or general view of the principles of agriculture ſeems neceſſarily to reſolve itſelf into the two following inveſtigations: 1ſt, To inquire, among the great variety of vegetables that exiſt in nature, what particular plants ought to be regarded as moſt worthy of cultivation: and 2dly, To conſider the beſt mode of cultivating with ſucceſs the plants thus ſelected.

13 The value of vegetables is abſolute and relative.

With regard to the firſt of theſe diviſions of the ſubject, or the vegetables that ought to be choſen as moſt valuable and worthy of cultivation, it may be obſerved, that the value of a plant is of two kinds, *abſolute*, or *relative*;

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relative: The *abſolute* value of a plant depends upon its fitneſs to afford ſubſiſtence to the human ſpecies, whereas its *relative* value conſiſts of the tendency which the cultivation of it will have to enrich a particular huſbandman, or claſs of huſbandmen, either becauſe their lands are well adapted for its growth, or becauſe there is a ready market for it in the vicinity, where it bears a high price.

14 They are uſeful directly and indirectly.

Concerning the abſolute value of plants, or their tendency to afford ſubſiſtence to mankind, it is to be obſerved, that ſome plants are *directly* uſeful or valuable, becauſe they are immediately conſumed as food by man, ſuch as wheat, oats, or potatoes; whereas mankind derive ſubſiſtence from another claſs of plants, only in an *indirect* manner, by giving them to cattle, and afterwards eating the fleſh of theſe cattle, as happens with regard to graſs and ſtraw of all kinds.

SECT. I. *Of Vegetables to be cultivated as Food for Man.*

15 Men feed on fruits and roots.

SOME vegetables afford ſubſiſtence to the human ſpecies by means of the fruit that grows upon them, which hangs, and is brought to maturity in the air, at the ſummit of their ſtems. Other vegetables derive their value from producing roots which come to maturity in the boſom of the ſoil, and are dug from thence to be conſumed by mankind.

16 Fruit trees not truſted to for food,

Of fruit-bearing vegetables, thoſe called trees, which riſe aloft with a ſtrong trunk, are the moſt permanent and remarkable. It is ſaid that a ſpot of ground, occupied by ſome kinds of trees, ſuch as cheſnuts or dates, is capable of producing a very great portion of food, uſeful for the ſupport of the human ſpecies. One advantage attending the cultivation of ſuch vegetables, would be that, after the trees are planted, and ſecured by fences for a few years againſt animals, they would for ever after, or at leaſt for many years, continue to grow and flouriſh without care or labour. It does not appear, however, that in any nation of ancient or modern times, foreſts of fruit-bearing trees have been reared with a view to afford ſubſiſtence to the community. For this two reaſons may be aſſigned. In the firſt place, a conſiderable number of years muſt elapſe, before ſuch plants could arrive at maturity, and fulfil the purpoſe of their deſtination. Of whatever uſe therefore they might be to future ages, it is evident that they could afford little benefit to the generation which planted them. But in a queſtion about ſubſiſtence, mankind are uſually under the neceſſity of conſidering their own immediate wants, and hence they have been led to the cultivation of ſuch plants, as afford the moſt ſpeedy reward for the efforts of their induſtry. Another reaſon for preferring the culture of ſmall annual plants, to the greater and more permanent productions of nature, would ariſe, in the early ages of the world, from the turbulent ſtate of ſociety and the frequency of wars. A community that ſhould depend for its ſubſiſtence upon the fruit of foreſt trees, might be ruined for half a century by the inroad of an enemy. An example of this was exhibited in the war between Great Britain and her North American colonies. When the parent ſtate hired the ſavages on the weſtern frontier, to join her party, and to make inroads upon the coloniſts, the latter retaliated upon the ſavages in the following manner. Several of the colonies united

17 becauſe they ripen ſlowly, and are deſtroyed in war.

in ſending an expedition againſt the Indians. The bodies of militia employed upon this expedition, were ſurpriſed to find ſmall corn fields around a conſiderable number of the Indian hamlets. They were not ſatisfied however with deſtroying the huts of the natives, and theſe incipient efforts of ſavage induſtry; but they anxiouſly ſought out and deſtroyed every fruit-bearing tree that they found in their progreſs of almoſt a thouſand miles, thereby rendering the wilderneſs utterly uninhabitable to a people deſtitute of agriculture, and who could not always depend for ſubſiſtence upon their ſucceſs in hunting. From this example we ſee that the frequent wars ariſing from the barbarous character of ancient nations, would compel them to ſeek ſubſiſtence, not from the fruit of foreſt trees, but from grain, which ſpeedily arrives at maturity, and which when deſtroyed can ſoon be renewed. Thus war becomes a leſs waſteful ſcourge to the human race, and communities are enabled ſpeedily to recover from the devaſtation which it produces. Had the nations of Europe depended for ſubſiſtence, upon any fruits which could not be ſpeedily reſtored when deſtroyed, it is evident, that, in the late ſanguinary conflict, the greater number of them muſt have been irretrievably ruined.

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18 Men rather truſt to grain.

Hence it appears that the cultivation of plants of annual growth, as a ſource of ſubſiſtence, is favourable to the permanence of civilization in the world; and that before nations can venture to rely for their ſubſiſtence upon the fruit of plants of ſlower growth, their character muſt have arrived at a degree of moral amelioration far ſuperior to what it has ever been known to poſſeſs.

Of annual plants cultivated for fruit, wheat has always been accounted the moſt valuable. This has probably ariſen from the extreme facility with which the flour of it undergoes a proceſs of fermentation, which renders it capable of becoming a more light and agreeable kind of bread than the flour of any other grain. This quality is believed to ariſe from a quantity of a ſubſtance contained in wheat that is of the ſame nature with the gluten, or glue, that is prepared from animal bodies. In other reſpects, however, is does not appear that wheat is more valuable than ſome other kinds of grain; by means of long boiling, a given weight of barley, or even of oats, will render a quantity of water as thick or full of mulcilage as can be done by the ſame weight of wheat.

19 The uſe of grain has been objected to.

It may not be improper here to remark, that, in modern times, an author of no mean reputation, has ariſen, who endeavours to prove that wheat ought not to be cultivated, nor bread to be eaten. This is M. Linguet, who has written a treatiſe expreſsly upon the ſubject, and, ridiculous as the aſſertion may ſeem, it has been thought worthy of a formal refutation by Dr Tiſſot.—One of M. Linguet's arguments it, that wheat impoveriſhes the ground on which it grows: but in oppoſition to this, Dr Tiſſot argues, that corn is more eaſily cultivated than graſs; and that conſequently in the country he ſpeaks of, Switzerland, the beſt fields are appropriated to hay, and the worſt to corn. "If there are ſome diſtricts of very poor land (ſays he) almoſt entirely ſown with corn, they are not poor becauſe they produce only corn, but becauſe they are not fit to produce any thing elſe. Their ſoil is ſo bad, that they can grow but very little fodder: conſequently they maintain only ſuch cattle as are abſolutely neceſſary for

labour,

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labour; and thoſe are ill fed, and frequently periſh, They have but little manure, and their crops are ſmall; for large crops of all ſorts can only be expected from lands naturally rich or ſtrongly manured. Thus the poverty of the inhabitants is only owing to their poſſeſſing an ungrateful ſoil. What proves evidently that it is the natural ſoil which is in the fault, and not the corn which impoveriſhes it, is, that where there is meadow and arable land, the price of the meadow land is much more conſiderable than that of the arable. In moſt parts of this country the proportion is nearly ten to one; and there are even ſome meadows, for one part of which they would give 30 of field lands; and ſome of vines, for which 100 of arable would be given. Thoſe diſtricts where the ſoil will produce nothing but corn, are poor; but in thoſe which furniſh fodder, and alſo fine crops of grain, the inhabitants are wealthy and happy, unleſs they are oppreſſed by taxes."

M. Linguet draws another objection from the length of time required to cultivate wheat: but Tiſſot, by another calculation, ſhows, that 48 days work throughout the year would cultivate more wheat than is ſufficient for a family of ſix perſons. The time neceſſary for cultivation of arable land alſo does not increaſe in proportion to its extent; but in caſe more is cultivated than is requiſite for the ſubſiſtence of the family, a trade is formed, which might be increaſed to an unlimited extent. He then compares the time requiſite for the cultivation of vines, which are recommended by M. Linguet, and finds it to be much longer than that required for wheat. "I know very well (ſays he) that the one requires cattle, and the other does not: but theſe cattle, far from being expenſive, will, if properly managed, increaſe the gain of the farmer: therefore they muſt not be looked upon as any expence. Corn is ſubject to many accidents, but vines are ſubject to many more; thoſe which the vines ſuffer, ſometimes ſpoil the vintage for ſeveral years; whereas thoſe which happen to arable land, only ſpoil the crop for the ſeaſon; and as the expence of cultivating vines, for which only manual labour can be employed, is much more conſiderable, therefore the *vigneron* (or perſon who cultivates vines), who engages more largely than the farmer, will conſequently be a much greater loſer if unſucceſsful.—Hay is alſo ſubject to frequent and very diſagreeable accidents; the ſecuring it is ſometimes very difficult; and, when it is badly made, it is very hurtful to cattle.—A ſingle fact will be ſufficient to prove the caſualties to which hay is ſubject; viz. that it varies in price as much as grain. Accidents of hay mows taking fire are but too frequent: and this is not to be feared in corn mows."

The other objections of M. Linguet to wheat appear to be quite frivolous; ſo that concerning the cultivation of this grain, Dr Tiſſot draws the following concluſions: "It appears then, from what has been ſaid, that wheat is not a commodity that is impoveriſhing in itſelf; and that this grain will grow indifferently at leaſt in lands and ſituations which are unfavourable to other plants. This grain is likewiſe adapted to moſt climates; and if there are diſtricts almoſt entirely ſown with wheat, and yet poor, it is the fault of the ſoil, and not of this uſeful grain."

But the moſt extraordinary argument perhaps ever thought of on this ſubject is M. Linguet's aſſertion, that the uſe of wheat, or bread made from it, is detrimental to population; and that the countries where this grain is cultivated are poor and thinly inhabited, whereas thoſe which abound with vineyards and paſture lands are rich and populous. But this, in Dr Tiſſot's opinion, ſhows only that one ſoil is more rich than another, and that a fertile ſoil will maintain moſt inhabitants. "No perſon (ſays he) is more capable of aſſigning the cauſe of the ſubjection of the Roman empire to the northern powers, than M. Linguet; but he cannot ſurely be ſerious when he ſays, that they were enabled to conquer it becauſe thoſe northern countries produced no corn, and that population decreaſed ſince the introduction of grain. I ſhall make three obſervations on this paſſage: Firſt, The armies of Guſtavus Adolphus, Charles XII. and the king of Pruſſia, whoſe food was bread, would be as formidable againſt the Italians of thoſe times, who eat leſs than was eaten in the days of Scipio, as their anceſtors were 1400 years ago againſt the Romans: and M. Linguet muſt certainly know, that thoſe Greeks who ſubſiſted on bread, thoſe Romans who ate nothing but bread and vegetables in pottage, ſubdued all the known world, among whom were many nations who ate leſs bread than themſelves. A Roman ſoldier's allowance of bread was much greater than what ſoldiers have at preſent; and by the uſe of this food they had much more ſtrength than our modern ſoldiers can boaſt of. The allowance to a Roman ſoldier was 64 pounds of wheat *per* month; and this he was ſtrictly forbidden either to ſell or exchange. Their ſoldiers had very ſeldom any cheeſe, bacon, or pulſe; ſo that wheat was almoſt their only food, and the proportion was double what is allowed ſoldiers in our days. They ate it in bread, in flour-milk, and in thin cakes; and they were not ſubject to epidemic or putrid diſorders, which is too much the caſe with our modern armies. We may eaſily judge, from the weight of their accoutrements, that the Roman ſoldiers were not poſſeſſed of leſs perſonal ſtrength than thoſe who compoſe the armies at this day: they were not leſs brave, nor did their food render them in any way unhealthy: on the contrary, where there is ſuch difficulty in procuring a ſupply of good animal food to an army, as is often the caſe in modern times, it is probable that reducing them to the ſimple diet of a Roman ſoldier would be the moſt proper method of preventing epidemic diſeaſes among them. Secondly, It is very doubtful whether thoſe countries were more populous formerly than they are at this time; it is even probable that they were leſs ſo. Laſtly, The people of theſe northern countries were not without wheat; is was the baſis of their food and drink: without quoting other authors who atteſt it, ſuffice it to ſay, that Tacitus affirms it," &c.

In this laſt particular, however, our author appears to be miſtaken; but whatever may be in this, we apprehend that few of our readers will entertain any doubt concerning the wholeſomeneſs of wheat, or the propriety of making it into bread after once it is cultivated.

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20

Oats a valuable grain.

After wheat, oats have in our country been conſidered as of very great importance. It is a hardy and beautiful plant; grows with little cultivation, and is particularly well ſuited for lands newly brought in from a ſtate of nature, upon which it was always uſed at the firſt crop, till the introduction of the turnip huſbandry.

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bandry. The meal of it is usually very coarsely ground, and mixed with a considerable quantity of the inner covering of the grain. Hence it has always a considerable degree of roughness, and is harsh, and unsuited to very delicate constitutions; but this very harshness, from its stimulant effect, producing a feeling of warmth in the stomach, renders it more grateful to persons much exposed to the open air, and accustomed to hard labour, who account it a hearty kind of food. Essentially, and in its intrinsic qualities, this grain differs little from some others.

21 Barley valuable from its convertible to a saccharine substance.

Barley is chiefly valued in consequence of the facility with which it produces a great quantity of saccharine matter by the process of vegetation or malting, which fits it for the preparation of vinous or spirituous liquors. Pease are also sometimes used when grinded into meal as an article of human food; but on account of their viscid and indigestible quality, they can never become valuable in that point of view, unless to persons engaged in the open air, in the most active and severe kinds of labour.

22 Different kinds of grain are not essentially different.

In other respects, however, it does not appear that there is much difference in point of quality or wholesomeness between the various kinds of grain cultivated in different countries. They are all capable of affording nourishment to the human constitution, and of preserving it in health and vigour: When grinded into meal, they require little farther preparation, and are easily made into bread, or otherwise prepared for immediate consumption, by being mixed according to the fancy or taste of different nations, with a small quantity of water, or any other liquid.

23 Roots used as human food.

Of the roots which are used to afford subsistence to man, the potato has hitherto been the principal. The rest, consisting chiefly of carrots, turnips, and parsnips, are never used as a sole nutriment, being rather adopted for the purpose of giving variety and relish to other food, and chiefly to butchers meat. The potato, however, is in some measure an exception to this general rule. It contains a large quantity of starch, which does not seem inferior to the starch prepared from wheat, so far at least as that ingredient is to be regarded as contributing to the nourishing qualities of the grain. Its taste resembles, more nearly than any other root, the taste of bread; and accordingly it is daily beginning to be more extensively used, and to form a larger portion of the food of the poor. The celebrated Dr Adam Smith long since remarked its tendency to produce a strong and handsome race of people, as demonstrated by its effect upon the common people of Ireland, who have for a considerable length of time in a great measure subsisted upon it.

24 They produce more food on the same extent of soil than grain.

It is to be observed concerning all the roots now mentioned, that a crop of them always contains a much larger quantity of human food than a crop of any kind of grain upon the same extent of ground. A Scots acre of good land, which will not produce more than 1280 pounds weight of oatmeal, will easily produce 20,000 pounds weight of potatoes, and will sometimes in favourable seasons produce 30,000 or 35,000 pounds weight of that valuable root. Supposing one pound of oatmeal to contain as much nourishment as four pounds of potatoes, still it is evident, that, where an extent of territory employed in the production of oats can only support one million of people, the same territory employed in the cultivation of potatoes will support fifteen millions of persons.

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Potatoes, however, and all the other roots, have hitherto possessed these radical defects: The carriage of them is extremely expensive, in consequence of their weight, arising from the vast quantity of moisture they contain. Hence they can only be cultivated in abundance in the vicinity of great towns, or where they are meant to be consumed upon the farm as the food of cattle.

25 Their defect as food.

26 The transportation of them expensive.

Roots are also incapable of long preservation. In the winter they are destroyed by frost, and in summer by heat, which causes them to vegetate or to corrupt; both of which changes render them unfit to be used as food.

27 Are unfit for long preservation.

These roots are also much more bulky than grain in proportion to the quantity of nourishment contained in them. Hence they are rendered less fit to be consumed by persons engaged in sedentary professions. Such persons accordingly seldom fail to find them injurious to the stomach, by their bulkiness, and their tendency to injure the powers of digestion, by producing flatulencies and other unpleasant consequences.

28 Too bulky for the stomach.

On the whole, the difference between these succulent roots and the grain of corn plants seems to amount to this, that, although they are both formed of similar substances, the potato being analogous to wheat, and the carrot and parsnip to rye, or rather to barley after it has been converted into malt, yet, as the roots are formed in the bosom of the soil, and are of a loose and watery texture, their formation requires from nature a slighter effort than the bringing to perfection the small grains which are produced in the air at the top of corn plants. She therefore compensates by an abundant crop the diminished quality of her work.

29 Wherein they differ from grain.

Hence it has appeared an important problem in economics, to devise a plan by which the succulent roots of vegetables may be deprived of their superfluous moisture, that thus human art may perform for them what nature has not accomplished; and that they may be rendered completely equal in value to grain in point of quality, while in quantity they are so superior. With this view different processes have been adopted. Potatoes have been grated down in their raw state, and repeatedly washed with water: the result of which operation is, that the starch contained in them is obtained with great labour; but the rest of the root is lost; and this operation cannot be applied to other kinds of roots with success. Another mode of accomplishing the object was devised a few years ago by M. Grenet, and published in the Journal of the Lyceum of Arts of Paris. It is performed in this manner: The potatoes must first be boiled by the heat of the steam of boiling water, without touching the water itself. They are then stript of their skin, and allowed to cool, and made use of in the following way:—A white iron tube of two inches diameter, and eight inches in length, open at the one end and close at the other, is everywhere perforated with small holes, and a round piece of wood is prepared, which easily goes into the tube, but which at the same time fills it. Things being thus in readiness, a quantity of the potatoes, boiled as already mentioned, is put into the tube till it is full. They are then forcibly rammed down with the round piece of wood or piston; the consequence of which operation

30 How the may be rendered equal in value to grain.

31 Potato-starch.

32 Grenet's mode of granulating potatoes.

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operation is, that they are forced through the little holes in the ſides of the tube, and come out in the ſhape of worms. They are received upon linen cloths, covered with unſized paper, and dried in the heat of the ſun, or in a warm room. The ſmall pieces muſt be ſtirred from time to time; and it is ſaid, that in leſs than 12 hours, the preparation dries ſo as to be capable of being preſerved.

The defect of this proceſs evidently is, that it is a petty operation, which can only proceed ſlowly, and upon a diminutive ſcale. It is therefore unlikely to be adopted in the great operations of an extenſive agriculture, as a mode of preparing or preſerving human food.

33 Mr Forſyth's proceſs for converting roots into flour.

At the beginning of the preſent year 1802, another proceſs for accompliſhing this important object was contrived by Robert Forſyth, Eſq. advocate. Of this proceſs, which has been communicated to the Board of Agriculture, we are authorized to give the following account:

The whole difficulty of diſcovering a proceſs, with the view to render ſucculent roots as eaſily preſerved and tranſported, and therefore in every reſpect as valuable as grain, ſeems to ariſe from our not having the command of ſuch a degree of ſteady and vigorous, but moderate heat, as will deprive them of their moiſture, while at the ſame time they are prevented from being burnt or ſcorched in the way that coffee-beans are treated before being grinded. This requiſite degree of heat may be obtained in a very cheap and eaſy manner, by making uſe of the ſteam of boiling water, which never can burn any vegetable ſubſtance. Upon this principle, Mr Forſyth's proceſs is founded, and is conducted in the following manner:

1ſt, Let a quantity of potatoes, or carrots, or parſnips, &c. be waſhed, and then cut or chopped into very ſmall pieces,

2dly, Lay them upon a metallic plate, and dry them with the heat of ſteam tranſmitted through the metal. They are then in a ſtate analogous to grain, and ſeem capable of being preſerved for any length of time.

3dly. Reduce them into flour or meal, by grinding in any mill, or with any inſtrument capable of grinding grain.

The meal or flour thus prepared has no tendency to attract moiſture from the atmoſphere, and may be preſerved during any length of time, if cloſely preſſed or packed. Without this precaution, Mr Forſyth has preſerved it for ſix months, when it had been coarſely grinded in a coffee mill.

The drying proceſs is not tedious. As potatoes contain a great quantity of ſtarch or gummy matter, the pieces of them, while drying, are apt to adhere to each other; they muſt therefore be frequently turned or ſtirred during that part of the operation. When dry, they are almoſt as hard as barley, and taſte ſomewhat like the ſkin of a roaſted potato.

Carrots and parſnips contain leſs gummy matter. They require leſs attention while drying, and do not become ſo hard. They may be grinded with eaſe. Their flour is very ſweet to the taſte. Its ſmell is fragrant, and though the taſte of the roots cannot be ſaid to be altered, it is rendered rich and agreeable by the concentration produced by the proceſs. This is more particularly the caſe with regard to the parſnips. Their meal, when coarſely grinded, and expoſed to the air for a month or two, loſes its grateful ſmell, but the taſte continues unchanged. The taſte is communicated very rapidly to lukewarm water, by pouring it upon the meal, ſo that it may probably prove of ſome value when ſubjected to the vinous fermentation; and it ſeems not improbable, that if ſugar is ever to be produced in abundance from plants of European growth, it muſt be by preparing them according to this proceſs.

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Mr Forſyth performed his experiments with a ſteam apparatus, which, with ſome alterations, may prove not unſuitable, when erected upon a great ſcale.

34 Mr Forſyth's ſteam apparatus.

A, Plate XII, A ſhallow veſſel of white iron, one foot ſquare, and two inches in depth, for containing ſubſtances to be dried.

B, a ſmall round veſſel, in which water is kept boiling by a lamp, C, with three wicks.

D, a tube, by which the ſteam paſſes into E, which contains the drying veſſel A, and is cloſely ſoldered all round to the bottom of it.

F, a tube, by which the water formed by the condenſed ſteam flows from the ſteam veſſel, E, back into the boiler B, entering at the bottom of the boiler.

G, a crooked tube, by which the ſuperfluous ſteam eſcapes into the open air. It is crooked, that it may retard the paſſage of the ſteam when the veſſel is at work, which forces it to depoſite more of its heat on the bottom of the drying veſſel A.

H, a tube by which the boiler B is filled with hot water.

I, a tube paſſing up through the centre of the boiler, and ſerving as a chimney to the lamp C. It does not communicate with the water in the boiler.

K ſhows the figure of the cover of the drying veſſel A. The cover has a groove or gutter LL, paſſing round its lower edge. The vapour which riſes from the roots when drying, condenſes on touching the cover, and flows down to the gutter, from which it eſcapes in the ſtate of water, by a hole left for that purpoſe at each corner. The cover is only uſed for the neatneſs requiſite in making experiments.

The whole is ſupported by four moveable feet, attached to the corners of the drying veſſel A, but not appearing in the figure. Every part of it is made of white iron or tinned plate.

Inſtead of the lamp C, a ſmall iron pan filled with pieces of burning charcoal, was ſometimes uſed to keep the water boiling, and a ſtill more convenient plan was at times adopted during the winter ſeaſon. It conſiſted of reſting the bottom of the boiler B, upon the front of the grate of the chamber, while a fire was burning, the reſt of the inſtrument being at the ſame time ſupported by a rope attached to the back of a chair, to a nail or peg in the wall for hanging a picture, or to any other convenient ſupport. When uſed in this laſt manner, however, the inſtrument has this defect, that the water in the tube H boils over at times into the fire, which might be avoided, by placing the tube on the oppoſite ſide of the boiler.

Upon the above contrivance, it may be remarked, that a kiln formed of a large metallic plate, heated by the ſteam of boiling water, may prove valuable in many proceſſes. In particular, it will probably be found

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found useful for drying malt, with a view to prevent the ale formed of it from having a brown colour. It may also, perhaps, be used with success for drying wheat that is intended to be sown, to prevent the future crop from suffering by mildew, as will be afterwards mentioned; and it affords a ready and cheap mode of drying not only roots, but all vegetable productions, without burning them, or altering their taste or other essential properties.

Sect. II. *Of the most proper kinds of Vegetables to be raised for the purposes of feeding Cattle.*

Though this must be an article of the utmost consequence to every farmer, we do not find that it has been much considered. Mr Anderson seems to have been the first writer on agriculture who hath properly attended to this subject; and what he hath wrote upon it, is rather a catalogue of desiderata than any thing else: and indeed the desiderata on this subject are so many and so great, that we must acknowledge ourselves very unable to fill them up.——To attain to a competent knowledge in this respect, the following things must be taken into consideration. (1.) The

35 Qualities of the food requisite for cattle.

wholesomeness of the food for cattle, with regard to health and strength, or fatness. (2.) The quantity that any extent of ground is capable of yielding. (3.) The quantity necessary to feed the different kinds of cattle. (4.) The labour of cultivation; and, (5.) The soil they require to bring them to perfection, and the effect they have upon it.

With regard to the wholesomeness, it is plain, that as the natural food of wild cattle is the green succulent plants they meet with all the year round, food of this kind, could it be had, must be preferable to hay; and accordingly we find that cattle will always prefer succulent vegetables where they can get them. To find plants of this kind, and having proper qualities in other respects, we must search among those which continue green all the year round, or come to their greatest perfection in the winter time.—Of these, cabbages

36 Cabbages, their properties.

bid fair for holding the first place; both as being very succulent, and a very large quantity of them growing upon a small space of ground. In Mr Young's Six Months Tour, we have an account of the produce of cabbages in many different places, and on a variety of soils. The produce by Mr Crow at Keplin, on a clay soil, was, on an average of six years, 35 tons per acre; by Mr Smelt at the Leases, on a sandy gravel, 18 tons per acre; by Mr Scroop at Danby, on an average of six years, 37 tons per acre: and the general average of all the accounts given by Mr Young, is 36 tons per acre.

Cabbages, however, have the great inconveniency of sometimes imparting a disagreeable flavour to the milk of cows fed with them, and even to the flesh of other cattle. This, it is said, may be prevented by carefully picking off the decayed and withered leaves: and very probably this is the case; for no vegetable inclines more to putrefaction than this; and therefore particular care ought to be taken to pull off all the leaves that have any symptoms of decay. Dr Priestley

37 Air rendered noxious by them.

found that air was rendered noxious by a cabbage leaf remaining in it for one night, though the leaf did not show any symptom of putrefaction.—For milk cows, probably, the cabbages might be rendered more proper food by boiling them.

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The culture of the turnip-rooted cabbage has lately been much practised, and greatly recommended, particularly for the purpose of a late spring feed; and seems indeed to be a most important article in the farming economy, as will be shown in its proper place.

38 Turnip-rooted cabbage.

Turnips likewise produce very bulky crops, though far inferior to those of cabbages. According to Mr Young's calculations, the finest soil does not produce about five tons of turnips per acre; which is indeed a very great disproportion: but possibly such a quantity of turnips may not be consumed by cattle as of cabbages; an ox, of 80 stone weight, ate 210lb. of cabbages in 24 hours, besides seven pounds of hay.

39 Turnips.

Carrots are found to be an excellent food for cattle of all kinds, and are greatly relished by them. In a rich sand, according to Mr Young's account, the produce of this root was 200 bushels per acre. In a finer soil, it was 640 bushels per acre. A lean hog was fatted by carrots in ten days time: he ate 196 lb; and his fat was very fine, white, firm, and did not boil away in the dressing. They were preferred to turnips by the cattle; which having tasted the carrots, soon became so fond of them, as difficultly to be made to eat the turnips at all. It is probable, indeed, that carrots will make a more wholesome food for cattle than either cabbages or turnips, as they are strongly antiseptic; insomuch as to be used in poultices for correcting the sanies of cancers. It is probably owing to this, that the milk of cows fed on carrots is never found to have any bad taste. Six horses kept on them through the winter without oats, performed their work as usual, and looked equally well. This may be looked upon as a proof of their salubrity as a food; and it certainly can be no detriment to a farmer to be so much versant in medical matters, as to know the impropriety of giving putrescent food to his cattle. It is well known what a prodigious difference there is in the health of the human species when fed on putrid meats, in comparison of what they enjoy when supplied with food of a contrary nature; and why may there not be a difference in the health of beasts, as well as of men, when in similar circumstances?—It is also very probable, that as carrots are more solid than cabbages or turnips, they will go much farther in feeding cattle than either of them. The above-mentioned example of the hog seems some kind of confirmation of this: he being fed, for ten days together, with 21lb. less weight of carrots, than what an ox devoured of cabbages and hay in one day. There is a great disproportion, it must be owned, between the bulk of an ox and that of a hog; but we can scarce think that an ox will eat as much at a time as ten hogs. At Parlington in Yorkshire, 20 work horses, four bullocks, and six milk cows, were fed on the carrots that grew on three acres; from the end of September till the beginning of May; and the animals never tasted any other food but a little hay. The milk was excellent, and 30 hogs were fattened upon what was left by the cattle.

40 Carrots.

Potatoes likewise appear to be a very palatable food for all kinds of cattle; and not only oxen, hogs, &c. are easily fed by them, but even poultry. The cheapness of potatoes compared with other kinds of food for cattle, cannot well be known, as, besides the advantage

41 Potatoes.

of

Food for Cattle.

of the crop, they improve the ground more than any other known vegetable. According to a correſpondent of the Bath Society *, "roaſting pork is never ſo moiſt and delicate as when fed with potatoes, and killed from the barn doors without any confinement. For bacon and hams, two buſhels of pea-meal ſhould be well incorporated with four buſhels of boiled potatoes, which quantity will fat a hog of twelve ſtone, (fourteen pounds to the ſtone). Cows are particularly fond of them: half a buſhel at night, and the ſame proportion in the morning, with a ſmall quantity of hay, is ſufficient to keep three cows in full milk; they will yield as much and as ſweet butter as the beſt graſs. In fattening cattle, I allow them all they will eat: a beaſt of about 35 ſtone will require a buſhel per day, but will fatten one-third ſooner than on turnips. The potatoes ſhould be clean waſhed, and not given until they are dry. They do not require boiling for any purpoſe but fattening hogs for bacon, or poultry; the latter eat them greedily. I prefer the champion potato to any ſort I ever cultivated. They do not anſwer ſo well for horſes and colts as I expected (at leaſt they have not with me), though ſome other gentlemen have approved of them as ſubſtitutes for oats."

* *Letters and Papers on Agriculture, &c.* vol. iii. art. 16.

The above-mentioned vegetables have all of them the property of meliorating, rather than exhauſting the ſoil; and this is certainly a very valuable qualification: but carrots and cabbages will not thrive except in ſoils that are already well cultivated; while potatoes and turnips may be uſed as the firſt crops of a ſoil with great advantage. In this reſpect, they are greatly ſuperior to the others; as it may be diſagreeable to take up the beſt grounds of a farm with plants deſigned only for food to cattle.

42 Buck-wheat.

Buck-wheat (*Polygonum fagopyrum*) has been lately recommended as an uſeful article in the preſent as well as other reſpects. It has been chiefly applied to the feeding of hogs, and eſteemed equal in value to barley; it is much more eaſily ground than barley, as a malt-mill will grind it completely. Horſes are very fond of the grain; poultry of all ſorts are ſpeedily fattened by it; and the bloſſom of the plant affords food for bees at a very opportune ſeaſon of the year, when the meadows and trees are moſtly ſtripped of their flowers. Probably the grain may hereafter be even found a material article in diſtillation, ſhould a ſufficient quantity be raiſed with that view. From the ſucceſs of ſome experiments detailed in the Bath Society Papers, and for which a premium was beſtowed, it has been inferred, that this article ought in numerous caſes to ſuperſede the practice of ſummer-fallowing.

43 Whins an excellent food for horſes.

Whins have lately been recommended as a very proper food for cattle, eſpecially horſes; and are recommended by Mr Anderſon in a particular manner. They have this advantage that they require no culture, and grow on the very worſt ſoil; but they are troubleſome to cut, and require to be bruiſed in a mill conſtructed for the purpoſe; neither is the ground at all meliorated by letting whins grow upon it for any length of time. Notwithſtanding theſe diſadvantages, however, as whins continue green all the year round, and when bruiſed will afford an excellent ſucculent food, which ſeems poſſeſſed of ſtrongly invigorating qualities, they may be looked upon as the cheapeſt winter food that can poſſibly be given to cattle.—According to the calculations of Mr Eddiſon of Gateford, a ſingle acre, well cropped with whins, will winter ſix horſes: at three or four years growth, the whole crop ſhould be taken cut cloſe to the ground, and carried to the mill; in which the whins are to be bruiſed, and then given to the horſes. Four acres ought to be planted, that one may be uſed each year, at the proper age to be cut; and he reckons the labour of one man ſufficient for providing food to this number of horſes. He ſays, they all prefer the whins to hay, or even to corn.

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44 Burnet.

The herb called *burnet* hath likewiſe been recommended as proper food for cattle, on account of its being an evergreen; and further recommended, by growing almoſt as faſt in winter as in ſummer. Of this herb, however, we have very various acounts. In a letter addreſſed by Sir James Caldwell, F. R. S. to the Dublin Society, the culture of this plant is ſtrongly recommended on the authority of one Bartholomew Rocque, farmer at Walham Green, a village about three miles ſouth-weſt of London.

45 Recommended by Sir James Caldwell.

What gave occaſion to the recommendation of this plant, was, that about the year 1760, Mr Wych, chairman of the committee of Agriculture of the London Society for the encouragement of arts, manufactures, and commerce, came to Rocque (who was become very eminent by the premiums he had received from the Society), and told him, he had been thinking, that as there are many animals which ſubſiſt wholly upon the fruits of the earth, there muſt certainly be ſome plant or herb fit for them that naturally vegetates in winter; otherwiſe we muſt believe the Creator, infinitely wiſe and good, to have made creatures without providing for their ſubſiſtence; and that if there had been no ſuch plants or herbs, many ſpecies of animals would have periſhed before we took them out of the hands of nature, and provided for them dry meat at a ſeaſon, when, indigenous plants having been indiſcriminately excluded, under the name of weeds, from cultivated fields and places ſet apart for natural graſs, green or freſh meat was no longer to be found.

Rocque allowed the force of this reaſoning; but ſaid, the knowledge of a graſs, or artificial paſture, that would vegetate in winter, and produce green fodder for cattle, was loſt; at leaſt, that he knew of no ſuch plant.—Mr Wych, however, knowing how very great that advantage would be of diſcovering a green fodder for winter and early in the ſpring, wrote to Bern, and alſo to ſome conſiderable places in Sweden, ſtating the ſame argument, and aſking the ſame queſtion. His anſwers to theſe letters were the ſame that had been given by Rocque. They owned there muſt be ſuch plant, but declared they did not know it.

Mr Wych then applied again to Rocque; and deſired him to ſearch for the plant ſo much deſired, and ſo certainly exiſting. Rocque ſet about this ſearch with great aſſiduity; and finding that a pimpernel, called *burnet*, was of very ſpeedy growth, and grew nearly as faſt in winter as in ſummer, he took a handful of it and carried it into his ſtable, where there were five horſes; every one of which ate of it with the greateſt eagerneſs, ſnatching it even without firſt ſmelling it. Upon the ſucceſs of this experiment he went to London, and bought all the burnet ſeed he could get, amounting to no more than eight pounds, it having been only uſed in ſalads; and he paid for it at the rate of

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of 4s. a pound. Six of the eight pounds of feed he fowed upon half an acre of ground, in March, in the year 1761, with a quarter of a peck of ſpring wheat, both by hand. The ſeed being very bad, it came up but thin. However, he ſowed the other two pounds in the beginning of June, upon about ſix rood of ground: this he mowed in the beginning of August; and at Michaelmas he planted off the plants on about 20 rood of ground, giving each plant a foot every way, and taking care not to bury the heart. Theſe plants bore two crops of ſeed the year following; the firſt about the middle of June, the ſecond about the middle of September; but the June crop was the beſt. The year after, it grew very rank and produced two crops of ſeed, both very good. As it ought not to be cut after September, he let it ſtand till the next year; when it ſheltered itſelf, and grew very well during all the winter, except when there was a hard froſt; and even during the froſt it continued green, though it was not perceived to grow. In the March following it covered the ground very well, and was fit to receive cattle.

If the winter is not remarkably ſevere, the burnet, though cut in September, will be 18 inches long in March; and it may be fed from the beginning or February till May: if the cattle are taken off in May, there will be a good crop of ſeed in the beginning of July. Five weeks after the cattle are taken off, it may be removed, if that is preferred to its ſtanding for ſeed. It grows at the rate of an inch a-day, and is made into hay like other graſs. It may be mown three times in one ſummer, and ſhould be cut juſt before it begins to flower. Six rood of ground has produced 1150 pounds at the firſt cutting of the third year after it was ſowed; and, in autumn 1763, Rocque ſold no leſs than 300 buſhels of the ſeed.

According to Rocque, the ſoil in which burnet flouriſhes beſt, is a dry gravel; the longeſt drought never hurts it: and Sir James Caldwell aſſerts, that he ſaw a very vigorous and exuberant plant of this kind, growing from between two bricks in a wall in Rocque's ground, without any communication with the ſoil; for he had cut away all the fibres of the root that had ſtretched downward, and penetrated the earth, long before.

Burnet was found equally fit for feeding cows, ſheep, and horſes; but the ſheep muſt not be ſuffered to crop it too cloſe. Though no ſeed was left among the hay, yet it proved nouriſhing food; and Rocque kept a horſe upon nothing elſe, who, at the time of writing the account, was in good heart, and looked well. He affirmed alſo, that it cured horſes of the diſtemper called the *greaſe*, and that by its means he cured one which was thought incurable; but ſays, it is only the firſt crop which has this effect.

46 Burnet reckoned an improper food by Miller and Mr Anderſon.

This is the ſubſtance of Sir James Caldwell's letter to the Dublin Society, at leaſt as to what regards the culture of burnet; and it might reaſonably be expected, that a plant, whoſe uſe was recommended to the public with ſo much parade, would ſoon have come into univerſal eſteem. We were ſurpriſed, therefore, on looking into Mr Miller's Dictionary, to find the following words, under the article *Poterium*:—"This plant has of late been recommended by *perſons of little ſkill*, to be ſown as a winter pabulum for cattle: but we never will give themſelves the trouble to examine the grounds where it naturally grows, will find the plants left uneaten by the cattle, when the graſs about them has been cropped to the roots; beſides, in wet winters, and in ſtrong land, the plants are of ſhort duration, and therefore very unfit for that purpoſe; nor is the produce ſufficient to tempt any perſon of ſkill to engage in its culture; therefore I wiſh thoſe perſons to make trial of it in ſmall quantities, before they embark largely in theſe new ſchemes."—Mr Anderſon, too, in his Eſſays on Agriculture, mentions the produce of burnet being ſo ſmall, as not to be worth cultivating.

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47 White beet recommended.

Upon the authority of Mr Rocque, likewiſe, the white beet is recommended as a moſt excellent food for cows; that it vegetates during the whole winter, conſequently is very forward in the ſpring: and that the moſt profitable way of feeding cows is to mow this herb, and give it to them green all the ſummer. It grew in Rocque's garden, during a very great drought, no leſs than four feet high, from the 30th of May to the 3d of July; which is no more than one month and four days. In ſummer it grows more than an inch a-day; and is beſt ſown in March: a buſhel is enough for an acre, and will not coſt more than ten ſhillings. It thrives beſt in a rich, deep, light ſoil: the ſtalks are very thick and ſucculent; the cows ſhould therefore eat them green.

48 Root of Scarcity.

Another ſpecies of beet (*Beta cicla*), the Mangel Wurzel, or *Root of Scarcity*, as it has been called, has been lately extolled as food both for man and cattle; but, after all, ſeems only to deſerve attention in the latter view. It is a biennial plant; the root is large and fleſhy, ſometimes a foot in diameter. It riſes above the ground ſeveral inches, is thickeſt at the top, tapering gradually downward. The roots are of various colours, white, yellow, and red; but theſe laſt are always of a much paler colour than beetrave. It is good fodder for cows, and does not communicate any taſte to the milk. It produces great abundance of leaves in ſummer, which may be cut three or four times without injuring the plant. The leaves are more palatable to cattle than moſt other garden plants, and are found to be very wholeſome. The farmers in thoſe parts of Germany where it is chiefly cultivated, we are told, prefer this ſpecies of beet, for feeding cattle, to cabbages, principally becauſe they are not ſo liable to be hurt by worms or inſects; but they think they are not ſo nouriſhing as turnips, potatoes, or carrots, and that cattle are not nearly ſo ſoon fattened by this root as by carrots, parſnips, or cabbages. It has even been aſſerted that this root affords leſs nouriſhment than any of thoſe that have been commonly employed for feeding cattle. This does not correſpond with the pompous accounts with which the public has been entertained. Upon the whole, however, it is a plant which ſeems to deſerve the attention of our farmers; as on ſome ſoils, and in particular circumſtances, it may prove a very uſeful article for the about purpoſes.

49 Sheep's fescue graſs

In Mr Anderſon's Eſſays, we find it recommended to make trial of ſome kinds of graſſes, which probably would not only anſwer for freſh fodder during the winter, but might alſo be cut for hay in ſummer. This is particularly the caſe with that ſpecies called *ſheep's feſcue graſs*. "I had, ſays he, a ſmall patch of this graſs in winter 1773; which, having been cut in the

month

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month of Auguſt or September preceding, was ſaved from that period, and had advanced before winter to the length of five or ſix inches; forming the cloſeſt pile that could be imagined. And although we had about ſix weeks of very intenſe froſt, with ſnow; and about other ſix weeks, immediately ſucceeding that, of exceeding keen froſt every night, with frequent thaws in the day time, without any ſnow, during which time almoſt every green thing was deſtroyed; yet this little patch continued all along to retain as fine a verdure as any meadow in the month of May; hardly a point of a leaf having been withered by the uncommon ſeverity of the weather. And as this graſs begins to vegetate very early in the ſpring, I leave the reader to judge what might be the value of a field of graſs of this kind in theſe circumſtances."

50 Purple feſcue.

Of another kind of graſs, called *purple feſcue*. Mr Anderſon gives the following character: "It retained its verdure much better than rye-graſs during the winter ſeaſon; but it had more of its points killed by the weather than the former. It likewiſe riſes in the ſpring, at leaſt as early as rye-graſs."

This ingenious farmer has alſo made experiments on the culture of theſe and ſeveral other kinds of graſſes; which being very well worthy of attention, we ſhall here inſert.

1. *Purple feſcue graſs*. "Although this graſs is very often found in old paſtures, yet, as it has but few flower-ſtalks, and as it is greedily eaten by all domeſtic animals, theſe are ſeldom ſuffer to appear; ſo that it uſually remains there unperceived. But it ſeems to be better able to endure the peculiar acrimony of the dung of dogs than almoſt any other plant; and is therefore often to be met with in *dog hills*, as I call the little hills by road ſides where dogs uſually piſs and dung: and as it is allowed to grow there undiſturbed, the farmer may have an opportunity of examining the plant, and becoming acquainted with its appearance.

"The leaves are long and ſmall, and appear to be roundiſh, ſomething like a wire; but, upon examination, they are found not to be tubulated like a reed or ruſh; the ſides of the leaf being only folded together from the middle rib, exactly like the ſtrong bent graſs on the ſea ſhore. The flower-ſtalk is ſmall, and branches out in the head, a little reſembling the wild oat; only the grains are much ſmaller, and the ear does not ſpread full open, but lies bending a little to one ſide. The ſtalks are often ſpotted with reddiſh freckles, and the tops of the roots are uſually tinged with the ſame colour; from whence it has probably obtained its diſtinctive name of *feſtuca rubra*, or *red (purple) feſcue*.

"It is often to be met with in old garden walks; and, as its leaves advance very quickly after cutting, it may uſually be diſcovered above the other graſſes, about a week or fortnight after the walks are cut. Nor do they ſeem to advance only at one ſeaſon, and then ſtop and decay, like the rye-graſs; but continue to advance during the whole of the ſummer, even where they are not cut; ſo that they ſometimes attain a very great length. Laſt ſeaſon (1774), I meaſured a leaf of this graſs, that ſprung up in a neglected corner, which was four feet and four inches in length, although not thicker than a ſmall wire. It is unneceſſary to add, that theſe leaves naturally trail upon the ground, unleſs where they meet with ſome accidental ſupport; and, that if any quantity of it is ſuffered to grow for a whole ſeaſon, without being eaten down or cut, the roots of the leaves are almoſt rotted, by the overſhadowing of the tops of the other leaves, before the end of the ſeaſon.

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51 Appearance in its cultivated ſtate.

"This is the appearance and condition of the plant in its native ſituation: as it is ſeldom that it is diſcovered but in pretty old paſtures, and as in that ſtate it carries only a very few ſeed-ſtalks, it was with ſome difficulty that I could collect a ſmall handful of the ſeed, which I carefully ſowed in a ſmall patch of garden mould, to try if it could be eaſily cultivated. It came up as quickly as any other kind of graſs, but was at firſt as ſmall as hairs: the leaves, however, advanced apace; and were, before autumn, when the grain with which they had been ſowed was cut down, about 16 or 18 inches in length; but having been ſown very thin, it was neceſſary to pick out ſome other kinds of graſs that came up amongſt it, leſt it might have been choked by them. Early next ſpring it advanced with prodigious vigour, and the tufts that were formed from every ſeed became exceeding large; ſo that it quickly filled the whole ground. But now the leaves were almoſt as broad as thoſe of common rye-graſs, and the two ſides only inclined a little towards one another from the mid-rib, without any appearance of roundneſs. In due time a great many ſeed-ſtalks ſprung out, which attained very nearly to the height of four feet, and produced ſeeds in abundance; which may be as eaſily ſaved as thoſe of common rye graſs.

"The prodigious difference between this plant in its native and cultivated ſtate amazed me; but it was with a good deal of ſatisfaction that I found there would be no difficulty in procuring ſeeds from it, which I had much doubted of at firſt. It would ſeem, that nature hath endowed this plant with a ſtrong generative power during its youth, which it gradually loſes as it advances in age (for the difference perceived in this caſe could not be attributed to the richneſs of the ſoil); and that, on the contrary, when it was old, the leaves advanced with an additional vigour, in proportion to the declining ſtrength of the flower-ſtalks: for the leaves of the young plants ſeldom exceed two feet, whereas numbers of the old leaves were near four feet in length.

"From theſe peculiarities in the growth of this plant, it would ſeem to promiſe to be of great uſe to the farmer; as he could reap from a field of it, for the firſt two or three years, as great a weight of hay as he could obtain from any of the culmiferous graſſes (thoſe bearing a long jointed ſtalk); and, if he meant afterwards to paſture it, he would ſuffer no inconveniences from the flower ſtalks; and the ſucculent leaves that continue to vegetate during the whole ſummer, would at all times furniſh his cattle with abundance of wholeſome food. It has alſo been remarked, that this graſs riſes as early in the ſpring as rye-graſs; and continues green for the greateſt part of winter, which the other does not. It is moreover an abiding plant, as it ſeems never to wear out of the ground where it has once been eſtabliſhed. On all which accounts, it appears to me highly to merit the attention of the farmer; and

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well deſerves to have its ſeveral qualities, and the culture that beſt agrees with it, aſcertained by accurate experiments.

52 Sheep's feſcue deſcribed.

2. "*Sheep's feſcue graſs*, or *feſtuca ovina*, is much praiſed by the Swediſh naturaliſts for its ſingular value as a paſture-graſs for ſheep; this animal being repreſented as fonder of it than of any other graſs, and fattening upon it more quickly than on any other kind of food whatever. And indeed, the general appearance of the plant, and its peculiar manner of growth, ſeems very much to favour the accounts that have been given us of it.

"This plant is of the ſame family with the former, and agrees with it in ſeveral reſpects; although they may be eaſily diſtinguiſhed from one another. Its leaves, like the former, in its natural ſtate, are always rounded, but much ſmaller; being little bigger than large horſe hairs, or ſwine-briſtles, and ſeldom exceed ſix or ſeven inches in length. But theſe ſpring out of the root in tufts, ſo cloſe upon one another, that they reſemble, in this reſpect, a cloſe hair bruſh more than any thing elſe I know: ſo that it would ſeem naturally adapted to form that thick ſhort pile of graſs in which ſheep are known chiefly to delight. Its flower-ſtalks are numerous, and ſometimes attain the height of two feet; but are more uſually about 12 or 15 inches high.

53 Its appearance when cultivated.

"Upon gathering the ſeeds of this plant, and ſowing them as the former, it was found that they ſprung up as quickly as any other kind of graſs; but the leaves are at firſt no bigger than a human hair. From each ſide ſprings up one or two of theſe hair-like filaments, that in a ſhort time ſend out new offsets, ſo as quickly to form a ſort of tuft, which grows larger and larger, till it at length attains a very large ſize, or till all the intervals are cloſed up, and then it forms the cloſeſt pile of graſs that it is poſſible to imagine. In April and May it puſhed forth an innumerable quantity of flower-ſtalks, that afforded an immenſe quantity of hay; it being ſo cloſe throughout, that the ſcythe could ſcarcely penetrate it. This was allowed to ſtand till the ſeeds ripened; but the bottoms of the ſtalks were quite blanched, and almoſt rotted for want of air before that time.

"This was the appearance that it made the firſt year after it was ſowed: but I have reaſon to think, that, after a few years, it likewiſe produces fewer ſeed-ſtalks, and a greater quantity of leaves, than at firſt. But however that may be, it is certain, that if theſe are eaten down in the ſpring, it does not, like rye graſs, perſiſt in a continued tendency to run to ſeed; but is at once determined to puſh forth a quantity of leaves without almoſt any ſtalks at all: and as all domeſtic animals, but more eſpecially ſheep, are extremely fond of this graſs, if they have liberty to paſture where it grows, they bite it ſo cloſe as never to ſuffer almoſt a ſingle ſeed-ſtalk to eſcape them; ſo that the botaniſt will often ſearch in vain for it, when he is treading upon it with his feet. The beſt way to diſcover it in any paſture, is to ſearch for it in winter, when the tufts of it may be eaſily diſtinguiſhed from every other kind of graſs, by their extraordinary cloſeneſs, and the deep green colour of the leaves.

54 What ſoil moſt proper.

"It ſeems to grow in almoſt any ſoil; although it is imagined that it would flouriſh beſt in a light ſandy ſoil, as it can evidently live with leſs moiſture than almoſt any other kind of graſs; being often ſeen to remain in the ſods that have been employed in coping for ſtone dykes, after all the other graſſes that grew in them have diſappeared. It is likewiſe found in poor barren ſoils, where hardly any other plant can be made to grow at all: and on the ſurface of dry worn-out peat moſs, where no moiſture remains ſufficient to ſupport any other plant whatever: but in neither of theſe ſituations does it thrive; as it is there only a weak and unſightly plant, very unlike what it is when it has the good fortune to be eſtabliſhed upon a good ſoil; although it is ſeldomer met with in this laſt ſtate than in the former.

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"I will not here repeat what has been already ſaid about the particular property that this plant poſſeſſes of continuing all winter; nor point out the benefits that the farmer may reap from this valuable quality.—He need not, however, expect to find any verdure in winter on ſuch plants as grow upon the looſe moſſy ſoil above mentioned; for, as the froſt in winter always hoves up the ſurface of this ſoil the roots of the plants are ſo lacerated thereby, as to make it, for ſome time in the ſpring, to all appearance dead. Nor will he often perceive much verdure in winter upon thoſe plants that grow upon poor hungry ſoils, which cannot afford abundant nouriſhment to keep them in a proper ſtate of vegetation at all times: but ſuch plants as grow on earthen dykes, which uſually begin to vegetate with vigour when the autumnal rains come on, for the moſt part retain their verdure at that ſeaſon almoſt as well as if they were in good garden-mould.

"I have been very particular in regard to this plant; becauſe, in as far as my obſervations have yet gone, it promiſes on many accounts to make a moſt valuable acquiſition to the farmer, and therefore juſtly demands a very particular ſhare of his attention."

55 Holcus lanatus.

3. The *holcus lanatus*, or creeping ſoft-graſs of Hudſon.—This is conſidered by our author as one of the moſt valuable kinds of meadow-graſſes; its pile being exceedingly cloſe, ſoft, and ſucculent. It delights much in moiſture, and is ſeldom found on dry ground, unleſs the ſoil is exceeding rich. It is often found on thoſe patches near ſprings, over which the water frequently flows; and may be known by the uncommon ſoftneſs and ſucculence of the blade, the lively light green colour of the leaves, and the matted intertexture of its roots. But, notwithſtanding the ſoftneſs of its firſt leaves, when the ſeed-ſtalks advance, they are rough to the touch, ſo that the plant then aſſumes a very different appearance from what we would have expected. The ear is branched out into a great number of fine ramifications ſomewhat like the oat, but much ſmaller.—This kind of graſs, however, would not be eaſily cultivated, on account of a kind of ſoft membrane that makes the ſeeds adhere to the ſtalk, and to one another after they are ſeparated from it, as if they were intermixed with cobweb, ſo that it is difficult to get them ſeparated from the ſtalk, or to ſpread readily in ſowing. It ſpreads, however, ſo faſt by its running roots, that a ſmall quantity ſowed very thin, would be ſufficient to ſtock a large field in a ſhort time.

Theſe are the kinds of *graſſes*, properly ſo called, which have not as yet been cultivated, that Mr Anderſon thinks the moſt likely to be of value; but, beſides theſe, he recommends the following of the pea tribe.

1. *Milk-vetch*,

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56 Milk-vetch.

1. *Milk-vetch, liquorice-vetch*, or *milkwort*. This plant, in some respects, very much resembles the common white clover: from the top of the root a great number of shoots come out in the spring, spreading along the surface of the ground every way around it; from which arise a great many clusters of bright yellow flowers, exactly resembling those of the common broom. These are succeeded by hard round pods, filled with small kidney-shaped seeds. From a supposed resemblance of a cluster of these pods to the fingers of an open hand, the plant has been sometimes called *ladies fingers*. By others it is called *crow-toes*, from a fancied resemblance of the pods to the toes of a bird. Others, from the appearance of the blossom, and the part where the plant is found, have called it *feal*, improperly *fell-broom*. It is found plentifully almost everywhere in old grass fields; but as every species of domestic animals eat it, almost in preference to any other plant, it is seldom allowed to come to the flower in pasture grounds, unless where they have been accidentally saved from the cattle for some time; so that it is only about the borders of corn fields, or the sides of inclosures to which cattle have not access, that we have an opportunity of observing it. As it has been imagined that the cows which feed on the pastures, where this plant abounds, yield a quantity of rich milk, the plant has, from that circumstance, obtained its most proper English name of *milk-vetch*.

57 Its good qualities.

One of the greatest recommendations of this plant is, that it grows in poor barren ground, where almost no other plant can live. It has been observed in ground so poor, that even heath, or ling (*erica communis*), would scarcely grow; and upon bare obdurate clays, where no other plant could be made to vegetate; insomuch that the surface remained entirely uncovered, unless where a plant of this kind chanced to be established: yet, even in these unfavourable circumstances, it flourished with an uncommon degree of luxuriance, and yielded as tender and succulent, though not such abundant shoots, as if reared in the richest manured fields. In dry barren sands, also, where almost no other plant could be made to live, it has been found to send out such a number of healthy shoots all round, as to cover the earth with the closest and most beautiful carpet that can be desired.

The stalks of the milk-vetch are weak and slender, so that they spread upon the surface of the ground, unless they are supported by some other vegetable. In ordinary soils they do not grow to a great length, nor produce many flowers; but in richer fields the stalks grow to a much greater length, branch out a good deal, but carry few or no flowers or seeds. From these qualities our author did not attempt at first to cultivate it with any other view than that of pasture; and, with this intention, sowed it with his ordinary hay seeds, expecting no material benefit from it till he desisted from cutting his field. In this, however, he was agreeably disappointed; the milk-vetch growing the first season as tall as his great clover, and forming exceeding fine hay; being scarce distinguishable from lucerne, but by the slenderness of the stalk, and proportional smallness of the leaf.

Another recommendation to this plant is, that it is perennial. It is several years after it is sowed before it attains to its full perfection; but, when once established, it probably remains for a great number of years in full vigour, and produces annually a great quantity of fodder. In autumn 1773, Mr Anderson cut the stalk from an old plant that grew on a very indifferent soil; and, after having thoroughly dried it, he found that it weighed 14 ounces and a half. Food for Cattle.

The stalks of this plant die down entirely in winter, and do not come up in the spring till the same time that clover begins to advance; nor does it advance very fast, even in summer, when once cut down or eaten over: so that it seems much inferior to the above-mentioned grasses; but it might be of use to cover the worst parts of a farm, on which no other vegetable could thrive.

58 Yellow vetchling.

2. The *common yellow vetchling* (*Lathyrus pratensis*), or *everlasting tare*, grows with great luxuriance in stiff clay soils, and continues to yield annually a great weight of fodder, of the very best quality, for any length of time. This is equally fit for pasture or hay; and grows with equal vigour in the end of summer as in the beginning of it; so would admit being pastured upon in the spring, till the middle, or even the end of May, without endangering the loss of the crop of hay. This is an advantage which no other plant except clover possesses; but clover is equally unfit for early pasture or for hay. Sainfoin is the only plant whose qualities approach to it in this respect, and the yellow vetchling will grow in such soils as are utterly unfit for producing sainfoin.—It is also a perennial plant, and increases so fast by its running roots, that a small quantity of the seed would produce a sufficient number of plants to fill a whole field in a very short time. If a small patch of good ground is sowed with the seeds of this plant in rows, about a foot distance from one another, and the intervals kept clear of weeds for that season, the roots will spread so much as to fill up the whole patch next year; when the stalks may be cut for green fodder or hay. And if that patch were dug over in the spring following, and the roots taken out, it would furnish a great quantity of plants, which might be planted at two or three feet distance from one another, where they would probably overspread the whole field in a short time.

59 Blue tare.

3. The *common blue tare* seems more likely than the former to produce a more flourishing kind of hay, as it abounds much more in seeds; but as the stalks come up more thinly from the root, and branch more above, it does not appear to be so well adapted for a pasture grass as the other. The leaves of this plant are much smaller, and more divided, than those of the other; the stalks are likewise smaller, and grow to a much greater length. Though it produces a great quantity of seeds, yet the small birds are so fond of them, that, unless the field were carefully guarded, few of them would be allowed to ripen.

60 Bush-vetch.

4. The *vicia sepium, purple everlasting*, or *bush-vetch*. Our author gives the preference to this plant beyond all others of the same tribe for pasture. The roots of it spread on every side a little below the surface of the ground, from which, in the spring, many stems arise quite close by one another; and as these have a broad tufted top covered with many leaves, it forms as close a pile as could be desired. It grows very quickly after being cut or cropt, but does not arrive at any great height; so that it seems more proper for pasturage than

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making hay; although, upon a good ſoil, it will grow ſufficiently high for that purpoſe; but the ſtalks grow ſo cloſe upon one another, that there is great danger of having it rotted at the root, if the ſeaſon ſhould prove damp. It ſeems to thrive beſt in a clayey ſoil.

61 Everlaſting pea.

Beſides theſe, there are a variety of others of the ſame claſs, which he thinks might be uſeful to the farmer. The common garden everlaſting pea, cultivated as a flowering plant, he conjectures, would yield a prodigious weight of hay upon an acre; as it grows to the height of ten or twelve feet, having very ſtrong ſtalks, that could ſupport themſelves without rotting till they attained a great height.

62 Achillea millefolium.

One other plant, hitherto unnoticed, is recommended by our author to the attention of the farmer; it is the *common yarrow* (*Achillea millefolium*), or *hundred-leaved graſs*. Concerning this plant, he remarks, that in almoſt every fine old paſture, a great proportion of the growing vegetables with which the field is covered conſiſts of it; but the animals which feed there are ſo fond of the yarrow, as never to allow one ſeed-ſtalk of it to come to perfection. Hence theſe ſeed-ſtalks are never found but in neglected corners, or by the ſides of roads; and are ſo diſagreeable to cattle, that they are never taſted; and thus it has been erroneouſly thought that the whole plant was refuſed by them.—The leaves of this plant have a great tendency to grow very thick upon one another, and are therefore peculiarly adapted for paſturage. It arrives at its greateſt perfection in rich fields that are naturally fit for producing a large and ſucculent crop of graſs. It grows alſo upon clays; and is among the firſt plants that ſtrike root in any barren clay that has been lately dug from any conſiderable depth; ſo that this plant, and thiſtles, are uſually the firſt that appear on the banks of deep ditches formed in a clayey ſoil. All animals delight to eat it; but, from the dry aromatic taſte it poſſeſſes, it would ſeem peculiarly favourable to the conſtitution of ſheep. It ſeems altogether unfit for hay.

63 Lucerne.

Beſides theſe plants, which are natives of our own country, there are others which, though natives of a foreign climate, are found to thrive very well in Britain; and have been raiſed with ſuch ſucceſs by individuals, as highly to merit the attention of every farmer. Among theſe the firſt place is claimed by lucerne.

This is the plant called *medica* by the ancients, becauſe it came originally from Media, and on the culture of which they beſtowed ſuch great care and pains. It hath a perennial root, and annual ſtalks, which, in a good ſoil, riſe to three feet, or ſometimes more, in height; its leaves grow at a joint like thoſe of clover; the flowers, which appear in June, are purple; and its pods are of a ſcrew-like ſhape, containing ſeeds which ripen in September. All ſorts of domeſtic cattle are fond of this plant, eſpecially when allowed to eat it green, and black cattle may be fed very well with the hay made from it; but an exceſs of this food is ſaid to be very dangerous.

Lucerne has the property of growing very quickly after it is cut down, inſomuch that Mr Roeque has mowed it five times in a ſeaſon, and Mr Anderſon affirms he has cut it no leſs than ſix times. It is, however, not very eaſily cultivated; in conſequence of which it ſometimes does not ſucceed.

64 Timothy graſs.

Another graſs was brought from Virginia, where it is a native, and ſown by Rocque in 1763. This graſs is called *timothy*, from its being brought from New-York to Carolina by one Timothy Hanſon. It grows beſt in a wet ſoil; but will thrive in almoſt any. If it is ſown in Auguſt, it will be fit for cutting in the latter end of May or beginning of June. Horſes are very fond of it, and will leave lucerne to eat it. It is alſo preferred by black cattle and ſheep; for a ſquare piece of land having been divided into four equal parts, and one part ſowed with lucerne, another with ſainfoin, a third with clover, and the fourth with timothy, ſome horſes, black cattle, and ſheep, were turned into it, when the plants were all in a condition for paſturage; and the timothy was eaten quite bare, before the clover, lucerne, or ſainfoin, was touched.

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One valuable property of this graſs is, that its roots are ſo ſtrong and interwoven with one another, that they render the wetteſt and ſofteſt land, on which a horſe could not find footing, firm enough to bear the heavieſt cart. With the view of improving boggy lands, therefore, ſo as to prevent their being poached with the feet of cattle, Mr Anderſon recommends the cultivation of this kind of graſs, from which he has little expectation in other reſpects.

65 Grazing compared with the plough.

On this ſubject, of the kind of plants moſt proper to be raiſed for feeding cattle, one general queſtion ought not to paſs unnoticed concerning the propriety of feeding them upon roots and plants cultivated by the aid of the plough, or upon leaving them to derive their ſubſiſtence from lands allowed to remain continually in paſturage. The advantages of the latter practice are ſet forth by Thomas Davis, Eſq. of Longleet, in the following words. "Experience ſufficiently evinces the extreme difficulty of perſuading tenants that they get more (generally ſpeaking) by feeding their lands, than by ploughing them; yet it requires very few arguments to convince a landlord, that, in cold wet land eſpecially, the leſs ploughed land you have, the leſs you put it in the tenant's power to ruin your eſtate. That a tenant of 60l. *per annum* on a dairy farm will get money, while a corn farm of the ſame ſize will ſtarve its occupier (though perhaps the former gives 15s. per acre for his land, and the latter only 10s.), is ſelf-evident. The plough is a friend of every body's, though its advantages are very far from being particularly and locally felt; corn being an article that will bear keeping till the whim or caprice, or ſuppoſed advantage of its poſſeſſor, call it forth. But the produce of the cow is far otherwiſe. Cheeſe muſt neceſſarily be ſold at a certain period: it is a ponderous article; and one-twelfth, or at leaſt one-fifteenth of its value, is often paid for carrying it to a fair 50 miles off; and the butter and ſkimmed milk find their way no great diſtance from home, as is evident by the price of butter varying frequently one third in 20 or 30 miles. Every inhabitant of Bath muſt be ſenſible, that butter and cheeſe have riſen one-third or more in price within 20 years. Is not this owing to the great encouragement given to the plough and to grazing, at a time when, on account of the increaſed demand for milk, cream, butter, and cheeſe, every exertion on behalf of the dairy ſhould have been encouraged?" &c.

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In ſome remarks on this letter by Mr Billingſley, the ſame ſuperiority of dairy farms to the arable kind is aſſerted in the moſt poſitive terms. "Perhaps (ſays he)

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he) there cannot be a ſtronger proof of the inferiority of the plough with reſpect to profit, than the ſuperior punctuality of the dairy farmer in the payment of his rent. This obſervation, I believe, moſt ſtewards who ſuperintend manors devoted partly to corn and partly to dairy farms, will verify; at leaſt I have never met with one who controverts it. But perhaps the advocate for the plough will deſire me not to confound the abuſe of a thing with its intrinſic excellence; and ſay, that the generality of corn farmers are moſt egregious ſlovens; that lands devoted to the plough are not confined to ſuch a mediocrity of profit as 20s. per acre; that the produce of artificial graſſes (without which a well managed arable farm cannot exiſt), far exceeds that of natural graſs both in reſpect of quantity and nutrition: that the ſtraw yard is a moſt convenient receptacle for the cow when freed from the pail. Theſe, and many other reaſons, may be adduced to ſhow the propriety of walking in the middle path, and of judiciouſly blending *arable* with *paſture*, in the proportion perhaps of *three* of the latter to *one* of the former."

On theſe letters we ſhall only remark, that for the good of mankind we hope the opinions they contain will never come into general practice: as thus the price of bread muſt be raiſed ſo high, that the lower claſſes of people would be entirely deprived of it. In the Bath Papers, vol. v. p. 43. we have a method propoſed by Mr Wimpey of improving ſmall arable farms in ſuch a manner as to make them yield as much milk, butter, and cheeſe, as thoſe which are kept continually in paſture. He agrees with the maxim already mentioned, that ſmall arable farms do not afford the occupier ſo good a maintenance as dairy farms of the ſame value; and that the poſſeſſor of a dairy farm will do well and ſave money, while the former, with much toil and trouble, is ſtarving himſelf and family. Notwithſtanding this, he maintains, that there is an eſſential difference between ground that is naturally arable, and ſuch as is by nature adapted for paſture. Land which is naturally arable, according to him, can by no means be converted into paſture of any duration. "Such as, from a wild ſtate of nature, overrun with furze, fern, buſhes and brambles, has been rendered fertile by means of the plough, muſt be kept in that improved ſtate by its frequent uſe; otherwiſe it would ſoon revert to that wild barren ſtate which was its original condition. A farm, therefore, which conſiſts wholly, or almoſt ſo, of land that is properly arable, muſt ever continue arable; for it is not practicable to render it in any degree fertile but by means of the plough, or to keep it long in that ſtate even when it is made ſo." He is of opinion, however, that by raiſing crops proper for feeding cattle, the poſſeſſor of an arable farm may raiſe as great a number of horned cattle as one who has a paſture farm; the only queſtion is, Whether he can be reimburſed of his expences by the produce? "To aſcertain this fact (ſays he), we muſt inquire what may be the average expences of keeping a milch cow on a dairy farm for any given time. It is ſaid, upon very good authority, that the expence is generally from 3l. to 3l. 10s. per annum. Two acres and a half of paſture fit for this uſe is ſufficient to keep a cow the whole year through, and ſuch land is valued at from 25s. to 30s. per acre. At 25s. the keeping of each cow would amount to 3l. 2s. 6d. per annum. A dairy farm, therefore, conſiſting of 48 acres, at 25s. per annum, would amount to 60l. rent; and the number of cows that might be kept on ſuch a farm would be about 20. In the next place, with regard to the expence of keeping a cow upon food raiſed in arable land as a ſuccedaneum for graſs, we are aſſured by unqueſtionable authority, that a buſhel of potatoes, given half at night and half in the morning, with a ſmall allowance of hay, is ſufficient to keep three cows a day; by which allowance their milk will be as rich and as good as in the ſummer months when the cows are in paſture. An acre of land, properly cultivated with potatoes, will yield 337 buſhels; and the total expence of cultivation, rent and tithe included, will not exceed 6l. 13s. If three cows eat ſeven buſhels per week, then they would eat 364 buſhels in a year; and 20 cows would conſume 2433 buſhels:" So that, according to this calculation, ſeven acres and a quarter would nearly maintain as many cows as on the paſture farm could be maintained by 48 acres. If then the cultivation of one acre of ground coſts 6l. 13s. the cultivation of ſeven acres and a quarter will coſt about 48l. We have ſeen, however, that the rent of a dairy farm capable of maintaining 20 milch cows, is not leſs than 60l. ſo that the calculation is thus entirely in favour of the arable farm; ſeven or eight acres of the arable farm being ſuperior by 12l. in value, when cultivated with potatoes, to 48 acres of meadow or paſture ground." "It muſt indeed be obſerved (adds our author), that in this ſtatement no allowance is made for the ſmall quantity of hay given to the cows with the potatoes. It muſt be noted alſo, that the account of cultivation is charged with 40s. an acre for manure, and ſome expence for ploughing, which of right is chargeable to the crop of wheat that is to follow. Now, if we deduct 40s. an acre from the expence of cultivating the potatoes, it reduces the ſum to 4l. 13s. and the whole expence upon ſeven acres and a quarter is thus leſs than 34l. and conſequently the keeping of 20 cows is little more than half to the occupier of the arable farm what it is to the occupier of the grazing farm. If this concluſion be fairly drawn, and the calculation free from errors, it is matter of the greateſt importance, eſpecially to the little arable farmer. It plainly raiſes him from a ſtate of acknowledged inferiority to one greatly ſuperior."

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66 Objection anſwered from an experiment of Mr Vagg.

Our author next proceeds to obviate an objection, "that the whole of his reaſoning muſt be indeciſive, as relating only to potatoes." In oppoſition to this, he adduces an experiment made on a pretty large ſcale by Mr Vagg; from which it appears, that cabbages, when raiſed upon arable ground, are nearly as much ſuperior to a natural crop as potatoes are. Twelve acres were employed in this experiment, and thoſe of an indifferent quality. The rent was 30s. per acre, and the whole expence of culture and carting off the crop amounted only to 11. 14s. ſo that all the coſt of the twelve acres was 38l. 9s. From the produce were fed 45 oxen and upwards of 60 ſheep; and he was aſſured that they improved as faſt upon it as they do in the beſt paſture months, May, June, and July. "Now (ſays Mr Wimpey), if inſtead of 60 ſheep we reckon 15 oxen, or that four ſheep are equal to about

67 Number of cattle fed from 12 acres of cabbages.

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one ox, in which we cannot err much; then 60 oxen were kept well for three months, or, which is the ſame thing, 15 for a whole year, for 38l. 9s.; and conſequently 20 oxen would coſt 51l. 5s. 4d. which is not quite 3l. more than the keeping of 20 cows would coſt in potatoes. Turnips, turnip-rooted cabbage, carrots, parſnips, and ſome other articles, by many experiments often repeated, have been found quite adequate to the ſame valuable purpoſes; at leaſt ſo far as to be more lucrative than meadow or paſture. Clover and rye graſs are omitted, as having been long in general practice; but are in common very ſhort of the advantages which may be derived from the cultivation of the other articles recommended." Sainfoin is greatly recommended; but our author acknowledges that it makes but a miſerable appearance the firſt year, though afterwards he is of opinion that one acre of ſainfoin is equal to two of middling paſture ground; for which reaſon he accuſes the farmer of intolerable indolence who does not cultivate ſo uſeful a plant. On this ſubject, however, we muſt remember, that the culture of ſainfoin is clogged with the loſs of one if not two crops; which may ſometimes be inconvenient, though afterwards it remains in perfection for no leſs than 20 years. The moſt advantageous method of raiſing it he ſuppoſes to be after potatoes. Thus it will thrive even upon very poor ground; as the culture and manure neceſſary for the potatoes both pulverize the ſoil and enrich it to a ſufficient degree.

68 Feeding of cattle not brought to perfection.

We ſhall afterwards have an opportunity of attending to this ſubject when we come to conſider the ſubject of feeding cattle. In the mean time, it may be remarked, that this branch of the art of the huſbandman, has by no means hitherto been carried to its higheſt perfection in this country; and that in proportion as it is improved, and cattle are more carefully fed, the value of the plough will appear more conſpicuous.

Sect. III. *Of the comparative Profit to be derived from the Cultivation of different Vegetables.*

69 Circumſtances that render vegetables profitable or not.

Like every other artiſt or tradeſman, a huſbandman will always be under the neceſſity of regarding himſelf as the ſervant of the community, and muſt endeavour to rear the vegetables that are in greateſt demand, and that will enable him to derive the greateſt profit from the portion of territory which he occupies. The product of ſome ſoils and ſituations is ſo fixed by nature, that it is in vain for human art or induſtry to alter her deſtination. In our own and in many other countries, there are extenſive tracts of lofty and rugged mountains, from which the art of agriculture ſeems to be for ever baniſhed. Such ſituations belong excluſively to the ſhepherd and his flock, to the utter excluſion of the plough. Even on ſome arable lands it may be found fruitleſs to attempt to rear many of the more valuable vegetable productions. In many bleak and unſheltered fields of the higher country of Scotland, in which turnips and oats are cultivated with tolerable ſucceſs, it would be in vain to expect regular crops of wheat; and though potatoes are found to proſper in a ſandy, or even a moſſy ſoil, it would be in vain to expect them to produce an equally valuable crop upon a ſtiff clay, in which the roots cannot ſwell or expand to a proper ſize. In forming a plan of agriculture, therefore, the huſbandman muſt not overlook the peculiar nature of the ſoil that has fallen to his lot, or its phyſical relation to the nature of certain vegetables, as he can only hope for ſucceſs by adapting the one of theſe to the other.

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The huſbandman muſt alſo have a ſpecial regard to the ſtate of the market to which his commodities are to be brought. It is in vain for him to cultivate large quantities of roots, ſuch as potatoes or carrots, at a diſtance from great towns, which alone can afford a market for them, unleſs he intend to conſume them upon his own farm by feeding cattle. In a part of the country, however, in which great breweries are eſtabliſhed, if his ſoil is fit for the purpoſe, he may ſafely venture to rear large quantities of barley; as he cannot in ſuch a ſituation be at any time deſtitute of a market. Hence we can perceive, that it is the ſtate of the market which muſt at all times regulate the enterpriſes of the agriculturiſt, and the kind of crops which he is to bring forward. Thus alſo we ſee the mode in which agriculture may be moſt ſucceſsfully encouraged by a nation. Let an abundant market be provided for the produce of the ſoil, and that produce will infallibly be augmented. In this way, it is evident that the conſumption of grain, by means of diſtilleries or breweries, is highly favourable to the production of it in great quantities. They are even favourable to the exiſtence of plenty, or of abundance of bread for the uſe of the people. In good ſeaſons, by affording a ready market, they give activity to the huſbandman, and in bad ſeaſons their operations can be arreſted by law, and the ſuperfluous quantity of grain which was meant to be conſumed by them, can be converted into human food. Thus they operate in ſome meaſure like a great public granary, in which proviſions ſhould be kept againſt an accidental ſcarcity.

It may ſometimes happen, that by the character of the age in which he lives, and the ſtate of the market which it produces, a huſbandman may find himſelf moſt profitably employed, when rearing a kind of food which is by no means the moſt advantageous to the population of his country. This takes place, when he is employed in preparing butchers meat inſtead of bread; that is, when he finds it more profitable to rear upon his lands vegetables which can only be conſumed by cattle, and thus contribute only in an indirect manner to the ſuſtenance of the human ſpecies, than to cultivate thoſe vegetable productions which are ſuited to the human ſtomach, and which therefore directly and immediately afford ſubſiſtence to man. According to Archdeacon Hiſlop's comparative ſtatement, lately publiſhed, the weight of food from an acre of arable land, on the average of three years, a fallow year being included, is nine and a half times greater than from an acre of feeding ſtock; and, according to the calculations of the Rev. Dr Walker, at Collington, profeſſor of natural hiſtory at Edinburgh, a Scots acre of land in paſture, fed with ſheep, produces only 120 pounds weight of meat, whereas the ſame land will yield 1280 pounds of oatmeal, or above ten times as much. Let it even be ſuppoſed, then, that one pound of mutton contains in itſelf as much ſubſtantial nouriſhment for the human conſtitution, as

70 Paſturage and agriculture compared.

two

Profit from different vegetables.

two pounds weight of oat meal; ſtill it will follow, that lands cultivated for the production of oats, will ſupport a population five times greater in number, than can be ſupported by the ſame land when uſed for the paſture of ſheep; and, where one million of people are found to exiſt upon a territory occupied in the one way, between five and ſix millions of people might exiſt upon the ſame land if it were cultivated for raiſing grain, and if the inhabitants would conſent to uſe it as their food. Were any contrivance adopted, of the nature of thoſe already mentioned, for converting the ſucculent roots of potatoes, carrots, &c. into dry meal or flour; the ſame proportional difference of population would continue to exiſt, between nations in which that kind of flour ſhould be conſumed as human food, and in which it ſhould be uſed for feeding cattle: For a man always commits an enormous waſte of food, who, inſtead of eating grain himſelf, gives it to an inferior animal, in the expectation of afterwards receiving an equivalent, by devouring the fleſh of that animal.

71 Population greateſt where men live on vegetable food.

Accordingly, it ſeems impoſſible for any nation to reach a very extenſive degree of population, unleſs the people at large conſent to ſubſiſt chiefly, or altogether, upon vegetable food. In China, where the practice of polygamy renders the families of rich men very numerous, and where the equal diſtribution of the property among the children of the ſame family prevents the accumulation of great wealth by individuals, almoſt all perſons have found it convenient or neceſſary to relinquiſh the ordinary uſe of butchers meat, and to have recourſe to vegetable food. It is only in conſequence of this circumſtance, that the enormous population of that empire is ſupported. The quantity of butchers meat conſumed in a country will, therefore, always in ſpite of every agricultural improvement, ſet bounds to its population. A nation of hunters and ſhepherds, who live upon wild animals, or upon flocks and herds, muſt always be few in number. By agriculture, the numbers of theſe animals may indeed be increaſed; but the men who can find ſubſiſtence by conſuming them, will always be five or ſix times fewer in number, than might live upon the ſame territory, were the cattle expelled, and the lands occupied in rearing food to be immediately uſed by man.

With theſe general conſiderations, however, the practical agriculturiſt, or huſbandman, may have nothing to do. To ſucceed in his profeſſion, he muſt accommodate himſelf to the public taſte, or to the ſtate of the market around him; and muſt conſider what commodity, whether grain or butchers meat, will there bring the beſt reward for his labour. He may even find the ſtate of the market affected by other circumſtances, than the mere taſte of the public for butchers meat, in preference to vegetable food; although that muſt always be of great importance among a luxurious people. Conquering nations, who extend their political dominions over diſtant regions, never fail to draw to their native country a very great portion of the wealth of the vanquiſhed ſtates. The victorious nation never fails, in ſuch caſes, to contain a great number of wealthy individuals, whoſe revenue is not derived from the cultivation of their native ſoil, or from any branch of manufacture or of commercial induſtry carried on by them upon it; but which conſiſts of money drawn from the remote provinces of the empires, in conſequence of eſtates poſſeſſed, or fortunes acquired there, in the ſervice of government. The reſult of ſuch circumſtances naturally is, that theſe wealthy individuals not only live at home in a luxurious manner, and increaſe to an immenſe extent the conſumption of butchers meat by themſelves and their numerous retinues; but for the ſake of oſtentation, and as the only means of employing their wealth, they maintain great numbers of carriages and of riding horſes. To ſupport ſuch eſtabliſhments, they themſelves not only convert large tracts of territory from arable into paſture lands; but even the whole huſbandmen of the country are induced to do the ſame, to derive a profit from ſupplying them with butchers meat, and with food for their pleaſure horſes. In the mean time, the grain that may be wanted for the conſumption of the people, whether rich or poor, being a commodity which is eaſily preſerved and tranſported, muſt be bought from foreign nations, by a portion of the ſuperfluous wealth of the ſtate; and thus a rich and proſperous people may come to depend upon foreigners for a morſel of bread; and when theſe foreign nations happen to experience an unfortunate ſeaſon, this wealthy people may ſuffer all the horrors of famine upon a fertile ſoil, and in the midſt of overflowing treaſures.

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Such was the ſtate of Italy under the ancient Romans. Every part of it was adorned with the parks and villas and gardens of the nobles, who derived their revenues from the remote parts of the empire. This ſeat of dominion exhibited a picture of boundleſs ſplendour and magnificence. But the ſoil was entirely occupied in the ſervice of oſtentation or of luxury; and Italy, one of the moſt fertile corn countries in Europe, depended for grain upon Egypt, and the weſtern provinces of Africa that border upon the Mediterranean. Such alſo, though perhaps in an inferior degree, ſeems to be the preſent ſtate of Great Britain. It has acquired vaſt and fertile and populous provinces, within the torrid zone in the eaſt, from which individuals are annually tranſporting home immenſe treaſures obtained in the public ſervice. In the weſt, alſo, within the ſame torrid zone, by a great expence of treaſure and of human lives, the cultivation of certain valuable commodities has been eſtabliſhed; and from eſtates ſituated there, individuals reſiding at home now derive great revenues. The principles which regulate human affairs are unalterable; and in every age the ſame cauſes are attended with the ſame conſequences. What occurred in ancient Italy, took place among us ſoon as the poſſeſſion of diſtant territories had leiſure to diſplay its natural effects. Britain formerly not only produced abundance of grain, for the ſupport of its own inhabitants, but it poſſeſſed a conſiderable ſurplus for exportation. After the acquiſition of foreign poſſeſſions, this ſurplus produce gradually ceaſed to exiſt; and it appears from documents, which the legiſlature has acknowledged to afford authentic and complete evidence of the truth of the fact, that, for twenty years paſt, notwithſtanding all our agricultural improvements, and the waſte lands that have been brought under the plough, the produce of grain is annually becoming more and more unequal to the conſumption; and this decreaſe appears in ſome meaſure to keep pace with the increaſing value of our diſtant poſſeſſions. In the mean time we are annually coming under

72 Circumſtances that add to the diſpoſition to prefer raiſing grain.

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under the neceſſity of purchaſing larger and larger ſupplies of grain, from the foreign ſtates of Europe or of North America; and thus theſe nations, without undergoing the imputation of uſurpation, and without encountering the hazard of an unfriendly climate, have been enabled, through the medium of our luxury, to obtain a ſhare of the riches of Hindoſtan, and of the profits of our Weſt India cultivation. In the mean time their agriculture is encouraged, while we are made to depend upon them for the neceſſaries of life. After all, it appears unreaſonable, and would perhaps be improper, to regret a ſtate of affairs, which is the reſult of national aggrandiſement, and of the ſuperiority and ſucceſsful enterpriſes of our countrymen. Still, however, it is obviouſly to be wiſhed, that, ſo far as agriculture is concerned, we could be reſtored to the ſtate of independence which our anceſtors enjoyed, when they were able, from their own ſoil, to ſupply themſelves with the neceſſaries of life: ſuch a ſtate is ſometimes neceſſary to the independent exiſtence of a community, and is at all times conducive to its welfare. It can only however be produced by means of agriculture. Therefore,

Ye generous Britons, venerate the *Plough*,
And o'er your hills and long withdrawing vales,
Let autumn ſpread her treaſures to the ſun;
So with ſuperior boon may your rich ſoil,
Exuberant, nature's better bleſſings pour
O'er every land, the naked nations clothe,
And be th' exhauſtleſs granary of a world!

THOMSON.

SECT. IV. *General Principles of Cultivation.*

IT is not our intention here to enter into a minute diſquiſition, concerning the nature of vegetables, or the different ſubſtances with which they may be connected, in their growth or in their decay. Such inveſtigations, in a proper arrangement of the ſciences, ought to be left to chemiſtry; but even that ſcience, ſo far as vegetable ſubſtances are concerned, is ſtill in ſuch a ſtate of imperfection, that a detail of the experiments and opinions of philoſophical chemiſts, concerning vegetables, would as yet afford but a very trifling portion of uſeful information to the huſbandman. We ſhall therefore content ourſelves with here ſtating ſuch general remarks, as appear neceſſarily connected with the important art of which we are now treating.

73 Nature of the growth of vegetables.

A vegetable is not to be regarded merely as a piece of matter, or as a mixture of certain material ſubſtances. It is an organized being, poſſeſſed of life, which it derived from another ſimilar organized being that exiſted previous to itſelf; and this former organized and living being derived its conſtitution from a parent ſtem, which grew out of a ſtill older plant, up to an antiquity of which we have no knowledge. A vegetable, in this manner, not only has a birth, but it alſo has a growth, which is ſupported by food that it takes in and conveys by peculiar organs to the particular parts for which it is deſtined. When it has arrived at maturity, or reached the perfection of its form and conſtitution, a vegetable like an animal begins to decay, and finally dies, and, by a proceſs of putrefaction, is converted into a kind of earth.

To the life of vegetables, in the ſame manner as to the life of animals, the preſence of atmoſpheric air is neceſſary. They alſo require a certain moderate degree of heat; without which their growth cannot proceed, although a great degree of it is utterly fatal even to their texture. That they require moiſture, is equally obvious; as appears from the ordinary effect of rain, or of the continued want of it, upon fields and plants. They require likewiſe to be inſerted in the earth, or in ſome way connected with a collection of its particles; for although ſome plants, particularly the bulbous-rooted kinds, vegetate in pure water and air alone, it appears that they acquire little addition of ſolid ſubſtance, and that neither they, nor any of the other larger plants, reach perfection, or produce ſeed, unleſs planted in the earth, or ſupplied with a portion of it.

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74 Four kind of ſoils.

As all ſoils are by no means equally adapted for ſupporting vegetables, or bringing them to maturity, it is neceſſary for the huſbandman to attend to their nature, and the modes in which they may be altered or ameliorated for his uſe. Independent of theſe hard concretions, which obtain the name of ſtones or rocks, it is to be obſerved, that the looſer and more diviſible earth which covers moſt part of the ſurface of the globe, and receives the appellation of *the ſoil*, may, upon the whole, and with ſufficient accuracy for practical purpoſes, be divided into four kinds, which are in general mixed with each other, but which receive their name, in ordinary language, from the kind that predominates or is moſt abundant. Theſe are ſand, clay, chalk, and garden mould. Of theſe, ſand and clay are in ſome meaſure the oppoſites of each other, while chalk forms a kind of medium between them. Sand allows water to filter rapidly through it, and ſpeedily becomes dry, while clay is extremely tenacious of moiſture; but a mixture of chalk renders ſand conſiderably more tenacious of water, while it renders clay more looſe, and eaſily penetrated. None of theſe ſoils are valuable for the purpoſes of agriculture.—Sand does not ſufficiently retain water for the uſe of vegetables; nor does clay ſuffer their roots to expand with freedom in queſt of nouriſhment. Chalk, or, as it is uſually called, a calcareous ſoil, is not of itſelf adapted for raiſing uſeful plants; for, although it may not have the mechanical defects of ſand and clay, yet, it is found by experience to be of little value to them, either in conſequence of its tendency to deſtroy their texture by its corroſive quality, that is, by having too much chemical affinity with the materials of which they conſiſt, or from its not containing within itſelf the proper materials neceſſary to them as food.

The fourth kind of ſoil we have denominated garden mould; becauſe it is in its higheſt perfection when it approaches neareſt to the rich black earth which receives that appellation. This is the moſt proper of all kinds of ſoil for rearing the whole of thoſe vegetables which are accounted valuable in our climate. In proper circumſtances, that is, with a moderate degree of heat and of moiſture, it never fails to ſend forth and to bring to perfection an abundant crop. In proportion to the degree in which any ſoil conſiſts of this black mould, its value increaſes. If, therefore, a huſbandman could cover the portion of territory allotted to him with a tolerable depth of this kind of ſoil, nothing more would be neceſſary to the ſucceſs of his enterpriſes, as he

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he could rear whatever vegetables he thought fit, in perfection, and in great profusion. It is to be observed, however, that this kind of mould or soil cannot be relied upon as permanent. If crops of grain should be taken from it year after year, it would soon lose its fertile qualities, and become unfit for the purposes of a prosperous agriculture. Here then is the remarkable difference between this kind of soil and the three others that were formerly mentioned, sand, clay, and chalk. Whatever properties these possess are unperishing, and can only be altered or modified by the operation of a fierce heat. Unfortunately, however, in their pure state, as already mentioned, they are of little value to the husbandman; and it is only in proportion to the degree in which they are mixed with the dark coloured or garden mould, that they become adapted to his purposes: but as the qualities of this mould are of a transitory nature, it is of the utmost importance, and ought indeed to form the great basis of every theory of agriculture, to explain how they may be preserved in existence, or restored when lost.

75 Nature of garden mould.

To understand this subject correctly, it is necessary to consider the nature and origin of this fertile mould. It is evidently not one of those original substances which form a part of the great mass of the solid globe of the earth, but appears to be the result of the operations and of the destruction of living and organized beings that have existed upon it. "Were a naked rock, says Mr Headrick, in an essay which we shall afterwards have occasion to mention, suddenly thrown up from the sea or from the bowels of the earth, the first plants which nature would place upon it, would be the various species of *lichens*, and such as can subsist wholly upon what they imbibe from the air, without needing a soil in which to push their roots. These plants serve the double purpose of clothing the rock, and thus preventing the fine particles that are dissolved by air and moisture from being washed away, and, from their growth and dissolution, of accumulating vegetable soil for the sustenance of more succulent plants. The rock is thus gradually made to acquire such a depth of soil, that it becomes able to sustain not only grasses and shrubs, but may become a receptacle for the oak itself." The progress here stated is correct; but some circumstances must be added to it, to render it practically useful to the husbandman. It is to be observed then, that animal substances, after they have ceased to form a part of a living body, have a tendency to proceed rapidly into a state of putrefactive fermentation, by which the greatest part of their mass is rendered volatile. When animal substances are mingled with vegetables, they speedily communicate their own fermentation or putrefaction to the vegetables, which by means of it are decomposed, fall to pieces, and are transformed into that kind of black earth, which we have called garden mould, and which forms the most fertile of all soils for the production of vegetables. It is by this process then, that is, by the fermentation of vegetable by means of animal substances, that the surface of this globe has been fertilized, or a black and rich mould produced upon it, as we daily see taking place in a variety of situations. No sooner do the small lichens or mosses cover the face of the naked rock, or gravel, or clay, than a variety of species of small animals appear, and feed upon them. As the plants and animals die in succession, their substances mingle and give rise to the putrefaction already mentioned, which is productive of a small portion of soil. A new race of plants of greater strength and bulk rises upon the ruins of the first, and supports larger animals, all destined in their turn to perish and to increase the quantity of fertile soil. More valuable grasses soon supplant the original small and coarse vegetables, and the spot assumes the appearance of a rich verdure. New species of animals also begin to inhabit it: snails and worms abound; and by their remains contribute to the dissolution of the roots of plants, which everywhere penetrate the new soil, and to the decomposition of the stems which periodically fall down. When the soil has acquired sufficient depth, it is sheltered by shrubs; and, lastly, by forest trees, under the shade of which the larger animals exist. The trees shed their leaves every season, and every season consequently gives an additional layer or *stratum* of fertile mould to the soil: and thus while the forest endures, the fertility of the territory on which it stands continues to be augmented by its spoils, and by the bodies of the animals which repair to it for shelter.

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76 Process by which nature fertilizes the earth.

This process, by which nature gives fertility to the earth, or creates the rich mould on which vegetables flourish, ought to be imitated by the husbandman; and, in fact, it has been imitated in consequence of a knowledge that is derived from experience and from practice, rather than from the general speculations of science. The imitation of nature upon this point constitutes the art of producing manures, which will be afterwards considered. The principle upon which it proceeds, rests upon this foundation, which is known to be true in fact, that the fermentation of animal and vegetable substances produces that kind of dark rich mould which forms the most fertile soil.

In what way, or by what peculiar operation, this kind of mould or soil becomes so highly conducive and subservient to the growth of plants, is a point of more difficult research, and is fortunately of less importance to be known to the practical agriculturist. It may be observed, however, that this mould possesses, in an eminent degree, all the requisites necessary to the success of vegetation. It retains moisture, which is so necessary to that process, without, at the same time, keeping hold of it with that retentiveness which, in clay, has the effect of injuring the roots of the plants. As this mould consists of the remains both of animal and vegetable life, it necessarily contains an immense variety of ingredients which have different degrees of chemical affinity to each other. By the operation of these affinities in bringing the different substances into new combinations, a great quantity of heat must be continually produced or evolved, as occurs in so many chemical processes. By this heat the roots of the plants will be nourished, especially when assisted by the heat which they themselves throw out or produce when germinating. Thus, by the kind of soil now mentioned, or by the aid of manure, the defects of a cold and ungenial climate may, in some measure, be rectified, and the seeds and roots of vegetables may be supplied with due and seasonable warmth. It is also probable, that what is called the exhausted state of a soil, in consequence of much plowing, and many crops having been taken from it, may chiefly arise from this circumstance, that

77 Conjecture about exhausted soils.

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that all the chemical affinities having at laſt operated, every particle of the ſoil remains at reſt, and no more heat is produced by the activity of its parts.

That plants growing in fertile mould, like that now mentioned, derive nouriſhment or food from it, cannot be doubted, ſince we ſee, that when taken out of it, or placed in another but leſs favourable ſoil, they ſpeedily go into decay. What the particular ſubſtances are, however, which they take from it, has not been diſcovered. But it appears from the minuteneſs of the extreme fibres of the roots of plants, that the food taken in by them muſt be ſoluble in water, or in a liquid ſtate when taken in by them. Accordingly, their food is actually found to aſcend through their organs in a liquid form. Of this liquor or ſap there are two kinds, the aſcending and the deſcending. The aſcending ſap is that which riſes in the ſpring; and by cutting a ſhort way through the bark into the wood of many trees, large quantities of it may be drawn off, without injury to their health or growth. This ſap aſcends to the leaves, and there undergoes ſome change by the action of the air; for the leaves of vegetables appear to perform to them an office ſimilar to that which is accompliſhed in animals by the organ called the *lungs*. From the leaves the ſap, thus changed, deſcends to every part of the plant, and contributes to its growth by becoming a part of its ſubſtance. It would ſeem, however, that the liquors which circulate in plants, not only undergo a change at the leaves, but alſo at their firſt entrance by the veſſels of the roots; for if ſeveral different kinds of trees are ingrafted upon the ſame common ſtock, each of them is able to derive the ſap peculiar to itſelf from the ſap of the common ſtock. Thus alſo the chemiſts have informed us, that vinegar, called by them the *acetous acid*, is found variouſly combined in the aſcending ſap of various trees; but it has never yet been diſcovered, that vinegar exiſts in any perceptible quantity in vegetable mould. That ſubſtance, therefore, muſt be formed by the root, by bringing together the ingredients of that acid which it finds and ſelects in the earth.

When any plant, whether great or ſmall, is put into a cloſe veſſel, and ſtrongly heated, allowing only the ſmoke to eſcape, the reſidue is in all caſes of the ſame nature, and is called *charcoal*, or by the chemiſts *carbon*. Of this carbonaceous matter a conſiderable quantity is always found in rich garden mould, derived no doubt from the remains of vegetable ſubſtances of which that mould was originally formed. This carbonaceous matter, however, or charcoal, being inſoluble in water, cannot in its ordinary ſtate enter into the veſſels of growing vegetables; but, as it is rendered ſoluble by a variety of combinations, it is no doubt found out in ſuch a ſtate by the fibres of growing roots, and conveyed upwards in the juice. But as all vegetable mould, and the charcoal or carbonaceous matter which it contains, is the reſult of the ruins of vegetation, and as the lichens or vegetables of the coarſeſt and ſimpleſt kind, which originally grow upon the naked ſtone, have no other nouriſhment than water and atmoſpheric air, it is probable, that out of theſe materials they are capable of forming the charcoal, which conſtitutes the baſis of their form, and of the conſtitution of every other vegetable. It is true, that the chemiſts ſtill regard carbon or charcoal as a ſimple and uncompounded ſubſtance; and they have not found it in water, nor in atmoſpheric air, unleſs in the moſt minute degree, reſulting probably from the combuſtion of fires and the breathing of animals in inhabited countries. But although chemiſts have not hitherto been able to find charcoal in the three ſimple ſubſtances, oxygen, hydrogen, and azote, of which atmoſpheric air and water are compoſed, it ſeems evident, that the mighty Chemiſt who contrived this world and the conſtitution of vegetables, finds no difficulty in forming it of thoſe materials by means of their organization. Hence we rather think, that water and air muſt conſtitute the original food of the ſimpleſt and coarſeſt kind of plants; but if this idea be true, it is to be regarded as a fact that is more curious in ſpeculation than uſeful in practice: for it is certain, that the more valuable and larger vegetables, which it is the buſineſs of the huſbandman to cultivate, cannot be reared to perfection without the aid of vegetable mould. Though they may poſſeſs, therefore, the power of deriving a portion of their ſolid ſubſtance, or of the carbonaceous matter which they contain, from common air and water, they cannot obtain the whole by this means, and require the aid of the remains of former vegetation. It is thus that one ſyſtem is ſeen to pervade every part of nature, as through all her works one claſs of animated beings only enjoys life in conſequence of the deſtruction of another. Thus the carnivorous animals conſume thoſe that live upon vegetables; and thus, in like manner, one ſpecies of vegetables only ſubſiſts upon the ruins, and is fed by the ſubſtance, of a former generation of plants.

76 Vegetables are the food of each other.

Beſides animal ſubſtances, there are ſome minerals that have a tendency to accompliſh the decompoſition of vegetables, and thereby to reduce them into a ſtate of mould, poſſeſſing in a great degree the qualities of the garden mould that is produced by the fermentation of the remains of animals and vegetables, the formation of which has now been deſcribed. Of the minerals that have this tendency, lime is the chief, and indeed the one commonly in uſe, either pure or when combined with clay under the form of marl. To the effect of lime, therefore, we ſhall now call the attention of the reader.

Where the ground has been ſuffered to remain uncultivated for many ages, producing all that time ſucculent plants which are eaſily putrefied, and trees, the leaves of which likewiſe contribute to enrich the ground by their falling off and mixing with it, the ſoil will in a manner be totally made up of pure vegetable earth, and be the richeſt, when cultivated, that can be imagined. This was the caſe with the lands of America. They had remained uncultivated perhaps ſince the creation, and were endowed with an extraordinary degree of fertility; nevertheleſs we are aſſured by one who went to America in order to purchaſe lands there, that ſuch grounds as had been long cultivated, were ſo much exhauſted, as to be much worſe than the generality of cultivated grounds in this country. Here, then, we have an example of one ſpecies of poor ſoil; namely, one that has been formerly very rich, but has been deprived, by repeated cropping, of the greateſt part of the vegetable food it contained. The farmer who is in poſſeſſion of ſuch ground, would no doubt willingly reſtore it to its former ſtate; the preſent queſtion is,

79 One ſpecies of poor ſoil deſtroyed by lime.

What

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What muſt be done in order to obtain this end? We have mentioned ſeveral kinds of manures which long practice has recommended as ſerviceable for improving ground: we ſhall ſuppoſe the farmer tries lime or chalk; for, as we have already ſeen, their operations upon the ſoil muſt be preciſely the ſame. This ſubſtance, being of a ſeptic nature, will act upon ſuch parts of the ſoil as are not putrefied, or but imperfectly ſo; in conſequence of which, the farmer will reap a better crop than formerly. The ſeptic nature of the lime is not altered by any length of time. In ploughing the ground, the lime is more and more perfectly mixed with it, and gradually exerts its power on every putreſcible matter it touches. As long as any matter of this kind remains, the farmer will reap good crops; but when the putreſcible matter is all exhauſted, the ground then becomes perfectly barren; and the cauſtic qualities of the lime are moſt unjuſtly blamed for *burning* the ground, and reducing it to a *caput mortuum*; while it is plain the lime has only done its office, and made the ſoil yield all that it was capable of yielding.

So ſpecies of poor ſoil meliorated by lime.

When ground has been long uncultivated, producing all the time plants, not ſucculent, but ſuch as are very difficultly diſſolved, and in a manner incapable of putrefaction; there the ſoil will be exceſſively barren, and yield very ſcanty crops, though cultivated with the greateſt care. Of this kind are thoſe lands covered with heath, which are found to be the moſt barren of any, and the moſt difficultly brought to yield good crops. In this caſe lime will be as ſerviceable as it was detrimental in the other: for by its ſeptic qualities, it will continually reduce more and more of the ſoil to a putrid ſtate; and thus there will be a conſtant ſucceſſion of better and better crops, by the continued uſe of lime when the quantity firſt laid on has exerted all its force. By the continued uſe of his manure, the ground will be gradually brought nearer and nearer to the nature of garden mould; and, no doubt, by proper care, might be made as good as any: but it will be as great a miſtake to imagine, that, by the uſe of lime, this kind of ſoil may be rendered perpetually fertile, as to think that the other was naturally ſo; for though lime enriches this ſoil, it does ſo, not by adding vegetable food to it, but by preparing what it already contains; and when all is properly prepared, it muſt as certainly be exhauſted as in the other caſe.

81 Poor ſoils, how reſtored.

Here, then, we have examples of two kinds of *poor* ſoils; one of which is totally deſtroyed, the other greatly improved, by lime, and which therefore require very different manures; lime being more proper for the laſt than dung; while dung, being more proper to reſtore an exhauſted ſoil than lime; ought only to be uſed for the firſt. Beſides dunging land which has been exhauſted by long cropping, it is of great ſervice to let it lie fallow for ſome time: for to this it owed its original fertility; and what gave the fertility originally, cannot fail to reſtore it in ſome degree.

By attending to the diſtinction between the reaſons for the poverty of the two ſoils juſt now mentioned, we will always be able to judge with certainty in what caſes lime is to be uſed, and when dung is proper. The mere poverty of a ſoil is not a criterion whereby we can judge; we muſt conſider what hath made it poor. If it is naturally ſo, we may almoſt infallibly conclude, that it will become better by being manured with lime. If it is *artificially* poor, or exhauſted by continual cropping, we may conclude that lime will entirely deſtroy it. —We apprehend, that it is this *natural* kind of poverty only which Mr Anderſon ſays, in his Eſſays on Agriculture, may be remedied by lime; for we can ſcarce think that experience would direct any perſon to put lime upon land already exhauſted. His words are,

82 Mr Anderſon's opinion concerning lime.

"Calcareous matters act as powerfully upon land that is naturally poor, as upon land that is more richly impregnated with thoſe ſubſtances that tend to produce a luxuriant vegetation."

"Writers on agriculture have long been in the cuſtom of dividing manures into two claſſes, viz. *Enriching* manures, or thoſe that tended directly to render the ſoil more prolific, however ſterile it may be; among the foremoſt of which was dung: *Exciting* manures, or thoſe that were ſuppoſed to have a tendency to render the ſoil more prolific, merely by acting upon thoſe enriching manures that had been formerly in the ſoil, and giving them a new ſtimulus, ſo as to enable them to operate anew upon that ſoil which they had formerly fertilized. In which claſs of ſtimulating manures, *lime* was always allowed to hold the foremoſt place.

"In conſequence of this theory, it would follow, that lime could only be of uſe as a manure when applied to rich ſoils;—and, when applied to poor ſoils, would produce hardly any, or even perhaps hurtful, effects.

"I will frankly acknowledge, that I myſelf was ſo far impoſed upon by the beauty of this theory, as to be hurried along with the general current of mankind, in the firm perſuaſion of the truth of this obſervation, and for many years did not ſufficiently advert to thoſe facts that were daily occurring to contradict this theory. —I am now, however, firmly convinced, from repeated obſervations, that lime, and other calcareous manures, produce a much greater *proportional* improvement upon poor ſoils than ſuch as are richer;—and that lime alone, upon a poor ſoil, will, in many caſes, produce a much greater and more laſting degree of fertility than dung."

Thus far Mr Anderſon's experience is exactly conformable to the theory we have laid down, and what ought to happen according to our principles. He mentions, however, ſome facts which ſeem very ſtrongly to militate againſt it; and indeed he himſelf ſeems to proceed upon a theory altogether different.

83 Query concerning the nature of a proper ſoil.

"Calcareous matter alone (ſays he) is not capable of rearing plants to perfection;—mould is neceſſary to be mixed with it in certain proportions, before it can form a proper ſoil. It remains, however, to be determined, what is the due proportion of theſe ingredients for forming a proper ſoil.

"We know that neither chalk, nor marl, nor lime, can be made to nouriſh plants alone; and ſoils are ſometimes found that abound with the two firſt of theſe to a faulty degree. But the proportion of calcareous matter in theſe is ſo much larger than could ever be produced by art, where the ſoil was naturally deſtitute of theſe ſubſtances, that there ſeems to be no danger of erring on that ſide. Probably it would be much eaſier to correct the defects of thoſe ſoils in which calcareous matters

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ters ſuperabound, by driving earth upon them as a manure, than is generally imagined; as a very ſmall proportion of it ſometimes affords a very perfect ſoil. I ſhall illuſtrate my meaning by a few examples.

84 Examples of ſoil perpetually fertile.

"Near Sandſide, in the county of Caithneſs, there is a pretty extenſive plain on the ſea coaſt, endowed with a moſt ſingular degree of fertility. In all ſeaſons it produces a moſt luxuriant herbage, although it never got any manure ſince the creation; and has been from time immemorial ſubjected to the following courſe of crops.

"1. Bear, after once ploughing from graſs, uſually a good crop.

"2. Bear, after once ploughing, a better crop than the firſt.

"3. Bear, after once ploughing, a crop equal to the firſt.

"4. 5. and 6. Natural graſs, as cloſe and rich as could be imagined; might be cut, if the poſſeſſor ſo inclined, and would yield an extraordinary crop of hay each year.

"After this the ſame courſe of cropping is renewed. The ſoil that admits of this ſingular mode of farming, appears to be a pure incoherent ſand, deſtitute of the ſmalleſt particle of vegetable mould; but, upon examination, it is found to conſiſt almoſt entirely of broken ſhells: the fine mould here bears ſuch a ſmall proportion to the calcareous matter, as to be ſcarce perceptible, and yet it forms the moſt fertile ſoil that ever I yet met with.

"I have ſeen many other links (downs) upon the ſea ſhore, which produced the moſt luxuriant herbage, and the cloſeſt and ſweeteſt pile of graſs, where they conſiſted of ſhelly ſand; which, without doubt, derive their extraordinary fertility from that cauſe.

"A very remarkable plain is found in the iſland of Jir-eye, one of the Hebrides. It has been long employed as a common: ſo that it has never been diſturbed by the plough, and affords annually the moſt luxuriant crop of herbage, conſiſting of white clover and other valuable paſture graſs, that can be met with anywhere. The ſoil conſiſts of a very pure ſhelly ſand.

"From theſe examples, I think it is evident, that a very ſmall proportion of vegetable mould is ſufficient to render calcareous matter a very rich ſoil. Perhaps, however, a larger proportion may be neceſſary when it is mixed with clay than with ſand; as poor chalky ſoils ſeem to be of the nature of that compoſition."

To theſe examples brought by Mr Anderſon, we may add ſome of the ſame kind mentioned by Lord Kames. His lordſhip having endeavoured to eſtabliſh the theory of water being the only food of plants, though he himſelf frequently deviates from that theory, yet thinks it poſſible, upon ſuch a principle, to make a ſoil perpetually fertile.

"To recruit (ſays he), with vegetable food, a ſoil impoveriſhed by cropping, has hitherto been held the only object of agriculture. But here opens a grander object, worthy to employ our keeneſt induſtry, that of making a ſoil perpetually fertile. Such ſoils actually exiſt; and why ſhould it be thought, that imitation here is above the reach of art? Many are the inſtances of nature being imitated with ſucceſs. Let us not deſpair while any hope remains; for invention never was exerciſed upon a ſubject of greater utility. The attempt may ſuggeſt proper experiments: it may open new views: and if we fail in equalling nature, may we not, however, hope to approach it? A ſoil perpetually fertile muſt be endowed with a power to retain moiſture ſufficient for its plants, and at the ſame time muſt be of a nature that does not harden by moiſture. Calcareous earth promiſes to anſwer both ends: it prevents a ſoil from being hardened by water; and it may probably alſo invigorate its retentive quality. A field that got a ſufficient doſe of clay marl, carried above 30 ſucceſſive rich crops, without either dung or fallow. Doth not a ſoil ſo meliorated draw near to one perpetually fertile? Near the eaſt ſide of Fife, the coaſt for a mile inward is covered with ſea ſand, a foot deep or ſo; which is extremely fertile, by a mixture of ſea ſhells reduced to powder by attrition. The powdered ſhells, being the ſame with ſhell marl, make the ſand retentive of moiſture; and yet no quantity of moiſture will unite the ſand into a ſolid body. A ſoil ſo mixed ſeems to be not far diſtant from one perpetually fertile. Theſe, it is true, are but faint eſſays; but what will not perſeverance accompliſh in a good cauſe?"

Having thus in a manner, poſitively determined with Mr Anderſon, that no doſe of calcareous matter can poſſibly be too great, we cannot help owning ourſelves ſurpriſed on finding his lordſhip expreſſing himſelf as follows: "An overdoſe of ſhell marl, laid perhaps an inch, and an inch and an half, or two inches thick, produces, for a time, large crops: but at laſt it renders the ſoil a *caput mortuum*, capable of bearing neither corn nor graſs; of which there are too many inſtances in Scotland. The ſame probably would follow from an overdoſe of clay marl, ſtone marl, or pounded limeſtone."—To account for this, he is obliged to make a ſuppoſition directly contrary to his former one; namely, that calcareous matter renders the ſoil *incapable* of retaining water. This phenomenon, however, we think is ſolved upon the principles above laid down, in a ſatisfactory manner, and without the leaſt inconſiſtency.

85 Inconſiſtency in Lord Kames's theory.

As to rendering ſoils perpetually fertile, we cannot help thinking the attempt altogether chimerical and vain. There is not one example in nature of a ſoil perpetually fertile, where it has no ſupply but from the air and the rain which falls upon it. The above recited examples can by no means be admitted as proofs of perpetual fertility. We know, that the graſs on the banks of a river, is much more luxuriant than what grows at a diſtance: the reaſon is, that the water is attracted by the earth, and communicates its fertilizing qualities to it; but was the river to be dried up, the graſs would ſoon become like the reſt. Why ſhould not the ocean have the ſame power of fertilizing plains near its ſhores, that rivers have of fertilizing ſmall ſpots near their banks? We ſee, however, that it hath not: for the ſea ſhores are generally ſandy and barren. The reaſon of this is, that the waters of the ocean contain a quantity of looſe acid *; and this acid is poiſonous to plants: but abſtracting this acid part, we heſitate not to affirm, that ſea water is more fertilizing than river water. It is impoſſible to know how far the waters of the ocean penetrate under ground through a ſandy ſoil. Where they meet with nothing to abſorb their acid, there the ground is quite barren; but in paſſing through an immenſe quantity of broken ſhells, the calcareous matter, we are very certain, will abſorb all the acid;

86 Perpetual fertility of ſoils chimerical.

* See *Water*.

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acid; and thus the soil will be continually benefited by its vicinity to the ocean. All the above fields, therefore, are evidently supplied with nourishment from the ocean: for if the salt water has sufficient efficacy to render fields which are in its neighbourhood barren, why should it not render them fertile when the cause of barrenness is removed from its waters?

After all, the field in Caithness, mentioned by Mr Anderson, seems to have been perpetually fertile only in grass; for though the second year it carried a better crop of bear than it did the first, yet the third year the crop was worse than the second, and only equal to the first. Had it been ploughed a fourth time, the crop would probably have been worse than the first. Ground is not near so much exhausted by grass as corn, even though the crop be cut and carried off; and still less if it only feeds cattle, and is manured by their dung; which appears to have been the case with this field. Lord Kames, indeed, mentions fields in Scotland, that, past memory, have carried successive crops of wheat, pease, barley, oats, without a fallow, and without a manure; and particularises one on the river Carron, of nine or ten acres, which had carried 103 crops of oats without intermission and without manure: but as we are not acquainted with any such fields, nor know any thing about their particular situation, we can form no judgement concerning them.

87 Clay and sandy soils.

Besides the two kinds of soils above mentioned, there are others, the principal ingredient of which is clay or sand. The first of these is apt to be hardened by the heat of the sun, so that the vegetables can scarce penetrate it in such a manner as to receive proper nourishment. The second, if it is not situated so as to receive a great deal of moisture, is very apt to be parched up in summer, and the crop destroyed; nor has it sufficient adhesion to support plants that have few roots and grow high. From these opposite qualities, it is evident that these two soils would be a proper manure for one another: the clay would give a sufficient degree of firmness to the sand, and the sand would break the too great tenacity of the clay. According to Dr Home's experiments, however, sand is the worst manure for clay that can be used. He recommends marl most. To reduce clay ground as near as possible to the form of pure vegetable mould, it must first be pulverized. This is most effectually performed by ploughing and harrowing, but care must be taken not to plough it whilst too wet, otherwise it will concrete into hard clots which can scarcely be broken. After it is pulverized, however, some means must be taken to keep it from concreting again into the same hard masses as before. According to Lord Kames, though clay, after pulverization, will concrete into as hard a mass as before, if mixed with water; yet if mixed with dunghill juice, it will not concrete any more. Lime also breaks its tenacity, and is very useful as a manure for this kind of soil.

88 Fertility of the earth limited.

The conclusion we wish the practical farmer to draw from our theory is, That there is a certain limit to the fertility of the earth, both as to duration and to degree, at any particular time: that the nearer any soil approaches to the nature of pure garden mould, the nearer it is to the most perfect degree of fertility; but that there are no hopes of keeping it perpetually in such a state, or in any degree of approximation to it, but by constant and regular manuring with dung. Lime, chalk, marl, &c. may be proper to bring it near to this state, but are absolutely unfit to keep it continually so. They may indeed for several years produce large crops; but the more they increase the fertility for some years, the sooner will they bring on an absolute barrenness; while regular manuring with plenty of dung will always ensure the keeping up the soil in good condition, without any occasion for fallow. What we have said concerning the use of lime, &c. applies likewise to the practice of frequent ploughing, though in a less degree. This tends to meliorate ground that is naturally poor, by giving an opportunity to the vegetable parts to putrefy; but when that is done, it tends to exhaust, though not so much as lime. A judicious farmer will constantly strive to keep his lands always in good condition, rather than to make them suddenly much better; lest a few years should convince him that he was in reality doing almost irreparable mischief, while he fancied himself making improvements. As for the ridiculous notions of stimulating the ground by saline manures, we hope they will never enter the brain of any rational practitioner of agriculture.

Vegetables proper to be raised for Meliorating the Soil.

Sect. V. *Of the different kinds of Vegetables proper to be raised with a view to the Melioration of Soil.*

89 Soil pulverized by certain vegetables.

The methods of meliorating soils, which we have mentioned above, consisting of tedious and laborious operations that yield no return at first, it is natural for a farmer to wish for some method of meliorating his ground, and reaping crops at the same time. One very considerable step towards the melioration of ground is its pulverization. This is accomplished by repeated ploughings (A), as already mentioned; especially if performed in autumn, that the ground may be exposed to the winter's frost; but these ploughings yield no crop as long as the field is not sown. By planting in the field, however, those vegetables whose roots swell to a considerable bulk, the ground must constantly be acted upon by the swelling of their roots in all directions: and thus the growing of the crop itself may be equal, or superior, in efficacy to several ploughings, at the same time that the farmer enjoys the benefit of it. The plant most remarkable for the swelling of its roots is the potato; and by none is the ground meliorated more, or even so much. They are not, however, equally proper for all soils. In clay they do not thrive, nor are palatable; but in hard gravelly or sandy soils, they grow to a large size, and are of an excellent quality. Turnips likewise contribute to meliorate the

(A) This however, must be understood with some limitation; for it appears from experience, that many *light* and *thin* soils receive detriment rather than advantage from frequent ploughings; particularly in summer, when the sun exhales the nutritive particles in great abundance.

Of Deſtroying Weeds.

ground, by the ſwelling of their roots, though not ſo much as potatoes. They have this advantage, however, that they will thrive in almoſt any ſoil. In clay ground, peaſe and beans thrive exceedingly well, and therefore are proper in this kind of ſoil as a preparatory for other kinds of grain. Theſe puſh their roots deep into the ground, and cover it with their leaves more than other crops; ſo that the ſun has not ſo much acceſs as when it is covered with other kinds of grain. Wherever any of theſe kinds of vegetables are raiſed, it is obſervable, that more or leſs blackneſs is communicated to the ſoil: an evident ſign of its melioration; this being the colour of the true vegetable mould, or *loamy ſoil*, as it is called.

Beſides the above-mentioned plants, carrots, parſnips, cabbages, and all thoſe vegetables which ſink their roots deep in the ground, anſwer the ſame purpoſe of looſening and pulverizing the earth: but as they will not thrive but on ground already well cultivated, they cannot be raiſed to any advantage for the purpoſe of meliorating a poor ſoil.

It hath been cuſtomary in many places, particularly in England, to ſow turnip, peaſe, buck-wheat, &c. and then to plough them down for manuring the land. This being ſimilar to that operation of nature by which ſhe renders the uncultivated ſoils ſo exceedingly fertile, cannot fail of being attended with ſingular advantages; and might be looked upon as preferable even to driving dung on the land to fatten it, was it not attended with the entire loſs of a crop for that year.

In addition to this, it may be proper to remark, that an idea has been entertained with regard to the ſucceſſion of vegetables to each other, which ought not to be overlooked, as at ſome future period it may lead to important conſequences. It has been ſuppoſed, that the roots of plants, or at leaſt of ſome plants, poſſeſs a power of throwing out, as excrementitious, a part of the ſubſtances which they have taken in, but which are no longer neceſſary for their ſubſiſtence or growth. It is undoubted, at leaſt, that while by ſome plants the ſoil ſeems to be rendered altogether unfit for the production of certain others, it is rendered by different plants extremely well adapted to their growth. Thus wheat ſucceeds uncommonly well after drilled beans; and theſe two vegetables have even been repeated for a great number of years in rotation, without any deficiency or failure of crop.

90 Some vegetables ſeem to enrich the ſoil.

Sect. VI. *Of deſtroying Weeds.*

What we have already ſaid regarding the cultivation of the ſoil, reſpects only the fitting it for producing all kinds of vegetables indiſcriminately. Experience, however, ſhows, that the ground is naturally much more diſpoſed to produce and nouriſh ſome kinds of vegetables than others; and thoſe which the earth ſeems moſt to delight in, are commonly ſuch as are of very little uſe to man; but if neglected, will increaſe to ſuch a degree, as entirely to deſtroy the plants intended to be raiſed, or at leaſt hinder them from coming to perfection, by depriving them of nouriſhment. The clearing the ground of weeds, therefore, is an article no leſs neceſſary in agriculture, than the diſpoſing it to produce vegetables of any kind in plenty.

Of Deſtroying Weed

The weeds may be divided, according to the time of their duration, into *annual*, or ſuch as ſpring from a ſeed, and die the ſame year; and *perennial*, that is, ſuch as are propagated by the ſeeds, and laſt for a number of years. The firſt kind are the leaſt noxious, and moſt eaſily deſtroyed. For this purpoſe it will be ſufficient to let them ſpring up till near the time of ripening their ſeed, and then plough them down before it comes to maturity. It is alſo of ſervice to deſtroy ſuch weeds as grow in borders or neglected corners, and frequently ſcatter their ſeeds to a great diſtance; ſuch as the thiſtle, dandelion, rag-weed, &c. for theſe are ſufficient to propagate their ſpecies through a deal of ground; as their ſeeds are carried about with the wind to very conſiderable diſtances. A farmer ought alſo to take care, that the ſmall ſeeds of weeds, ſeparated from corn in winnowing, be not ſown again upon the ground; for this certainly happens when they are thrown upon a dunghill; becauſe, being the natural offspring of the earth, they are not eaſily deſtroyed. The beſt method of preventing any miſchief from this cauſe, would be to burn them.

91 Weeds divided into annual and perennial.

Perennial weeds cannot be effectually deſtroyed, but by removing the roots from the ground, which is often a matter of ſome difficulty. Many of theſe roots ſtrike ſo deep in the ground, that they can ſcarcely be got out. The only method that can be depended upon in this caſe, is frequent ploughing, to render the ground as tender as poſſible; and harrowing with a particular kind of harrow, which ſhall hereafter be deſcribed, in order to collect theſe pernicious roots. When collected, they ought to be dried and burnt, as the only effectual method of enſuring their doing no further miſchief.

92 Perennial weeds, how deſtroyed.

There is a particular ſpecies of weed, peculiar only to graſs lands, of a ſoft ſpongy nature, called *fog*, which it is found very difficult to exterminate. Where the land can be conveniently tilled, this weed may be deſtroyed by covering it with a crop of peaſe, potatoes, &c. or, paſſing a heavy roller over the ground will be of great ſervice; for fog owes its origin to too great a laxity of the ſoil, and will not grow on firm ground.

Beſides theſe kinds of weeds which are of an herbaceous nature, there are others which are woody, and grow to a very conſiderable ſize; ſuch as broom, furze or whins, and thorns. *Broom* is an evergreen ſhrub, that thrives beſt in a ſandy ſoil; and there it grows ſo vigorouſly, as ſcarcely to admit any graſs under it. It propagates by ſeed which grows in pods; and theſe, when fully ripe, break with violence, ſcattering the ſeeds all around. Thus, a field which is overgrown with broom, beſides the old plants, always contains an infinite number of young ones: ſo that though the old plants die when cut over, a freſh crop conſtantly ſprings up. It may, however, be deſtroyed by frequent ploughing and harrowing, in the ſame manner as other perennial weeds are; for it does not for ſome time carry any ſeed, and the frequent ploughing encourages the vegetation of all thoſe ſeeds that are already in the ground, which cannot fail of being deſtroyed by frequent repetitions of the operation. Another method of deſtroying broom, is by paſturing the field where it grows with ſheep. A few of the old buſhes may be left as a ſhelter, and theſe will be in a good meaſure prevented from

93 Broom, furze, &c. how deſtroyed.

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from ſpreading by the cropping of the ſheep. Theſe animals are very fond of broom, and greedily devour every young ſhoot: ſo that if any remain after the firſt year, there will not be a veſtige the ſecond. If this method of extirpating broom is equally effectual with that of frequent ploughing, it is certainly much more profitable, as there is no food more nourithing to ſheep than young broom. Broom, however, is ſaid to have a ſingular effect upon ſheep: it makes them drunk ſo effectually, that when heated with a little driving, they tumble over, and lie without motion.

The *whin* is a fine evergreen ſhrub, carrying a ſweet-ſmelling flower all the year round. It propagates both by ſeed and by its roots, which ſpread ſometimes to the diſtance of 10 or 12 feet; and hence, when once eſtabliſhed, it is with difficulty extirpated. The beſt method is to ſet fire to the whins in froſty weather; for froſt has the effect to wither whins, and make them burn readily. The ſtumps muſt then be cut over with a hatchet; and when the ground is well ſoftened by rain, it may be ploughed up, and the roots taken out by a harrow adapted to that purpoſe. If the field is ſoon laid down to graſs, the whins will again ſpring up in great abundance from the ſeeds, and ſmall parts of the roots left in the ground. In this caſe, paſturing with ſheep is an effectual remedy; as they are no leſs fond of young whins than of young broom; and if there are a ſufficient number, they will not leave a ſingle plant above ground. But if graſs is not immediately wanted, the moſt effectual method of clearing a field of whins, is by reiterated ploughings.

The *thorn*, or *bramble*, ſpreads its roots very wide, and at the ſame time ſinks them deep in the earth. Though cut in the winter, it riſes, and comes to ſuch perfection as to carry fruit in ſummer. It can only be extirpated by ploughing up the ground and collecting the roots.

94 Shrubs are deſtroyed by flooding the land.

One effectual plan, which, as will afterwards appear, is practicable in many more ſituations than it has hitherto been applied to, for deſtroying theſe and all other woody ſhrubs and plants, together with a great number of weeds that are of no value upon paſture grounds, conſiſts of flooding the land, by directing over it a ſtream of water. By means of ſuch a device, all whins and other ſhrubs are completely rotted and deſtroyed.

Sect. VII. *Of the Diſeaſes of Plants.*

95 The diſeaſes of vegetables are ill underſtood.

As ſome of the moſt valuable kinds of vegetables are liable to ſuffer much by diſeaſes peculiar to themſelves, it is of much importance to the huſbandman to be aware of this circumſtance, and to adopt every known mode of protecting his crop againſt them. At the ſame time, as the principles of vegetable life are by no means well underſtood, the cauſes and the cure of the moſt ſerious diſeaſes affecting plants ſtill remain under a great degree of obſcurity, and the moſt experienced and intelligent huſbandmen expreſs great uncertainty reſpecting the meaſures to be adopted for preventing their appearance. Hence it appears moſt proper to introduce the conſideration of them in this place before we proceed to the practical part of the ſubject; and as wheat is accounted the moſt valuable kind of grain, we ſhall begin with the diſeaſes to which it is expoſed. Diſeaſes of Plants.

96 Diſeaſes to which wheat is liable.

Wheat chiefly ſuffers from two diſeaſes, the blight and the mildew. Of the blight in wheat we ſhall give an account upon the authority of an eſſay by Robert Somerville, Eſq. ſurgeon, 1ſt Battalion, 8th Fencible Regiment, inſerted in the communications to the Board of Agriculture *, giving a ſtatement of the nature and appearance of the blight which occaſioned the failure of the crop in 1795.—When the crop had juſt ſhaken the flowers, and the grains were beginning to form, moſt of them ſeemingly in a healthy manner, it was obſerved that many of the blades and ſtalks were rather of a dirty green colour, and in two weeks thereafter there appeared upon them great numbers of ſmall red inſects. As the ſeaſon advanced, theſe inſects not only increaſed in ſize, but became more numerous, and in almoſt every field the grain began to manifeſt unequivocal ſymptoms of diſeaſe, which were ſo formidable, that in many inſtances a total loſs was dreaded, and in not a few caſes, one half of the crop was actually deſtroyed. The minute ſymptoms of the blight were theſe:

* Vol. ii.

97 Blight in 1795.

1ſt, In the very early ſtages of the diſeaſe, and before the ear was affected, the blades and ſtalks were marked with black and ruſty ſpots. Theſe ſpots ſeemed to be occaſioned by a glutinous ſubſtance depoſited upon them, eaſily ſoluble in water, and which could be readily waſhed off by rubbing the ſtalks with a wet cloth. Some ſpots, however, were white, and theſe ſeemed to be owing to wounds or punctures made by vermin; the leaf having, to a certain extent, in conſequence of theſe, withered and become white. As the ſeaſon advanced, the black and ruſty-coloured ſpots became larger and more numerous: and when the grain began to ripen, not only the blades but the ſtraw were almoſt entirely coloured with black ſpots.

2d, After the crop had begun to ſhoot, and was in the ear, many of the heads were entirely empty. Where the ſtalk was green, and to appearance tolerably healthy, but the ear at the ſame time withered and without grain, the misfortune ſeemed to have ariſen from an injury done to the neck of the ear, at the place of its junction with the ſtalk. There the outer rind was deſtroyed all round, which muſt have cut off the circulation between the ear and the ſtalk, as happens in trees that have had their bark deſtroyed all round.

3d, Many of the ears were entirely empty in the upper part, while the lower half was well filled. In theſe caſes, the injury ſeemed owing to the rind being deſtroyed about the middle of the ear, at that place which ſeparated the full from the empty part, and was ſimilar to the injury done in the preceding caſe where the whole ear was deſtroyed.

4th, In very many caſes the ears had a plump well-filled pickle and an empty huſk alternately. In theſe the injury ſeemed owing to a wound inflicted at the bottom of the empty grains, where they are joined to the ſtalk, and which had taken place while they were in flower, preventing them from making any farther progreſs.

5th, Many ears, though not entirely empty, contained only ſmall ſhrivelled grains, or what are called hungry

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hungry pickles. Theſe ſeemed to have eſcaped any accident till they had made ſome progreſs in filling, after which they became ſtationary and ripened prematurely. On examination they were found to be injured at the place where they were joined to the ſtalk, in the ſame manner as was already mentioned, in the caſe of thoſe that had empty heads or ears. Like theſe alſo the whole ear was in ſome caſes ill filled. In others only half of it was in that ſtate, and in a very great number the ears conſiſted of a well and ill filled grain alternately. Without a ſingle exception, the whole of the ill filled or hungry grains, were wounded at the place of their inſertion into the ear.

6th, A number of ears, though well filled, were upon opening the huſks found almoſt entirely covered with black and ruſty ſpots, nearly reſembling thoſe already deſcribed, and like them alſo they were eaſily rubbed or waſhed off. The downy part of many of theſe grains, when examined carefully with a good glaſs, appeared to contain ſeveral ſmall white tranſparent globes, reſembling the eggs of inſects.

7th, In many fields, eſpecially ſuch as had been fallowed and well manured for the wheat crop, a great number of plants were entirely withered from top to bottom. The decay, in moſt of theſe caſes, took place when the wheat was beginning to ſhoot. No injury was viſible in theſe caſes upon the blade or ſtalk, but on examining the roots, a worm was found at every one of them.

Laſtly, As the crop began to whiten, the dark or ruſty ſpots on the ſtraw and ears became more numerous, and appeared more conſpicuous. In place of putting on a white or yellow appearance, the whole crop looked as if it had been ſprinkled with ſoot.

The whole of theſe ſymptoms appeared to ariſe from the attack of an inſect, and from the injuries and depredation which it committed upon the plants. This inſect when firſt diſtinguiſhable by the eye, was of a red colour, and ſo ſoft as to be killed by the ſlighteſt preſſure. As it increaſed in ſize the colour gradually changed to a dirty black, at which it became ſtationary. During its growth it loſt its ſoft texture, and in proportion as its colour darkened it became hard, and as it were covered with a cruſt or ſhell upon the back. It is ſaid to be not uncommon, and to be met with at all times, even in the beſt fields of wheat, though its numbers are infinitely increaſed in late wet ſeaſons. From its eggs appearing to lodge upon the well-filled ears of the grain, it might be conſidered as in danger of being propagated to the ſucceeding crop. On this account our author hazards ſome conjectures upon the beſt means of preventing future danger from it. One of theſe conſiſts of the uſe of lime mixed up with all manure, with a view to prevent inſects from being generated in it. It is alſo ſuggeſted that the manure, by means of which ſlugs and worms are chiefly ſuppoſed to be produced, ought not to be plowed into the ground in autumn, but applied as a top-dreſſing in the ſpring; becauſe it is underſtood that manure, expoſed to the ſun and air, has much leſs tendency to foſter inſects, than when it is covered up in the earth.

98 Mildew is red or black, called ſmut.

Another diſeaſe, which is much more deſtructive to wheat, and much more frequently met with, is the mildew. It is of two kinds, the black and the red. In both caſes it conſiſts of a quantity of ſeemingly coarſe powder attached to the grain in the ear, or looſely ſurrounding it; in conſequence of which it is evidently prevented from filling or arriving at perfection. The black kind of mildew is by far the moſt frequent and the moſt pernicious. It is moſt generally known in England by the name of *ſmut*, and in Scotland by that of the *black*, both of which are ſufficiently expreſſive. Concerning the cauſe of this diſeaſe various opinions have been entertained. Dr Home, in his Principles of Agriculture and Vegetation, aſcribes it to an over luxuriancy of growth. He is of opinion, that too great an abundance of juices in a vegetable will produce diſeaſes ſimilar to thoſe occaſioned by repletion in animal bodies, viz. ſtagnations, corruptions, varices, cariofities, &c. along with the too great luxuriancy we have juſt now mentioned, which he expreſſes by "too great an abundance of water ſhoots." Hence he is induced to claſs the ſmut among diſeaſes ariſing from this cauſe, it being a corruption happening moſt in rainy ſeaſons and to weak grain. Like other contagious diſeaſes, he tells us, the ſmut may be communicated from the infected to healthful grain. At a preventive he recommends ſteeping the ſeed in a ſtrong pickle of ſea ſalt. Beſides the effect which this has upon the grain itſelf, it is uſeful for ſeparating the good from the bad; the beſt ſeed falling to the bottom, and the faulty ſwimming on the top of the liquor.

Diſeaſes of Plants.

99 Opinions concerning the cauſe of mildew.

Independent of this notion of an over luxuriancy of growth, it may be obſerved, that two opinions have chiefly been ſupported by perſons who have ſpeculated and written on this ſubject. One opinion is, that the mildew conſiſts of a great multitude of paraſitical plants adhering to the grains of wheat, living upon it, and thereby conſuming its ſubſtance. Another opinion is, that it conſiſts of great numbers of inſects and of eggs of inſects, whoſe form is too ſmall to be diſtinguiſhable by the naked eye. The firſt of theſe opinions has been adopted by the celebrated Italian writer Fontana, and the other by certain writers of our own country.

100 Fontana's opinion.

Fontana endeavours to refute the hypotheſis, that the duſt of the mildew conſiſts of animal eggs, by the following experiment. He cloſely confined the grains of the mildew between two glaſs plates, in ſuch a manner as neceſſarily to break the ſuppoſed eggs. He then, with an accurate microſcope, obſerved them while cruſhed in ſucceſſion. No liquid or glutinous juice proceeded from them, though great force was uſed in cruſhing them; but they appeared wholly to conſiſt of tough reſiſting ſubſtances altogether unlike real animal eggs: their being faſtened to the ſtalk or leaves of the grain, appeared alſo to militate againſt ſuch a ſuppoſition. From a variety of microſcopic obſervations, he is of opinion, that the powder of the black mildew or ſmut conſiſts of a great multitude of ſmall plants attached to the grain by a ſlender fibre. Theſe paraſitical plants, though extremely ſmall, he thinks ſufficiently regular. With regard to the red mildew he admits, that it appears to be compoſed of an immenſe multitude of minute eggs. After a variety of experiments and obſervations, however, he thought he diſcovered, that theſe apparent eggs are in truth the heads or fruit of very fine threads fixed on the ear of corn; that theſe threads or ſtems are exceedingly fine and tranſparent, which gives the appearance of eggs to their outward extremities. Theſe ſtems or tails

are

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are repreſented by him, as infinitely finer than thoſe of the black mildew; and their heads, which reſemble eggs, may be ſeparated from them by the ſlighteſt ſhock. From all his obſervations he concludes, that both the black and the red mildew conſiſt of real plants, though, perhaps, of an imperfect kind; and that they enfeeble and waſte the crop by abſorbing the nutritive juices of the plant. He obſerves, that, if a heavy rain ſpeedily fall on an extenſive mildew, waſhing the leaves and ſtalks affected, it preſently diſappears with hardly any damage to the corn; becauſe the ſmall plants having hardly taken root are eaſily diſperſed before any miſchief is done. He thinks, that the damage occaſioned by this diſeaſe may ſometimes be moderated or diminiſhed by cutting down the grain before it is fully ripe. In this caſe, he ſays, that the crop will be leſs than it ought to be; but ſtill it will be conſiderably greater than if the cuſtomary time of harveſt is waited for, when the diſeaſe will have leiſure to produce greater miſchief.

In our own country, and particularly by Mr Somerville, in the eſſay already quoted, the ſmut in wheat has been regarded as conſiſting of a great variety of inſects. He alſo founds his opinion upon microſcopic obſervations, and apprehends that from them he has clearly aſcertained the exiſtence of the inſects; and he thinks that it is communicated to other grain by contact, in conſequence of the paſſage of the inſects. Hence he endeavours to explain the utility of ſteeping the ſeed in pickles before it is ſown, with a view to the deſtruction of ſuch inſects.

101 Pickles to prevent ſmut or mildew.

It is to be remarked, that in all countries a great variety of theſe pickles has been contrived, with a view to prevent the exiſtence of ſmut in wheat, ſome of which we ſhall now mention. One of the moſt common is the ſalt pickle, conſiſting of a ſolution of common ſalt in water, of ſuch ſtrength as that an egg will ſwim in it. To the wheat, after it has been waſhed in this pickle, and the light grains removed, ſome new ſlaked lime is added, and carefully mixed with it with a wooden ſhovel, till it attain a ſufficient degree of dryneſs, in which ſtate it is committed to the earth. A pickle conſiſting of very ſtale urine has alſo been recommended to be uſed for waſhing wheat that is meant to be uſed as ſeed. It is attended with this diſadvantage, however, that if the urine is very ſtale, and if any length of time is ſuffered to elapſe, in conſequence of rain or other accidents, before the grain is ſown, its vegetative power is ſaid to be greatly injured by the corroſive quality of the volatile alkali with which ſuch urine abounds. This is more particularly the caſe when quicklime is added to the urine; as the alkali is then brought into a cauſtic ſtate.

Another pickle has been propoſed to the Board of Agriculture by an Italian phyſician, J. B. Scandella. It is prepared and uſed in the following manner:—Take of nitre, three pounds; alum, one pound; vitriol, ſix ounces; verdegris, three ounces; wood-aſhes, well ſifted, ſix pounds: Boil the whole in a copper with five pails of water for an hour, then remove them from the fire, and pour them into a large veſſel; then add ſixteen pails of water, in which half a buſhel of quicklime has been previouſly diſſolved: mix the whole intimately, and allow them to ſtand till they are quite cold. In this ſteep two buſhels and a half of wheat are to be plunged, and left for about ſix hours, ſtirring it up frequently with a wooden ſhovel, and ſkimming off what riſes to the ſurface; the wheat is then to be withdrawn, and ſpread out till it is dry enough for ſowing. The proceſs is thus to be continued until the whole quantity of ſeed intended to be ſown is pickled. The above ſteep is generally ſufficient for preparing about twenty-four buſhels of wheat.

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Another pickle has been recommended, conſiſting of a decoction in water of Barbadoes aloes, tobacco, and hellebore powder. A committee of the Royal Society of Agriculture at Paris, in 1786, recommended the following pickle for the ſame purpoſe, contrived by M. Tillet:—Pour upon 50 pounds of wood-aſhes, 900 pints of water; ſtir it well for three days, and then draw off. Waſh the black wheat in ſo many clear waters as not at laſt to dirty it. Heat the lye, ſo as juſt to bear the hand in it; ſlake in the hot lye one pound of lime to every ſeven or eight pints of it. Into the preparation dip the ſeed in baſkets many times. For want of wood-aſhes uſe potaſh, ſeven or eight pounds for 100 pints of water.

Communications to the Board of Agriculture, vol. ii. *Annals of Agricul.* vol. ix.

102 Arſenic uſed to prevent the mildew.

In addition to theſe it may be remarked, that a ſolution of arſenic in water is made uſe of in ſome counties of England, as a pickle in which they waſh or ſteep the grain previous to its being ſown, for the purpoſe of protecting the future crop againſt ſmut.

103 Arthur Young, Eſq. his experiments to prevent mildew.

The moſt complete ſet of experiments, however, which we have met with upon the ſubject, was made by Arthur Young, Eſq. at preſent ſecretary to the Board of Agriculture. December 7. 1787. he ſowed 14 beds with the ſame ſeed wheat as black with the ſmut as any he ever ſaw.

N° 1. Sown dry, nothing done to it.
2. Waſhed well in clean water.
3. Waſhed in lime-water.
4. Waſhed in a lye of wood aſhes.
5. Waſhed in an arſenic and ſalt mixture.
6. Steeped in lime-water four hours.
7. Ditto in the lye four hours.
8. Ditto in the arſenic four hours.
9. Ditto in lime-water 12 hours.
10. Ditto in the lye 12 hours.
11. Ditto in the arſenic 12 hours.
12. Ditto in the lime-water 24 hours.
13. Ditto in the lye 24 hours.
14. Ditto in the arſenic 24 hours.

RESULT.

N° 1.	Had	377 ſmutty ears.
2.	Ditto	325
3.	Ditto	43
4.	Ditto	31
5.	Ditto	28
6.	Ditto	12
7.	Ditto	3
8.	Ditto	1
9.	Ditto	6
10.	Ditto	0
11.	Ditto	4
12.	Ditto	0
13.	Ditto	0
14.	Ditto	5

A propoſal has alſo been made, to deſtroy by means of:

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of heat the inſects which are ſuppoſed to propagate the diſeaſe called *ſmut* from the ſeed wheat to the future crop. The following directions for that purpoſe are

104 Erſkine of Marr's remedy.

extracted from the Agricultural Survey of the County of Clackmannan, by J. F. Erſkine, of Marr, Eſq. "Let the wheat be laid upon the kiln, about three or four inches thick: the kiln to be heated middling ſtrong with blind coal; the wheat to continue on the kiln for 24 hours, but turned frequently. After taking it off the kiln, it muſt be allowed 24 hours to cool; during which time it muſt be frequently turned; then put it through the fanners once or twice. After the wheat has lain a few hours on the kiln, and the fire begins to have effect, a great number of very ſmall worms, formerly undiſcovered by the eye, appear on the top of the grain, and are ſoon deſtroyed by the heat. Theſe come from blacked wheat, or other corns, that could not be ſuſpected to be indifferent; or may lie in or on good wheat; which worms continuing, (when not thus killed) might conſume the corn after it is thrown into the earth, thereby checking the growth entirely, or preventing it from having the ſtrength it otherwiſe would have to bring forth a ſtrong productive ſtalk. This practice is ſaid to have been brought from Ireland, and is recommended as preferable to pickling. It might perhaps be performed with greater ſucceſs by the uſe of a kiln heated by the ſteam of boiling water, in the way already mentioned, as ſuch a kiln would inſtantly afford a fixed and known degree of heat, which could in no caſe be exceeded."

After all, however, both from the reaſon of the thing, and from the concurring opinion of the moſt experienced and intelligent farmers, we think ourſelves authorized to ſay, that the huſbandman will act imprudently if he place entire and complete confidence in any one of the remedies above mentioned. His ſafeſt and beſt plan for procuring crops of wheat free from ſmut is this: In the firſt place, he ought to procure ſeed from a ſituation in which the grain has riſen abſolutely free from this diſeaſe. He ought next to exert the greateſt care in cleaning out, in the moſt anxious manner, his whole barns and their floors, and every place within doors into which his grain may come, and in which diſeaſed grain has formerly been kept: with this view it may probably be neceſſary to whitewaſh the walls with a mixture of quicklime and water, which will prove an effectual remedy. After having adopted theſe precautions, it may ſtill be neceſſary, with a view to ſecure a ſound and full crop, to plunge the ſeed into a ſtrong pickle of ſalt and water, with a view to float the lighter grains, which ought to be ſkimmed off and laid aſide for poultry, to which they may be given after being waſhed in freſh water. No future change of ſeed will be neceſſary. Of the farmers who have adopted this judicious mode of proceeding, there is no inſtance recorded of any one whoſe crop has ſuffered by ſmut; on the contrary, they have uſually derived a conſiderable profit from becoming the furniſhers of grain for ſeed to all their neighbours.

The want of nouriſhment in plants may be eaſily known by their decay; in which caſe, the only remedy

105 Diſeaſes peculiar to ſaffron.

is, to ſupply them with food, according to the methods we have already directed, or to remove from their neighbourhood ſuch other plants as may draw off the nouriſhment from thoſe we wiſh to cultivate.—In the Memoirs of the Academy of Sciences for 1728, Mr Du Hamel mentions a diſeaſe, which he calls *le mort*, that attacks ſaffron in the ſpring. It is owing to another plant, a ſpecies of trefoil, fixing ſome violet-coloured threads, which are its roots, to the roots of the ſaffron, and ſucking out its juice. This diſeaſe is prevented by digging a trench, which ſaves all the unaffected. Diſeaſes of Plants.

106 Vegetables deſtroyed by inſects.

The bad qualities, and unequal diſtribution of the juices of plants, are the occaſion of ſo few of the diſeaſes to which vegetables in this country are ſubject, that we forbear to mention them at preſent. Moſt of the diſeaſes of our plants are owing to external accidents, particularly to the depredations of inſects.—The inſects by which the greateſt devaſtations are committed in this country are, ſnails, caterpillars, grubs, and flies. The ſnails and caterpillars feed on the leaves and young ſhoots; by which means they often totally deſtroy the vegetable. Where the plants are of eaſy acceſs, theſe vermine may be deſtroyed by ſprinkling the vegetable with lime-water; for quicklime is a mortal poiſon to creatures of this kind, and throws them into the greateſt agonies the moment they are touched with it. On trees, however, where this method cannot ſo well be followed, fumigation is the moſt proper; and, for this purpoſe, nothing is better than the ſmoke of vegetables not perfectly dry. In ſome caſes the eggs of theſe deſtroying creatures may be obſerved, and ought without doubt immediately to be taken away. On the fruit trees, as apples, pears, medlars, on ſome foreſt trees, the oak and dwarf maple eſpecially, and the white and black thorn in hedges, a kind of little tufts are to be obſerved, reſembling at firſt ſight withered leaves twiſted by a cobweb, about the uppermoſt twigs or branches. Theſe contain a vaſt number of little black eggs, that in the ſpring produce ſwarms of caterpillars which devour every thing. To prevent this, all the twigs on which theſe cobwebs appear ſhould be taken off and burnt as ſoon as poſſible. This ought to be done before the end of March, that none of the eggs be allowed ſufficient time for hatching.

107 Inſects deſtroyed by lime-water.

108 Grubs.

The grubs are a kind of worms which deſtroy the corn by feeding upon its roots; they are transformed every fourth year into the beetles called *cockchaffers*, *may-bugs*, &c. they are very deſtructive when in their vermicular ſtate, and cannot then be deſtroyed, becauſe they go deep into the ground. When become beetles, they conceal themſelves under the leaves of trees, where they ſeem aſleep till near ſunſet, when they take their flight. It is only now that they can be deſtroyed, and that by a very laborious method; namely, by ſpreading pack-ſheets below the trees in the day-time when the beetles are in their torpid ſtate, then ſhaking them off and burning them. Some time ago they made ſuch devaſtations in the county of Norfolk, that ſeveral farmers were entirely ruined by them; one gathered 80 buſhels of theſe inſects from the trees which grew on his farm. It is ſaid, that in 1574 there fell ſuch a multitude of theſe inſects into the river Severn, that they ſtopped and clogged the wheels of the water-mills.

109 Turnip-fl

Turnips, when young, are apt to be totally deſtroyed by a multitude of little black flies, from thence called the *turnip fly*. As a preventive of theſe, ſome adviſe the ſeed to be mixed with brimſtone; but

this

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110 Prevented by fumigation, &c.

this is improper, as brimſtone is found to be poiſonous to vegetables. The beſt method ſeems to be the fumigation of the fields with ſmoke of half-dried vegetables. For this purpoſe weeds will anſwer as well as any. This fumigation muſt no doubt be often repeated, in order to drive away the innumerable multitudes of theſe inſects which are capable of deſtroying a large field of turnips.

Some have ſuppoſed that the fly is either engendered in new dung, or enticed by it; and have therefore adviſed the manure to be laid on in the autumn preceding, by which it loſes all its noxious qualities, while its nutritive ones are retained, notwithſtanding theſe might be ſuppoſed liable in ſome degree to be exhaled by the ſun. This method is ſaid to have been aſcertained by experiments; and it is added, that another material advantage accruing from autumn manuring for turnips is, that all the ſeeds contained in the dung, and which of courſe are carried on the land with it, vegetate almoſt immediately, are moſtly killed by the ſeverity of the winter, and the few that remain ſeldom avoid deſtruction from the ploughſhare.

111 Various remedies againſt the turnip-fly.

The following method of ſowing has alſo been recommended as a preventive of the fly:—"About Midſummer, take the firſt opportunity, when it rains, or there is an apparent certainty of rain approaching, to ſow your turnip ſeed; if about the full moon, the better. In this caſe, neither harrow, bruſh, nor roll, after ſowing. The natural heat of the ground at that ſeaſon, and the conſequent fermentation occaſioned by copious rain, will give an aſtoniſhingly quick vegetation to the ſeed, which in a few days will be up and out of all danger from the fly. At all events, ſow not till it rains; it is better to wait a month, or even longer, for rain, than to ſow (merely for the ſake of ſowing about the uſual time) when the ground is parched with heat. By the ſcorching of the ſun, the oil and vegetative quality of the ſeed are exhauſted; and the few weak plants that come up will be deſtroyed by the fly before they can attain ſtrength to put forth their rough leaves. The fly infeſts the ground abundantly in dry hot weather, but does no injury in rain. The falling rain will ſufficiently waſh the turnip ſeed into the ground without harrowing it in; which, inſtead of merely covering, too often buries this ſmall ſeed at ſo great a depth, as never afterwards to get above ground."

The following remedies are alſo recommended as having often proved ſucceſsful:—A ſmall quantity of ſoot ſown over the land at their firſt appearance. Branches of elder, with the leaves bruiſed, drawn in a gate over them. Muſk mixed with the ſeed before it is ſown. And ſulphur burnt under it, after moiſtening it with water in which tobacco has been ſteeped.

But ſhowers on the plants, as ſoon as they appear above ground, are eſteemed the beſt preſervatives. They enfeeble and kill the fly, and haſten the plants into the rough leaf, in which ſtate they are out of danger.

The ſweet ſmell of the turnip has been thought to attract the fly; upon which ſuppoſition, the remedy appeared to conſiſt in overpowering that ſmell by one which is ſtrong, fetid, and diſagreeable. Hence it has been recommended, that upon an acre of turnips ſown in the uſual way, a peck or more of dry ſoot be thrown after the ground is finiſhed, and in as regular a way as he ſows the ſeed.

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112 Corn-butterfly.

Some time ago an inſect, called the *corn butterfly*, committed ſuch ravages while in its vermicular ſtate, in France, that upwards of 200 pariſhes were ruined by it; and the miniſtry offered a reward to the diſcoverer of an effectual remedy againſt this deſtroying worm. The cure which was at laſt diſcovered was, to heat the corn in an oven ſo much as not to deſtroy its vegetative power, but ſufficiently to deſtroy the ſmall worms which made their neſt in the ſubſtance of the grain, and at laſt ate out the ſubſtance ſo completely, that nothing could be got from the huſk even by boiling it in water. It is certain, that though inſects can bear a great deal of cold, they are eaſily deſtroyed by a ſlight degree of heat; nor is the vegetative power of corn eaſily deſtroyed, even when kept for a long time in a pretty ſtrong heat. This method muſt therefore be very effectual for deſtroying all kinds of inſects with which grain is apt to be infected: but care muſt be taken not to apply too great a heat; and the adjuſting of the preciſe degree neceſſary to deſtroy the inſect, without hurting the corn, will be attended with ſome difficulty.

113 The curled diſeaſe in potatoes.

The curled diſeaſe in potatoes has long been a ſubject of inveſtigation and experiment among farmers: and the knowledge of its cauſe and cure ſeems yet to remain a deſideratum. The Agricultural Society at Mancheſter, a few years ago, offered a premium for diſcovering by actual experiment the cauſe of the diſeaſe in queſtion; and a great variety of letters were, in conſequence, addreſſed to them upon the ſubject.—As theſe contain many intereſting obſervations both on the diſeaſe itſelf and the beſt methods hitherto adopted for preventing it, the following abſtract of them may not improperly be introduced in this place.

114 Various methods of prevention.

I. According to the writer of the firſt letter, this diſeaſe is cauſed by an inſect produced by froſt or bad keeping before ſetting; and the neweſt kinds, ſuch as have been raiſed within theſe nine or ten years, are moſt apt to curl, becauſe they will not ſtand to be kept in winter and ſpring before ſetting, as the old kinds will. In autumn 1776, he got up a bed of potatoes to lay by in winter, leaving plenty in the ground as regular as poſſible; and, before the ſeverity of winter came on, covered part of the bed with ſtraw and peaſe-haulm, and left the other part of the bed uncovered. That part of the bed which was covered was quite free from curled ones; but the uncovered part produced a great many curled, owing, as the writer ſays, to froſt and ſeverity of the weather.

II. This writer had about a quarter of an acre of potatoes, well manured with cow and horſe dung, and took the greateſt care in picking the fine ſmooth-ſkinned potatoes for ſets; yet nine out of ten parts were curled. He attributes the cauſe of this diſeaſe to a white grub or inſect, which he found near the root, about half an inch long, with eight or ten legs, its head brown and hard; as upon examining a number of the curled roots, he found them all bitten, chiefly from the ſurface to the root, which of courſe ſtopped the progreſs of the ſap, and threw the leaf into a curl. The uncurled roots were not bitten. He tried a few experiments as follow:—Firſt, he put ſoot to the inſects in the rows

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for two days; and after that, he put lime to them for the ſame time, but they ſtill kept lively; next he put a little ſalt, which deſtroyed them in a few hours. From which he infers, that if coarſe ſalt were put into the ground at the time the land is preparing for potatoes, it would effectually cure this diſtemper.

III. In this letter, the cauſe of the diſeaſe is attributed to the method of earthing the ſtems while in cultivation; and the branch, ſtriking root into the new earthed-up ſoil, it is ſaid, produces potatoes of ſuch a nature as the year following to cauſe the diſeaſe complained of.

To prevent the diſeaſe, it is recommended to take the ſets from thoſe potatoes that have not bred any from the branch covered; or, otherwiſe, to dig the part the ſets are to be raiſed from.

IV. According to this writer, the diſorder proceeds from potatoes being in old-tilled or worn-out ground; for though theſe potatoes may look tolerably well, yet their ſets will moſtly, if not all, produce curled potatoes.

Hence he is convinced, that no ſets ought to be uſed from old-tilled or couch-graſs land; and that, in order to have good ſets, they ſhould be procured from land that was purpoſely fallowed for them; from freſh ley land, where they are not curled; or from ley land that was burnt laſt ſpring. He directs to plant them on virgin mould, and the potatoes will have no curled ones amongſt them; and to keep them for winter, from any other kind.

To avoid the uncertainty of getting good ſets, he recommends crabs to be gathered from potatoes growing this year on freſh land free from curl, and the next ſpring to ſow them on freſh ley land; and continue to plant their ſets on freſh ley land yearly, which he is convinced will prevent the curl.

All the good potatoes he ſaw this year, either on freſh ley land or on old tilled land, were raiſed from ſets that grew upon freſh ley land laſt year; and where he has ſeen curled potatoes, he found, upon inquiry, the potato ſets grew upon old-tilled and worn out land laſt year. He gives as a general reaſon for the diſorder, that the land is oftener cropt than it had uſed to be, much more corn being now raiſed than formerly.

V. In 1772, this writer planted ſome potatoes by accident full nine inches deep: when taken up, many of the plants were rotted, and a few curled. He kept the whole produce for ſeed, and planted two acres with it in 1773, not quite ſix inches deep. The crop was amazingly great; and he did not obſerve any curled plants among them. In 1774, many of theſe were planted in different ſoils; yet they were ſo infected with the curled diſeaſe, that not one in twenty eſcaped. In 1775, the complaint of this diſeaſe became general. In 1776, it occurred to him that the good crop of 1773 was owing to the accidental deep ſetting of 1772; and that the reaſon why the ſame ſeed became curled in 1774, was their being ſet ſo near the ſurface in 1773; and attributes the diſeaſe to the practice of ebb ſetting. In 1777, he took ſome potatoes from a crop that was curled the year before, and after cutting the ſets, left them in a dry room for a month. Half were planted in ground dug fourteen days before; the other half, having been ſteeped in a brine made of whitſter's aſhes for two hours, were alſo planted in the ſame land at the ſame time. The ſteeped ones came up ten days before the others, and hardly any miſſed or were curled. The unſteeped ones generally failed, and thoſe few that came up were moſtly curled.

He therefore adviſed as a remedy, 1. That the potatoes intended for next year's ſets be planted nine inches deep. 2. That they remain in the ground as long as the ſeaſon will permit. 3. That theſe ſets be well defended from froſt till the beginning of March. 4. That the ſets be cut a fortnight before planting. 5. That they be ſteeped, as above, two hours in brine or lye. 6. That the dung be put *over* the ſets. And, 7. That freſh ſets be got every year from ſandy ſoils near the coaſt, or on the ſhore.

P. S. At planting, the hard dry ſets ſhould be caſt aſide, for they will probably be curled. Curled potatoes always proceed from ſets which do not rot or putrefy in the ground.

VI. This writer had five drills of the old red potatoes, and four of the winter whites, growing at the ſame time in the ſame field. The drills were prepared exactly alike. Among the red not one was curled; the winter whites were nearly all curled. He ſays he has found by experience, that the red never curl.

VII. Two of the writer's neighbours had their ſets out of one heap of potatoes. They both ſet with the plough, the only early, and the other late, in the ſeaſon. Moſt of thoſe early ſet proved curled, and moſt of thoſe ſet late ſmooth; the latter on clay land.

A few roods of land were alſo planted with ſmall potatoes, which had lain ſpread on a chamber floor all the winter and ſpring till the middle of May. They were ſoft and withered; they proved ſmooth and a good crop. Middle-ſized potatoes, withered and ſoft, which had been kept in a large dry cellar, and the ſprouts of which had been broken off three times, produced alſo a ſmooth good crop.

Hence he was led to think a ſuperfluity of ſap, occaſioned by the ſeed being unripe, might cauſe the diſeaſe. To be ſatisfied in this, he aſked the farmer whether he had ſet any of the ſame potatoes this year, and what was the nature of his land? He told him "he had; that they had been ſet on his farm fourteen years without ever curling; that his ſoil was a poor whitiſh ſand, of little depth; that he let thoſe he deſigned for keeping grow till they were fully ripe."

Hence he concludes, the only ſure way to prevent the curl is, to let potatoes intended for ſeed ſtand till they are fully ripe, and to keep them dry all winter.

VIII. This writer ſet a quantity of the red potatoes, without having a curled one amongſt them. His method is, when the ſets are cut, to pick out ſuch as are reddeſt in the inſide. On digging them up at Michaelmas, he mixes none of the curled ſeed among the others. The curled are eaſily diſtinguiſhed, by their ſtalks withering two months before the reſt of the crop.

The cauſe of the curled diſeaſe he attributes to potatoes being of late years produced from ſeed inſtead of roots, as formerly. Such will not ſtand good more than two or three years, uſe what method you pleaſe. Laſt ſpring, he ſet the old red and white ruſſets, and had not a curled potato amongſt them.

On the limeſtone land about Denbigh, in North Wales,

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Wales, they have no curled potatoes. If this be owing to the nature of that land, perhaps lime might prevent the diſeaſe.

IX. According to this writer, all ſorts of grain wear out and turn wild if ſown too long on the ſame land; the ſame will hold good in all ſorts of pulſe, peaſe, beans, and (as he conceives) potatoes. It generally happens, that thoſe who have moſt curled potatoes plant very ſmall ſets.

Eleven years ago he bought a parcel of freſh ſets, of the golden-dun kind, and has uſed them without change to the preſent year, without any being curled. This he principally attributes to his having always planted good large ſets.

About four years ſince, he thought of changing his ſets, as his potatoes were too ſmooth, too round, and much diminiſhed in ſize. But the curl at that time beginning to be very alarming, he continued his ſets till part of his crop miſſing laſt year, he was obliged to buy new ſets this ſpring, which being ſmall, were curled like other people's.

He allows, that the curl has frequently happened to perſons who have uſed large potatoes for ſets; for, as all roots are not equally affected, ſome curled ones may be mixed with the reſt.

To prevent the evil, cut your ſets from clear and middle-ſized potatoes, gathered from places as clear of the curl as poſſible; preſerve them as uſual till ſpring. If any are harder, or graſh more in cutting than uſual, caſt them aſide. He would alſo recommend the raiſing a freſh ſort from the crab produced on the ſorts leaſt affected, which in Lancaſhire are the long duns.

X. Set potatoes with the ſprits broke off, and they will (ſays the writer of this letter) be curled ones; if ſet with the ſprits on, they will not be curled. Again, take a potato which is ſprit, and cut a ſet off with two ſights; break one ſprit off, and let the other ſtay on, and ſet it; the former will be curled, and the latter will not.

When you have holed your potatoes, take them out before they are ſprit, and lay them dry until you have ſet or ſown them, and you will have no curled potatoes.

XI. This writer was at the expence of procuring ſets at fifty miles diſtance, and where this diſeaſe was not known. The firſt year's trial was ſucceſsful; the year following he procured ſets from the ſame place, but one-fifth of his crop was infected. By way of experiment, he planted ſets from roots which had been infected the year before, and ſome of theſe produced healthy plants, free from all infection.

As every effect muſt have a cauſe, he ſuppoſed it might be ſome inſect, which, living on the leaves, gave them that curled and ſickly appearance, as is the caſe in the leaves of many ſhrubs and trees. But whether the inſect is lodged in the old ſets, and to be deſtroyed at the time of planting, or, proceeding from ſome external cauſe, can only be deſtroyed afterwards, he is not yet certain, although he has made the following experiments.

On a piece of ground that had not been dug for 20 years, he planted four rows of ſets, which he knew to be perfectly clear; the drills were two feet diſtant, the ſets one foot diſtant in each drill. He then planted on the ſame ground four rows with ſets from curled potatoes, at equal diſtances; in each row were about 20 ſets. Diſeaſes of Plants.

Lot 1ſt, The curled ſets.

N° 1. Without manure,
2. In ſalt,
N° 3. In ſoot,
4. In quicklime.

Lot 2d, The clear ſets.

N° 1. Without manure,
2. In ſalt,
N° 3. In ſoot,
4. In quicklime.

Thoſe planted in ſalt and ſoot in both lots were deſtroyed. In Lot 1ſt, N° 1. and 4. all curled. Lot 2d, N° 1. and 4. quite clear.

This experiment was made on a ſuppoſition that the inſect lodged in the ſet, and muſt be deſtroyed on planting. But of that he is not fully ſatisfied. He repeated ſalt, ſoot, and quicklime, on the branches of ſeveral curled potatoes. Salt deſtroyed all he touched with it. Lime and ſoot had, he thought, a partial effect on the plants. After ſome time, they appeared almoſt as healthy as the reſt. Thus, although he had done little towards the cure, he flatters himſelf he has pointed out the cauſe, the inſects on the curled plants being not only very numerous, but viſible to the naked eye.

XII. This writer aſcribes the cauſe of the diſeaſe to the froſt, and bad keeping in winter and ſpring before ſetting. They are liable to be damaged by froſt after they are ſet; but this may be prevented by covering. If it be aſked, why froſt did not injure them formerly? he anſwers, it is only the NEW kinds which are apt to curl. To this may be added, that leſs care is now taken of the ſeed than formerly. To prevent the latter, let them remain in the ground covered with hauim or litter till the time they are wanted for ſetting: and, in caſe no froſt touches them afterwards, they will be free from the diſeaſe.

XIII. This writer ſays, the red potato was as generally planted as the winter white and the Lincolnſhire kidney are now. The firſt, being a later potato, did not ſprout ſo early as the others. The white ſprout very early, and therefore ſhould firſt be moved out of the place where they have been preſerved in the winter. Inſtead of that, they are often let remain till their roots and ſprouts are matted together. On ſeparating them, theſe ſprouts are generally rubbed off, and they are laid by till the ground is ready; during which interval they ſprout a ſecond time: but theſe ſecond ſprouts, being weak and languid, will ſhrink, ſicken, and die; and the fruit at the roots will be ſmall, hard, ill-ſhaped, and of a brown colour.

Now, if putting off the ſprouts once or more, before the ſets are put in the ground, be the cauſe (as he verily believes it is) of the curled diſeaſe, an eaſy remedy is at hand. When the potatoes intended for ſets are dug up, lay them in a weſt aſpect as dry as poſſible: in ſuch a ſituation they will not ſprout ſo ſoon. The beſt time for removing moſt ſorts, is the firſt fine day after the 24th of February. Cut them into ſets as ſoon as poſſible, and let them remain covered with dry ſand till the ground is prepared, which ſhould be a winter fallow. Lay the ſets in without breaking off any of the ſprouts, for the ſecond will not be ſo vigorous. This accounts for one ſprout out of three from the ſame ſet being curled. The two items not curled roſe from two later eyes, and were firſt

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ſprouts. The ſprout curled was a ſecond, the firſt having been rubbed off.

XIV. This writer ſays, that laſt ſpring one of his neighbours cut and ſet, in the uſual way of drilling, ſome loads of the largeſt potatoes he could procure; and more than half of them proved curled. Being a few ſets ſhort of the quantity wanted, he planted ſome very ſmall potatoes which he had laid by for the pigs. Theſe being fully ripe and ſolid, there was not a curled plant among them. He apprehends, the others being curled was owing to their not being fully ripe. A crop of potatoes, ſet this year in rows on ground that had borne a crop of them laſt year, were moſtly curled; but many plants came up from ſeed left in the ground laſt ſeaſon, and there was not a curled one among them.

XV. Of late years, this writer ſays, great improvements have been made in ſetting potatoes and cutting the ſets. The ground is dreſſed cleaner and dunged ſtronger. Many people, in drilling, wrap up the ſets entirely in the dung; by which means, though their potatoes are larger, the diſeaſe ſeems to be increaſed. They alſo cut their ſets out of the richeſt and largeſt potatoes, which is perhaps another cauſe of this evil. In cold countries, where they ſet their own ſeed, which has grown on poor land, with leſs dung, they have no curled plants. On the contrary, when they bought rich and large potatoes for ſeed, they have been curled in great quantities. He believes, the richneſs and largeneſs of the ſeed to be the cauſe of the evil; for he does not remember to have ſeen a curled ſtem which did not ſpring from a ſet of a large potato.

XVI. This writer apprehends the curled diſeaſe in potatoes to proceed from a defect in the *planta ſeminalis*, or ſeed plant; and from comparing curled ones with others, there appeared to be a want of, or inability in, the powers of expanding or unfolding the parts of the former; which, from this defect, forms ſhrivelled, ſtarved, curled ſtems. On examining ſome of the ſets at the time of getting the crop, he found them hard and undecayed; ſo hard, indeed, that ſome of them would not be ſoft with long boiling. This led him to think, that ſome manures might have the ſame effect on them as tanners ooze has on leather, and ſo harden them, that the embryo plant could not come forth with eaſe; but a cloſer examination taught him otherwiſe, and that they grow equally in all manures.

Some have thought that the fermentation is occaſioned by too great quantities being heaped together; but the writer has ſeen an inſtance, wherein a ſingle potato, preſerved by itſelf, when ſet, produced ſtems of the curled kind. He thinks the moſt conſiſtent and rational opinion is, that the diſeaſe is occaſioned by the potatoes being taken from the ground before the ſtamen, or miniature plant, is properly matured and ripened.

For let it be obſerved, that the potato, being a native of a warmer climate, has there more ſun, and a longer continuance in the ground, than in its preſent exotic ſtate; conſequently it has not the ſame natural cauſes here to mature the ſeed plant as in its native ſtate. We ought, therefore, to give all the opportunities our climate will admit for nature to complete her work, and fit the ſtamen for the next ſtate of vegetation, eſpecially in thoſe intended for ſeed. But if the potato be taken up before the ſeed-plant be fully matured, or the air and ſap veſſels have acquired a proper degree of firmneſs or hardneſs, it muſt, when thus robbed of further nutrition, ſhrivel up; and when the veſſels, in this immature ſtate, come to act again in the ſecond ſtate of vegetation, they may produce plants which are curled.

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If it be aſked, why are they more common now than formerly? he anſwers, that before the preſent mode of ſetting them took place, people covered them, while in the ground, with ſtraw, to protect them from froſt.

If it be aſked, why one ſet produces both curled and ſmooth ſtems? he anſwers, we ſuppoſe every eye to contain a *planta ſeminalis*; that all the embryos, or ſeed plants, contained in one potato, are nourished by one root; and that, as in ears of corn, ſome of theſe ſeed plants may be nourished before others.

One of his neighbours, laſt year, ſet two rows of potatoes, which proving all curled, he did not take them up; and this year there is not a curled one among them. Such potatoes, therefore, as are deſigned for ſeed, ſhould be preſerved as long in the ground as poſſible.

XVII. This writer adviſes ſuch ſets to be planted as grow in moſs land; and, he ſays, there will not be a ſingle curled one the firſt year. This is affirmed by the inhabitants of two townſhips, where they grow amazing quantities. A medical gentleman ſowed laſt year two buſhels of ſets from one of the above places, and had not one curled; but on ſowing them again this year, he had a few.

Notwithſtanding there ſeems to be a diverſity of opinions in the above writers, occaſioned by the different appearances of their crops, and the ſeemingly contrary effects of the means uſed to prevent or cure the diſeaſe, we conceive that the following general propoſitions may be fairly drawn from the whole. 1. That ſome kinds of potatoes are (*cæteris paribus*) much more liable to be affected by the diſeaſe than the reſt; and that the old red, the golden dun, and the long-dun, are the moſt free from it.—2. That the diſeaſe is occaſioned by one or more of the following cauſes, either ſingly or combined: 1ſt, By froſt, either before or after the ſets are planted: 2d, From planting ſets out of large unripe potatoes: 3d, From planting too near the ſurface, and in old worn-out ground: 4th, From the firſt ſhoots of the ſets being broken off before planting; by which means there is an incapacity in the *planta ſeminalis* to ſend forth others ſufficiently vigorous to expand ſo fully as they ought.—3. That the moſt ſucceſsful methods of preventing the diſeaſe, are cutting the ſets from ſmooth middle-ſized potatoes, that were fully ripe, and had been kept dry after they were taken out of the ground; and without rubbing off their firſt ſhoots, planting them pretty deep in freſh earth, with a mixture of quicklime, or on limeſtone land.

A correſpondent of the Bath Society is convinced, that, whatever may be its cauſe, the fault itſelf is inherent in the ſeed; and has communicated the following method of avoiding it: "I made a hot-bed in the following manner (which method I have uſed ever ſince):

It

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I laid horſe dung, &c. (as is generally uſed in making hot-beds), about 18 inches thick; over which I ſpread a layer of fine rich mould about four or five inches thick: upon the top of this mould I laid, in different diviſions, a certain number of potatoes of various ſorts, ſome of my own growth, and others bought from different parts, and covered theſe lightly over with more mould; they ſoon came up. I then obſerved which was freeſt from the blight or curl; for if there were not more than one defective in *forty* or *fifty*, I concluded I might ſet of that ſort with ſafety. This method I have now practiſed near twelve years, and never loſt my crop, or any part thereof worth mentioning; whilſt my neighbours, who followed the old method, were frequently diſappointed in their crops; and to the beſt of my knowledge, all thoſe of my neighbours who have of late been perſuaded to take the trouble of uſing the ſame means as myſelf, have never failed of ſucceſs to their utmoſt wiſhes in one inſtance; nor do I ever think it will fail, if duly attended to; the fault being ſome hidden cauſe in the ſeed unknown at preſent, and I believe incurable by any means, at leaſt which have yet come to my knowledge. My reaſon for planting my hot-beds ſo ſoon is, that if the froſt hinder the firſt experiment, or they all prove bad, I may have time to make a ſecond or third, if neceſſary, with different ſorts of ſeed, before the proper ſeaſon arrives for planting in the fields and grounds appointed for the great and general crops."

In addition to the intereſting information upon this ſubject, which has been obtained by means of theſe ſocieties, various other ſpeculations about the cauſe and cure of this diſeaſe have of late been introduced to the notice of the public. In particular it has been ſtrongly urged, that the diſeaſe is almoſt always occaſioned by inſects. It is ſaid, that on looking at the roots of ſuch potatoes as grow up curled, it will uſually be found, that the bearing plant is devoured and excavated by ſnails, centipedes, or beetles. Sometimes alſo, though more rarely, the curl is ſuppoſed to ariſe from the leaves themſelves being infected with minute animalcula. Hence, in rich ſoils in the neighbourhood of cities and well-manured gardens, the potatoes are moſt ſubject to the curl, becauſe ſuch inſects as devour the ſeed abound moſt in theſe ſoils. The inſects are thought to prefer one potato to another. They will hardly touch a yam. A potato from a late part of the country, which has been hardly ripened, the vermin do not ſeem to like; but a potato that has been ſomewhat ſweetened or mellowed by the froſt, is ſuppoſed to be greedily devoured by them.

Farmer's Mag.

An ingenious notion concerning the cauſe of the diſeaſe has been ſuggeſted from attending to the hiſtory of the plant in this country. The potato plant was introduced into the iſland of Great Britain from a climate much warmer than ours, as early as the reign of Queen Elizabeth; but it is a ſingular circumſtance, that the curled diſeaſe did not make its appearance till within leſs than 40 years ago. Indeed, the diſeaſe is ſaid to have firſt occurred in the year 1764, in the very diſtrict of Lancaſhire where potatoes had been firſt cultivated. It is alſo ſaid, that the Surinam potato and ſome other kinds which have been more recently introduced into our climate, have never yet exhibited any ſymptom of the curl. It is farther ſaid, that till within theſe 40 years the potato plant never brought its ſeeds to maturity in this country, though the roots were in full perfection; that the Surinam potato and others lately introduced do not as yet produce perfect ſeeds at the top of their ſtem; and that potatoes, which have been cultivated for a length of time in bleak and mountainous ſituations, are ſtill in the ſame ſtate, and do not bring their ſeeds to maturity. Hence it is endeavoured to be inferred, that there exiſts a connexion in the nature of the plant between this diſeaſe and the ſtate of maturity to which the ſeed is brought. It is ſuppoſed, that the plant is unfit at once to afford mature and perfect ſeed at the ſummit of its ſtem, and alſo roots capable of propagating it in perfection. From theſe premiſes it is ſuggeſted, that, to prevent the curl, it will be neceſſary to procure ſeed potatoes from mountainous ſituations into which the diſeaſe has not yet come, becauſe the plant has never produced perfect fruit at the ſummit of its ſtem; or an attempt may be made to procure more perfect ſeed from the ordinary kind of potatoes, by deſtroying the flowers, which may have the effect to prevent the plant from being exhauſted by bringing to maturity both fruit at its ſummit and roots at its bottom. Laſtly, It has been ſuppoſed, upon theſe principles, that the diſeaſe may be prevented by rearing potatoes from the ſeed produced at the ſummit of the ſtem; the mode of practiſing which will afterwards be explained.

Tranſact. ety for Encouragement of Arts, vol. iii.

In the mean time, it may be obſerved, that the ſubject has been farther diſcuſſed, in a leſs ſpeculative manner, by an anonymous correſpondent of the Board of Agriculture*. This gentleman does not conſider the curl as a ſpecific diſeaſe, but as an accidental debility of thoſe plants in which it occurs; that we are not, therefore, to ſeek for a cure or preventive in a change of ſeed alone, as many have all along done, but in complete attention to all that experience ſhows to be neceſſary to an accurate culture, and to their perfect growth. In this way alone, he thinks, there is reaſon to expect that this very uſeful article of human food may be cultivated with the ſame ſucceſs as before its dreadful enemy the curl made ſuch havock in our crops, as of late years it certainly has done. He deſcribes the diſeaſe as occuring, in Mid Lothian, moſt frequently from the following cauſes: 1ſt, From planting potatoes on ſoils altogether unfit for them. Being unable to penetrate a ſtiff ſoil, potatoes require a light, pervious, or open mould. For a long period after potatoes firſt appeared in the country, this circumſtance was carefully attended to. They were planted entirely with the ſpade, in the lighteſt ſpots upon every farm. Hence, the plants roſe vigorous, and no curl was ſeen; but on farmers wiſhing to extend the culture of potatoes; they were tempted to plant them on every ſoil, without regard to its nature, or tendency to produce this crop. 2dly, Imperfect culture is deſcribed as a frequent cauſe of curling. A crop of potatoes is commonly ſtrong, abundant, and free from curl, in proportion to the previous culture given to the ſoil, and the care taken to keep it clean after they are planted. Hence, it frequently happens, that while a farmer who cultivates this root in a negligent manner, and upon a great ſcale, by means of the plough, finds his crop deficient in conſequence of this diſeaſe, his cottars and ſervants, to whoſe uſe he allows

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allots ſmall portions of potato ground, which they cultivate with the ſpade, obtain crops free from curl, and often double in quantity to his, in proportion to the extent of ground which they occupy. 3dly, Small roots, or too ſmall a portion cut off along with the eye that is to ſerve for ſeed, appears to be a cauſe of curl. In the caſe of grain, it ſeldom happens, unleſs in very fine ſeaſons, that ſmall ſeed produces a large crop; and it is thought that ſomething ſimilar may occur in the caſe of potatoes. As the young plant muſt always derive its earlieſt nouriſhment from the root, out of which it ſprings, before it is capable of ſeeking its food in the ſurrounding ſoil, thoſe plants, whoſe early growth is beſt ſupported and foſtered, muſt be expected to reach the greateſt perfection. To ſubject theſe ideas to the teſt of experiment, 64 ſets were planted; 16 of which were full grown potatoes, 16 from ſmall roots, in which no curl appeared when in the field, 16 from roots raiſed from the ſeeds two years before, and 16 from roots of plants ſtrongly curled. They were all planted in the ſame manner in a light ſoil, in parallel furrows, with a moderate quantity of dung, and covered to the depth of three inches. Of thoſe taken from large potatoes, none were curled, and the plants were ſtrong and healthy. Some good plants appeared in each of the other rows, but nearly a half of the whole were curled. The proportion of curled plants was rather greateſt in thoſe raiſed from the ſeed. 4thly, Sets taken from roots that have ſprouted early, and from which the germs have been rubbed, are ſaid never to fail to produce curl. 5thly, Too much, as well as too little dung, appears to have an influence in producing curl; the firſt probably by corrupting the germ of the young plant, the latter by not being ſufficient to produce vigorous plants. Hence, attention ought to be paid to the regular ſpreading of dung, which ought not to be thrown about in a careleſs and ſlovenly manner, which allows ſome plants to have none, while others are covered with it to the depth of ſeveral inches. 6thly, Too deep, as well as too ſhallow planting, gives riſe to the curl. To aſcertain the proper depth, 12 were planted at 18 inches deep; the ſame number at the depth of 16 inches, and of 14, 12, 10, 8, 7, 6, 5, 4, 3, and 2 inches; and 12 were ſo lightly covered, that they were not, perhaps, at the depth of one inch. The ſets were all from large roots, of the ſame crop, cut as nearly as poſſible of the ſame ſize. They were all planted at the ſame time, in the firſt week of April, in a light dry ſoil, and they all got the ſame quantity of dung. The plants at the depth of 1 and 2 inches appeared firſt; but they were weak, and ſome of them curled. Thoſe at 3, 4, and 5 inches, were all ſtrong, and free from curl. At 6 and 7 inches, they were alſo healthy, and free from curl, but they were three weeks later in getting above the ground than thoſe that were thinly covered, and the plants were neither ſo ſtrong, nor the roots ſo large. Thoſe planted at the depth of 8 inches roſe ſtill later, and were all weak.—Nine out of the 12 were curled. Of thoſe planted at 10 inches deep, only four appeared; and they were ſo weak, that they ſoon withered and died. Of thoſe deeper planted, none ever appeared. On digging them up at the end of two months, thoſe at 16 and 18 inches deep were found unchanged; while ſome of thoſe at the depth of 12 and 14 inches, had put forth ſome feeble germs not exceeding the length of an inch. Thoſe planted at 3 and 4 inches were evidently the ſtrongeſt during the whole ſeaſon, and their roots largeſt. Hence, to procure an early, abundant, and healthy crop, 3 inches appears to be the beſt depth for planting potatoes. 7thly, Whatever injures the new ſets or the germs afterwards may produce curl: ſuch as the trampling of horſes feet at the time of planting; their being partially covered with ſtones or hard clods of earth; deep harrowing, when the young ſhoots are advancing; and grubs, ſnails, or inſects attacking the germs at firſt, or the ſtems afterwards. Hence, 8thly, The curl was produced to an uncommon degree upon a field of ſtiff land, by paſſing a roller over it, about a fortnight after planting. 9thly, The ſtate of the weather when the crop is young may produce the curl. Rain alone will not do ſo, if it be not allowed to lodge; but a long continuance of dry weather, eſpecially with cold winds, when the ſhoots firſt appear, is apt to produce this diſeaſe, and alſo hoar-froſts in this early ſtate of the crop. Hence, it is thought, that the three firſt weeks of April anſwer beſt for planting potatoes in the ſouth of Scotland and north of England, as they do not, in that caſe, appear till the middle or end of May. From all theſe remarks it is concluded, that though with the beſt management the curl can never be completely baniſhed from our fields, yet with due attention to the leading points above mentioned, it may be prevented from being attended with any ſerious miſchief.

As no information upon this intereſting ſubject ought to be overlooked, we think it neceſſary to ſtate, that the following plan for preventing the curl in potatoes has very recently been laid before the public, by an anonymous correſpondent of the publiſhers of the Farmer's Magazine, who aſſerts, that he has adopted it with complete ſucceſs. It conſiſts of uſing for ſeed what are called *potato beans*. Theſe beans are a dark brown excreſcence, larger than a horſe bean, which grows near the ground, on the haulm or ſhaw, generally, it is ſuppoſed, where it has been broken or wounded. They are ſhaped like potatoes, and have a number of eyes, from one of which grow two ſmall leaves. It is ſaid, that eight or ten years ago, ſeveral of theſe potato beans were planted merely to try if they would grow, and that they produced a great number of common ſized potatoes, but of a bad quality. Theſe potatoes, however, being cut and planted next year, produced potatoes of an excellent quality, and in great plenty. Since that time, a number of beans have always been planted ſufficient to produce enough of potatoes for next year's ſeed. They are planted at the ſame diſtance, and treated in every reſpect in the ſame manner with common ſets; and their produce is equally plentiful. No other change of ſeed has ever been neceſſary.

Sect. VIII. *Of the Obſtacles to Agricultural Improvement.*

Diſeaſes of Plants.

115 Moral and political obſtacles to agricultural improvement.

Before proceeding to the practical part of the ſubject, it may be proper to take notice of ſome of the moral and political circumſtances which reſiſt the progreſs of the art of agriculture, and which ought not to be overlooked by perſons engaged, or who have an intention to engage in it.

One

Obſtacles to Agriculture.

One of the firſt and moſt obvious obſtacles to the improvement of this or of any other art conſiſts of the ignorance of its practitioners, or of its being carried on by perſons of an illiterate and unintelligent character, who are unable to take a comprehenſive view of the principles of their profeſſion, or who have not ſufficient curioſity to inquire after the beſt modes of practice, or underſtanding to diſcern the value of any new practices that are explained to them. It ought never to be forgotten, that the art of the huſbandman is an intricate and extenſive one, and that one of the chief circumſtances which has hitherto prevented its improvement has ariſen, as already mentioned, from the ſecluded ſituation of perſons engaged in it. They are ſcattered over the face of the country, inſtead of being collected together like other artiſts in towns, ſo as to be enabled to derive aid from each other's experience. Fortunately this difficulty is paſſing away, in conſequence of the diffuſion of agricultural knowledge, by means of the great number of publications upon that ſubject which are gradually introducing themſelves into the remoteſt corners of the country. Perſons receiving a liberal education, particularly at the univerſity of Edinburgh, have now alſo an eaſier opportunity than formerly of acquiring a knowledge of the principles of this art, in conſequence of the eſtabliſhment of a profeſſorſhip of agriculture, which has been endowed by a private gentleman, Mr Pulteney. Even with all theſe advantages, however, aided as they are by the exertions of the Board of Agriculture, it can never be expected that this art can reach its ultimate degree of perfection, unleſs a conſiderable number of the perſons engaged in it are men of intelligent characters and good education, who will call in the improvements which are making in other ſciences, as well as in this art, in diſtant countries, to the aſſiſtance of their perſonal experience.

A ſecond obſtacle to agricultural improvement conſiſts of the poverty of the huſbandman, or of his want of capital, to enable him fully and completely to labour the ſoil, and provide materials for its amelioration. Complaints have often been made with little reaſon, of the obſtinacy of farmers, and of the tenacious manner in which they adhere to old practices, though demonſtrated to be improper: But a poor man cannot afford to make experiments, or to hazard the loſs of a crop for the chance of obtaining a more valuable one by ſome untried practice. In conſequence of want of capital, large portions of territory remain in ſome parts of the country in a ſtate of nature, and conſequently unproductive, both to the occupier and to the proprietor. Both landlords and tenants, therefore, ought to know, that a man who engages in agriculture without a ſufficient capital takes up a bad trade, in which ſomething may be loſt by both parties by the deterioration both of the ſoil and of the ſtock upon it, but from which neither the public nor themſelves can derive profit.

A third obſtacle to agricultural improvement ſometimes ariſes from the poſſeſſor of the ſoil not having a ſufficient intereſt in it. In barbarous nations, lands are often poſſeſſed by communities as an undivided property, without any individual member having an excluſive right to a particular ſpot. In ſuch caſes, the worſt kind of agriculture muſt always prevail, for the ſame reaſon that public affairs are always worſe managed than the affairs of private perſons, who find their induſtry ſtimulated not merely by a ſenſe of duty, but by the influence of avarice, and of all the other ſelfiſh paſſions. Conſiderable portions of territory in England ſtill remain withheld from the exertions of an improving agriculture by this ſtate of property. But, even where the intereſt which the cultivator has in the ſoil is excluſive, it may ſtill be too limited. Where a landlord is prevented by an entail, or other family ſettlement, or by narrow prejudices and a ſhort-ſighted policy, from granting leaſes of a proper endurance, it is never likely that the ſoil can be well cultivated. Every outgoing farmer will endeavour, during the laſt years of his leaſe, to do as little for the land as poſſible, and to take from it all that he can poſſibly obtain. The firſt years of every new leaſe will therefore be ſpent by every new farmer in repairing the damage done by his predeceſſor. Scarcely, however, has he accompliſhed this object, than he himſelf, if his leaſe be ſhort, muſt ſet about procuring indemnity for the money he has laid out in ameliorating the ſoil, by ſcourging it in his turn, or by taking from it as heavy crops as poſſible, and by beſtowing upon it little or no expence.

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Under the ſame head of a want of proper intereſt in the ſoil, may be enumerated the payment of tithes, of which in England every farmer ſo grievouſly complains. Whatever money the huſbandman may there lay out in improvements, is not expended for himſelf; as the proprietor of the tithes is entitled to draw a ſhare of the whole additional increaſe, and thus becomes a partner in the profits of the enterpriſe, without running any riſk of loſs by its failure. The odium of this tax, is ſaid to induce great numbers of huſbandmen to continue their lands in paſturage, to the no ſmall detriment of the public, from the comparative unproductiveneſs of human food, which attends that mode of occupying the ſoil. Fortunately, in Scotland this evil hath been removed by the wiſdom of our forefathers, as every landlord poſſeſſes the privilege of obtaining his tithes to be fixed at a ſettled rate of payment for ever; and, in many caſes, of having his lands altogether diſburdened, upon payment of a very moderate price.

The progreſs of the art of agriculture in Europe was long retarded by the want of reſpectability which attended it, when engaged in as a profeſſion or trade from which profit was to be derived. In the feudal times, the military profeſſion was the only employment in which a layman of liberal education could reſpectably engage. Agriculture, the only art which is abſolutely neceſſary to the exiſtence of man, was regarded with contempt, and left in the hands of the meaneſt of the people. Even the moſt ordinary mechanics were conſidered as ſuperior to perſons whoſe employment it was; becauſe the mechanic, reſiding in a town, and uſually under the protection of the prince, was ſafe from the dominion and the inſults of the petty chieftains that ruled in every part of the open country. The ſtate of affairs is now greatly altered in this reſpect. More enlightened views, and a better ſtate of ſociety, have reſtored to the profeſſion of agriculture the reſpectability which naturally belongs to it. It muſt be acknowledged, however, that the recent improvements which have taken place in the art, have contributed not a little to this change in the ſentiments of mankind concerning

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cerning the perſons occupied in it. It is now found, that a man may become rich by agriculture, and that there are few better ways in which a prudent and induſtrious man can lay out a moderate capital. In a commercial age, the path that leads to wealth is always reſpected and accounted honourable, and accordingly it is now not unuſual for the ſons of Britiſh noblemen and gentlemen, of extenſive fortunes, to become apprentices to farmers.

The laſt obſtacle to agricultural improvements, of which we ſhall take notice, ariſes in ſome countries from the want of judicious legiſlation, or proper arrangements made by the public in its favour. The produce of the art of the huſbandman, and the manures of which his lands have occaſion, are all bulky commodities which cannot be tranſported without labour and expence. Unleſs care is taken, therefore, to prepare and maintain good roads throughout the country, the profits of agriculture muſt always be ſubjected to ſuch deductions as will greatly retard its proſperity. In the ſame manner, if the ſtate, from any narrow policy, ſhall prevent the huſbandman from bringing his goods to the beſt market, by exportation or otherwiſe, it is impoſſible that his art can flouriſh. In former times, nations were afraid to permit the exportation of grain, even in ſeaſons of plenty, leſt they ſhould be left without food, not conſidering that the ſureſt mode of producing abundance of any commodity conſiſts in offering, at all times, a good price for it. This error is now rectified in moſt nations; and at all events, in the preſent ſtate of affairs, the Britiſh huſbandman has no reaſon to complain, as the grain reared in this country is, even in the beſt ſeaſons, underſtood to be inadequate to afford ſubſiſtence to its inhabitants.

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PRACTICE ON AGRICULTURE.

116 Diviſion of the ſubject.

THE practice of agriculture naturally divides itſelf into three parts; 1ſt, The cultivation of vegetable food for men and animals; 2dly, The cultivation of vegetables, ſuch as flax and hemp, which are more properly articles of commerce; and 3dly, The rearing and management of animals. To theſe we ſhall add, as connected with all the branches of agriculture, a ſhort deſcription of the moſt uſeful modes of fencing and encloſing lands for cattle and other objects of huſbandry.

PART I. OF THE CULTIVATION OF VEGETABLE FOOD.

117 Cultivation of vegetables divided into four branches.

We ſhall conſider this branch of the ſubject under four diviſions. In the firſt we ſhall preſent to the reader a ſtatement of the moſt uſeful inſtruments of agriculture: 2dly, We ſhall ſtate the mode of preparing land for cropping, by removing the phyſical obſtructions to agriculture, and reducing the ſoil into a proper ſtate; 3dly, We ſhall explain the culture of particular plants, and the practices of huſbandry connected with it; and, laſtly, We ſhall ſtate the principles and operations of the horſehoeing or drill huſbandry.

SECT. I. *Inſtruments of Huſbandry.*

THE inſtruments employed in agriculture are various; as the plough, the harrow, the roller, &c. which are again diverſified by various conſtructions adapted to particular uſes.

1. Of PLOUGHS.

118 The plough

The plough, is a machine for turning up the ſoil by the action of cattle, contrived to ſave the time, labour, and expence, which, without this inſtrument, muſt have been employed in digging the ground, and fitting it for receiving all ſorts of ſeed.

Amidſt all the varieties which can occur in the manner of ploughing the ground, ariſing from difference of ſoil, local habits, and other cauſes, there is ſtill a ſameneſs in the taſk which gives a certain uniformity to the chief parts of the inſtrument, and ſhould therefore furniſh principles for its conſtruction. There is not, perhaps, any invention of man that more highly merits our utmoſt endeavours to bring it to perfection; but it has been too much neglected by thoſe perſons who ſtudy machines, and has been conſidered as a rude tool, unworthy of their attention. Any thing appears to them ſufficient for the clumſy taſk of turning up the ground; and they cannot imagine that there can be any nicety in a buſineſs which is ſucceſsfully performed by the ignorant peaſant. Others acknowledge the value of the machine, and the difficulty of the ſubject; but they think that difficulty inſuperable, becauſe the operation is ſo complicated, and the reſiſtances to be overcome ſo uncertain, or ſo little underſtood, that we cannot diſcover any unequivocal principle, and muſt look for improvement only from experience or chance.

119 an inſtrument of the greateſt value,

But theſe opinions are ill founded. The difficulty is indeed great, and it is neither from the ignorant farmer nor the rude artiſt that we can expect improvement. It requires the ſerious conſideration of the moſt accompliſhed mechanician; but from him we *may* expect improvement. We have many data: we know pretty diſtinctly what preparation will fit the ground for being the proper receptacle for the ſeed, and for ſupporting and nouriſhing the plants; and though it is, perhaps, impoſſible to bring it into this ſtate by the operation of any inſtrument of the plough kind, we know that ſome ploughs prodigiouſly excel others in reducing the ſtiff ground to that uniform crumbling ſtate in which it can be left by the ſpade. The imperfections of their performance, or what yet remains to be done to bring the ground into this ſtate, is diſtinctly underſtood. It ſeems, then, a determinate problem (to uſe the language of mathematicians), becauſe the operation depends on the invariable laws of mechanical nature.

120 and may improved

It will therefore be very proper under this article, to aſcertain, if poſſible, what a plough in general ought

121 The taſk it perform

to

Instruments of Husbandry.

to be, by describing distinctly its task. This will surely point out a general form, the chief features of which must be found under every variety that can arise from particular circumstances.

The plough performs its task, not by digging, but by being pulled along. We do not aim at immediately reducing the ground to that friable and uniform state into which we can bring it by the spade; but we wish to bring it into such a state that the ordinary operations of the season will complete the task.

For this purpose, a slice or sod must be cut off from the firm land. This must be shoved to one side, that the plough and the ploughman may proceed in their labour; and the sod must be turned over, so that the grass and stubble may be buried and rot, and that fresh soil may be brought to the surface; and all must be left in such a loose and open condition, that it may quickly crumble down by the influence of the weather, without baking into lumps, or retaining water. The first office is performed by the coulter, which makes a perpendicular cut in the ground. The point of the sock follows this, and its edge gets under the sod, and lifts it up. While lifting it up, it also heels it over, away from the firm land. The mouldboard comes last, and pushes it aside, and gradually turns it over as far as is required.

Plate VI.

122 General form of the plough.

The general form of the body of a plough is that of a wedge, or very blunt chissel, AFEDBC, (fig. 1.), having the lower corner D of its edge considerably more advanced than the upper corner B; the edge BD and the whole back AFDB is the same perpendicular plane; the bottom FDB approaches to a triangular form, acute at D, and square at F; the surface BCED is of a complicated shape, generally hollow, because the angle ABC is always greater than FDE: this consequence will be easily seen by the mathematician. The back is usually called the LAND SIDE by the ploughmen, and the base FDE is called the SOLE, and FE the HEEL, and BCED the MOULDBOARD. Lastly, The angle AFE is generally square, or a right angle, so that the sole has level both as to length and breadth.

123 Advantages of this form.

By comparing this form with attention, the reader will perceive that if this wedge is pulled or pushed along in the direction FD, keeping the edge BD always in the perpendicular cut which has been previously made by the coulter, the point D will both raise the earth and shove it to one side and twist it over; and, when the point has advanced from F to D, the sod, which formerly rested on the triangle DFE, will be forced up along the surface BCED, the line DF rising into the position D*f*, and the line EF into the position E*f*.—Had the bottom of this furrow been covered with a bit of cloth, this cloth would be lying on the mouldboard, in the position D*f*E: the slice, thus deranged from its former situation, will have a shape something like that represented in fig. 2.

In as much as the wedge raises the earth, the earth presses down the wedge; and as the wedge pushes the earth to the right hand, the earth presses the wedge to the left; and in this manner the plough is strongly pressed, both to the bottom of the furrow by its sole, and also to the firm land by its back or land side. In short, it is strongly squeezed into the angle formed along the line FD (fig. 1.) by the perpendicular plane *a b* DF and the horizontal plane FDE; and in this manner the furrow becomes a firm groove, directing the motion of the plough, and giving it a resisting support, by which it can perform all parts of its task. We beg our readers to keep this circumstance constantly in mind. It evidently suggests a fundamental maxim in the construction, namely, to make the land side of the plough an exact plane, and to make the sole, if not plane, at least straight from point to heel. Any projection would tear up the supporting planes, destroy the directing groove, and expend force in doing mischief.

Instruments of Husbandry.

124 A fundamental maxim in the construction of a plough.

This wedge is seldom made of one piece. To give it the necessary width for removing the earth would require a huge block of timber. It is therefore usually framed of several pieces, which we shall only mention in order to have the language of the art. Fig. 3. represents the land side of a plough, such as are made by James Small at Rosebank, near Foord, Mid Lothian. The base of it, CM, is a piece of hard wood, pointed before at C to receive a hollow shoeing of iron CO, called the SOCK, and tapering a little towards the hinder end, M, called the HEEL. This piece is called the HEAD of the plough. Into its fore part, just behind the sock, is mortised a sloping post, AL, called the SHEATH, the front of which is worked sharp, forming the edge of the wedge. Nearer the heel there is mortised another piece, PQ, sloping far back, called the STILT, serving for a handle to the ploughman. The upper end of the sheath is mortised into the long BEAM RH, which projects forward, almost horizontally, and is mortised behind into the stilt. To the fore end of the beam are the cattle attached. The whole of this side of the wedge is fashioned into one plain surface, and the intervals between the pieces are filled up with boards, and commonly covered with iron plates. The COULTER, WFE, is firmly fixed by its shank, W, into the beam, rakes forward at an angle of 45° with the horizon, and has its point E about six inches before the point of the sock. It is brought into the same vertical plane with the land side of the plough, by giving it a knee outward immediately below the beam, and then kneeing it again downward. It is further supported on this side by an iron stay FH, which turns on a pin at F, passes through an eye-bolt I on the side of the beam, and has a nut screwed on it immediately above. When screwed to its proper slope, it is firmly wedged behind and before the shank — Fig. 3. N° 2. represents the same plough viewed from above. ST is the right-hand or small stilt fixed to the inside of the mouldboard LV.

125 The several parts of the plough.

Fig. 4. represents the bottom of the wedge. CM is the head, covered at the point by the sock. Just behind the sock there is mortised into the side of the head a smaller piece DE, called the wrest, making an angle of 16° with the land side of the head, and its outside edge is in the same straight line with the side of the sock. From the point to the heel of the head is about 33 inches, and the extreme breadth of the heel is about nine. The side of the wedge, called the furrow side, is formed by the mouldboard, which is either made of a block or plank of wood, or of a thick iron plate.

126 Socks.

The sock drawn in this figure is called a SPEAR SOCK, and is chiefly used in coarse or stony ground,

Inſtruments of Huſbandry.

which requires great force to break it up. Another form of the ſock is repreſented in the next figure 4. N° 2. This is called a FEATHER SOCK, and has a cutting edge CF on its furrow ſide, extending back about ten inches, and to the right hand or furrow ſide about ſix. The uſe of this is to cut the ſod below, and detach it from the ground, as the coulter detaches it from the unploughed land. This is of great uſe when the ground is bound together by knotted roots, but it is evident that it cannot be uſed to advantage in very ſtony ground. In general, the feather ſock is only fit for ground which has been under tolerable culture; but it greatly facilitates the labour of ſeparating the ſod. It may reaſonably be aſked, why the feather is not much broader, ſo as to cut the whole breadth of the furrow? This is ſometimes done. But we muſt recollect that the ſod is not only to be puſhed aſide, but alſo to be turned over. If it were completely detached by the feather, and chanced at any time to break on the back of the ſock, it would only be puſhed aſide; but by leaving a little of the ſod uncut, it is held faſt below while it is ſhoved aſide above, which cannot fail to twiſt it round. As the wreſt advances, it eaſily deſtroys the remaining connection, which in general is very ſlight and crumbling.

127 Proper breadth of the ſole.

The breadth of the ſole at the heel determines the width of the furrow. Nine inches will give enough of room for a horſe or man to walk in. A greater breadth is of no uſe, and it expends force in puſhing the earth aſide. It is a miſtake to ſuppoſe that a broad ſole gives more room for the turned ſlice to ſtand on; for whatever is the breadth of the furrow, the ſucceſſive ſlices will be left at their former diſtances, becauſe each is ſhoved aſide at the ſame diſtance. When the breadth of a ſlice exceeds its depth, and it is turned on its ſide, it will now ſtand on a narrow baſe, but higher than before, and therefore will ſtand looſer, which the farmers deſire. But in this caſe it generally falls on its back before it has been far enough removed, and is then puſhed aſide, and left with the graſſy ſide down, which is not approved of. On the other hand, when the depth conſiderably exceeds the breadth, the ſods, now turned on their ſides, muſt be ſqueezed home to the ploughed land, which breaks them and toſſes them up, making rough work. In wet clay ſoil, this is alſo apt to knead them together. On the whole, it is beſt to have the breadth and depth nearly equal. But all this is workmanſhip, and has no dependence on the width of the ſole behind.

128 It ſhould be level.

We have already ſaid that the ſole is generally level from right to left at the heel. This was not the caſe formerly, but the wreſt was conſiderably raiſed behind. It reſulted from this form, that the furrow was always ſhallower on the right ſide, or there was left a low ridge of unſtirred earth between the furrows. This circumſtance alone was a bad practice; for one great aim of ploughing is the renewal of the ſuperficial ſoil. In this way of ribbing the furrows, the ſod tumbles over as ſoon as it is puſhed to the top of the rib on the right of the *rut* made by the plough; the firmeſt parts of it fall undermoſt, and the reſt crumbles above it, making the work appear neat; whereas it is extremely unequal, and what moſt needs the influence of the weather to crumble it down is ſheltered from it. Add to theſe circumſtances, that the hollow is a receptacle for water, with a ſurface which can retain it, having been conſolidated by the preſſure of the plough. For all theſe reaſons, therefore, it ſeems adviſable to form the furrow with a flat or level bottom, and therefore to keep the heel of the wreſt as low as the heel of the head. For the ſame reaſon it is proper to hold the plough with the land ſide perpendicular, and not to heel it over to that ſide, as is frequently done, producing the ſame ribbed furrow as an ill-formed ſole.

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129 Length of the plough

There is great variety of opinions about the length of the plough. If conſidered merely as a pointed inſtrument, or even as a cutting inſtrument acting obliquely on a given length of ſod, there can be no doubt but that it will be more powerful as it is longer: that is, it will require leſs force to pull it through the ground. But it muſt alſo ſhove the earth aſide, and if we double its length we cauſe it to act on twice as much earth at once; for when the plough has entered as far as the heel, the whole furrow ſide is acting together in puſhing the earth to the ſide. Now it is found, that the force neceſſary for puſhing a maſs of earth horizontally along the rough ground is nearly equal to its weight. It would ſeem, therefore, that nothing is to be gained by making the baſe of the plough of a great length, except a greater facility in making the firſt penetration, and this is chiefly performed by the coulter and ſock; and a great length renders the plough heavy and cumberſome; and, by cauſing it to act long on the ſod, tends to knead and cake it.

Nothing very preciſe can be offered on this ſubject. Some ſenſible advantage is derived by making the plough taper, eſpecially forward, where it acts as a boring and cutting inſtrument; and for this purpoſe it is convenient to give the coulter a ſlope of 45 degrees. (This has alſo the advantage of throwing up the ſtones and roots, which it would otherwiſe drive before it through the firm ground.) And for the ſame reaſon the edge of the feather has a great ſlope, it being 10 inches long and only ſix inches broad. But if we purſue this advantage too far, we expoſe ourſelves to another riſk. It is ſometimes neceſſary to heel over the plough to the right, in order to get over ſome obſtruction. In doing this, the coulter is neceſſarily raiſed for a moment, and the ſlanting cut now made by the feather becomes the directing groove for the plough. When the feather has a very long ſlope, this groove has force enough to guide the whole plough; and it is almoſt impoſſible for the ploughman to prevent it from running out of the ground to the land ſide (A). The feather, therefore, ſhould not exceed ten or twelve inches in length.

130 Slope of the coulter and of the feather.

But to return to the length of the plough, from which this obſervation has diverted us a little, we muſt add, that a long plough has a great advantage in the ſteadineſs of its motion, having a much more extenſive ſupport

(A) This is often felt with the excellent plough deſcribed by Mr Arbuthnot of Surry, in the Tranſactions of the Society for the Encouragement of Arts, &c. London.

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support both on the land side and below, and being therefore less affected by its inequalities. Accordingly, they are now made considerably longer than formerly; and 33 inches has been assumed as a proportion to 9 inches in breadth, in conformity to the most approved ploughs now in use.

131 The mould-board.

We come now to treat of the mouldboard. This is the most delicate part of the plough, and is to be seen in the greatest variety in the works of different artists, each of whom has a nostrum of great value in his own opinion. It is here indeed that the chief resistances are exerted and must be overcome; and a judicious form of this part of the plough may diminish them considerably, while it performs the work in the best manner. Without pretending to say that the different resistances are susceptible of an accurate determination, we can still draw sufficient information from palpable rules of mechanics to direct us to what would be nearly the best possible form for a mouldboard. The task to be performed is to raise, push aside, and turn over to a certain degree, a slice already cut off from the firm ground. As we cannot provide for every inequality of the cohesion or tenacity of the earth, our safest way is to consider it as uniform: the weight of it is always so. As we cannot provide for every *proportion* between the tenacity and the weight, we must take an average or medium proportion which is not far from that of equality. Conceiving the slice at first as only tenacious, and without weight, it is an easy problem to determine the form which shall give it the intended twist and removal with the smallest force. In like manner we can proceed with a slice that has weight without tenacity. It is equally easy to combine both in any proportion; and it is easiest of all to make this combination on the supposition of equality of weight and cohesion. Supposing the slice like a brick, we know that it requires the greatest force to *begin* to raise it on one edge, and that the strain becomes less as it rises, till its centre of gravity is perpendicularly above the supporting angle. It requires no force to raise it further; for on pushing it beyond this position, it would fall over of itself, unless withheld by the tenacity of what is not yet raised. But on considering the form or plan of the sock, we find that while the weight of the sod resists most strongly, there is less of it in this situation actually rising, and this nearly in the same proportion with the labour of raising it; and we see that after the sod has attained that position in which it is ready to fall over, it has reached the wider part of the wrest, and is now pushed aside, which requires nearly the same force as to raise it: and this continues to the end of the operation.

When we take all these circumstances into consideration, it appears probable, that the compound resistance does not change much from first to last. If this be really the case, it is an undoubted maxim that the whole operation should proceed equably: if it does not, there must be some part of the sod that makes a resistance greater than the medium; and as the resistances in all this class of motions increase nearly as the squares of the velocities with which they are overcome, it is demonstrable that we shall lose power if we render them unequal.

132 low to be rmed.

Hence we deduce this maxim, *That as the plough advances through equal spaces, the twist and the lateral sliding of the sod should increase by equal degrees.* And this determines *à priori* the form of the mouldboard. This principle occurred to Mr James Small, a plough-maker in Berwickshire, and he published a treatise on the subject in 1784. He has given several methods for constructing mouldboards, which he supposes are in conformity to his principle; but being merely a country artist, and unacquainted with science, his rules do not produce mouldboards having this property of equable operation, although they do not deviate far from it. His book is a very useful and instructive performance, and level to the capacity of those for whom it is intended; and we have here availed ourselves of the author's information on many points.

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The high character which Small's ploughs have maintained for 25 years is a strong argument for the truth of the maxim. We shall therefore give such instructions as will enable any intelligent workman to construct such a mouldboard without any risk of failure; and if future theory or experience should discover any error in the principles from which this maxim is deduced, by showing that either the weight, the tenacity, or the lateral resistance, is exerted according to a different law from what has been assumed, the directions to be given are of such a nature that they adapt themselves with precision to these changes of principle, and will still produce a perfect and efficacious plough. Our readers will readily acknowledge that this is gaining a great point; because at present the instrument is constructed very much at random, and by a guess of the eye.

Let us now return to the wedge formerly made use of for illustrating the action of the plough. Suppose it placed in a furrow already ploughed, and that the space before the line FE (*fig.* 1.), which is square from the line of motion FD, is covered with a piece of cloth or carpet, and that the point of the wedge enters upon it at F, and advances to D. It will evidently raise the cloth, which will now cover the side of the wedge, forming the triangle *f*DE. The line *f*D is what formerly lay in the angle along the line FD, and *f*E formerly lay on FE. It is this line FE therefore that we are to raise, shove aside, and twist round, by equal degrees, while the plough advances through equal spaces.

Now, if the length DF of the plough-wedge, reckoned from the point of the sock to the heel, be 33 inches, and the breadth FE behind be nine inches, the angle DEF or DE*f* will be nearly 74°. The construction of the furrow side of the plough is therefore reduced to this very simple problem, "To make the angle DE*f* turn equably round the axis DE, while the angular point L advances equably from D to E.

133 Description of an instrument for this purpose.

This will be done by means of the following very simple tool or instrument. Let IHFK (*fig.* 5.) be a piece of hard wood, such as oak, a foot long, three inches broad, and an inch thick. Plant on this another piece BHFC of the same breadth, four inches long, and half an inch thick. This will leave beyond it a flat 8 inches long. We shall call this the *flock* of the instrument. Let ABC be a piece of clean oak, half an inch thick, 20 inches long, and three inches broad at the end BC. Let this be fashioned like the style of a sundial, having its angle ABC 74°. Let it have a part BCE square, to the extent of four inches from C, and the rest EA worked into the form of a straight slender rod.

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Let EFG be a ſemicircle of clean plane tree or of metal, four inches radius: faſten this by ſmall ſcrews to the ſquare part of the ſtile CE, ſo that its centre may be at C. Let this ſemicircle be divided into 180 degrees, and numbered from G along the arch GFE, ſo that 0° may be at G, and 180° at E. Let this ſtile and ſemicircle turn round the line BC by means of ſmall hinges. This inſtrument may be called the mouldboard gage, or protractor. When the ſtile is folded down on the ſtock BIK, the point G will be at F; and when it is raiſed up to any angle, the degrees will be pointed out on the ſemicircle by the ſtraight edge CF.

Nothing can be more obvious than the manner of employing this inſtrument once we have determined the moſt proper poſition for the ſod when the work is completed. Now it ſeems to be the opinion of the moſt intelligent framers, that the beſt poſition of the ſod is that repreſented in fig. 6.

134 Proper poſition of the ſod.

Fig. 6. repreſents a ſection of the ground and the working parts of the plough, as viewed by a perſon ſtanding ſtraight before it. ABDC is the unploughed ground, and WB the coulter, kneed in Small's manner. FGKB is the ſection of the plough (or rather of the whole ſpace through which the plough has paſſed, for no part of the plough has this ſection). HOFE is the ſection of a ſlice, puſhed aſide and turned over, ſo as to lean on the next. HE is that ſide of the ſlice which formerly lay on KB. EF is the ſide cut off by the coulter; and FO is the upper or graſſy ſide. The lower corners are ſuppoſed to be a little bruiſed inwards, as muſt generally happen.

The ſod is puſhed 9 inches to the right hand, and it leans with its graſſy ſide on the preceding furrow, in an angle of about 50 degrees. In this poſition the graſs is turned down ſo as to rot; and there is a hollow left below to allow the rain water to run freely off, and to receive the earth as it crumbles down by the weather: and if the harrow is dragged acroſs theſe ridges, it diſtributes along the ſurface the mould which was formerly at the bottom. The ſod has got a twiſt of 130 degrees; but it is evident, that after it has been turned 90 degrees, or even a little before this, it is ready to fall over of itſelf. It is ſufficient therefore that it be turned 90 degrees when the heel of the wreſt has reached it, and the remainder of the twiſt is given to it by the wing or flap of the mouldboard. This, then, dictates to us the manner of applying the inſtrument.

Divide the edge DE (fig. 7.) of the wreſt, or of a lath nailed on it, into 90 equal parts, and continue the diviſions backwards to G in the ſame line to 130. Number the diviſions backwards from the point of the ſock; then place the protractor on the edge of the wreſt, with the point B of fig. 5. at the 90th diviſion (fig. 7.); that is, juſt at the heel, with the ſtock under the wreſt, and the ſtile raiſed to 90°, and preſs it home to the joint, ſo that the ſtock may be ſquare to the edge, and then the ſtile will be in the poſition ſuiting that part of the mouldboard. In like manner ſlide the ſtock forward to the 80th diviſion, and lower the ſtile to 80°, and it will have the poſition which ſuits that part of the mouldboard. In the ſame way ſlide it forward to 70, 60, 50, &c. and lower the ſtile to 70°, 60° 50°, &c. and we ſhall have the poſition for theſe ſeveral parts of the mouldboard; and thus it may be formed to the very point of the ſock, becauſe the ſtraight edge of the wreſt may be continued ſo far. A block of wood may be hewed to fit theſe ſeveral poſitions of the protractor ſtile; and thus, when placed with its ſtraight edge on the outer line of the wreſt, and cut away behind in the land-ſide plane, will be the exact ſhape of the plough-wedge. It would riſe up indeed into a tall piece of ſingular ſhape, gradually tapering down to the point of the ſock; but when cut off parallel to the ground, at the height of about 12 inches, it will form the mouldboard, the front or edge of the ſheath, and the whole back of the ſock except the feather, which is an extraneous piece. The wing or flap of the mouldboard is formed in the ſame manner, by ſliding the ſtock of the protractor to 100, 110, 120, 130, and opening the ſtile to 100°, 110°, 120, 130°. This will extend the top of the mouldboard to about 22 or 23 inches; but the lower part of the wing muſt be cut away, becauſe it would puſh the ſod too far aſide after it has got the proper twiſt. The form of this part ſhould be ſuch as would exactly apply itſelf to a plank ſet at the heel of the wreſt, parallel to the land-ſide of the head, and leaning outward 40 degrees. This will be very nearly the caſe, if it be made a ſweep ſimilar to the edge of the ſheath. Fig. 8. is a reſemblance of the ſurface of the mouldboard; AD being the edge of the ſheath, E the heel of the wreſt, and EBC the wing or flap. When cut through in a perpendicular direction, the ſection is hollow; if cut horizontally it is convex; and if in the direction CE, making an angle of 74° with ED, it is ſtraight. If the protractor be ſet on it at D, and gradually ſlidden backwards, the mouldboard will gradually open the ſtile, and the ſtile will ſkim its whole ſurface without any vacuity between them.

135 How to form the mouldboard.

This form is given to the mouldboard on the authority of the ſuppoſition that the ſum of the reſiſtances ariſing from weight and tenacity remain pretty conſtant in its whole length. This cannot be affirmed with confidence in any caſe, and is by no means true in all. In ſtiff clay ſoils the effects of tenacity prevail, and in light or crumbling ſoils the weight is the chief reſiſtance. The advantage of this mode of conſtruction is, that it can be adapted to any ſoil. If the difficulty of cutting and raiſing the ſod is much greater than that of ſhoving it aſide and turning it over, we have only to make the riſe and twiſt more gentle towards the point of the ſock, and more rapid as we advance; and it is eaſy to do this according to any law of acceleration that we pleaſe. Thus, inſtead of dividing the edge of the wreſt DE (fig. 9.) continued to G into 130 parts, draw a line G*g* perpendicular to it, and draw ſome curve line D*g* convex towards DG, and divide this into equal parts in the points 10, 20, 30, 40, &c; and then draw perpendiculars to the wreſt edge, cutting it in 10, 20, 30, 40, &c. and apply the protractor to theſe points. It is evident that the diviſions of the wreſt line are bigger at D, and grow gradually leſs towards G; and therefore, becauſe each has 10° more twiſt than the preceding, the twiſt will be more rapid as it approaches the end of the mouldboard. This curve may be choſen ſo as to produce any law of acceleration. On the contrary, we produce a retarded or diminiſhed twiſt by making the curve concave towards DG, as repreſented by the dotted curve.

The mathematical reader will obſerve, that this conſtruction

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ſtruction aims at regulating the twiſt round the line of the wreſt ED. This does not produce preciſely the ſame regulation round the line FD, which is the line of the plough's motion, and of the ſod's poſition before it is ploughed over. The difference, however, is not worth attending to in a matter ſo little ſuſceptible of preciſion. But the twiſt round the line FD may be regulated according to any law by this inſtrument with equal facility. Inſtead of placing the ſtock of the protractor ſquare with the edge of the wreſt, it may be placed ſquare with the land ſide of the plough. To do this, draw a line BL (fig. 5. No 2.) acroſs the ſtock from the point B, making the angle LBC 16°, and put a braſs pin at L, making a hole in the ſtyle that it may not be prevented from the folding down. Then, in uſing the inſtrument, let the points B and L reſt againſt the edge of the wreſt, and proceed as directed.

A ſtill greater variety of forms, and accommodation to particular views, with the ſame general dependence on principle, will be procured by giving the rod BA a motion round B in the plane of the ſtile, ſo as to form a ſtile of a variable angle.

A tool may even be conſtructed in which the rod BA might be a cutting knife: and the whole may be led along by a ſcrew, while this knife turns round according to any law, and would gradually pare away the mouldboard to the proper form.

Thus have we reduced the faſhioning the operative part of the plough to a rule which is certain. We do not mean by this, that a mouldboard made according to the maxim now given will make the beſt poſſible plough; but we have given a rule by which this part of the plough can be made unequivocally of a certain quality by every workman, whatever this quality may be, and this without being obliged to copy. No deſcription of any curve mouldboard to be met with in books has this advantage; and we ſay that this rule is capable of any ſyſtematic variation, either with reſpect to the width of furrow, or the quantity or variation of its twiſt. We have therefore put it in the power of any intelligent perſon to make ſuch gradual and progreſſive changes as may ſerve to bring this moſt uſeful of all inſtruments to perfection. The angle of the head and wreſt, and the curve for dividing the wreſt-line, can always be expreſſed in writing, and the improvements communicated to the public at large.

136 Mode of the plough's action.

After this deſcription of the working parts of a plough, and directions for giving it the moſt effective form, it will not be improper to conſider a little its mode of action, with the view of attaining a more diſtinct conception of what is done by the ploughman and the cattle, and to direct him in his procedure.

Returning again to the wedge (fig 1.), we ſee that it is preſſed down at the point D, and as far back along the mouldboard as its ſurface continues to look upward, that is, all the way to the heel of the wreſt. Behind this, the perpendicular ſections of the mouldboard overhang, and look downward; and here, while preſſing down the ſod, the plough is preſſed upwards. Theſe two preſſures tend to twiſt the plough round a tranſverſe line ſomewhere between the heel and the point. The plough therefore tends to riſe at the heel, and to run its point deeper into the ground. Upon the whole, the preſſure downwards is much greater than the upward preſſure. It is exerted over a much greater ſpace, and is greater in moſt parts of that ſpace. Behind, very little downward preſſure is neceſſary, the ſod being ready to fall down of itſelf, and only requiring a gentle touch to lay it in a proper poſition.

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In like manner the plough is preſſed backward by the reſiſtance made to the coulter and ſock, and part of the reſiſtance made to the ſloping ſide of the mouldboard: and it is preſſed to the left by the other part of the preſſure on the ſock and mouldboard.

All theſe preſſures muſt be balanced by the joint action of the cattle, the reſiſtance of the bottom, and the reſiſtance of the firm ground on the left-hand or land-ſide.

It is the action of the cattle, exerted on that point to which they are attached, which produces all theſe preſſures. It is demonſtrated by the principles of mechanics, that this force muſt not only be equal to the mean or compound force of theſe reſiſting preſſures, but muſt alſo be in the oppoſite direction.

It is further demonſtrated, that if a body be dragged through any reſiſting ſubſtance by a force acting on any point G, and in any direction whatever GH, and really moves uniformly in that direction, the force exerted exactly balances the reſiſtances which it excites, both as to quantity and direction: And if the body advances without turning round the point by which it is dragged, the reſiſtances on one ſide of this point are in equilibrio with thoſe on the oppoſite ſide.

And, laſtly, it is demonſtrated, that when this equilibrium is obtained, it is indifferent to what point in the line GH the force is applied. Therefore, in fig. 3. N° 1. the force acting in the direction HO may either be applied to the point of the beam H, or to the point N of the coulter, or to the point O of the ſock.

When therefore a plough advances ſteadily, requiring no effort of the ploughman to direct it, if the line of draught OM (fig. 10.) be produced backwards to the point G of the mouldboard, that point is the place round which all the reſiſtances balance each other. This point may be called the *centre of reſiſtance* and the *centre of action*.

It would be of importance to determine this point by principle; but this can hardly be done with preciſion even in a plough of a known form: and it is impoſſible to do it in general for all ploughs, becauſe it is different in each. It even varies in any plough by every variation of the proportion between the weight and the coheſion of the ſod. We ſee how it can be found experimentally in any given uniform ſod, viz. by producing backwards the line of draught. Then, if the draught rope, inſtead of being fixed to the muzzle of the beam, were fixed to this point, and if it were pulled in the ſame direction, the plough would continue to perform its work without any aſſiſtance from the ploughman, while the ſod continued uniform. But the ſmalleſt inequality of ſod would derange the plough ſo as to make it go entirely out of its path. Should the reſiſtances between G and D prevail, the plough would go deeper, which would increaſe the reſiſtances on that ſide where they already exceed, and the plough would run ſtill deeper. Should the reſiſtances behind G prevail, the heel would be preſſed down, and the point would riſe, which would ſtill farther deſtroy the equilibrium, and, producing a greater deviation from the

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the right path, would quickly throw the plough out of the ground.

For theſe reaſons we muſt not think of attaching the draught to the centre of reſiſtance; but muſt contrive a point of draught, ſuch as ſhall reſtore the plough to its proper poſition when it has been driven out of it by any obſtruction.

137 Muzzle of the beam.

The muzzle or end of the beam is a point which will completely ſuit our purpoſe. For ſuppoſe that the reſiſtance on the back of the ſock has prevailed, and the plough MNFD (fig. 10.) has taken the poſition *m n f d* repreſented by the dotted lines, the draught line GMO is brought down into the poſition *g m o*, diverging a little from GMO, and meeting the mouldboard in a point *g* conſiderably before G. By this means the reſiſtances on the hinder ſide of *g* are increaſed, and thoſe before it are diminiſhed, and the plough quickly regains its former poſition.

138 The point of draught.

From theſe obſervations it is plain, that whatever is the ſituation of the centre of reſiſtance, the point of draught may be ſo choſen that the action of the cattle ſhall be directly oppoſed to the reſiſtance of the ground, and that moreover the plough ſhall have no tendency either to go deeper or to run out. This is the uſe of the apparatus at the point of the beam, called the muzzle, repreſented at H (fig. 3.). It turns round a bolt *i* through the beam, and can be ſtopped at any height by another pin *k* put through the holes in the arch *l m*. A figure is given of the muzzle immediately below, as it appears when looking down on it. The eye to which the draught rope is hooked is ſpread out horizontally, as ſhown by HK, and has ſeveral notches O in it, to either of which the hook can be applied. This ſerves to counteract any occaſional tendency which the plough may have to the right or left.

When the plough goes on ſteadily, without any effort of the ploughman, it is ſaid to be in trim, and to ſwim fair; the preſſure before and behind the centre of action being in equilibrio with each other. In order to learn whether a plough will be in this manner under management, hook the draught ropes as high as poſſible.

139 Of the plough in trim.

In this ſtate the plough ſhould have a continual tendency to riſe at the heel, and even to run a little into the ground. Then hook the rope as low as poſſible. The plough ſhould now preſs hard on the furrow with the heel, and have ſome tendency to run out of the ground. If both theſe are obſerved, the plough is properly conſtructed in this reſpect; if not, it muſt be altered, either by changing the poſition of the ſock or that of the beam. Lowering the end of the beam will correct the tendency of the plough to go deeper; the raiſing the point of the ſock will alſo have the ſame effect. But it is of conſiderable importance not to take the point of the ſock out of the plane of the ſod, and it is much better to make the alteration by the beam. The ſlope of the coulter has a conſiderable effect, but it cannot be placed very far from the inclination of 45° without the riſk of choaking the plough by driving the roots and ſtones before it. It is of great conſequence to have the coulter ſit exactly in the direction of the plough's motion: if it is in any other direction, it will powerfully twiſt the plough into its own track. As it muſt be fixed in the middle of the beam's thickneſs to have ſtrength, it is removed a little from the plane of the land ſide, and it was the uſual practice to point it to the left below to compenſate for this; but this by no means removes the diſpoſition to twiſt, and it expoſes to the riſk of catching a ſtone between its point and that of the ſock, which muſt now be driven forward through the firm ground at a great expence of labour to the cattle. Mr Small has very ingeniouſly remedied this by giving the coulter a ſhort knee to the left immediately below the beam, and thus pointing it downwards in the plumb of the land ſide. See fig. 6.

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It is not without its uſe to know the abſolute force neceſſary for tilling the ground. This has been frequently meaſured with a ſpring ſteelyard. One of Small's ploughs, worked by two horſes, and employed in breaking up ſtiff land which had been ploughed before winter, and much conſolidated by the rains, required a force of 360lbs. avoirdupois; and we may ſtate this as the ordinary rate of ſuch work; but moderately firm ſod, under good culture, requires at a medium 320lbs.

As we with to embrace every opportunity of rendering this work uſeful to the public, we ſhall conclude this article with an account of a plough which has juſt now been recommended to public notice by the Scots Highland Society as extremely proper for a hilly country. The inventor, the Rev. Alexander Campbell miniſter at Kilcalmonell in Argyleſhire, was honoured with the ſociety's gold medal, value 25l.

140 The Argyleſhire plough.

A, the ſock (fig. 11.); the land-ſide of which ſupplies the place of the coulter, and the ſole of it ſerves for a feather; it is 18 inches long, and is made of a plate of iron 12 inches broad when finiſhed, and ſomewhat under half an inch thick.—B, the head; to be made of iron in a triangular form, 4 inches broad by 2 inches at the thickeſt part. There are 5 inches of the head fixed in the ſock.—C, the beam, 4 inches thick by 5 inches deep, gradually tapered thinner; the length 6 feet.—E, the ſheath, muſt be of the ſame thickneſs with the beam above and the head below, and is five inches broad. An iron ſcrew-bolt connects the beam and head behind the ſheath.—F, the handles are ſo made that the ſlope of the mouldboard, which is fixed to one of them, may be the longer and more gradual. They are 5 feet 8 inches long, and 2 feet 4 inches aſunder at the ends.—G, the mouldboard, conſiſts of 7 rounded ſticks two inches in diameter; the covert of them is in the plane of the ſole, the reſt in ſucceſſion cloſe to each other above it. This makes the mouldboard 14 inches broad. To prevent any earth from getting over the mouldboard, a thin deal 4 or 5 inches broad is fixed above it. The mouldboard, land ſide, and ſole of the plough, are clad with iron.—The length is 20 inches: this added to 18 inches, the length of the ſock, makes the length from point to heel 3 feet 2 inches.—The muzzle or bridle OPH is alſo of a more convenient and better conſtruction than thoſe commonly in uſe. By means of the ſcrew pins at L and M, different degrees of land may be given to the plough; the iron rod LH being thereby moved ſidewiſe in the ſocket LN, and up and down by OP. The rod is 30 inches long, one broad, and half an inch thick. It is hooked into a ſcrewbolt at H. Two inches of the rod project at N, in the form of an eye, before the muzzle, to receive the hook of the croſtree.

The advantages of this plough are ſaid to be: It is not ſo liable to be interrupted or turned out of its courſe by

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by ſtones, roots, &c. as other ploughs are; nor does it dip ſo deep as to be liable to be broken by large ſtones or flags. The motion of the muzzle is alſo thought an improvement. Another advantage it has over other ploughs is, its not being ſo liable to be choaked up by ſtubble, &c. This we underſtand to be its chief excellency, and an object much deſired in the conſtruction of the plough. Upon the whole, we are informed that this plough is lighter, leſs expenſive, and leſs liable to go out of trim than the ordinary plough, and that with it two horſes can plough land which require four with any other plough.

141 Objections to its conſtruction.

Such are ſaid to be the advantages of this conſtruction; but we cannot help expreſſing our apprehenſion that the uniting the coulter and feather at the point of the ſock will expoſe the plough to great riſks of being put out of order. When the upright edge ſtrikes a ſtone obliquely, eſpecially on the land-ſide, it muſt be violently twiſted round the point of the head; and, having but a moderate thickneſs at this part, may be broken or permanently twiſted. The plough will then be continually running out of its direction: and we apprehend that this defect cannot be amended without taking off the ſock and putting it in the fire. When a coulter is bent by the ſame cauſe, the ploughman can either rectify it by altering the wedging, or he can ſtraighten it in the field; and it muſt be obſerved, that the plough oppoſes much leſs reſiſtance to the derangement of this ſort of coulter than of the common one. In the common coulter the ſtrain does not ſo much tend to twiſt the plough round the line of its motion, as to preſs it wholly to landward. The reſiſtance to this is great; but a very moderate force will twiſt it round its line of motion. In either caſe, if the blow be given in that point of the coulter where the draught line croſſes it, there will be no twiſt of the whole plough, but the point of the plough will be forced horizontally to or from the land. When the blow is out of this line, the ſtrain tends to twiſt the beam or the plough. Experience will determine which of the two is the moſt hazardous. Theſe ploughs were made by Thomas Lindſay, Abbeyhill, Edinburgh, and models are to be ſeen in the hall of the Highland Society.

142 cots lough.

The plough conſtructed in the following manner is ſtill the moſt common and the moſt generally underſtood in Scotland; and, if properly made, is the beſt for anſwering all purpoſes, when only one is uſed; though others are, perhaps, more proper on ſome particular occaſions.

143 eſcription the Scots ough.

The parts of which this plough is compoſed, are, the head, the beam, the ſheath, the wreſt, the mouldboard, the two handles, the two rungs, the ſock, and the coulter; the two laſt are made of iron, and all the reſt of wood.

late VII. fig. 1.

The HEAD is deſigned for opening the ground below. The length of the head from A to B is about 20 inches, and the breadth from A to D above five inches; C is the point upon which the ſock is driven, and the length from B to C is about ſix inches; *a* is the mortiſe into which the larger handle is fixed, and *b* is the mortiſe into which the ſheath is fixed.

The head is that part of the plough which goes in the ground; therefore the ſhorter and narrower it is, the friction will be the leſs, and the plough more eaſily drawn; but the longer the head is, the plough goes more ſteadily, and is not ſo eaſily put out of its direction by any obſtructions that occur. Twenty inches is conſidered as a mean length; and five inches as the moſt convenient breadth. Inſtruments of Huſbandry.

The SHEATH, E, is driven into the mortiſe *b*, and thus fixed to the head AB. It is not perpendicular to the head, but placed obliquely, ſo as to make the angle formed by the lines AB and EB about 60 degrees. The ſheath is about 13 inches long, beſides what is driven into the mortiſe *b* (fig. 1.); about three inches broad, and one inch thick. Fig. 2.

The ſheath is fixed to the mouldboard, as in fig. 11. E, in the ſame manner as the wreſt is fixed to the head in fig. 7. Fig. 3.

The MOULDBOARD is deſigned to turn over the earth of the furrow made by the plough; and it is obvious, that, according to the poſition of the ſheath, the mouldboard will turn over the earth of the furrow more or leſs ſuddenly. Beſides, when it forms a leſs angle with the head than 60 degrees, the plough is in great danger of being *choked*, as the farmers term it.

The larger HANDLE, FA, is fixed to the head, by driving it into the mortiſe *a* (fig. 1.). It is placed in the ſame plane with the head; and its length from AF is about five feet four inches, and its diameter at the place where it is fixed to the beam is about two inches and a half, and tapers a little to the top F. About ten inches from A, there is a curve in the handle, which, when F is raiſed to its proper height, makes the lower part of it nearly parallel to the ſheath EB. This curve is deſigned to ſtrengthen the handle. The proper poſition of the handle is, when the top F is about three feet two inches higher than the bottom of the head AB. Fig. 3

The longer the handles, the plough is the more eaſily managed, becauſe the levers are more diſtant from the centre of motion. The higher the top of the handles, the plough is more eaſily raiſed out of the ground, provided they be no higher than the lower part of a man's breaſt.

The BEAM is fixed to the larger handle and the ſheath, all of which are placed in the ſame plane with the head. The length of it, from H to I, is about ſix feet; its diameter is about four inches. When the plough is in the ground, the beam ſhould be juſt high enough not to be incommoded by any thing on the ſurface. Fig. 4.

The poſition of the beam depends on the number of cattle in the plough. When two horſes are yoked, the beam ſhould be placed in ſuch a manner as to make the perpendicular diſtance betwixt the bolt-hole of the beam and the plane of the head about 21 inches; when four horſes are yoked, two a-breaſt, this diſtance ſhould only be about 18 inches.

The SOCK, BP, is fixed to the end of the head, and is about two feet long. In fitting the ſock to the head, the point ought to be turned a little to the land or left ſide; becauſe otherwiſe it is apt to come out of the land altogether. When turned to the left, it likewiſe takes off more land; when turned upwards, the plough goes ſhallow; and when downwards, it goes deeper. Fig. 5.

The COULTER is fixed to the beam, and is about two feet ten inches long, two inches and a half broad, ſharp at the point and before, and thick on the back, Fig. 6

like

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like a knife. It is fixed and directed by wedges, so as to make the point of it equal to, or rather a little before, the point of the sock, and upon a line with the left side of the head. This oblique position enables it to throw roots, &c. out of the land, which requires less force than cutting or pushing them forward.

Fig. 7. The WREST, BD, is fixed to the head, and is about 26 inches long, two broad, and one thick. It is fixed to the head at B, in such a manner as to make the angle contained between the lines AB and BD about 25 degrees. The wrest is seldom or never placed in the same plane with the head, but gradually raised from the place where it is fixed to it; that is, from B to K, as in fig. 8. The position of the wrest determines the nature of the furrow. When the wrest is wide and low set, the furrow is wide; and when it is narrow and high set, the furrow is narrow.

Fig. 9. represents the two HANDLES, fixed together by the two rungs. The larger handle has already been described; the lesser one is a few inches shorter, and does not require to be quite so strong. The distance of the handles at the little rung depends on the position of the wrest. Their distance at M and P is about two feet six inches. The lesser handle is fixed to the mouldboard at M, fig. 10. and to the wrest KB, at L.

Fig. 11. represents the plough complete, by joining together figures 6. and 10. in the sheath E B. The wrest BK is supposed to make an angle with the head AB as in fig. 7. and the handles joined together as in fig. 9.

After having giving such a particular description of all the parts and proportions of the Scots plough, it will easily appear how it separates, raises, and turns over the earth of the furrow. If it had no coulter, the earth would open above the middle of the sock, and in a line before the sheath; but as the coulter opens the earth in a line with the left side of the head, if the soil has any cohesion, the earth of the furrow will be wholly raised from the left side, and, as the sock moves forward, will be thrown on the right side of the sheath, and by the casting out of the mouldboard, or the raising of the wrest, will be turned over.

Fig. 12. The BRIDLE or MUZZLE, is another article belonging to the plough. It is fixed to the end of the beam, and the cattle are yoked by it. The muzzle commonly used is a curved piece of iron, fixed to the beam by a bolt through it. ABC is the muzzle, AC the bolt by which it is fixed to the beam; D is the swingle-tree or cross-tree, to which the traces are fixed; and B is a hook or *cleek*, as it is commonly called, which joins the muzzle and swingle-tree.

Fig. 13. Some use another kind of muzzle, ABCD. It is fixed to the beam by two bolts, and has notches by which the cleek of the swingle-tree may be fixed either to the right or the left of the beam. There are also different holes for the hind bolt to pass through, by which the draught may be fixed either above or below the beam. AD is the fore bolt upon which the muzzle turns; on BC are four notches, betwixt any two of which the cleek of the swingle-tree may be fixed. When the cleek is fixed at B, the plough is turned towards the firm land, and takes off a broader furrow; and when fixed at C, it is turned towards the ploughed land, and takes off a narrower furrow. E and F are the holes on each side through which the hindmost bolt passes. When the bolt is put through the highest two, these holes being thereby brought to the middle of the beam, the fore part of the muzzle is raised above the beam, and the plough is made to go deeper, and when put through the lowest two, the fore part of the muzzle is sunk below the beam, and the plough is made to go shallower. This muzzle may be so constructed as to have the same play with the common one. A is the end of the beam; B a plate of iron sunk into it, and, with a similar one in the other side, is rivetted into it by bolts; C is the muzzle fixed to these plates of iron by the bolt D, which bolt may be put through any of the holes EE. From the construction of this muzzle it is plain, that it has the same play with the common one, and that by it the land of the plough may be altered at pleasure.

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Fig. 16.

144 Properties of the Scots plough.

Of all forms, that of the Scots plough is the fittest for breaking up stiff and rough land, especially where stones abound; and no less fit for strong clays hardened by drought. The length of its head gives it a firm hold of the ground; its weight prevents it from being thrown out by stones; the length of the handles gives the ploughman great command to direct its motion; and by the length of its head, and of its mouldboard, it lays the furrow-slice cleverly over. This plough was contrived during the infancy of agriculture, and was well contrived: in the soils above described it has not an equal.

145 In what soil improper.

But in tender soil it is improper, because it adds greatly to the expence of ploughing, without any counterbalancing benefit. The length of the head and mouldboard increases the friction, and consequently it requires a greater number of oxen or horses than are necessary in a shorter plough. There is another particular in its form that resists the draught: the mouldboard makes an angle with the sock, instead of making a line with it gently curving backward. There is an objection against it no less solid, that it does not stir the ground perfectly: the hinder part of the wrest rises a foot above the sole of the head: and the earth that lies immediately below that hinder part, is left unstirred. This is ribbing land below the surface, similar to what is done by ignorant farmers on the surface.

These defects must be submitted to in a soil that requires a strong heavy plough; but may be avoided in a cultivated soil by a plough differently constructed. Of all the ploughs fitted for a cultivated soil free of stones, that already mentioned, which was introduced into Scotland about 20 years ago, by James Small in Blackadder Mount, Berwickshire, is the best. It is now in great request; and with reason, as it avoids all the defects of the Scots plough. The shortness of its head and of its mouldboard lessens the friction greatly: from the point of the sock to the back part of the head it is only 30 inches; and the whole length, from the point of the beam to the end of the handles, between eight and nine feet. The sock and mouldboard make one line gently curving; and consequently gather no earth. Instead of a wrest, the under edge of the mouldboard is one plane with the sole of the head; which makes a wide furrow, without leaving any part unstirred. It is of late commonly termed the *chain plough*, because it is drawn by an iron chain fixed to the back part of the beam immediately before the coulter. This has two advantages: first, by

146 Chain-plough. Plate VI fig. 1.

means

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means of a muzzle, it makes the plough go deep or ſhallow; and, next, it ſtreſſes the beam leſs than if fixed to the point, and therefore a ſlenderer beam is ſufficient.

As we have already ſufficiently explained the ſpeculative principles upon which this plough is formed, we ſhall only remark, that it is proper for loams, for carſe clays, and, in general, for every ſort of tender ſoil free of ſtones. It is even proper for opening up paſture ground, where the ſoil has been formerly well cultivated.

147 The ſock. Plate VII.

A ſpiked ſock is uſed in the Scots plough. The difference between it and the feathered ſock will be beſt underſtood by comparing their figures. Fig. 14. is the common ſock, and fig. 15. the feathered one.

From the conſtruction of the feathered ſock, it is obvious, that it muſt meet with greater reſiſtance than the common ſock. However, when the plough takes off the earth of the furrow broader than that part of the ſock which goes upon the head, it is more eaſily drawn than the plough with the common ſock; for the earth which the common ſock leaves to be opened by the wreſt, is more eaſily opened by the feather of the other ſock. In ley, the feathered ſock makes the plough go more eaſily, becauſe the roots of the graſs, which go beyond the reach of the plough, are more eaſily cut by the feather than they can be torn aſunder by the common ſock. The feathered ſock is alſo of great uſe in cutting and deſtroying root weeds. The common ſock, however, anſwers much better in ſtrong land.

It is proper here to add, that in fitting the feathered ſock to the head, the point of it ſhould be turned a little from the land, or a little to the right hand.

148 Ignorance of farmers in Scotland not a few years ago.

If we look back 40 years, ploughs of different conſtructions did not enter even into a dream. The Scots plough was univerſally uſed, and no other was known. There was no leſs ignorance as to the number of cattle neceſſary for this plough. In the ſouth of Scotland, ſix oxen and two horſes were univerſal; and in the north, 10 oxen, ſometimes 12. The firſt attempt to leſſen the number of oxen was in Berwickſhire. The low part of that county abounds with ſtone and clay marl, the moſt ſubſtantial of all manures, which had been long uſed by one or two gentlemen. About 30 years ago it acquired reputation, and ſpread rapidly. As two horſes and two oxen were employed in every marl cart; the farmer, in ſummer fallowing, and in preparing land for marl, was confined to four oxen and two horſes. And as that manure afforded plenty of ſucculent ſtraw for oxen, the farmer was ſurpriſed to find that four oxen did better now than ſix formerly. Marling, however, a laborious work, proceeded ſlowly, till people were taught by a noted farmer in that country, what induſtry can perform by means of power properly applied. It was reckoned a mighty taſk to marl five or ſix acres in a year. That gentleman, by having plenty of red clover for his working cattle, accompliſhed the marling of 50 acres in a ſummer, and once of 54. Having ſo much occaſion for oxen, he tried with ſucceſs two oxen and two horſes in a plough; and that practice became general in Berwickſhire.

Now here appears with luſtre the advantage of the chain-plough. The great friction occaſioned in the Scots plough by a long head, and by the angle it makes with the mouldboard, neceſſarily requires two oxen and two horſes, whatever the ſoil be. The friction is ſo much leſs in the chain-plough, that two good horſes are found ſufficient in every ſoil that is proper for it. Beſides, the reducing the draught to a couple of horſes has another advantage, that of rendering a driver unneceſſary. This ſaving on every plough, where two horſes and two oxen were formerly uſed, will, by the ſtricteſt computation, be 15l. ſterling yearly; and where four horſes were uſed, no leſs than 20l. ſterling. There is now ſcarce to be ſeen in the low country of Berwickſhire, or in the Lothians, a plough with more than two horſes; which undoubtedly in time will become general. We know but of one further improvement, that of uſing two oxen inſtead of two horſes. That draught has been employed with ſucceſs in ſeveral places; and the ſaving is ſo great, that it muſt force its way everywhere, providing only a breed of oxen with a quick ſtep could be obtained. It may be confidently affirmed, no ſoil ſtirred in a proper ſeaſon, can ever require more than two horſes and two oxen in a plough, even the ſtiffeſt clay. In all other ſoils, two good horſes, or two good oxen abreaſt, may be relied on for every operation of the chain-plough.

149 Advantages of the chain-plough particularly illuſtrated.

A chain-plough of a ſmaller ſize than ordinary, drawn by a ſingle horſe, is of all the moſt proper for horſe-hoeing, ſuppoſing the land to be mellow, which it ought to be for that operation. It is ſufficient for making furrows to receive the dung, for ploughing the drills after dunging, and for hoeing the crop.

150 A ſmall ſingle-horſe plough recommended for various purpoſes.

A ſtill ſmaller plough of the ſame kind may be recommended for a kitchen garden. It can be reduced to the ſmalleſt ſize, by being made of iron; and where the land is properly dreſſed for a kitchen garden, an iron plough of the ſmalleſt ſize drawn by a horſe will ſave much ſpade-work. In Scotland, forty years ago, a kitchen garden was an article of luxury merely, becauſe at that time there could be no cheaper food than oatmeal. At preſent, the farmer maintains his ſervants at double expence, as the price of oatmeal is doubled; and yet he has no notion of a kitchen garden more than he had thirty years ago. He never thinks, that living partly on cabbage, kail, turnip, carrot, would ſave much oatmeal: nor does he ever think, that change of food is more wholeſome, than vegetables alone, or oatmeal alone. We need not recommend potatoes, which in ſcanty crops of corn have proved a great bleſſing; without them, the labouring poor would frequently have been reduced to a ſtarving condition. Would the farmer but cultivate his kitchen garden with as much induſtry as he beſtows on his potato crop, he needed never fear want; and he can cultivate it with the iron plough at a very ſmall expence. It may be held by a boy of 12 or 13; and would be a proper education for a ploughman. But it is the landlord who ought to give a beginning to the improvement. A very ſmall expence would encloſe an acre for a kitchen garden to each of his tenants; and it would excite their induſtry, to beſtow an iron plough on thoſe who do beſt.

Nor is this the only caſe where a ſingle-horſe plough may be profitably employed. It is ſufficient for ſeed-furrowing barley, where the land is light and well-dreſſed.

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dreſſed. It may be uſed in the ſecond or third ploughing of fallow, to encourage annual weeds, which are deſtroyed in ſubſequent ploughings.

151 Rotheram Plough, Plate IX. fig. 3.

The *Rotheram plough* is a machine of very ſimple conſtruction, and eaſily worked. AB is the beam, CD the ſheath, EBD the main handle, FR the ſmaller handle, GH the coulter, KI the ſock or ſhare, NP the bridle, S the fly-band, and ML a piece of wood in place of a head. The whole of this plough ſhould be made of aſh or elm; the irons ſhould be ſteeled and well tempered; and that part of the plough which is under ground in tilling ſhould be covered with plates of iron. The difference between this and the common plough ſeems to conſiſt in the bridle at the end of the beam, by which the ploughman can give the plough more or leſs land by notches at N, or make it cut deeper or ſhallower by the holes at P; in the coulter or ſhare, which is ſo made and ſet as to cut off the new furrow without tearing; and in the mouldboard, which is ſo ſhaped at firſt to raiſe a little, and then gradually turn over, the new cut furrow with very little reſiſtance. But the greateſt advantage attending it, is its being ſo eaſy of draught, that it will do double the work of any common plough.

152 The Paring Plough. Plate IX. fig. 4.

The *paring plough* is an inſtrument uſed in ſeveral parts of England for paring off the ſurface of the ground, in order to its being burnt. Mr Bradley has given the following deſcription of a very ſimple inſtrument of this kind: From A to A (fig. 15.) is the plough-beam, about ſeven feet long, mortiſed and pinioned into the block B, which is of clean timber without knots. CC are the ſheaths or ſtandards, made flat on the inſide, to cloſe equally with the paring plate, and faſtened to it with a bolt and key on each ſide, as at D. E is the paring plate of iron laid with ſteel, about four inches wide, and from 12 to 18 inches long. This plate muſt be made to cut on the ſides, which are bolted to the ſtandards as well as at the bottom part. FF are two iron braces to keep the ſtandards from giving way: theſe ſtandards muſt be mortiſed near their outſides and through the block. GG are the plough handles, which muſt be fixed ſlopeways between the beam and the ſtandards. The pin holes in the beam, the uſe of which is to make this plough cut more or leſs deep, by fixing the wheels nearer to or farther from the paring plate, ſhould not be above two inches aſunder.

153 The Four-coultered Plough, Plate IX.

Fig. 1. repreſents the four-coultered plough of Mr Tull. Its beam is ten feet four inches long, whereas that of the common plough is but eight. The beam is ſtraight in the common plough, but in this it is ſtraight only from *a* to *b*, and thence arched; ſo that the line let down perpendicularly from the corner at *a*, to the even ſurface on which the plough ſtands, would be 11¼ inches; and if another line were let down from the turning of the beam at *b* to the ſame ſurface, it would be one foot eight inches and a half; and a third line let down to the ſurface from the bottom of the beam at that part which bears upon the pillow, will ſhow the beam to be two feet ten inches high in that part. At the diſtance of three feet two inches from the end of the beam *a*, at the plough-tail, the firſt coulter, or that next the ſhare, is let through; and at 13 inches from this, a ſecond coulter is let through: a third at the ſame diſtance from that; and, finally, the fourth at the ſame diſtance from the third, that is, 13 inches, and from *a* to *b* is ſeven feet.

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The crookedneſs of the upper part of the beam of this plough is contrived to avoid the too great length of the three foremoſt coulters, which would be too much if the beam was ſtraight all the way; and they would be apt to bend and be diſplaced, unleſs they were very heavy and clumſy. Aſh is the beſt wood to make the beam of, it being ſufficiently ſtrong, and yet light. The theat in this plough is to be ſeven inches broad. The fixing of the ſhare in this, as well as in the common plough, is the niceſt part, and requires the utmoſt art of the maker; for the well-going of the plough wholly depends upon the placing this. Suppoſing the axis of the beam, and the left ſide of the ſhare, to be both horizontal, they muſt never be ſet parallel to each other; for if they are, the tail of the ſhare bearing againſt the trench as much as the point, would cauſe the point to incline to the right hand, and it would be carried out of the ground into the furrow. If the point of the ſhare ſhould be ſet ſo, that its ſide ſhould make an angle on the right ſide of the axis of the beam, this inconvenience would be much greater; and if its point ſhould incline much to the left, and make too large an angle on that ſide with the axis of the beam, the plough would run quite to the left hand; and if the holder, to prevent its running quite out of the ground, turns the upper part of his plough towards the left hand, the pin of the ſhare will riſe up, and cut the furrow diagonally, leaving it half unploughed. To avoid this and ſeveral other inconveniences, the ſtraight ſide of the ſhare muſt make an angle upon the left ſide of the beam; but that muſt be ſo very acute a one, that the tail of the ſhare may only preſs leſs againſt the ſide of the trench than the point does. This angle is ſhown by the pricked lines at the bottom of fig. 9. where *ef* is ſuppoſed to be the axis of the beam let down to the ſurface, and *gf* parallel to the left ſide of the ſhare: and it is the ſubtenſe *eg* that determines the inclination which the point of the ſhare muſt have towards the left hand. This ſubtenſe, ſays Mr Tull, at the fore-end of an eight-feet beam, ſhould never be more than one inch and a half, and whether the beam be long or ſhort, the ſubtenſe muſt be the ſame.

The great thing to be taken care of, is the placing the four coulters; which muſt be ſo ſet, that the four imaginary places deſcribed by their four edges, as the plough moves forward, may be all parallel to each other, or very nearly ſo; for if any one of them ſhould be very much inclined to, or ſhould recede much from, either of the other, then they would not enter the ground together. In order to place them thus, the beam muſt be carefully pierced in a proper manner. The ſecond coulter-hole muſt be two inches and a half more on the right hand than the firſt, the third muſt be as much more to the right of the ſecond, and the fourth the ſame meaſure to the right hand of the third; and this two inches and a half muſt be carefully meaſured from the centre of one hole to the centre of the other. Each of theſe holes is a mortiſe of an inch and a quarter wide, and three inches and a half long at the top, and three inches at the bottom. The two oppoſite ſides of this hole are parallel to the top and bottom, but the back is oblique, and determines the obliquity

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obliquity of the ſtanding of the coulter, which is wedged tight up to the poll. The coulter is two feet eight inches long before it is worn: the handle takes up ſixteen inches of this length, and is allowed thus long, that the coulter may be driven down as the point wears away. As to the wheels, the left hand wheel is 20 inches diameter, and that on the right hand two feet three inches, and the diſtance at which they are ſet from each other is two feet 5½ inches.

154 Patent Sward-cutter, Plate IX.

2. The Patent Sward-cutter.

The different parts of this inſtrument are repreſented by N° 1. 2. 3. of fig. 6. AA, &c. a ſquare frame three feet four inches from the fore to the hind part, by four feet three inches, the breadth of the machine within ſide; the timber (when of fir) four inches ſquare, placed on two wheels BB three feet diameter, a little more or leſs (the old fore-wheels of a chaiſe may anſwer the purpoſe), to ſupport the hind part of the machine.

CC, &c. are ſix ſtrong pieces of wood, called *bulls*, three feet long, five inches and a half broad, the thickneſs ſix inches at E, and tapering to three inches at F. Into theſe bulls are fixed the cutting wheels, which are iron, 13 inches diameter, ¼ths of an inch thick at the centre, about an inch diameter, for piercing holes to fix the iron axles in; from that they are to be of ſuch thickneſs, as to allow the edges to be well ſteeled. The wheels are fixed by two bolts going through the bulls, with eyes on one end for the axles of the wheels to run in, and nuts and ſcrews on the other to make them very firm by being ſunk in the bulls, to prevent their interfering with the weights LL, &c. reſting on them.

GG, &c. are hollow pieces of wood, called *thorles*, each 3½ inches long, which encloſe the bolt MM, and keep the bulls CC, &c. at their proper diſtances, but may be made longer or ſhorter at pleaſure, according as the ſward requires to be cut in larger or ſmaller pieces. They are in two pieces bound together, and jointed by a ſtrap of leather or cord, which allows them to be readily changed when the cutting wheels require to be kept at more or leſs diſtance.

The iron bolt MM goes through two pieces of wood or iron PP, ſeven inches long, clear of the wood, ſupported by iron ſtays fixed to the frame, and through all the bulls. It requires to be ſtrong, as the draught of the horſes terminates there.

HH, N° 2. and 3. a cylinder or ſegment of wood, ſeven inches diameter, called a *rocking tree*, which goes acroſs the frame, and moves on the pivots fixed into it, one at each end, ſupported by an iron bolt or piece of wood mortiſed into the frame, eight inches high, as appears in N° 2. and 3. to which ſix chains or ropes are fixed by hooks, at different diſtances, as you want your cuts, nine, eight, ſeven, or ſix inches from one another, and are joined to the end of each bull in which the cutting wheels run; ſo that when the rocking tree is turned about by the lever I, fixed in the middle of it, all the bulls, with their cutting wheels, are raiſed out of the ground at once, as in N° 3. by which means the machine may be turned, or moved from place to place with great eaſe, without any danger of ſtraining the wheels.

LLL, &c. N° 1. 2. 3. are weights of freeſtone, 26 inches long and ſix inches broad; the under one four inches thick, the upper one three inches thick; weighing about 64lb. the under, and 48 the upper; each of them having two holes, through which iron ſpikes, firmly fixed in the bulls, paſs, in order to keep them ſteady.

When the ground is eaſily cut, the under ſtone may anſwer; when more difficult, the other ſtone may be added; ſo that every wheel may have ſeven ſtone weight upon it, which has been found ſufficient for the ſtiffeſt land and toughеſt ſward the machine has ever been tried on. Caſt iron weights will anſwer fully better, but are more expenſive.

The lever I, N° 2. 3. which ought to be five feet long, muſt have a ſliding rope on it; fixed to the back part of the frame; ſo that when the cutting wheels are all taken out of the ground three or four inches, by the rocking tree's being turned partly round by the lever, the rope may be fixed to it by a loop over the pin R, N° 3. (it ought to be placed three feet four inches from the extremity of the lever I). Thus all the cutting wheels are kept out of the ground till the machine is turned; and then by moving the loop off the pin, it ſlips back towards the frame, and the lever is gently let back to its place, as in N° 2. by which the cutting wheels are put into their former poſture, by the weights fixed on the bulls in which they run. The levers may be made of good tough aſh.

PP, N° 1. a ſmall bolt of iron, with a hook on one end of it (one is ſufficient), to ſtrengthen the bolt MM to be hooked on the centre of it, and joined to the frame by a nut and ſcrew.

The grooves in which the cutting wheels run, may be covered below at the hinder part with a plate of thin black iron, 6 inches long, 3 inches broad, having a ſlit in it where the wheels run, to prevent (if found neceſſary) any graſs, weeds, or ſmall ſtones, from filling the grooves, and clogging the wheels.

To the frame N° 1. are fixed (for a double-horſe ſward-cutter) three ſhafts, as in a waggon, of ſuch length, ſtrength, and diſtance from one another, as any workman may think proper.

For a ſingle-horſe ſward-cutter (which has only four cutting wheels), a pair of ſhafts are uſed, and may make the two ſides of the frame without any joinings. The width of the frame, in proportion to the double-horſe ſward-cutter, is as four to ſix.

It is recommended for a double-horſe ſward cutter to have eight bulls and wheels, in order that when it is uſed to reduce hard clody ſummer-fallow, or land for barley, before the laſt furrow, or even after it, the whole weight (42 ſtone) employed in cutting the ſtiffeſt land and toughеſt ſward, may be applied to the 8 bulls then at 6 inches from one another. The 64lb. weights to be applied to ſix of the bulls, and two of the 48lb. weights to each of the additional bulls, which is a ſufficient weight for the purpoſe, and will effectually prevent a clod of more than ſix inches breadth from eſcaping being broke into pieces.

In the ſame manner, a ſingle-horſe ſward-cutter may have ſix bulls for the above-mentioned purpoſe; the 28 ſtone belonging to it divided thus: The 64lb. weights to four of the bulls, and two of the 48lb. weights to each of the additional bulls.

That the machine may come as cheap as poſſible to

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the public, the inventor is of opinion, that the expence of the two wheels and the iron axle (which is conſiderable) may be ſaved, by joining ſtrongly to the frame at S, N° 3. a piece of wood with a little curve at the extremity of it, reſembling the foot of a ſledge formerly much uſed in Scotland to carry in the corn from the field; the part of it reſting on the ground being kept 18 inches (the half diameter of the wheels) from the frame by a ſtrong ſupport of wood.

As the two outer bulls next the frame are apt to get under it, ſo as to prevent the cutting wheels from being taken out of the ground, a thin ſlip of iron fixed to the inſide of the frame, nearly oppoſite to the back end of the bulls, of convenient length, will be found neceſſary.

The original intention of this machine was to prepare old graſs ground for the plough, by cutting it acroſs the ridges, in the beginning of or during winter, when the ground is ſoft, in order to anſwer all the purpoſes that Mr Tull propoſed by his four-coulter plough above deſcribed, and ſo ſtrongly recommended by him for bringing into tilth graſs ground that has been long reſted. This the ſward-cutter has been found to do much more effectually and expeditiouſly: For Mr Tull's machine cuts the ſward in the ſame direction with the plough; and is liable, from every obſtruction any of the coulters meet with, to be thrown out of its work altogether, or the inſtrument broken; to which the ſward-cutter, conſiſting of four, ſix, or more cutting wheels, is never liable, from theſe being entirely independent of one another, cutting the ground acroſs the ridges before ploughing, and rendering that operation eaſier to two horſes than it would be to three, without its being cut. The furrow being cut acroſs, falls finely from the plough in ſquares of any ſize required, not under ſix inches, in place of long ſlips of tough ſward ſeldom and imperfectly broke by the four-coultered plough.

This inſtrument is very fit for preparing ground for burnbating, as it will ſave much hard labour.

It may be properly uſed in croſs-cutting clover of one or two years ſtanding, to prepare the ground for wheat, if the land is ſtiff and moiſt enough.

It may be applied to cutting and croſs-cutting paſture ground, intended to have manure of any kind put upon it to meliorate the graſs. In this it will far exceed the ſcarificator mentioned in one of Mr Young's tours; as that inſtrument is liable, as well as the four-coultered plough, to be thrown out of its work when meeting with a ſtone or other interruption. This the ſward-cutter is proof againſt, which is looked on as its greateſt excellence.

In preparing for barley, the ſward-cutter excels a roller of any kind in reducing the large hard clods in clay land, occaſioned by a ſudden drought, after its being ploughed too wet; and it is likewiſe very proper for reducing ſuch clay land when under a ſummer-fallow. In this operation, the ſward-cutter is greatly to be preferred to the cutting-roller, likewiſe mentioned by Mr Young in one of his tours; for the wheels of the latter being all dependent one on another, when one is thrown out by a ſtone, three or four muſt ſhare the ſame fate. Beſides, the cutting-roller has but ſeven wheels in ſix feet; whereas the ſward-cutter has ſix in four feet three inches, at nine inches diſtant; and, if neceſſary, may have them ſo near as ſix inches.

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After old graſs ground is cut acroſs with the ſward-cutter and ploughed, it has a very uncommon and worklike appearance, from each ſquare turned over by the plough being raiſed up an inch or two at the ſide laſt moved by the earthboard; ſo that the field when finiſhed, is all prettily waved, and reſembles a piece of water when blown on by a gentle breeze. By this means a very great deal of the land's ſurface is expoſed to the froſt and other influences of the air, which cannot fail to have a good effect on it.

Two horſes are ſufficient for the draught of a double-horſe ſward-cutter, and one horſe for a ſingle-horſe one. One man manages the machine and drives the horſes. He begins his operation by firſt meaſuring off 20 or 30 paces from the machine, leſs or more as he inclines, and there fixes a pole. He then cuts the field acroſs, as near at right angles with the ridges as he can. When the cutting wheels are paſt the laſt furrow about a yard or ſo, and the machine is upon the utmoſt ridge of the field on which it muſt turn, he muſt ſtop the horſes; then take hold of the lever I, N° 2. and by pulling it to him he raiſes the cutting wheels out of the ground, which are kept ſo by the loop of the rope being put over the pin R, in the lever I, N° 3. till the machine is turned and brought to its proper place, which is done by meaſuring off the ſame diſtance formerly done on the oppoſite ſide of the field. When the cutting wheels are exactly over the outmoſt furrow, then, on the horſes being ſtopped, the rope is ſlipt off the pin R, and the lever returned to its former place, as repreſented N° 2. which allows the weights L L, &c. to force the cutting wheels into the ground again. He then goes on until the interval betwixt the firſt and ſecond ſtroke of the machine is all cut. In this manner the field is to be finiſhed, after which you may begin to plough when you pleaſe. (N. B. There muſt be a pole at each ſide of the field.)

It is of no conſequence whether the land to be ſward-cut is in crooked ridges or ſtraight, in flat ridges or in very high raiſed ones. Be the ſurface ever ſo uneven, the cutting wheels, being all independent of one another, are forced by their weights into every furrow or hollow.

One ſward-cutter will cut as much in one day as ſix ploughs will plough.

The land may lie ſeveral months in winter after being ſward-cut, when there is no vegetation to make the cuts grow together again before it is ploughed; but the ſooner it is ploughed after cutting the better, that it may have the benefit of all the winter's froſt, which makes it harrow better at ſeed time.

When the ground is harrowed, the harrows ought to go with the waves which appear after ploughing, not againſt them, as by that means they are leſs apt to tear up the furrows all cut into ſquares. This, however, need only be attended to the two firſt times of harrowing, as they are called.

Any common wright and ſmith may make the inſtrument. It is very ſtrong, very ſimple, and eaſily managed and moved from place to place; and, if put under cover, will laſt many years.

It was invented ſome time ago, by the Honourable Robert Sandilands; and is repreſented in the Plate as it

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it has been lately improved by him, the price being at the ſame time reduced from 15l. or 16l. to 5l. or 6l.

3. The Cultivator.

155 The cultivator described.

This inſtrument was invented by Mr William Leſter of Northampton; and that gentleman received, from the Society for the encouragement of Arts, the ſociety's ſilver medal. The purpoſe of this inſtrument is to pulverize tenacious ſoils that have been once ploughed, in a much more complete and rapid manner than can be accompliſhed by any other inſtrument. It is thus deſcribed, Plate XII.—A, the beam; BB, the handles; CC, a croſs bar of a ſemicircular form, containing a number of holes, which allow the two bars DD to be placed nearer or further from each other.

DD are two ſtrong bars moveable at one end upon a pivot E, and extending from thence in a triangular form to the croſs bar C. In theſe bars are ſquare holes, which allow the ſhares F placed therein to be fixed to any height required.

The ſeven ſhares marked F, are ſhaped at their lower extremities like ſmall trowels; the upper parts of them are ſquare iron bars.

GGG are three iron wheels on which the machine is moved; they may be raiſed or lowered at pleaſure.

H, the iron hook to which the ſwingle-tree and horſes are to be fixed.

When the machine is firſt employed on the land, the bars DD are expanded as much as poſſible. As the ſoil is more looſened, they are brought nearer to the centre; the ſhares then occupy a leſs ſpace, and the ſoil will conſequently be better pulverized.

In working on a rough fallow, therefore, the cultivator ſhould be ſet for its greateſt expanſion, and contracted in proportion as the clods are reduced. The inventor declares himſelf confident that one man, a boy, and ſix horſes, will move as much land in a day, and as effectually, as ſix ploughs, meaning land in a fallow ſtate that has been previouſly ploughed. It is requiſite in ſome ſtates of the ſoil to alter the breadth of the ſhares, but of this it is preſumed that every farmer will be a proper judge. By the expanſion and contraction of the cultivator, the points of the ſhares are in a ſmall degree moved out of the direct line; but this is ſaid to be ſo trifling as to prove no impediment to its working.

A certificate from Mr William Shaw of Cottenend, near Northampton, ſtates, that he had uſed Mr Leſter's cultivator, upon a turnip fallow in ſummer 1800; and that he believes it to be a very uſeful implement for cultivating the land in a fallow ſtate, by its working or ſcuffling off ſeven acres per day with ſix horſes. He adds, that from its property of contracting and expanding, it is calculated to work the ſame land in a rough or fine ſtate, by which means it unites the principles of two implements in one, and by the index on the axis it may be worked at any depth if required.

4. The Brake.

156 Brake deſcribed, Plate VIII. fig. 2.

The brake is a large and weighty harrow, the purpoſe of which is to reduce a ſtubborn ſoil, where an ordinary harrow makes little impreſſion. It conſiſts of four ſquare bulls, each ſide five inches, and ſix feet and a half in length. The teeth are 17 inches long, bending forward like a coulter. Four of them are inſerted into each bull, fixed above with a ſcrew-nut, having 12 inches free below, with a heel cloſe to the under part of the bull, to prevent it from being puſhed back by ſtones. The nut above makes it eaſy to be taken out for ſharping. This brake requires four horſes or four oxen. One of a leſſer ſize will not fully anſwer the purpoſe: one of a larger ſize will require ſix oxen; in which caſe the work may be performed at leſs expence with the plough.

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157 Uſes.

This inſtrument may be applied to great advantage in the following circumſtances. In the fallowing ſtrong clay that requires frequent ploughings, a braking between every ploughing will pulverize the ſoil, and render the ſubſequent ploughings more eaſy. In the month of March or April, when ſtrong ground is ploughed for barley, eſpecially if bound with couch-graſs, a croſs-braking is preferable to a croſs-ploughing, and is done at half the expence. When ground is ploughed from the ſtate of nature, and after a competent time is croſs-ploughed, the brake is applied with great ſucceſs, immediately after the croſs-ploughing, to reduce the whole to proper tilth.

Let it be obſerved, that a brake with a greater number of teeth than above mentioned, is improper for ground that is bound together by the roots of plants, which is always the caſe of ground new broken up from its natural ſtate. The brake is ſoon choked, and can do no execution till freed from the earth it holds. A leſs number of teeth would be deficient in pulverizing the ſoil.

4. The Harrow.

Harrows are commonly conſidered as of no uſe but to cover the ſeed; but they have another uſe, ſcarce leſs eſſential, which is to prepare land for the ſeed. This is an article of importance for producing a good crop. But how imperfectly either of theſe purpoſes is performed by the common harrow, will appear from the following account of it.

158 Imperfection of the common harrow.

The harrow commonly uſed is of different forms. The firſt we ſhall mention has two bulls, four feet long and 18 inches aſunder, with four wooden teeth in each. A ſecond has three bulls, and 12 wooden teeth. A third has four bulls, and 20 teeth of wood or iron, 10, 11, or 12 inches aſunder. Now, in fine mould, the laſt may be ſufficient for covering the ſeed; but none of them are ſufficient to prepare for the ſeed any ground that requires ſubduing. The only tolerable form is that with iron teeth; and the bare deſcription of its imperfections will ſhow the neceſſity of a more perfect form. In the firſt place, this harrow is by far too light for ground new taken up from the ſtate of nature, for clays hardened with ſpring drought, or for other ſtubborn ſoils: it floats on the ſurface; and after frequent returns in the ſame track, nothing is done effectually. In the next place, the teeth are too thick ſet, by which the harrow is apt to be choked, eſpecially where the earth is bound with roots, which is commonly the caſe. At the ſame time, the lightneſs and number of teeth keep the harrow upon the ſurface, and prevent one of its capital purpoſes, that of dividing the ſoil: nor will fewer teeth anſwer for covering the ſeed properly. In the third place, the teeth are too ſhort for reducing a coarſe ſoil to proper tilth; and yet it would be in vain to make them longer, becauſe

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the harrow is too light for going deep into the ground. Further, the common harrows are ſo ill conſtructed, as to ride at every turn one upon another. Much time is loſt in diſengaging them. Laſtly, It is equally unfit for extirpating weeds. The ground is frequently ſo bound with couch-graſs, as to make the furrow ſlice ſtand upright, as when old ley is ploughed: notwithſtanding much labour, the graſs roots keep the field, and gain the victory.

A little reflection, even without experience, will make it evident, that the ſame harrows, whatever be the form, can never anſwer all the different purpoſes of harrowing, nor can operate equally in all different ſoils, rough or ſmooth, firm or looſe. The following, therefore, have been recommended; which are of three different forms, adapted for different purpoſes. They are all of the ſame weight, drawn each by two horſes. Birch is the beſt wood for them, becauſe it is cheap, and not apt to ſplit. The firſt is compoſed of four bulls, each four feet ten inches long, three and a quarter inches broad, and three and a half deep; the interval between the bulls 11 inches and three fourths; ſo that the breadth of the whole harrow is four feet. The bulls are connected by four ſheths, which go thro' each bull, and are fixed by timber nails driven through both. In each bull, five teeth are inſerted, ten inches free under the bull, and ten inches aſunder. They are of the ſame form with thoſe of the brake, and inſerted into the wood in the ſame manner. Each of theſe teeth is three pounds weight: and where the harrow is made of birch, the weight of the whole is ſix ſtone 14 pounds Dutch. An erect bridle is fixed at a corner of the harrow, three inches high, with four notches for drawing higher or lower. To this bridle a double tree is fixed for two horſes drawing abreaſt, as in a plough. And to ſtrengthen the harrow, a flat rod of iron is nailed upon the harrow from corner to corner in the line of the draught.

159 Improved harrows. Plate VIII. fig. 3.

Fig. 4.

The ſecond harrow conſiſts of two parts, connected together by a crank or hinge in the middle, and two chains of equal length, one at each end, which keep the two parts always parallel, and at the ſame diſtance from each other. The crank is ſo contrived, as to allow the two parts to ply to the ground like two unconnected harrows; but neither of them to riſe above the other, more than if they were a ſingle harrow without a joint. In a word, they may form an angle downward, but not upward. Thus they have the effect of two harrows in curved ground, and of one weighty harrow in a plain. This harrow is compoſed of ſix bulls, each four feet long, three inches broad, and three and a half deep. The interval between the bulls nine and a half inches; which makes the breadth of the whole harrow, including the length of the crank, to be five feet five inches. Each bull has five teeth, nine inches free under the wood, and ten inches aſunder. The weight of each tooth is two pounds; the reſt as in the former.

Fig. 5.

The third conſiſts alſo of two parts, connected together like that laſt mentioned. It has eight bulls, each four feet long, two and a half inches broad, and three deep. The interval between the bulls is eight inches; and the breadth of the whole harrow, including the length of the crank, is ſix feet four inches. In each bull are inſerted five teeth, ſeven inches free under the wood, and ten and an half inches aſunder, each tooth weighing one pound. The reſt as in the two former harrows.

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These harrows are a conſiderable improvement. They ply to curved ground like two unconnected harrows; and when drawn in one plane, they are in effect one harrow of double weight, which makes the teeth pierce deep into the ground. The imperfection of common harrows, mentioned above, will ſuggeſt the advantages of the ſet of harrows here recommended. The firſt is proper for harrowing land that has long lain after ploughing, as where oats are ſown on a winter furrow, and in general for harrowing ſtiff land: it pierces deep into the ſoil by its long teeth, and divides it minutely. The ſecond is intended for covering the ſeed: its long teeth lays the ſeed deeper than the common harrow can do; which is no ſlight advantage. By placing the ſeed conſiderably under the ſurface, the young plants are, on the one hand, protected from too much heat, and, on the other, have ſufficiency of moiſture. At the ſame time, the ſeed is ſo well covered that none of it is loſt. Seed ſlightly covered by the common harrows wants moiſture, and is burnt up by the ſun; beſide, that a proportion of it is left upon the ſurface uncovered. The third harrow ſupplies what may be deficient in the ſecond, by ſmoothing the ſurface, and covering the ſeed more accurately. The three harrows make the ground finer and finer, as heckles do lint; or, to uſe a different compariſon, the firſt harrow makes the bed, the ſecond lays the ſeed in it, the third ſmooths the clothes. They have another advantage not inferior to any mentioned: they mix manure with the ſoil more intimately than can be done by common harrows; and upon ſuch intimate mixture depends greatly the effect of manure, as has already been explained. To conclude, theſe harrows are contrived to anſwer an eſtabliſhed principle in agriculture, That fertility depends greatly on pulverizing the ſoil, and on an intimate mixture of manure with it, whether dung, lime, marl, or any other.

160 Properties of their harrows.

The Chain and Screw harrow. Fig. 8. is the plan of a harrow alſo invented by Mr Sandilands, and to which he has given the name of the *chain and ſcrew harrow*. Its properties are, that if your ridges be high, and you wiſh to harrow them from one end to the other, by lengthening the chain (which the ſcrew commands), the harrow, when drawn along, forms an angle, downwards, and miſſes none of the curve of the ridge, ſo far as it extends (which may be nine feet, the diſtance from A to B. The extent, in the contrary direction, is five feet ſix inches). When the crowns of the ridges have got what is thought a ſufficient harrowing lengthwiſe, you ſhorten the chain by the ſcrew, which forms an angle upwards; the harrow is then drawn by the horſes, one on each ſide of the furrow; which completely harrows it, and the ſide of the ridges, if 18 feet broad. Plate VII.

When you want to harrow even ground or high ridges acroſs with the ſcrew, you can bring the harrow to be horizontal, ſo as to work as a ſolid harrower without a joint.

The teeth are formed and fixed in the common manner, ſquare, not in the faſhion of coulters; and are nine or ten inches below the wood, and of ſuch ſtrength as it is thought the land requires. The teeth cut, or rather

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ther tear, the ground at every four inches without variation, though ſeemingly placed irregularly; and this without any riſk of choking, except ſometimes at the extreme angles, where the teeth are neceſſarily near each other: but which may be cleaned with the greateſt eaſe, by raiſing them a little from the ground. The figures 1, 2, &c. point out where the 12 teeth on each ſide of the harrow are placed.

Where a ſtrong brake-harrow is not neceſſary, by making the teeth ſhorter and lighter you may have 48 teeth, which will tear the ground at every two inches, cover the ſeed well, and make a fine mould.

It is recommended, that harrows for every purpoſe, and of any ſize, be made on the above principle; by which no tooth can ever follow the track of another, and all of them will be kept conſtantly acting.

5. The Roller.

161 The roller.

The roller is an inſtrument of capital uſe in huſbandry, though, till of late years, ſcarcely known in ordinary practice; and where introduced, it is commonly ſo ſlight as to have very little effect.

Rollers are of different kinds; ſtone, caſt-iron, wood. Each of theſe has its advantages. We would recommend theſe laſt, conſtructed in the following manner: Take the body of a tree, ſix feet ten inches long, the larger the better, made as near a perfect cylinder as poſſible. Surround this cylinder with three rows of ſtaves, one row in the middle, and one at each end. Line theſe ſtaves with planks of wood equally long with the roller, and ſo narrow as to ply into a circle. Bind them faſt together with iron rings. Beech wood is the beſt, being hard and tough. The roller, thus mounted, ought to have a diameter of three feet ten inches. It has a double pair of ſhafts for two horſes abreaſt. Theſe are ſufficient in level ground; in ground not level, four horſes may be neceſſary. The roller without the ſhafts ought to weigh 200 ſtone Dutch; and the large diameter makes this great weight eaſy to be drawn.

162 Seaſons for rolling.

Rolling wheat in the month of April is an important article in looſe ſoil: as the winter rains preſſing down the ſoil leave many roots in the air. Barley ought to be rolled immediately after the ſeed is ſown; eſpecially where graſs ſeeds are ſown with it. The beſt time for rolling a gravelly ſoil, is as ſoon as the mould is ſo dry as to bear the roller without clinging to it. A clay ſoil ought neither to be tilled, harrowed, nor rolled, till the field be perfectly dry. And as rolling a clay ſoil is chiefly intended for ſmoothing the ſurface, a dry ſeaſon may be patiently waited for, even till the crop be three inches high. There is the greater reaſon for this precaution, becauſe much rain immediately after rolling is apt to cake the ſurface when drought follows. Oats in a light ſoil may be rolled immediately after the ſeed is ſown, unleſs the ground be ſo wet as to cling to the roller. In a clay ſoil, delay rolling till the grain be above ground. The proper time for ſowing graſs ſeeds in an oat field, is when the grain is three inches high; and rolling ſhould immediately ſucceed, whatever the ſoil be. Flax ought to be rolled immediately after ſowing. This ſhould never be neglected; for it makes the ſeed puſh equally, and prevents after-growth; the bad effect of which is viſible in every ſtep of the proceſs for dreſſing flax. The firſt year's crop of ſown graſſes ought to be rolled as early the next ſpring as the ground will bear the horſes. It fixes all the roots preciſely as in the caſe of wheat. Rolling the ſecond and third crops in looſe ſoil is an uſeful work; though not ſo eſſential as rolling the firſt crop.

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163 Effects of rolling.

In the firſt place, rolling renders a looſe ſoil more compact and ſolid; which encourages the growth of plants, by making the earth clap cloſe to every part of every root. Nor need we be afraid of rendering the ſoil too compact; for no roller that can be drawn by two or four horſes will have that effect. In the next place, rolling keeps in the moiſture, and hinders drought to penetrate. This effect is of great moment. In a dry ſeaſon, it may have the difference of a good crop, or no crop, eſpecially where the ſoil is light. In the third place, the rolling graſs ſeeds, beſides the foregoing advantages, facilitates the mowing for hay; and it is to be hoped, that the advantage of this practice will lead farmers to mow their corn alſo, which will increaſe the quantity of ſtraw both for food and for the dunghill.

There is a ſmall roller for breaking clods in land intended for barley. The common way is, to break clods with a mell; which requires many hands, and is a laborious work. This roller performs the work more effectually, and at much leſs expence: let a harrowing precede, which will break the clods a little; and after lying a day, or a day and a half, to dry, this roller will diſſolve them into powder. This, however, does not ſuperſede the uſe of the great roller after all the other articles are finiſhed, in order to make the ſoil compact, and to keep out the ſummer drought. A ſtone roller four feet long, and fifteen inches diameter, drawn by one horſe, is ſufficient to break clods that are eaſily diſſolved by preſſure. The uſe of this roller in preparing land for barley is gaining ground daily, even among ordinary tenants, who have become ſenſible both of the expence and toil of uſing wooden mells. But in a clay ſoil, the clods are ſometimes too firm, or too tough, to be ſubdued by ſo light a machine. In that caſe, a roller of the ſame ſize, but of a different conſtruction, is neceſſary. It ought to be ſurrounded with circles of iron, ſix inches aſunder, and ſeven inches deep; which will cut even the moſt ſtubborn clods, and reduce them to powder. Let not this inſtrument be conſidered as a fiſical refinement. In a ſtiff clay it may make the difference of a plentiful or ſcanty crop.

6. The Fallow-cleansing Machine.

164 The fallow-cleanſing machine, Plate IX. fig. 5.

This was invented by Mr Aaron Ogden, a ſmith at Aſhton-under-Line, near Manchester in Lancaſhire. It is intended for cleanſing fallows from weeds, &c. which exhauſt the riches of the ſoil. A, A, is the frame; B, the firſt roller; C, the ſecond ditto; in which laſt are two cranks to move the arms, D, D, which work the rake up the directors fixed on the plank E. The under ſide of the lower ends or ſhares of theſe directors are ſharp, to cut the clods and let them come on the upper ſide. Each alternate heel of the ſhare is longer that the intermediate one, that they may not have more than one-half to cut at once. At the back of the plank E are two ſcrews to let it looſe, that the directors may be ſet higher or lower. The ſhares are to penetrate the ground two or three inches, to raiſe the quicks till the rake I, I, fetches

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fetches them into the cart H, where a man muſt be ready with a muck-hook to clear them backward when gathered. In the rake I are two teeth for every ſpace of the directors, that ſtones, &c. may be gathered without damage. K, K, are two ſtaples, by which the machine is drawn: under them at *h* are two hooks, placed low to raiſe the machine in turning, by the help of the traces; and the axletree of the cart ſhould be fixed upon a pin, that it may turn like a waggon. F, F, are the triggers to throw the rake behind the roots. The long teeth at G, G, are to cleanſe the roller C. I, I, is the rake which gathers up the weeds into the cart H, and is drawn above the trigger F by the working of the arms D, expreſſed by the dotted lines at *d d*, *i i*. The triggers F, of which there is one on each ſide, move on the pivots *a*; ſo that when the points *b* of the rake I have been drawn up by the directors E to the part marked *c*, the trigger, giving way, permits the rake to paſs; but immediately falling, the rake returns along the upper ſurface of the trigger marked *e*, *e*, and of courſe falls on the weeds when it comes to the end, a little beyond the pivot *a*. The reader will obſerve, that the boarding is taken away on one ſide, in the Plate, in order to give a more perfect view of the inner parts of the machine; and in fact it would perhaps be better if all the boarding, marked L, L, L, was taken away, and frame-work put in its ſtead. The cart H might undoubtedly alſo be made lighter. The wheels M, M, appear in the Plate to be made of ſolid wood: but there is no neceſſity they ſhould be ſo. At N, is another view of the roller C, by which the diſpoſition of the ſpikes may be eaſily comprehended. Suppoſe the circle O, deſcribed by the end of the roller N, to be divided by four ſtraight lines into eight equal ſegments, as repreſented at P. Let the ſame be done at the other end of the roller, and parallel lines be drawn from one correſponding point to the other the length of the roller; mark the points with figures 1, 2, 3, 4, 5, 6, 7, 8; afterwards draw oblique lines, as from 1, at the end of O, to 2, at the other end, and from 2 to 3, &c. on theſe oblique lines the ſpikes are to be fixed at equal diſtances, in eight circles, deſcribed on the circumference of the roller. The ſpikes of the ſmall roller B are fixed in the ſame manner, except that the diameter being ſmaller, there are only ſix inſtead of eight rows. R is another view of the directors, with the plank E on which they are fixed; and S is a ſection of a part of the plank, with one of the directors as fixed, in which may be ſeen the heel *m*, from whence to the point of the ſhare *n* is a ſharp cutting edge. See the ſame letters in figure R. At T is one of the long teeth to be ſeen at G; it is bent towards the roller C, which it ſerves to cleanſe. When the end of the rake *b*, after riſing above *c*, is puſhed, by the motion of the arms D, D, along the upper part *e*, *e*, of the trigger F, and comes to the end beyond *a*; as it falls, the part of the arm marked *o* reſts in the notch *p*, till it is again raiſed by the motion of the roller C with the rake. The roller C is to be one foot diameter, the ſpikes nine inches long, that they may go through the furrow (if the ſoil ſhould be looſe) into the hard earth, the more effectually to work the rake, which otherwiſe might be ſo overcharged as to cauſe the roller to drag without turning. In the rake-ends *b* there ſhould be pivots, with rollers or pullers on, to go in the groove, to take off the friction; and they would likewiſe take the triggers more ſurely as the rake comes back. The rake ſhould alſo be hung ſo far backward, that when it is fallen, the arms of it may lie in the ſame plane or parallel with the directors, on which it comes up (which will require the frame to be two inches longer in the model). This will cauſe the rake to fall heavier, and drive the teeth into the roots, and bring them up without ſhattering. Theſe teeth muſt be made of ſteel, very fine, and ſo long as to reach down to the plank on which the directors are fixed, that is to ſay, ſix inches long (the directors are alſo to be made ſix inches broad above the plank). The rake-head ſhould alſo fall a little before the crank is at its extremity, which will cauſe the rake to puſh forward to let the teeth come into the roots. The rake-teeth muſt drop in the ſame plane with the roller and wheels, or on the ſurface of the earth. No more ſpace ſhould be given from the roller C to the long teeth at G G, than that the rake may juſt miſs the ſpikes of the roller C and fall on the places before mentioned. As the firſt roller B was intended to cleanſe the ſecond C more than for any other uſe, it may be omitted when the machine is made in large, as Mr Ogden has lately found that the long teeth at G G anſwer the end alone, and this renders the machine about a ſixth part ſhorter. Now, to ſuit any ſort of earth, there ſhould be to each machine three planks, with directors at different ſpaces to uſe occaſionally; in the firſt, the ſpaces between the directors ſhould be eight inches wide, in the ſecond ſix, and in the third four. This will anſwer the ſame end as having ſo many machines.

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As there may be ſome objections to the rake not leaving the roots when it has brought them up, Mr Ogden has ſeveral methods of cleanſing it; but as he would make it as ſimple as poſſible, he chooſes to let it be without them at preſent; but ſuppoſe it ſhould bring ſome roots back again with it, it will probably loſe them before it gets back to the extremity; whence they will lie light, and be of but little detriment to the others coming up. Mr Ogden would have the firſt machine made four feet ſix inches wide, the teeth divided into equal ſpaces, the outſides into half ſpaces.

7. The new-invented Patent Univerſal SOWING *Machine*.

165 Univerſal ſowing machine, Plate X. fig. 1. 2. 1

This machine, whether made to be worked by hand, drawn by a horſe, or fixed to a plough, and uſed with it, is extremely ſimple in the conſtruction, and not liable to be put out of order; as there is but one movement to direct the whole, nor does it require any ſkill in working. It will ſow wheat, barley, oats, rye, clover, cole-ſeed, hemp, flax, canary, rape, turnip, beſides a great variety of other kinds of grain and ſeeds broad-caſt, with an accuracy hitherto unknown. It is equally uſeful in the new huſbandry, particularly when fixed to a plough; it will then drill a more extenſive variety of grain, pulſe and ſeed, through every gradation, with regard to quantity, and deliver each kind with greater regularity than any drill-plough whatever. When uſed in this manner, it will likewiſe be found of the utmoſt ſervice to farmers who are partial to the old huſbandry, as, among many other very valuable and peculiar properties, it will not only ſow

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in the broad-caſt way with the moſt ſingular exactneſs, but ſave the expence of a ſeedſman; the ſeed being ſown (either over or under furrow at pleaſure), and the land ploughed, at the ſame operation.

Perhaps a fair and deciſive experiment for aſcertaining the ſuperior advantage of broad-caſting or drilling any particular crop, was never before ſo practicable; as the ſeed may now be put in with the utmoſt degree of regularity, in both methods of culture, by the ſame machine; conſequently the ſeed will be ſown in both caſes with equal accuracy, without which it is impoſſible to make a juſt deciſion.

The excellence of this machine conſiſts in ſpreading any given quantity of ſeed over any given number of acres with a mathematical exactneſs, which cannot be done by hand; by which a great ſaving may be made in ſeeding the ground, as well as benefiting the expected crop.

There has always been a difficulty in ſowing turnip ſeed with any degree of exactneſs, both from the minuteneſs of the ſeed, and the ſmallneſs of the quantity required to be ſown on an acre. Here the machine has a manifeſt advantage, as it may be ſet to ſow the leaſt quantity ever required on an acre; and with an accuracy the beſt ſeedſman can never attain to.

It will alſo ſow clover, cole, flax, and every other kind of ſmall ſeed, with the utmoſt degree of regularity.

It will likewiſe broad-caſt beans, peaſe, and tares, or drill them with the greateſt exactneſs, particularly when conſtructed to be uſed with a plough.

Another advantage attending the uſe of this machine is, that the wind can have no effect on the falling of the ſeed.

Of the Machine when made to be uſed without a Plough, and to be drawn by a Horſe.—It may in this caſe be made of different lengths at the deſire of the purchaſer. The upper part AAAA, contains the hoppers from which the grain or ſeed deſcends into the ſpouts. The ſeveral ſpouts all reſt upon a bar, which hangs and plays freely by two diagonal ſupporters BB; a trigger fixed to this bar bears a catch-wheel; this being fixed on the axle, occaſions a regular and continual motion, or jogging of the ſpouts, quicker or ſlower in proportion to the pace the perſon ſowing with it drives; and of courſe, if he quickens his pace, the bar will receive a greater number of ſtrokes from the catch-wheel, and the grain or ſeed will feed the faſter. If he drives ſlower, by receiving fewer ſtrokes, the contrary muſt take place. In going along the ſide of a hill, the ſtrength of the ſtroke is corrected by a ſpring which acts with more or leſs power, in proportion as the machine is more or leſs from a horizontal poſition, and counteracts the difference of gravity in the bar, ſo that it preſſes, in all ſituations, with a proper force againſt the catch-wheel. The ſpring is unneceſſary if the land be pretty level. At the bottom of the machine is placed an apron or ſhelf in a ſloping poſition; and the corn or ſeed, by falling thereon from the ſpouts above, is ſcattered about in every direction under the machine, and covers the ground in a moſt regular and uniform manner.

Fig. 2.

To ſow the corn or ſeed in drills, there are moveable ſpouts (ſee fig. 10.), which are fixed on or taken off at pleaſure, to direct the ſeed from the upper ſpout to the bottom of the furrow.

The machine is regulated for ſowing any particular quantity of ſeed on an acre by a braſs ſlider, A, fig. 7. fixed by ſcrews againſt a braſs bridge on each of the ſpouts. The machine is prevented from ſeeding while turning at the ends, by only removing the lever E, fig. 2. out of the channel G, to another at H, on the right hand of it, which carries back the bar from the catch-wheel, and occaſions the motion of the ſpouts to ceaſe, and at the ſame time brings them upon a level by the action of the diagonal ſupporters; ſo that no corn or ſeed can fall from them.

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The machine in this form is particularly uſeful for broad-caſting clover upon barley or wheat; or for ſowing any other kind of ſeed, where it is neceſſary that the land ſhould firſt be harrowed exceedingly fine and even.

Manner of uſing the Machine, when drawn by a Horſe.—Place the machine about two feet from the ends of the furrows where you intend it ſhall begin to ſow. Fill the hoppers with ſeed, and drive it forwards with the outſide wheel in the firſt furrow. When you are at the end of the length, at the oppoſite ſide of the field, lift the lever E, fig. 2. into the channel H, and the machine will inſtantly ſtop ſowing. Drive it on about two feet, and then turn. Fill the hoppers again if neceſſary; then remove the lever back again into the channel G, and in returning, let the outſide wheel of the machine go one furrow within the track which was made by it, in paſſing from the oppoſite end; as for example, if the wheel paſſed down the eighth furrow from the outſide of the field, let it return in the ſeventh; and in every following length let the outſide wheel always run one furrow within the track made by the ſame wheel: becauſe the breadth ſown is about nine inches leſs than the diſtance between the wheels.

Let the machine be kept in a perpendicular ſituation. If the farmer wiſhes to ſow more or leſs ſeed on any one part of the field than the other, it is only raiſing the handles a little higher, or ſinking them a little lower than uſual, and it will occaſion a ſufficient alteration; and ſhould the laſt turn be leſs in breadth than the machine, thoſe ſpouts which are not wanted may be taken up from the bar, and prevented from feeding, by turning the knob above them.

Alſo, when the land required to be ſown has what is called a *vent*, that is, when the ſides of the field run in an oblique line to the furrows, which by this means are unequal in length; the ſpouts muſt be taken up or let down in ſucceſſion by turning the knobs, as that part of the machine where they are placed arrives at the ends of the furrows. This is done while the machine is going forwards.

If the land be tolerably level, the machine may be fixed by the ſcrew in the front, and the machine may then be uſed by any common harrow boy.

Method of regulating the Machine.—In each ſpout is fixed a bridge (ſee fig. 7.), with an aperture in it, B, for the grain or ſeed to paſs through. This aperture is enlarged or contracted by a ſlider, A, which paſſes over it; and, when properly fixed for the quantity of ſeed deſigned to be ſown on an acre, is faſtened by means of two ſtrong ſcrews firmly againſt the bridge. This is made uſe of in ſowing all kinds of ſeed, where it is required to ſow from one buſhel upwards on an acre. To ſow one, two, three gallons, or any of the inter-

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mediate quantities, as of clover, cole-ſeed, &c. the braſs plate, fig. 6. is placed between the bridge and the ſlider, with the largeſt aperture B downwards, which aperture is enlarged or contracted by the ſlider as before. To ſow turnips, the ſame plate is placed between the bridge and the ſlider, with its ſmalleſt aperture A downwards, and the hollow part about the ſame aperture inwards.

Fig. 8. is a view of the regulator, by which the apertures in the ſeveral ſpouts are all ſet exactly alike, with the utmoſt eaſe, to make them feed equally. The extreme height of the largeſt aperture is equal to the breadth AB, and the breadth at C is equal to the height of the ſmalleſt aperture uſed, viz. that for turnips. The ſide AC is divided into 60 equal parts, and on it moves the ſlider or horſe D; which being placed at any particular degree, according to the quantity of ſeed required to be ſown on an acre, is fixed upon it, by a ſcrew on the ſide of the ſlider or horſe. When this is done, the end of the regulator is put through the aperture in the bridge or plate (whichever is intended to be uſed), and the ſlider againſt the bridge in the ſpout, raiſed by it, till it ſtops againſt the horſe on the regulator: then the ſlider is faſtened againſt the bridge firmly by the two ſcrews; care being taken at the ſame time that it ſtand nearly ſquare.

By this means the ſpouts (being all fixed in the ſame manner) will feed equally.

It is eaſy to conceive that the ſize of the apertures, and conſequently the quantity of ſeed to be ſown on an acre, may be regulated with a far greater accuracy than is required in common practice.

The ſpouts may be regulated with the utmoſt nicety, in five minutes, to ſow each particular ſeed, for the whole ſeaſon. But a little practice will enable any perſon, who poſſeſſes but a very moderate capacity, to make the ſpouts feed equally, even without uſing the regulator (A).

Of the Machine, when made to be uſed by Hand.—The difference of the machine in this caſe is, that it is made lighter, with but three ſpouts, without ſhafts, and is driven forwards by the handles. It hath alſo a bolt in front, which being puſhed in by the thumb, releaſes the machine; ſo that it can then eaſily be placed in a perpendicular poſition. This alteration is neceſſary to keep the handles of a convenient height, in ſowing up and down a hill, where the ſlope is conſiderable; and is done while the machine is turning at the end of the length. The method of regulating and uſing it is the ſame as when made to be drawn by a horſe.

Of the Machine, when conſtructed to be uſed with a Plough.—This is, without doubt, the moſt uſeful application of the machine; and it can be fixed without difficulty to any kind of plough, in the ſame manner as to that repreſented in fig. 1. Inſtrument of Huſbandry

The advantages ariſing from the uſe of it are great and numerous; for, beſide the increaſe in the crop, which will be enſured by the ſeeds being broad-caſt with a mathematical nicety, a large proportion of ſeed (the value of which alone, in a few months, will amount to more than the price of the machine) and the ſeedsman's labour will be ſaved. The ſeed may likewiſe be ſown either under or over furrow; or one caſt each way, as is practiſed by ſome farmers. The ſeeds alſo, being caſt by the machine upon the freſh ploughed land, may be immediately harrowed in, before the mould has loſt any part of its moiſture; which in a dry ſeaſon will greatly promote the crop. In drilling any kind of grain, pulſe, or ſeed, it poſſeſſes every property that can be wiſhed for in the beſt drill-plough, nor will it (as moſt of them do) bruiſe the ſeed, or feed irregularly. The conſtruction of the machine is the ſame as the large ones, except being made with one hopper and ſpout inſtead of ſeveral, and the apron moveable inſtead of being fixed, as may be ſeen by inſpecting fig. 4. The only alteration neceſſary to make the machine broad-caſt or drill is, in the former caſe to place the apron B, fig. 1. at the bottom of the machine, upon the hooks FF, ſloping either towards the furrows or the unploughed land, according as it is intended to ſow the ſeed either over or under furrow. Whenever the apron is required to be ſhifted, it is done in leſs than a ſecond of time; as it only requires to be moved up or down with the hand, when a catch fixes it.

To prepare it for drilling, inſtead of the apron, place the long ſpout, fig. 10. upon the brackets, on the front of the machine, by the ears AA, to receive the ſeed from the upper ſpout, and faſten the lower end of it, by a ſmall cord, to that hook upon which the apron is hung for broad-caſting which is next the plough (ſee fig. 3.); the ſeed will then be directed by the long ſpout, to the centre of the furrow, near the heel of the plough. The ſpring for correcting the ſtrength of the ſtroke, is neceſſary only when they are required to go along the ſide of a conſiderable declivity. The machine, when fixed to a plough, does not require the ſmalleſt degree of ſkill in uſing, as nothing is neceſſary but to keep the hopper filled, which will contain a ſufficient quantity of ſeed to go upwards of 140 rods, before it will want refilling, when three buſhels and a half

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(A) Proper directions are given with each machine for uſing it, as alſo for fixing the ſliders to ſow any particular quantity of corn or ſeed on an acre, ſo as to enable any perſon to ſet the ſpouts.

The prices of the machine (excluſive of the packing caſes) are as follow. If conſtructed to be uſed with a ſingle furrow plough; the wheel, with the axle and cheeks ſteeled, ſtrap, regulator, braſs-plates for broad-caſting or drilling turnips, lucerne, tares, wheat, barley, &c. &c. &c. and every article neceſſary for fixing it included, three guineas and a half. If made with a ſpring (for ſowing on the ſide of a hill, where the ſlope is conſiderable), but which is very rarely neceſſary, five ſhillings more. If made to be fixed to any double-furrow plough, four guineas and a half.

The large machine, fig. 2. when made to broad-caſt ſeven furrows at a time and to be drawn by a horſe, eight guineas and a half. If conſtructed to ſow five furrows at a time, and to be uſed by hand, ſix guineas. Theſe are alſo five ſhillings more if made with a ſpring.

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half are ſown on an acre. The accuracy with which it will broad-caſt, may in ſome meaſure be conceived, by conſidering that the ſeed regularly deſcends upon the apron or ſhelf, and is from thence ſcattered upon the ground, in quantity exactly proportioned to the ſpeed of the plough: alſo that each caſt ſpreads to the third furrow: and by this means ſhuts upon the laſt. In this manner it is continually filling up till the whole field is completely covered; ſo that it it impoſſible to leave the ſmalleſt ſpace without its proper quantity of ſeed.

When the plough is wanted for any other purpoſe, the machine, with the wheel at the heel of the plough for giving it motion, can be removed or replaced at any time in five minutes.

Fig. 11. repreſents the machine fixed to a double-furrow creaſing plough, and prepared for drilling. As this plough may not be generally known, it will not be improper to obſerve, that it is chiefly uſed for creaſing the land with furrows (after it has been once ploughed and harrowed); which method is neceſſary when the ſeed is to be ſown broad-caſt upon land that has been a clover ley, &c. becauſe, if the ſeed be thrown upon the rough furrows, a conſiderable part of it will fall between them, and be unavoidably loſt, by lying too deep buried in the earth. This mode anſwers extremely well, and partakes of both methods of culture; the ſeed, though ſown broad-caſt, falling chiefly into the furrows.

The machine is very uſeful for ſowing in this manner; as the ſeed is broad-caſt, with an inconceivable regularity, at the time the land is creaſed. The advantages it likewiſe poſſeſſes for drilling all ſorts of grain or ſeed with this plough, are too evident to need mentioning.

The machine, when conſtructed to be uſed with a double-furrow plough, is made with two upper and two long ſpouts for drilling, two aprons for broad-caſting, and with a double hopper; but in other reſpects the ſame as when intended for a ſingle furrow plough: it is uſed in all caſes with the greateſt eaſe imaginable.

The interval between the points of the two ſhares of a creaſing plough is uſually ten inches; the beam about nine feet long; and the whole made of a light conſtruction.

Plate XI.

A more particular explanation of the figures.—Fig. 1. The machine fixed to a Kentiſh turn-wreſt plough. A, The machine. B. The apron upon which the ſeed falls and rebounds upon the land, in broad-caſting. C, Lid to cover the hopper. D, Wheel at the heel of the plough. E, Scrap. FF, Hooks, upon which the apron turns by a pivot on each. G, Stay, to keep the machine ſteady, H, Lever, to prevent it from ſowing.

Fig. 2. The machine conſtructed to be drawn by a horſe. AAAA, The hoppers. BB, The diagonal ſupporters. CCCC, The upper ſpouts. D. The apron or ſhelf upon which the ſeed falls upon the upper ſpouts. E, The lever, which carries back the bar, and prevents the machine from ſowing. FF, Staples upon the handles, through which the reins paſs, for the man who conducts the machine, to direct the horſe by. I, Screw, to fix the machine occaſionally. N. B. The knobs (by turning which each particular ſpout may be taken from off the bar, and thereby prevented from feeding) are over each upper ſpout; but, to prevent confuſion, are not lettered in the Plate.

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Fig. 3. is the ſame machine with that in fig. 1. The dotted lines, expreſſing the ſituation of the long ſpout, when the apron is removed, and the machine adapted for drilling.

Fig. 4. Alſo the ſame machine, with the front laid open to ſhow the inſide. A, The catch-wheel fixed upon the axle. BB, The axle upon which the machine hangs between the handles of the plough. C, The pulley, by which the ſtrap from the wheel at the heel of the plough turns the catch-wheel. D, The bar, upon which the upper ſpout reſts, ſuſpended by the diagonal ſupporters EE, bearing againſt the catch-wheel by the trigger F, and thereby kept in motion while the plough is going. G, The apron in a ſloping poſition, upon which the corn or ſeed falls from the upper ſpout, and is ſcattered by rebounding upon the land. It turns upon pivots, and by this means throws the ſeed either towards the right hand or left at pleaſure.

Fig. 5. The upper ſpout.

Fig. 6. The plate which is placed between the bridge and the ſlider, for ſowing ſmall ſeeds. The aperture A being downwards for ſowing turnips; the larger one B downwards for ſowing clover, &c.

Fig. 7. The bridge, fixed in the upper ſpouts. A, The ſlider, which contracts or enlarges the different apertures. B, The aperture in the bridge, through which the ſeed paſſes, when ſowing any quantity from one buſhel upwards on an acre.

Fig. 8. The regulator, made of braſs. D, The ſlider or horſe which moves upon it, and is fixed at any particular degree by a ſcrew in its ſide.

Fig. 9. repreſents the movement in the machine fig. 2. AAAA, Cleets, between which the upper ſpouts reſt. BB, The diagonal ſupporters, by which the bar with the upper ſpouts hang. C, The catch-wheeel. DD, The axle. E, The trigger upon the bar, which bears againſt the catch-wheel. FF, Stays from the back of the machine, by which the bar plays.

Fig. 10. The long ſpout. AA, The ears by which it hangs.

Sect. II. *Of preparing Land for cropping, by removing obſtructions and bringing the Soil into a proper ſtate.*

1. Of Removing Stones.

166 Importance of removing ſtones.

It is of the utmoſt importance to have land effectually cleared of ſtones, before undertaking any agricultural operation upon in; for by means of them there is frequently more expence incurred in one ſeaſon, by the breaking of ploughs and the injury ſuffered by the cattle and harneſs, than would remuve the evil. It has alſo been obſerved that the ſoil round a large ſtone is commonly the beſt in the field. It may be conſidered as purchaſed at a low rate by removing the ſtone. At any rate, ſuch ſtones muſt be removed before the ground can be properly cultivated. For whether a large ſtone occupy the ſurface, or lie beneath it, but within reach of the plough, a conſiderable ſpace around it cannot be ſtirred by that inſtrument, and is therefore uſeleſs. Even the reſt of the field where

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ſtones abound muſt be laboured in a more ſlow and tedious manner, on account of the caution neceſſary to avoid the danger which they produce.

The ſtones which impede the improvement of land are, 1ſt, looſe ſtones, or ſuch as are thrown up to the ſurface by the plough; and, 2dly, ſitfaſt ſtones, which are either upon or immediately below the ſurface, but are of ſuch magnitude that they cannot be ſtirred by the plough. The firſt kind of ſtones may uſually be eaſily removed by being gathered and carried off. When land is laid down for hay, ſuch ſtones are often improperly thrown in heaps into the furrows, where they ever after continue to interrupt the plough, or are dragged again by the harrows over the land. Inſtead of proceeding in this manner, they ought to be carried wholly off the field in carts at the dryeſt ſeaſon of the year, and placed in ſituations in which they may be rendered uſeful to the farm. In this point of view, ſtones are ſometimes of conſiderable value for making concealed drains, or for making and repairing the roads through a farm, and alſo for the repairs of ſome kinds of fences.

167 Modes of removing ſtones.

The only writer upon agriculture who has in any caſe objected to the propriety of clearing land of ſmall ſtones, is probably Lord Kames. In ſome parts of the of the ſouth of Scotland, and particularly in Galloway, the ſoil is ſaid to be compoſed in a great meaſure of gravel, and of ſtones of a ſmooth ſurface, as if worn by the running of water. After being ploughed, the whole ſurface of every field appears to be compoſed of looſe ſtones lying almoſt in contact with each other. Some induſtrious farmers, with great labour, collected and removed the ſtones from a few of their fields with a view to their improvement; and the reſult is ſaid to have been, that the ſucceeding crops were wholly blighted in the tender blade, and never came to maturity. The ſtones upon the ſurface were ſuppoſed to have prevented the exhalation of the moiſture from the ſhallow and extremely porous and open ſoil which they covered: and they were alſo ſuppoſed to have contributed to foſter the young plants, by reflecting powerfully from their ſmooth ſurfaces the ſun's rays in every direction around them: but when they were removed, the ſoil, in that bleak climate, became at once too cold and too dry for any purpoſe of agriculture. The farmers, therefore, who had with ſo much toil and coſt removed the ſtones from part of their lands, could think of no better remedy than, with equal toil, to bring them all back again, and carefully replace them upon their fields. It is added, that the ſoil immediately reſumed its wonted fertility. The truth of this anecdote has never been conteſted; and there is no doubt that it has long been current in the ſouth of Scotland, both previous to its publication by Lord Kames, and after that period, among a claſs of perſons who are very unlikely to have been acquainted with his writings. It is poſſible that the replacing the ſtones was the beſt remedy for the want of fertility in the ſoil which its cultivators had within their reach: but it is probable that they might have found it of more importance to have covered the ſurface of their land with a ſubſtantial coat of clay marl, or even with almoſt any kind of earth or clay obtained from the bogs and ſwamps that uſually abound in theſe countries, providing only they could obtain a quantity of lime to add to it. In this way, poſſeſſing land whoſe bottom was very pervious to moiſture, they might have obtained a ſoil ſuited to every purpoſe of agriculture; whereas, in its preſent ſtate, it muſt remain for ever unfit to be touched with the ſcythe.

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With regard to large or ſitfaſt ſtones which cannot be removed by any ordinary effort, they uſually either appear fully above the ſurface or are concealed immediately under it. For the ſake of diſcovering concealed ſtones, it is ſaid to be a cuſtom in Yorkſhire, when they intend to reduce waſte and rude land under the plough, in the firſt place, carefully to go over the whole ſurface with ſharp prongs, which at the diſtance of every twelve or fourteen inches they thruſt into the ground to the depth of above a foot, and wherever a ſtone meets the prong, they mark the ſpot with a twig, a bit of wood, or ſome other object. They afterwards trace all the marks, and remove every ſtone before they touch the land with the plough.

Concerning the modes which have been adopted for removing large ſtones out of the way of the plough; one of the ſimpleſt is the following: A pit or hole is dug beſide the ſtone, 16 or 18 inches deeper than the height or thickneſs of the ſtone. A number of men are then aſſembled, who tumble it into the pit. It is immediately covered up with a part of the earth that came out of the hole; and the reſt of the earth is ſcattered over the field, or employed in bringing to a level with the reſt of the ſoil the ſpot where the ſtone formerly lay. As the ſtone now remains at a greater depth than the plough can reach, it is no longer an impediment to agriculture. In performing this operation, however, the workmen muſt attend to the nature of the ſoil, and take care that the weight of the ſtone do not bring down the ſide of the pit, which might be attended with dangerous conſequences. To obviate any hazard of this kind, it is always proper to have at hand a ſtout plank, which ought to be laid acroſs the pit or hole, immediately under the neareſt corner or edge of the ſtone. With this precaution, a ſingle man may uſually perform the whole operation of burying ſtones or pieces of rock of very great ſize and weight.

By the above operation, however, the ſtones are utterly loſt; whereas they may ſometimes be of conſiderable value for fences or other buildings. When this is the caſe, they muſt be broken to pieces before they are removed. With this view it is to be obſerved, that a great variety of ſtones have ſome thin veins, which being found, wedges can be driven into them by large hammers, ſo that they may be eaſily broken. For ſuch operations ſpades and pick axes are neceſſary to clear away the earth, and a large and a ſmall lever to turn the ſtones out of the ground. Hammers and wedges are alſo requiſite, with carts, to remove the fragments from the field. In the Statiſtical Account of Scotland, vol. xix. p. 565. pariſh of Maderty, we are told that "the Rev. Mr Ramſay, the preſent incumbent, who occupies a piece of land full of ſitfaſt ſtones, conſtructed a machine for the purpoſe of raiſing them. It operates on the principles of the pulley and cylinder, or wheel and axis, and has a power as one to 24; it is extremely ſimple, being a triangle, on two ſides of which the cylinder is fixed; it can be eaſily wrought and carried from place to place by three men. A low four-wheeled machine of a ſtrong conſtruction is made to go under the arms of the triangle, to receive

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the ſtone when raiſed up. This machine has been already of great uſe in clearing ſeveral fields of large ſtones in this place and neighbourhood."

It is evident, that the machine here deſcribed is only valuable for getting ſtones out of the way in the groſs and unbroken; and, accordingly, we learn that ſtone fences are almoſt unknown in the parith of Maderty.

Where ſtones are valuable, therefore, and the operation of breaking them with hammers and wedges is found impracticable or too laborious, it will be neceſſary to blaſt them with gunpowder. To perform this operation properly, however, conſiderable experience is requiſite; for it is ſaid, that a ſkilful workman can in moſt inſtances, by the depth and poſition of the bore, contrive to rend ſtones into three equal pieces without cauſing their fragments to fly about. In time of war, however, the expence of gunpowder is apt to become very great. With a view to diminiſh the coſt of that article, it has been ſuggeſted, that it is proper to perform the operation not with gunpowder alone, but with that article of a good quality, mixed up with about one-third of its bulk of quicklime in fine powder. It is ſaid that this compoſition poſſeſſes as much force as an equal quantity of pure gunpowder, and it is even alleged, that the proportion of quicklime may be increaſed with advantage. How the ſtrength of gunpowder ſhould be ſo much augmented by the addition of quicklime, we do not know. Perhaps it may add to the force of the exploſion by undergoing a chemical decompoſition of its parts, as it has of late been ſuſpected, that this mineral is by no means a ſimple or uncompounded body.

Where a field is very greatly overrun with concealed ſtones, the moſt effectual method of getting quit of them, and of rendering it permanently arable, conſiſts of trenching it wholly by the ſpade. Nor is this always the moſt expenſive mode of proceeding. The trenching can be done at the rate of from 3l. to 4l. *per* Scots acre, which is one-ſixth larger than an Engliſh acre, allowing at the ſame time the ſtones or their price at the quarry to the labourers. In this way, the expence of ploughing the field is ſaved. The ſoil is deepened to the utmoſt extent of which it is capable, and can be laid out in the form moſt convenient for cultivation. In Dr Anderſon's report of the ſtate of agriculture in Aberdeenſhire, it is ſaid that the expence of trenching an acre to the depth of from 12 to 14 inches, where the ſtones are not very large and numerous, runs from 4d. to 6d. a fall, which is from 2l. 13s. to 4l. *per* Scots acre. Ground that has been formerly trenched, is ſometimes done as low as 2d. *per* fall, or 1l. 6s. 6d. *per* acre. Hence, in conſequence of the practice of trenching ground by the ſpade being not unfrequent in Aberdeenſhire, workmen have become expert, and by competition have rendered the price extremely moderate. It is to be wiſhed that the ſame practice were more frequent in other parts of the country, as it would have a tendency to introduce a taſte for the moſt correct and perfect of all modes of labouring the ſoil, and would alſo occupy a conſiderable part of the population of the country, in the moſt innocent and healthful of all employments, that of agriculture.

2. Of Draining.

Imp. rtance of draining.

168 It has already been remarked, that the preſence of moiſture is of the utmoſt importance to the ſucceſs of vegetation. At the ſame time, as muſt neceſſarily happen with every powerful and active agent, the too great abundance of water is no leſs pernicious to many plants, than an entire want of it. When it ſtagnates upon the ſoil, it decompoſes or rots the roots and ſtems of the moſt valuable vegetables. Even when it does not remain on a ſpot round the whole year, its temporary ſtagnation during the winter renders the land unproductive. Seaſons of tillage are often loſt, and in wet years the crop muſt always be ſcanty and precarious. When in graſs, the land can only produce the coarſeſt and moſt hardy vegetables, which can reſiſt the chill or cold ſtate of the ſoil, or the fermentation which is often produced by ſudden warmth while the water remains upon the ground. Hence ariſes the importance of draining, by which arable land is rendered manageable, is made to dry gradually and early in the ſpring, and the corn is increaſed in quantity and weight; and by which, in paſture lands, the graſſes are made to change their colour and to loſe their coarſe appearance, and the finer kinds of plants are enabled to flouriſh. Even the climate is, by means of draining, very conſiderably improved. It is rendered leſs cold during the winter, and by diminiſhing in hot weather the exhalations from the ſoil, its ſalubrity both to animal and vegetable life is greatly increaſed. Every kind of grain comes earlier to maturity. The harveſt is leſs precarious, and the diſeaſes are baniſhed which aroſe from a damp ſoil and a humid atmoſphere.

Land is rendered wet by rain or by ſprings.

169 The water which ſtagnates upon the ſurface of a ſoil may originate from two cauſes. It may deſcend upon it in the form of rain, or it may aſcend from ſprings or reſervoirs of water in the bowels of the earth. The rules for draining land which is rendered too wet for the purpoſes of agriculture are different, according to the cauſes which occaſion the wetneſs. We ſhall firſt take notice of the moſt approved modes of draining, when the exceſſive moiſture is occaſioned by rain water ſtagnating upon the land; and we ſhall afterwards take notice of the plan of draining to be adopted, when the wetneſs ariſes from ſprings or water ariſing out of the earth.

Drains are open or hollow.

170 To relieve land from rain water that is apt to ſtagnate upon it, two kinds of drains have been adopted. One of theſe is called *open drains*, from their being expoſed to view in their whole length. The other kind receives the appellation of *hollow drains*, from their being covered, ſo that their exiſtence is not apparent to a ſtranger, nor is any part of the land loſt in conſequence of their being made. Hollow draining is ſometimes avoided on account of the great immediate expence with which it is attended, and in ſome ſituations it is altogether inadequate to the object in view. There are ſome ſoils that being chiefly compoſed of a ſtiff clay, poſſeſs ſo great a degree of tenacity as to retain water upon every trifling depreſſion of their ſurface, till evaporation carries it off. It is in vain to attempt to drain ſuch ſoils by hollow channels below ground, as the water will never be able to filtrate through the ſoil ſo as to reach the drain. In ſuch ſituations, therefore,

Hollow drains, when inapplicable.

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fore, open draining is the only mode that can be adopted for clearing the ſoil of ſurface water.

It alſo ſometimes happens that, on ordinary ſoils, hollow drains would ſpeedily be rendered uſeleſs. This muſt take place where the admiſſion of ſurface water cannot be avoided, and, from the figure of the adjoining lands, muſt be very greatly augmented in time of heavy rains. In ſuch caſes, a cloſe or hollow drain would ſpeedily be choked up by the ſand and ſoil brought down by ſudden and violent torrents. In theſe ſituations, therefore, open drains can alone prove uſeful.

172 Draining of clay ſoils.

Soils formed of a tenacious clay can only be drained by being laid up properly in ridges which are high in the middle, and have furrows at each ſide for carrying off the water. The great art of preſerving land of this deſcription, therefore, free from ſuperfluous moiſture, conſiſts of laying out every field in ſuch a direction as that all the furrows between the ridges may have a gradual deſcent to a common ditch or drain for carrying off the water. Where at any particular ſpot the regularity of the deſcent is interrupted, croſs furrows muſt be kept open with the ſame view. The ridges muſt alſo be laid up in ſuch a form as to allow the water to deſcend from the ſummit in the middle to the furrows on each ſide. If the ridges, however, are too high in the centre, there will be a danger that in heavy rains the ſoil may be waſhed from the ſummit down into the furrows, which would produce the double evil of impoveriſhing the centre of every ridge, and of choking up the furrows, and rendering them unfit to drain the land.

The diſtinguiſhed ſucceſs of the Flemiſh huſbandmen, and alſo of the farmers in the central counties of England where this kind of ſoil abounds, ſufficiently demonſtrates the practicability of preſerving it in a due degree of dryneſs for the moſt valuable purpoſes of agriculture. In theſe Engliſh counties, and in Flanders, the general mode of drying land conſiſts of ploughing it up in high and broad ridges, from 20 to 30, and even 40 feet wide, with the centre or crown three or four feet higher than the furrows. By attentively preſerving the furrows in good order, and free from ſtagnating water, the land is kept in a dry ſtate, and all kinds of crops flouriſh.

173 Draining in the Carſe of Gowrie.

The mode of ridging and croſs-furrowing the clay ſoil of the Carſe of Gowrie, Perthſhire, has been thus deſcribed by George Paterſon, Eſq. of Caſtlehuntly in that county. There are certain large common drains which paſs through the diſtrict in different directions, ſufficiently capacious to receive the water drained from the fields by the ditches which ſurround them, and of ſuch a level as to carry it clear off, and to empty their contents into the river Tay. There are alſo ditches which ſurround every farm, or paſs through them as their ſituation may require, but in ſuch manner as to communicate with every field upon the farm. Theſe ditches are made from two to four feet wide at top, and from one and a half to one foot at bottom; a ſhape which prevents their ſides from falling in: but even then they muſt be cleanſed and ſcoured every year at a conſiderable expence. If the fields be of an uniform level ſurface, the common furrows between the ridges, provided they be ſufficiently deepened at their extremities, will ſerve to lay the grounds dry; but, as it ſeldom happens that any field is ſo completely free of inequalities, the laſt operation, after it is ſown and harrowed in, is to draw a furrow with the plough through every hollow in the field which lies in ſuch a direction, that it can be guided through them, ſo as to make a free communication with any of the ditches which ſurround the farm, or with any of the furrows between the ridges which may ſerve as a conductor to carry the water off to the ſurrounding ditches. When this track is once opened with the plough, it is widened, cleared out, and ſo ſhaped with the ſpade, that it may run no riſk of filling up. Its width is from ſix inches to a foot according to its depth, which muſt depend upon the level of the field; but the breadth of a ſpade at bottom is a good general rule. It frequently happens that there are inequalities in ſeveral parts of the ſame field, which do not extend acroſs it, or which do not paſs through it in any direction that a plough can follow; but which may extend over two ridges, or one ridge, or even part of a ridge. Such require an open communication to be made with any furrow, which may ſerve as a conductor to carry off the water, which is always made with the ſpade. All theſe open communications are here called *gaas*, and to keep them perfectly clear is a very eſſential object of every Carſe farmer's attention.

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It is the general practice in the Carſe to have headridges, as they are called, at the two extremities of each field; that is the ground upon which the plough turns, is laid up as a croſs ridge higher in the middle and falling off at each ſide, ſo that a gaa is made in the courſe of the inner furrow with which the whole furrows between the longitudinal ridges communicate, and into which they pour all their ſurface water, which is carried off by gaas or openings cut through the head ridges, and emptied into the adjoining ditches which convey the water to the main drain. Beſides all this, an experienced Carſe farmer takes care that his lands be carefully ploughed, and laid up equally without inequalities that can hold water, and that the ridges be gradually rounded, ſo that the ſurface water may neither lodge nor run ſo rapidly off as to injure the equal fertility of the field.

174 Rules for making open drains.

With regard to the general rule for making open drains, it may be obſerved, that their depth and wideneſs muſt always in ſome meaſure be left to the judgement of each particular huſbandman, that they may be varied according to the variety of ſoils and ſituations. Upon the whole, however, the width at bottom ought to be one-third of that at top, that, by being ſufficiently ſloped, the ſides may be in no danger of falling in. The fall or declivity alſo ſhould be ſuch as may carry off the water without ſtagnation, and along with it any graſs and other looſe and light ſubſtances that may get into the ditch. At the ſame time, care ought to be taken to lead the drain in ſuch a direction down any ſteep declivity that may occur in an oblique manner, that the water may not have too rapid a motion, as it would otherwiſe be apt to form inequalities in the bottom, and to wear down the ſides. In moſs and very ſoft ſoils drains require to be of conſiderable width, on account of their tendency to fill up; and their breadth at top muſt exceed that at the bottom in a greater degree than the proportion already mentioned. In all caſes in which a ditch is intended for a drain only,

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and not to be uſed as a fence, none of the earth thrown out of it ought to be allowed to remain upon the ſides, but ſhould be ſpread abroad upon the land, or uſed in filling up the neareſt holes. When this is not done, the utility of the drain is injured by the ſurface water being prevented from reaching it, and by the tendency which this weight of earth has to cauſe the ſides to fall in; the difficulty of ſcouring or cleaning it is thus alſo much increaſed. If it be neceſſary, however, to uſe the ditch, and the earth thrown out of it, as a fence, a deep furrow ought to be made along the back of the mound of earth, with openings in convenient places into the ditch for tranſmitting to it the water collected in the furrow.

In plantations, open drains are the only kind that can be uſed, as the roots of the trees would be apt to choke up covered drains. In paſtures, ſmall and narrow open cuts, made with the plough or otherwiſe, are often extremely uſeful, to carry off ſtagnating water and a part of the rain as it falls. The only objection to them is, that they are eaſily ſtopt by the trampling of the cattle; but, on the other hand, they are eaſily reſtored. Concerning all open drains, indeed, it muſt be remembered, that they require to be cleaned out at leaſt once a-year; and when this proceſs is neglected for any length of time, it becomes more difficult, and the drains loſe their effect. Hence, though open drains are originally cheaper, yet, by the neceſſity of annual repairs, they ſometimes become ultimately more expenſive than covered or hollow drains, to the conſideration of which we ſhall next proceed.

175 ature and ſtory of ollow rains.

Hollow drains, in which the water is allowed to flow along a bed of looſe ſtones, or other porous materials, while they are covered with a bed of earth in which the operations of the plough can proceed, bear a near reſemblance to that part of the conſtitution of nature by which water flows in various channels along beds of porous ſtrata in the bowels of the earth, and coming to the ſurface in various ſituations, ſupplies ſprings and the conſtant flow of rivulets and of the largeſt ſtreams. The practice of hollow draining was known in a very remote antiquity. It is ſaid that the preſent Perſians are ſupplied by means of hollow drains with water in their moſt fertile fields, though they know not from whence the water is brought, and are unacquainted with the arts by which a more ingenious people in former times contrived to deprive one part of the ſoil of its ſuperfluous moiſture with a view to enrich another. The ancient Roman writers, Cato, Palladius, Columella, and Pliny, particularly mention the practice of hollow draining. They knew the kind of ſoils in which theſe drains are uſeful, and the propriety of directing them obliquely acroſs the ſlope of the field. They filled them half way up with ſmall ſtones, and for want of theſe with willow poles, or even with any coarſe twigs or other ſimilar materials twiſted into a rope. They alſo fortified the heads of their drains with large ſtones, and their mouths or outlets with a regular building; and they carried the whole drain to the depth of three or four feet.

As already mentioned, hollow drains are of little value in a ſoil that conſiſts of a ſtiff clay, and are chiefly uſeful where, from whatever cauſe the wetneſs may reſult, the ſoil is ſufficiently porous to allow the moiſture to percolate to an internal drain.

If the field propoſed to be drained lie on a declivity, great care ſhould be taken to make hollow drains in a direction ſufficiently horizontal to prevent a too rapid fall of the water, which might wear the bottom uneven, and have the effect to choak, or, as it is ſometimes called, to *blow up* the drain, whereby in certain ſpots in the field artificial ſprings would be formed. Preparation of Land. 176 Rules for making hollow drains.

Concerning the ſeaſon for executing drains, diſcordant opinions are entertained. Some prefer winter, others ſummer. Where much work is to be accompliſhed, a choice of ſeaſons may not indeed be left to the huſbandman. Some farmers, however, when they have the choice of time, always prefer ſummer for this employment, being then able to execute the cuts in a neater manner without that kneading of the ſoil which takes place in winter, which they think hurts the uſefulneſs of the drain, by ever after preventing the water from eaſily finding its way to it; beſides, that it is eaſier to bring the ſtones or other materials to the ſpot in ſummer than in winter. Others, however, prefer draining in winter, becauſe in the caſe of a clay ſoil the labour is at that ſeaſon much eaſier; and alſo becauſe labourers are then uſually moſt eaſy to be obtained.

The depth and width uſually adopted for hollow draining is very various, according to the nature of the ſoil and the ſituation of the field. When the practice firſt came into general uſe, three feet is ſaid to have been the common depth; but, for many years paſt, it is ſaid that hollow drains ſeldom exceed 30 or 32 inches, and that more drains are of two feet, or 26 inches deep, than of any other. One general rule, however, cannot be neglected with ſafety, that the depth muſt be ſufficient to prevent the materials with which the drain is filled from being affected by the feet of horſes in a furrow while ploughing; twenty-four inches is perhaps too little for this purpoſe. A horſe's foot in a furrow is uſually at the depth of four inches or more. If ten inches additional be allowed for the materials employed in filling the drain, there will remain only nine or ten inches to ſupport the foot of a horſe exerting his ſtrength in the act of ploughing, which upon a porous ſoil ſeems ſcarcely ſufficient. What are called *main drains*, which are thoſe intended to receive the water of ſeveral other drains, muſt always be ſomewhat deeper than the reſt, having more water to convey. As to the wideneſs of hollow drains, moſt farmers have of late been ſolicitous to render them as narrow as poſſible, becauſe by this means a great ſaving takes place of the materials uſed for filling them. If the ſtones are coupled at the bottom of the drain, that is, made to lean towards each other, ſo as to conſtitute a triangle, of which the bottom of the drain forms the baſe, the width need not be greater than one foot; nor perhaps is it even neceſſary to exceed this breadth where large ſtones are thrown in promiſcuouſly. That the ditches or cuts which are meant to be converted into hollow drains may be executed with neatneſs and care, a point of much importance to their uſefulneſs, it is thought prudent that the workmen ſhould not be paid according to the extent of ground which they open, but as day labourers. This, however, is more particularly the caſe with regard to filling the drains, an operation in which a ſtill greater degree of attention is neceſſary.

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177 Materials with which hollow drains may be filled.

The materials uſed for filling drains have been various, according to the ſubſtances which different farmers have been able to obtain. Stones, however, are the moſt common, and alſo the beſt of all materials, on account of their permanency. If ſtones from quarries are to be uſed, and the drain formed like a conduit at the bottom, the trench muſt be made at the loweſt part 16 inches wide, containing two ſide ſtones about ſix inches aſunder, and the ſame in height, with a cap or flat ſtone laid over, which ſecures the cavity. Such hollow drains are commonly uſed for permanent currents of water from ſprings, and are more expenſive than where no ſuch ſteady current exiſts, and the ſtones are either thrown in promiſcuouſly, or laid down ſo as to form triangular cavities. Small ſtones, however, ought not to be uſed for the bottom of a drain. Whether the ſtones are large or ſmall, they ought to be very clean, having no clay or earth adhering to them, and of the moſt hard and permanent quality that can be procured, with as little tendency as poſſible to moulder or decay in conſequence of alternate changes from wet to dry. They ought alſo to be laid in carefully, ſo as not to tumble down any earth, which might choke up their interſtices. The whole ſubject, however, will be better underſtood by a ſtatement of the way in which drains have been filled with ſucceſs by intelligent perſons.

The following directions are given by T. B. Bayley, Eſq. of Hope, near Mancheſter: "Firſt make the main drains down the ſlope or fall of the field. When the land is very wet, or has not much fall, there ſhould in general be two of theſe to a ſtatute acre; for the ſhorter the narrow drains are, the leſs liable they will be to accidents. The width of the trench for the main drains ſhould be 30 inches at top, but the width at the bottom muſt be regulated by the nature and ſize of the materials intended to be uſed. If the drain is to be made of bricks, 10 inches long, 3 inches thick, and 4 inches in breadth, then the bottom of the drain muſt be 12 inches; but if the common ſale bricks are uſed, then the bottom muſt be proportionably contracted. In both caſes there muſt be an interſtice of one inch between the bottom brick and the ſides of the trench, and the vacuity muſt be filled up with ſtraw, ruſhes, or looſe mould. For the purpoſe of making theſe drains, I order my bricks to be moulded ten inches long, four broad, and three thick; which dimenſions always make the beſt drain."

The method which this gentleman purſues in conſtructing his main drains is ſtated by him to be the following: When the ground is ſoft and ſpungy, the bottom of the drain is laid with bricks placed acroſs. On theſe, on each ſide, two bricks are laid flat, one upon the other, forming a drain ſix inches high, and four broad, which is covered with bricks laid flat.—When the bottom of the trench is found to be a firm and ſolid body, ſuch as clay or marl, he formerly thought that it might not be neceſſary to lay the bottom with brick; but in this he has candidly acknowledged that he was quite wrong. By the runs of water, the alternate changes from wet to dry, and the acceſs of air, theſe hard bottoms were rendered friable, crumbled away, and let in all the drains, and allowed them to choke up, that were not ſupported by a bottom laid with brick or ſtone. When ſtones are uſed inſtead of bricks, Mr Bayley thinks that the bottom of the drain ſhould be about eight inches in width; and in all caſes the bottom of main drains ought to be ſunk four inches below the level of the narrow ones, whoſe contents they receive, even at the point where the latter fall into them. Prepara of Lan

The main drains ſhould be kept open or uncovered till the narrow ones are begun from them, after which they may be finiſhed; but before the earth is returned upon the ſtones or bricks, it is adviſable to throw in ſtraw, ruſhes, or bruſhwood, to increaſe the freedom of the drain. The ſmall narrow drains ſhould be cut at the diſtance of 16 or 18 feet from each other, and ſhould fall into the main drain at very acute angles, to prevent any ſtoppage. At the point where they fall in, and eight or ten inches above it, they ſhould be made firm with brick or ſtone. Theſe drains ſhould be 18 inches wide at the top, and 16 at bottom.

A mode of draining clay ſoils wet by rain or ſurface water, practiſed by Sir Henry Fletcher, Bart. with great ſucceſs, ſeems worthy of being here ſtated. The upper ſoil is of good quality, but being ſituated in a mountainous part of the country, the frequent rains kept the upper ſoil ſo full of water, that it produced only a coarſe graſs worth 3s. per acre. The inferior ſoil of clay was of great depth. The mode of draining which has been ſucceſsfully practiſed upon it is the following: "On graſs lands he digs 22 inches, or 2 feet deep; the firſt ſpadeful is of the turf, taken ſo deep, as where it ſeparates from the clay, which is dug carefully out, and preſerved unbroken graſs ſide up, and laid on one ſide of the cut; then, with a very ſtrong ſpade, 18 inches long, 6 inches wide at top, and 2 at the bottom, he digs a ſpadeful in the clay, which the men ſpread about the land, on the ſide of the drain oppoſite to where the turfs were laid, as far as poſſible from the drain, ſo as none may get in again. A ſcoop, to clear out the fragments in the bottom, follows, which are alſo ſpread in like manner. They are then ready for filling; and in doing this, he takes three ſtones of a thin flat form, two of which are placed againſt the ſides of the drain, meeting at bottom; and the third caps the other two. Thus, a hollow triangular ſpace is left to convey the water, which is ſubject to no accidents that can fill it up or impede the current. Stones always ſink deeper in the ground; in the common method, this frequently cauſes ſtoppages by their being partly buried in the clay: but the triangle, when it ſubſides, does it regularly, and keeps its form and the paſſage for the water clear. One cart load of ſtones, in this way, will do a conſiderable length of drain. They are carefully laid down by the ſide of the cut, with a ſhovel or baſket, and if there are any ſmall refuſe ſtones left on the ground after the drain is ſet, they are thrown in above. The ſtones being thus fixed, the ſods are then trimmed to the ſhape of the drain, and laid on them, with the graſs ſide downwards, and none of the clay uſed in filling up.

The expence is a halfpenny per yard, the men earning 2s. and 2s. 6d. per day, at 10 yards diſtance from drain to drain. At 6 yards diſtance they anſwered well, but would not operate a cure, if more than 7 yards aſunder. At this laſt diſtance, therefore, the expence of draining an Engliſh acre, at ½d. per yard, would amount to 1l. 9s. 2d. the ſtones being not more than half a mile diſtant.

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Not only ſtones and bricks, but alſo wood and other materials have been uſed for filling drains. Upon this point, Lord Petre expreſſes himſelf thus: "The drains filled with wood, and covered as uſual with ſtraw or ruſhes, are, preferable to ſtones or any other kind of materials; the reaſon is, as the wood decays, the water continues to paſs. When filled with ſtones, and the drains ſtop up, which muſt be expected to take place in time, the earth becomes quite ſolid round the ſtones, and as they do not decay, the filtering of the water is for ever obſtructed: not ſo when buſhes or wood are uſed; continual filtering and draining are then for ever to be perceived; and by repeating the operation a ſecond time, cutting the drains tranſverſely of the old ones, the benefit of the filterings through the rotten wood is ſecured, and the ſpewing up of old, broken, and damaged drains corrected and carried off. Moreover, as buſhes form a much greater number of cavities than either ſtones or poles, they are leſs liable to ſtop up, and encourage filtering more than larger and more ſolid bodies. A load of buſhes containing 120 faggots, will do about 360 rods; and a load of ſtraw containing 120 bottles, the ſame: the load of buſhes is generally worth about 14s. and the ſtraw 18s. per load. I therefore calculate this expence about 12s. per acre, ditches a rod apart."

Richard Preſton, Eſq. of Blackmore, preſers, on twenty years experience, black thorns to every other material for filling drains. Wood is ſometimes uſed with this view, in the following manner: Two billets are placed at oppoſite ſides of the drain, and each is made to reſt under the oppoſite ſide to that on which its lower part ſtands, ſo as to form with each other a St Andrew's croſs. The upper part of the croſs is filled with bruſhwood, laid longitudinally, above which ſtraw is placed croſs-ways, and the mould is thrown in over all. This kind of drain is ſaid to have continued running in Berwickſhire for 30 years, and it is recommended by the author of the Agricultural Report of the county of Caermarthen, in Wales. He ſays, "The completeſt method I have yet known, is to cut the ſtrongeſt willows, or other aquatic bruſhwood, into lengths of about 20 inches, and place them alternately in the drain, with one end againſt one ſide of the bottom, and the other leaning againſt the oppoſite ſide. Having placed the ſtrong wood in this manner, I fill the ſpace left between them on the upper ſide with the ſmall bruſhwood, upon which a few ruſhes or ſtraw being laid, as before mentioned, the work is done. Willow, alder, aſp, or beech boughs, are exceedingly durable if put into the drain green, or before the ſap is dried; but if they are ſuffered to become dry, and then laid under ground, a rapid decay is the conſequence. I have ſeen willow taken out of a bog, after lying there thirty years, and its bark was as freſh and ſappy as if it had been recently cut from the hedge; and it is well known that beech laid green in the water will continue ſound for any length of time."

Another method of uſing wood conſiſts of fixing at every foot diſtance in the drain, a ſtick in the form of a ſemicircular arch, and of laying upon theſe longer branches or twigs longitudinally. Thus is a curved cavity, or arch, formed beneath, capable of ſupporting any weight of earth. For this purpoſe young wood is recommended, and in particular the prunings of larch.

Inſtead of wood or ſtone, in many places, it has of late become cuſtomary to fill the loweſt part of drains with ſtraw, and with that view to make uſe of wheat ſtubble as the cheapeſt kind of ſtraw. On this ſubject, Mr Vancouver, in his Report of the Eſſex huſbandry, remarks, that when the ſoil is a very cloſe and retentive clay, the drains ſhould be made proportionally near to each other, ſhallow, and filled with ſtraw only, it being totally unneceſſary to uſe wood or any more durable material upon land where the ſides of the drains are not likely to crumble in. He aſſerts that drains formed in this manner, through the tough and retentive clays, will be found in a ſhort time after the work is finiſhed, to afford over the ſtraw, with which the drain was filled, an arch of ſufficient ſtrength to ſupport the incumbent weight of the ſoil, and the caſual traffic of the field. "In 12 or 18 months it may be obſerved that the ſtraw, being of one uniform ſubſtance, is all rotted, and carried away, leaving a clear pipe through the land in every drain, into which the paſſage of the water may have been much facilitated, by a due attention to the filling of the drains with the moſt friable and porous parts of the ſurface the field might have afforded."

An improvement in filling hollow drains with ſtraw, conſiſts of twiſting the ſtraw into a rope, ſaid to have been deviſed by Mr Bedwell, of Eſſex. The rope of ſtraw is formed as large as a man's arm, and is placed at the bottom of the drain. The expence of draining an Engliſh acre of land with this material in Eſſex, is ſaid to ſtand thus:

For cutting and raking together an acre of wheat ſtubble, generally ſufficient for an acre of drains, - -	L.0	2	0
Digging eight ſcore rods of drains, -	0	13	4
Filling them up with ſtubble, -	0	2	8
Extra work with the common ſpade, on an average a day's work for a man, -	0	1	4
	L.0	19	4

As in ſome ſituations it is an object of great importance to ſave the expence of materials commonly uſed in filling drains, a variety of devices have with that view been adopted. One of theſe is of the following nature. A drain is firſt dug to the neceſſary depth, narrow at bottom. Into the trench is laid a ſmooth tree, or cylindrical piece of wood, 12 feet long, 6 inches diameter at the one end, and 5 at the other, having a ring faſtened into the thickeſt end. After ſtrewing a little ſand upon the upper ſide of the tree, the clay or toughest part of the contents of the trench, is firſt thrown in upon it, and thereafter the remainder of the earth is fully trod down. By means of a rope through the ring the tree is then drawn out to within a foot or two of the ſmall or hinder end, and the ſame operation is repeated till the whole drain is complete. Such a drain is ſaid to have conducted a ſmall run of water a conſiderable way under ground for more than 20 years without any ſign of failure.

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What is called the ſod or pipe drain conſiſts of a trench dug to a proper depth; after which a laſt ſpadeful is taken out in ſuch a way as to leave a narrow channel, which can be covered by a ſod or turf dug in graſs land and laid over it, the graſs ſide downwards. Such

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drains are said to continue hollow, and to discharge well for a great number of years. Mosses are said to be drained in Lancashire nearly in the same manner, by leaving shoulders about a foot and a half from the bottom of the trench, and laying across these pieces of dryed peat or turf, cut into lengths of 16 inches, and 8 or 9 inches in breadth.

In Buckinghamshire, in grass lands, the sod drain is thus made: When the line of drain is marked out, a sod in form of a wedge is cut, the grass side being the narrowest, and the sods being from 12 to 18 inches in length. The drain is then cut to the depth required, but is contracted to a very narrow bottom. The sods are then set in with the grass side downwards, and pressed as far as they will go. As the figure of the drain does not suffer them to go to the bottom, a cavity is left, which serves as a water course; and the space above is filled with the earth thrown out.

Another invention for draining land is described in the agricultural report of the county of Essex. It consists of a draining wheel of cast iron, that weighs about 4 cwt. It is 4 feet in diameter, the cutting edge or extremity of the circumference of the wheel is half an inch thick, and it increases in thickness towards the centre. At 15 inches deep it will cut a drain, one half of an inch wide at the bottom, and 4 inches wide at the top. The wheel is so placed in a frame, that it may be loaded at pleasure, and made to operate to a greater or less depth, according to the resistance made by the ground. It is used, in winter, when the soil is soft; and the wheel tracks are either immediately filled with straw ropes and lightly covered over with earth, or they are left to crack wider and deeper till the ensuing summer; after which the fissures are filled with ropes of straw or of twisted twigs, and lightly covered with the most porous earth that is at hand. Thus, upon grass or ley lands, hollow drains are formed at a trifling expence, which answer extremely well. It is said that 12 acres may be fully gone over with this draining wheel in one day, so as to make cuts at all necessary distances.

On sheep pastures a still simpler mode of removing surface water is said to be practised in some places. Wherever the water is apt to stagnate, a deep furrow is turned up with a stout plough. Thereafter, a man with a spade pares off the loose soil from the inverted sod, and scatters it over the field, or casts it into hollow places. The sod thus pared and rendered thin, or brought to the thickness of about three inches, is restored to its original situation, with the grassy side uppermost, as if no furrow had been made. A pipe or opening is thus formed beneath it two or three inches deep in the bottom of the furrow, which is sufficient to discharge a considerable quantity of surface water which readily sinks into it. These furrows, indeed, are easily choked up by any pressure, or by the growth of the roots of the grass; but they are also easily restored, and no surface is lost by means of them.

179 Duration of hollow drains.

With regard to the duration of hollow drains, or the length of time that the water will continue to flow in them, and thereby to preserve the soil in a proper state of dryness, it must necessarily depend, in a great degree, upon the nature of the materials with which they are filled, and the care that has been taken to prevent their being choked up by any accession of soft soil. Independent of this last circumstance, a drain filled with stones, like the channel which supplies a natural spring, may endure for ever. Wood, with which many drains have of late years been filled, perishes at certain periods according to its nature; but it does by no means follow, that the drain should lose its effect in consequence of the destruction of the wood. If the earth over it form itself into an arch, the water will still continue to flow. Accordingly, it is said, that drains filled with bushes and straw have been known to run well after 40 years.

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180 Drains when the wetness is caused by springs.

Having thus stated the various modes that have been most successfully adopted for draining lands of a superabundant moisture caused by rain or surface water, we shall proceed to consider the way in which a soil may be drained when its undue wetness is the consequence of natural springs, or of water arising out of the bowels of the earth; and also when the soil, whether injured by spring or rain water, is so completely surrounded by higher grounds, as to prevent the possibility, at a moderate expence, of obtaining a level by which the water may be conducted away, either by open or by artificial hollow drains.

181 Nature of springs.

To understand the principles upon which land, rendered wet by springs, may be drained for the purposes of agriculture, it is necessary to attend to the materials of which the globe we inhabit is composed, and to the manner in which large quantities of water find their way into its bowels. The earth upon which we tread is by no means an uniform mass of matter. It consists of various layers or strata of different substances, one placed over the other. These layers or strata are seldom situated horizontally, but almost always descend towards one side or the other. One part of a stratum or layer often ascends and appears on the surface, while the other end or side of it descends obliquely to a great depth into the earth. Having done so, it frequently again bends upwards towards the surface; and indeed assumes almost all the variety of irregular forms and bearings that the imagination can conceive; sometimes suddenly breaking off and giving place to other strata or layers, and sometimes continuing at one corner while the greater part of it ceases. These strata or layers, of which the earth is composed, may be considered, with a view to the explanation of our present subject, as of two kinds. Some of them are porous, and allow water to pass through their substance, and to fill up all their cavities and interstices, such as sand, gravel, some marls, and various kinds of porous rocks. Other layers, on the contrary, do not suffer water to enter into them; such as clay, or gravel with much clay mixed with it, and rocks of a close and compact nature, without any fissures or clefts in them.

It is next to be remarked, that it is chiefly upon high mountains that water exills, or is formed, in very great abundance. Not only do they catch and break the passing clouds, which deposite upon them the greatest portion of their watery contents, but they would seem to have a power, when neither rain nor clouds appear in the sky, of condensing, attracting, or somehow forming water from the atmosphere. In the great burning deserts of Africa rain is scarcely known. The inhabitants build their houses of clods of earth or of lumps of salt. A drizzling shower, which is apt to come once in several years, endangers every dwelling; and

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and two hours of heavy rain would lay a whole city in ruins; yet even there, wherever mountains exiſt, that is to ſay, naked rocks, which abound in a few diſtricts of this wilderneſs, water is almoſt always found in their vicinity; and, in conſequence of the water, ſpots covered with the moſt luxuriant verdure are ſeen like iſlands amidſt the dreary tracts of moveable and unproductive ſand.

The upper part of mountains is very frequently covered with a layer of gravel, or looſe and open rock, into which water readily penetrates. Theſe porous layers or ſtrata deſcend gradually into the bowels of the earth, and convey along with them the water which they contain, and have received from the clouds. Under the porous ſtratum or layer of gravel are uſually layers of clay or of ſolid rock, through which the water cannot paſs, but along the upper part of which it flows. After deſcending, however, a certain length obliquely down towards the plain country, layers or ſtrata of clay and other impervious materials uſually come to be placed above the layers of porous gravel. Thus, as the water in the gravel is confined between clay above and clay or rock below, and muſt deſcend along the gravelly channel which is pervious to it, ſtreams of water are formed in the bowels of the earth, which have their origin in high gravelly ſoils, and their outlets at any place in the low country, where any part of the beds of gravel or porous rock, along which they flow, happens to approach the ſurface, forming ſprings and rivulets, and, by their union or conflux, mighty rivers, which continue ſteadily to water the ſurface of the earth. Hence alſo, in very many ſituations, by digging pits into the earth, we at laſt reach a layer of pervious gravel or rock, containing a ſtream of water, brought, perhaps, from the ſummit of a diſtant mountain; and ſuch pits can be uſed as wells for ſupplying water for every domeſtic purpoſe.

We have ſaid that the upper part of the face of a mountain is often covered with a bed of porous or gravelly ſubſtances capable of taking in water. Upon the ſurface, at a certain diſtance down the hill, a bed of clay begins. The water received above into the layer of gravel continues to deſcend with that layer for a conſiderable ſpace below the bed of clay; and thereafter the gravel ſuddenly ſtops, and the clay above unites with the clay beneath, or with ſome other impervious ſtrata upon which the gravel all the way reſted. In this ſituation, as the water contained in the gravel can proceed no farther, it hangs within the ſide of the hill as in a bag of clay; and a reſervoir is formed of water within the earth. When this bag or natural reſervoir is full, the water contained in it is preſſed upwards againſt the clay by which it is covered. It moiſtens this clay, and finds its way by chinks through all its weaker parts or pores. Thus a belt of ſoft and ſpouty land is formed upon the ſide of the hill;

182 Principle on which land made wet by ſprings drained.

the mode of draining which is very eaſy. If a hole is dug into the earth near the bottom of the bag or reſervoir of water, ſo as to reach the layer of gravel, the water will inſtantly flow freely out, and, being no longer reſtrained, it will ceaſe to preſs upon the layer or ſtratum of clay that covers it, or to force a paſſage through its chinks; and the ſoil will conſequently be drained.

Let it be ſuppoſed, that the porous ſtratum or layer of gravel, inſtead of ſtopping on the ſide of a hill, deſcends into the plain or level country, the water all the while paſſing along in its bowels; and that the gravel has a layer of clay below and another layer of clay above it. After it has reached and paſſed to a conſiderable diſtance along the valley, if the layer of gravel either ſuddenly ſtop and allow the layers of clay to come together, or if the gravel have too little thickneſs and capacity to allow the water which flows within it to paſs eaſily along, it will neceſſarily, from the new ſupplies of water which are continually deſcending, be preſſed upwards againſt the layer of clay which covers it: as in the former caſe, the clay will be ſoftened, and the water will filtrate through all its weaker parts till it reach the ſurface, which it will keep conſtantly wet, and where it will ſtagnate in conſequence of the flat and level form of the country. Over the ſofteſt places, a coarſe verdure will ſpread, and the roots of the parts intertwining, will form ſhaking quagmires. In other places, the moſs plants, being the only ones which can thrive in the moiſt and ungenial ſoil which is thus produced, will rapidly ſpring up, and a moſs will be formed altogether unfit for any purpoſe of agriculture. To drain ſuch a ſoil, it is evidently only neceſſary to dig a pit or hole through the upper ſtratum of clay into the gravel, to give a free vent or iſſue to the water; which having thus found an eaſy paſſage to the open air, will ceaſe to preſs upon the incumbent layer of clay, or to render it moiſt. This clay will therefore ſpeedily become dry and collapſe; the moſs plants will wither, provided the ſurface is properly drained; and the whole ſoil will become ſolid and fit to be cultivated.

It ſometimes happens, as already noticed, that a piece of territory which lies low, is rendered extremely wet by rain and ſpring water coming from adjacent high grounds, and lodging upon its ſurface, while, at the ſame time, it is ſo completely ſurrounded by eminences, or land-locked, that it cannot be drained at a moderate coſt; the conſequence of which is, that the water ſtagnates, and a moſs or bog is formed. The principles which we have already ſtated concerning the manner in which the globe is made up of various ſtrata, indicate the way in which ſuch a bog may be drained at a cheap rate. It is only neceſſary to dig a pit at the loweſt part of it, down through the clay, or other impervious layer that holds up the water, till a porous ſtratum is reached, capable of conveying away the ſurface water down the country below ground to the ſea, or to ſuch rivers as it may chance to be connected with.

The whole art of draining land, where the wetneſs is occaſioned by water preſſing upwards from the bowels of the earth, depends upon theſe principles. It is an art whoſe importance is not yet ſufficiently appretiated, becauſe imperfectly underſtood, and becauſe it has not yet been carried into practice to its full extent. It is probable, however, that at no remote period it will be held in univerſal eſtimation, on account of the command of thoſe hidden ſtreams that are contained in the bowels of the earth, which it will give to mankind for the purpoſes of an improved agriculture, and for the ſervice of commerce in filling canals and giving motion to every kind of machinery. A diſpute exiſts about the original diſcoverer of this art. The celebrated writer upon agriculture, Dr James Anderſon of Aber-

183 Diſpute about the firſt diſcoverer of the mode of draining land made wet by ſprings.

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deen, in his "Eſſays on Agriculture and Rural Affairs," publiſhed in 1775, was undoubtedly the firſt perſon who explained to the world the nature of the art of draining land rendered wet by ſprings, and the principles upon which it ought to proceed; having been led to the inveſtigation many years before, by his having fortunately ſucceeded in draining a bog by ſinking a pit in it through the clay, till an opening was made into the gravel or porous ſtratum, from which the water ruſhed up vehemently. In the mean while, it had happened that Mr Joſeph Elkington, poſſeſſor of a farm in England called Princethorp, in the pariſh of Stretton upon Dunſmore, and county of Warwick, almoſt as early as Dr Anderſon, had accidentally diſcovered that land might be drained in many ſituations by making a ſmall hole into the earth. Being a man of conſiderable natural ingenuity, though, it is ſaid, of little literature, he had the addreſs to take advantage of the diſcovery he had made, with a view to the improvement of his affairs. He therefore commenced the trade of a drainer of lands; and by the novelty of draining land by a ſmall hole bored often at a conſiderable diſtance from the wetteſt part of it, and by conducting himſelf in a myſterious manner, he acquired great reputation, and was extenſively employed. This employment he appears to have merited, as his operations were attended with very great ſucceſs. After the eſtabliſhment of the Board of Agriculture, its members, who appear to have been unacquainted with Dr Anderſon's publication, ſuppoſed Mr Elkington to be the only diſcoverer and poſſeſſor of the art of draining land wet by ſprings in the way now mentioned; and upon their recommendation, parliament beſtowed a reward of 1000l. upon him. It was ſurely an unfortunate circumſtance, that the firſt premium granted upon the recommendation of this board, ſhould have proceeded upon an error, as it undoubtedly did; for, although Mr Elkington had the merit of being the firſt who introduced this art extenſively into practice, there is no doubt that Dr Anderſon, by whom alſo it was diſcovered, was the firſt who explained its principles to the public, and that at a period when Mr Elkington's ſecret remained with himſelf. After all, however, it is not to be ſuppoſed that the theory of this art was abſolutely unknown, although theſe perſons appear to have been the firſt who propoſed to apply it extenſively to the purpoſes of agriculture. It is ſaid that the practice is very ancient in Italy, when a well is dug, to avoid the expence of going to a great depth, by boring with an auger in the bottom of the pit, in the hope of reaching the porous ſtratum which contains the water. And in Germany it appears, as will be afterwards noticed, that the practice has long exiſted of draining land-locked bogs, by letting down the water by means of a pit through the impervious clay, to a porous ſubſtratum. We ſhall now proceed to ſtate the moſt approved modes of draining land that is rendered wet by ſprings, or water aſcending out of the earth; and as the Board of Agriculture inſtructed Mr John Johnſton, land ſurveyor, to inſpect Mr Elkington's principal drainings of this ſort, and to give an account of them, we ſhall give all due attention to the contents of the report made out by that gentleman, which is underſtood to have been executed with much fidelity and accuracy; though we ſhall alſo exhibit, at the ſame time, the practice of other intelligent perſons upon the ſame ſubject. Preparation of Land.

In the practice of this art it will readily occur, that it is of the utmoſt importance to obtain a knowledge of the internal ſtructure of the earth, and of the manner in which its various layers or ſtrata ſucceed, and are uſually intermingled with each other. This object, however, can only be attained in any conſiderable degree of perfection by obſervation and experience. There are ſeveral ways, however, by which a man of ſagacity and reflection may greatly abridge the difficulty of this ſtudy, ſo as in a ſhort time to enable himſelf to practiſe the art of draining with conſiderable ſucceſs. The ſureſt way of aſcertaining the inclination of the different ſtrata, or the way in which they lie upon each other, and the direction in which they deſcend into the earth, conſiſts of examining the bed of the neareſt rivers, and the appearance of their banks when ſteep and broken, ſo as to lay bare the different ſtrata of earth adjoining to them. Pits, quarries, and wells, that may have been dug in the neighbourhood, may alſo be examined with the ſame view. Ruſhes, ſmall elder buſhes, and other plants which grow on the wetteſt ſoils, alſo frequently afford ſymptoms of the line under which an internal reſervoir of water is placed, and is preſſing upwards from wanting a free paſſage below ground. 184 Practical rules for draining land made wet by ſprings.

It is often of much importance, even in ſheep countries, to drain the ſide of a hill, not only becauſe wet land is more unproductive than that which is properly drained, but becauſe the ſuperabundance of moiſture is apt to introduce and to keep up among the flock that deſtructive and incurable diſeaſe, the *rot*, for which draining is an almoſt infallible preventive. It is cheaply executed in ſuch ſituations, becauſe the drains for collecting and leading off the water, may uſually be left uncovered. Let it be ſuppoſed then, that in conſequence of internal ſprings at a certain diſtance down the declivity of a hill, or upon any other deſcending ſurface, the ground becomes wet and ſpouty, and unwholeſome for ſheep, and unfit for agriculture; the beſt mode of proceeding with a view to drain it is this. It ought to be recollected, that the reaſon of the wetneſs is this: The rain water at the ſummit of the high ground is received into a porous ſtratum of gravel, with which it deſcends down the ſide of the hill, till it comes to be covered with a clayey ſoil. After deſcending under the covering of clay to ſome diſtance, the gravel or porous under ſoil ſuddenly ceaſes; the clay becomes deeper, and touches the rock or another inferior bed of clay. In this ſituation, the water, unable to deſcend farther, regorges and preſſes upwards upon the clayey ſoil which covers it, rendering it moiſt and ſwampy in every part, and oozing through all its weaker crannies. Thus it forms a belt of moiſt ground along the face of the hill, from which the water perhaps deſcends and damages every part. To drain this declivity, begin at the bottom and carry up a ditch towards the wet ground. As the object is to let out the water at the loweſt point of the reſervoir or natural bag in which it is contained, by making an opening into the gravel there, it will be proper, as the ditch proceeds upwards, frequently to bore holes with an auger of about two inches diameter to a conſiderable depth, 185 To drain the ſide of a hill.

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depth, that is, about 15 feet, though ſometimes it is neceſſary to go to twice that depth. As long as the water is not found by boring, the ditch muſt be carried upwards, and new auger holes formed; when at laſt the auger by boring reaches the loweſt part of the gravel or reſervoir of water, the water will immediately ruſh forth with conſiderable violence at the hole formed by it, and will continue ever after to run without any danger of choking up. When the bottom of the reſervoir of water or layer of gravel is thus found, another ditch ought to be drawn acroſs the head of the former along the face of the hill, ſo as to form the figure of the latter T. In the upper ditch or drain that runs along the face of the hill, auger holes ought to be bored at ſhort diſtances, to let out the whole water from the interior reſervoir or ſtratum of gravel. The whole proceſs will be eaſily underſtood from conſidering the figure 3. Care ought always to be taken in digging the upper drain along the face of the hill, to form it in ſuch a way as that the water may deſcend in it towards the ditch firſt formed, which is intended to convey it down the hill to the neareſt brook. The old practice or mode of draining ground in this ſituation before the uſe of the auger was underſtood, and before men had reflected upon the way in which water is often confined in the earth, conſiſted of digging a trench wherever the ſpouty land commenced. As this was not deep enough to reach the level, that is, to penetrate to the reſervoir of water, it produces only a partial remedy. Other parallel ditches of the ſame kind were therefore cut the whole way down the declivity, and being filled with looſe ſtones and connected with a deſcending ditch, each carried off only a portion of ſurface water, leaving the ſoil ſtill cold in conſequence of the wetneſs of the bottom.

Plate XII.

In performing the operation already deſcribed, ſome difficulties are apt to occur, in conſequence of the irregularities with which the ſtrata are often placed in the earth. In boring in the aſcending trench, in the firſt part of the operation, with a view to diſcover the loweſt point at which the water may be let out from the internal reſervoir, the operator is ſometimes apt to be miſled by finding water before he has come high enough to reach the place at which the porous ſtratum ſtops. This ariſes from its ſometimes happening that at the bottom of the reſervoir ſmall leakages occur, and a portion of the water finds its way downwards through crannies in the earth to ſome diſtance from the main reſervoir. When the auger in boring meets theſe leakages, they are apt to be miſtaken for the main body of water, and the operator can only guard himſelf againſt ſuch errors, by forming an eſtimate of the quantity of water which the adjoining high grounds ought to afford. If the quantity of water that follows the auger be very trifling, while the extent of high ground is great, he may be aſſured that he has not yet reached the great cauſe of the wetneſs of the ſoil. It alſo ſometimes happens that the croſs drain carried along the face of the hill, may in ſome places be below the level of the reſervoir of water, while it is upon it at other places. In this caſe, when the auger by boring in the croſs trench brings no water, it will be neceſſary to bore above it, and to conduct the water that is there obtained by a ſmall cut into the general croſs trench.

It ſometimes happens that hills are compoſed of alternate ſtrata, of ruck and ſand and clay, which reſt horizontally or nearly ſo upon each other, and penetrate and form the maſs of the hill. In ſuch caſes the ſoil above the ſand or rock is often dry and productive, while the clay is wet and ſwampy. In this caſe, the higheſt part of the hill being generally porous, receives the rain water, which deſcends through it till it meets the impervious clay, which forces it to flow to the ſurface, which it renders wet. Having overflowed the upper clay ſurface, it is immediately abſorbed by the next porous ſtratum; and deſcending into it in like manner, again iſſues at the lower ſide of it, and injures the ſurface of the next bed of clay, as it did that of the firſt. To drain a hill ſide of this deſcription, it is neceſſary to make a trench along the upper ſide of every belt of ruſhy or boggy ſoil to receive the water from the ſuperior porous ſoil, and to lead the whole water thus obtained by one or more ditches downwards to the bottom.

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Where a ſoil is compoſed of intermixed varieties, with clay predominating, it is ſometimes very difficult to drain, as it is apt to form itſelf into a variety of hollow reſervoirs, each of which holds water like a cup, while, at the ſame time, theſe hollows being full of porous materials, the ſurface of the ſoil is ſufficiently regular. Thus in wet ſeaſons, patches of moiſt unwholeſome ſoil are formed, not by ſprings for which they may be miſtaken, but by rain water held up by clay in theſe diſjoined cavities. They can only be drained by ſeparate covered cuts, communicating in the ſhorteſt way poſſible with one or more main drains.

186 To drain a bog by letting the water aſcend freely.

With regard to the drainage of bogs, it has already been remarked, that they are either ſuch as can have their water carried off by a communication, at a tolerable expence, with ſome adjoining lower ground; or they are land-locked, ſo as not to admit of being drained in this way. With regard to the former, or thoſe which can be drained by trenches for conducting the water to an adjoining low country or river, they may be rendered wet in two ways: 1ſt, By ſprings oozing out of the adjoining higher ground, in a regular line along the upper ſide of the wet ſurface, which afford water that ſtagnates upon the ſurface of the inferior ground, forming it into a bog. To render free from water a bog of this kind, nothing more is neceſſary than merely to drain the upper adjoining ſwampy ground in the way that has been already ſtated, and to convey away to a diſtance the water produced by it, in regular, open, or hollow drains.—The ſecond claſs of bogs rendered wet by ſprings, conſiſts of thoſe in which the many ſprings that appear are not confined to one regular direction along the upper ſide, but burſt out everywhere, forming ſhaking quagmires, over which it is dangerous for cattle to paſs. The upper part of ſuch bogs uſually conſiſts of peat-earth. Below that is found a bed of clay, extremely wet and ſoft, through the crannies of which ſmall quantities of water are continually oozing. When the loweſt part of ſuch a bog it found, or the place in which it will be moſt convenient to convey away the water, little more is uſually neceſſary than to dig proper trenches, and to bore with the auger through the ſtratum of clay to the porous ſtratum containing the water. To drain an extenſive bog, it will uſually be neceſſary to dig a trench from end to end of it, with croſs trenches at conſiderable diſtances, the

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the bottom of the whole being frequently penetrated with the auger, ſo as to allow a free paſſage for the water to aſcend; the effect of which will be, that the nature of the ſurrounding ſoft ſoil will ſpeedily be altered, in conſequence of the water being removed from beneath it. It will become dry and ſolid, and ſoon fit for bearing the plough. The ſame effect would follow, although only a ſingle perforation were made through the inferior ſtratum of the bog; and accordingly Mr Elkington is ſaid ſometimes to have ſucceeded, while he drained a bog, in raiſing the water from it conſiderably above its own level, for any purpoſe for which it may be required. This was done by rearing around the perforation, a building of brick, puddled around and within with clay, to the top of which the water roſe, and was from thence conveyed away in pipes or otherwiſe.

187 Dr Anderſon's rules for draining ſpouty land.

That the whole of this important ſubject, of draining land rendered wet by ſprings, may be better underſtood, we ſhall give an account of it as deſcribed by Dr Anderſon, in his Eſſays publiſhed in 1775, already mentioned. Suppoſing, ſays he, a deſcending ſtratum of ſand or gravel ſhould be diſcontinued, and that the ſtratum above it ſhould be of a coherent clayey nature; in this caſe, the water being pent in on every ſide, and being accumulated in great quantities, muſt at length force a paſſage for itſelf in ſome way, and preſſing ſtrongly upon the upper ſurface, if any one part is weaker than the reſt, it would burſt forth, and form a ſpring: but if the texture of every part of this ſtratum were equally ſtrong, the water would ſquecze through many ſmall crannies, and would ooze out in numberleſs places, ſo as to occaſion that kind of wetneſs that is known by the name of ſpouting clayey ſoil.

The cure in this caſe is eaſily effected.—For if a ditch of a conſiderable ſize is opened towards the lowermoſt part of the ſpouting ground, ſo deep as to penetrate through the upper ſtratum of clay, and reach to the gravel, the water will riſe up through it at firſt with very great violence, which will gradually decreaſe as the preſſure from the water behind is diminiſhed; and when the whole of the water accumulated in the ſubterraneous reſervoir is run off, there being no longer any preſſure upon the clay above it, the whole ſoon becomes as dry as could be deſired, and continues ſo ever afterwards, if the ditch is always kept open. This the doctor ſays he can aſſert from experience, having rendered ſome fields of this kind that were very wet quite dry by this method of treating them. The attentive obſerver, he adds, will readily perceive, that if any field that is wet from this cauſe admits of being ploughed, it will be in equal danger of being hurt by being raiſed into high ridges, with the other kind of damp ground before mentioned. For as the depth of earth above the reſervoir would be ſmaller in the deep furrows than anywhere elſe, there would of conſequence be leſs reſiſtance to the water in that place, ſo that it would ariſe there in greater abundance. And if, in this caſe, a farmer ſhould dig a drain in each furrow, as a conſiderable quantity of water would riſe into them, in ſome caſes the ground might be improved, or even quite drained thereby, eſpecially if they ſhould have accidentally reached the gravel in any one place: although at an expence much greater than was neceſſary. "I take notice of this circumſtance, ſays he, in ſome meaſure to prevent the prejudice that ſome inattentive obſervers might entertain againſt what was ſaid before of this method of draining, from their having accidentally ſeen ſome fields that may have been bettered by it.

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"Bogs are only a variety of this laſt-mentioned kind of wet ground; and, therefore ought in general to be drained after the ſame manner with them. Clay is a ſubſtance that ſtrongly reſiſts the entrance of water into it: but when it is long drenched with it, it is, in proceſs of time, in ſome meaſure diſſolved thereby; loſes its original firmneſs of texture and conſiſtence; and becomes a ſort of ſemi-fluid maſs, which is called a *bog*; and as theſe are ſometimes covered with a ſtrong ſcurf of a particular kind of graſs, with very matted roots, which is ſtrong enough to bear a ſmall weight without breaking, although it yields very much, it is in theſe circumſtances called a *ſwaggle*. But, whatever be the nature of the bog, it is invariably occaſioned by water being forced up through a bed of clay, as juſt now deſcribed, and diſſolving or ſoftening, if you will, a part thereof. I ſay only a part; becauſe whatever may be the depth of the bog or ſwaggle, it generally has a partition of ſolid clay between it and the reſervoir of water under it, from whence it originally proceeds: for if this were not the caſe, and the quantity of water were conſiderable, it would meet with no ſufficient reſiſtance from the bog, and would iſſue through it with violence, and carry the whole ſemi-fluid maſs along with it. But this would more inevitably be the caſe, if there was a cruſt at the bottom of the bog, and if the cruſt ſhould ever be broken, eſpecially if the quantity of water under it were very conſiderable: and as it is probable, that, in many caſes of this ſort, the water ſlowly diſſolves more and more of this under cruſt, I make no doubt but that, in the revolution of many ages, a great many eruptions of this kind may have happened, although they may not have been deemed of importance enough to have the hiſtory of them tranſmitted to poſterity. Of this kind, although formed of a different ſubſtance, I conſider the flow of the Solway moſs in Northumberland to have been; which, upon the 16th of November 1771, burſt its former boundaries, and poured forth a prodigious ſtream of ſemi-fluid matter, which in a ſhort time covered ſeveral hundred acres of very fine arable ground. Nor will any one, who is acquainted with the nature of moſs,—who knows its reſemblance to clay in its quality of abſorbing and retaining water, and its very eaſy diffuſibility therein, be ſurpriſed at this; as from all theſe properties, it is much better adapted for forming an extenſive bog, and therefore in greater danger of producing an extenſive devaſtation by an irruption of the water into it, than thoſe that are formed of any kind of clay whatever.

"If the bog, or ſwampy ground, is upon a declivity, the ditch ought to be carried acroſs the field about the place where the loweſt ſprings ariſe. But if the ſurface of the ground is level or nearly ſo, ſo as to form ſoft quagmires, interſperſed through the whole of the field, it will be of little conſequence in what part the drain is opened; for if it is dug up ſo deep as to allow the water to riſe in it with freedom, it will iſſue through that opening, and the field will be left perfectly dry.

"But as it may frequently happen that the ſtratum of gravel ſhould be at a conſiderable depth beneath the

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furface of the earth, and as it may be fometimes even below the level of the place into which the drain muſt be emptied, it might fometimes be extremely difficult to make a ditch ſo deep as to reach the bed of ſand or gravel. But it is lucky for us that this is not abſolutely neceſſary in the preſent caſe; as a drain of two or three feet deep, will be equally effectual with one that ſhould go to the gravel. All that is neceſſary, in this caſe, is to ſink pits in the courſe of the drain, at a moderate diſtance from one another, which go ſo deep as to reach the gravel; for as the water there meets with no reſiſtance, it readily flows out at theſe openings, and is carried off by the drain without being forced up through the earth; ſo that the ground is left entirely dry ever after.

"I have likewiſe drained ſeveral fields in this way: and as I have generally found the appearances pretty much alike, I ſhall, for the information of the inexperienced reader, give a ſhort account of them.

"If you attempt to make your pit in one of theſe ſoft quaggy places where the water is found in great abundance, you will meet with very great difficulty in forming it; for as the ſubſtance of which it is compoſed is ſoft, it will always flow into the hole as faſt as you dig it; on which account I would adviſe, not to attempt to make the pit in the ſwaggle, but as near it in the ſolid earth as you conveniently can. However, if it is pretty firm, and of no great extent, it is ſometimes practicable to make a pit in the ſoft bog at the drieſt time of the year. This I have ſometimes practiſed, which gave me an opportunity of obſerving the nature of theſe bogs more perfectly than I otherwiſe would have had. In the trials of this kind that I have made, this ſoft quaggy ground has ſeldom been above three or four feet deep; below which I have always found a ſtratum of hard tough clay uſually mixed with ſtones, and ſo firm that nothing but a mattock or pickaxe could penetrate it: and as this is comparatively ſo much drier than the ground above it, an inexperienced operator is very apt to imagine that this is the bottom that he is in ſearch of. In digging through this ſtratum, you will frequently meet with ſmall ſprings oozing out in all directions; ſome of them that might fill the tube of a ſmall quill, and others ſo ſmall as to be ſcarce perceptible: but without regarding theſe, you muſt continue to dig on without intermiſſion till you come to the main body of the reſervoir, if I may ſo call it, that is contained in the rock, gravel, or ſand; which you will generally find from two to four feet below the bottom of the ſwaggle, and which you will be in no danger of miſtaking when you come to it: for, if there has been no opening made before that in the field, as ſoon as you break the crull immediately above the gravel or rock, the water burſts forth like a torrent, and on ſome occaſions riſes like a *jet d'eau*, to a conſiderable height above the bottom of the ditch; and continues to flow off with great impetuoſity for ſome time, till the pent-up water being drained off, the violent boiling up begins to ſubſide, and the ſtrength of the current to abate; and, in a ſhort time, it flows gently out like any ordinary ſpring; —allowing it to remain in this ſtate, the quaggy earth begins to ſubſide, and gradually becomes firmer and firmer every day; ſo that, in the ſpace of a few months, thoſe bogs which were formerly ſo ſoft as hardly to ſupport the weight of a ſmall dog, become ſo firm that oxen and horſes may tread upon them without any danger of ſinking, at the very wetteſt ſeaſon of the year. I have had a field of this nature, that, by having only one ſuch pit as I have now deſcribed opened in it, was entirely drained to the diſtance of above a hundred yards around it in every direction. But as it is poſſible that the ſtratum in which the water runs may be in ſome places interrupted, it will be in general expedient to make ſeveral of theſe pits, if the field is of great extent; always carrying the drain forward through the lowermoſt part of the field, or as near the quag as you conveniently can; and ſinking a pit wherever you may judge it will be moſt neceſſary. But if the ſtratum of gravel is not interrupted, there will be no violent burſt of water at opening any of theſe after the firſt, as I have frequently experienced. To keep theſe wells from cloſing up after they are made, it is always expedient to fill them up with ſmall ſtones immediately after they are made, which ought to riſe to the height of the bottom of the drain.

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"I have often imagined that the expence of digging theſe pits might be ſaved by boring a hole through this ſolid ſtratum of clay with a large wimble made on purpoſe; but as I never experienced this, I cannot ſay whether or not it would anſwer the deſired end exactly.

"If the whole field that is to be drained conſiſts of one extenſive bog, it will require a long time before the whole work can be entirely finiſhed, as it will be impoſſible to open a drain through it till one part of it is firſt drained and become ſolid ground. In a ſituation of this kind, the undertaker, after having opened a drain to convey the water from the loweſt part of the bog, muſt approach as near to the ſwampy ground as he can, and there make his firſt pit; which will drain off the water from the neareſt parts of the bog. When this has continued open for ſome time, and that part of the bog is become ſo ſolid as to admit of being worked, let him continue the ditch as far forward through it as the ſituation it is in will admit of, and there ſink another pit; and proceed gradually forward in the ſame manner; making croſs cuts where neceſſary, till the whole be finiſhed.

"In this manner may any bog or tract of ſpouting ground of this nature be rendered dry at a very inconſiderable expence; and as there can be no other method of draining ground of this ſort effectually, I recommend the ſtudy of it to the attention of every diligent farmer who may have occaſion for it. Let him firſt be extremely cautious in examining all the circumſtances of his particular fields, that he may be certain which of the claſſes above enumerated it may be ranked with; and when he is perfectly ſure of that, he may proceed without fear, being morally certain of ſucceſs.

We ſhall add the ſubſtance of a paper on this ſubject, for which the author received the ſilver medal of the Society inſtituted for the encouragement of Arts, Manufactures, and Commerce. That author is Mr John Wedge of Bickenhill, near Coventry, who is not only a great farmer himſelf, but had likewiſe been employed by the earl of Aylesford in the management of ſeveral eſtates. Encouraged by his lordſhip's liberality, Mr Wedge informs the ſociety, that he had

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been employed for some years in draining large portions of land, of which part was in the earl's occupation, and part in his own, as tenant to his lordship. The principles upon which he proceeded, as well as his mode of procedure, he states in the following terms:

In every country there are large portions of land that, in wet seasons, have always what may be called a *dry surface*, and other portions of land that have always a *moist* or *wet surface;* the former of these admitting all the water which falls upon them to sink freely through their pores to various depths, till falling on clay, or some other unctuous earth, whose pores will not permit it to pass through, it is there held up to a height proportioned to the quantity of water which comes upon it, and the facility with which that water is discharged. Thus, held up to various heights, it serves as a fountain to distribute its water (either by veins of sand, pebbles, or rock, according to the formation of the different under strata) on the neighbouring lands; and there forms bogs and other varieties of wet surface, on a basis that will be always found to consist of marl or clay, or some mixture thereof. The effect of water thus distributed may be divided into two classes. The first class, where the water is thrown out by a body of marl or clay, &c. upon the surface of descending ground, and in the valley (there held up by clay also) forms bogs or swamps. The second class, where the water is held up by marl or clay, as before, having above that marl or clay a stratum of sand, or pebbles, through which the water passes; and above those sands or pebbles another stratum of marl or clay, through the weakest parts of which the water, by a continual pressure from its fountain, forces a passage upwards; and thus, through the weakest parts of the marl or clay, furnishes a continual supply of water on the surface, for the formation or growth of bogs, &c. in proportion as this water is more or less abundantly supplied by its fountain or head, namely, the higher lands, into which rain-water freely passes, as before described. There are also different soils, under different circumstances, which may form a third class of land for draining; such as strong deep soils, or open light soils, having near the surface a body of marl or clay. In either of these cases, the water which falls on the surface must, for reasons which are self-evident, keep such lands, in rainy seasons, constantly wet and cold; and it should be observed, that a mixture of all the three before described classes of wet land sometimes occurs in one field, by sudden alterations of the under strata, and thereby perplexes the operator, by requiring all the different modes of draining in the same field.

If it be admitted that bogs are thus formed and fed, their cure may be effected with certainty: The first class, by cutting through the stratum (be it sand, pebbles, or rock), that conveys the water to the bog, and carrying off that water by a close drain to some proper place, where the level admits of its discharge: The second class, by sinking a drain to any convenient depth in the upper clay; and then digging or boring with a large auger, at a small distance on one side of this drain, through the remaining part, be it (the upper clay) ever so deep, into the under stratum of sand, pebbles, or rock, through which the water passes; which will then rush up into the drain so made, with a velocity proportioned to the height of the land or fountain whence it is supplied. As this drain advances through the land, holes must be dug or bored, as before, every seven yards, or at such distance as the strength of the springs may require; and the whole of the water thus brought up by tapping the springs, is carried off by the drain made in the upper clay, which must be a close one, to its proper level, and there discharged.

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By both these methods of draining, large tracts of land, under favourable circumstances, may be cured with one drain. The best place for fixing these drains is where the stratum that conveys the water comes nearest to the surface; and the best method of ascertaining that, is to bore or dig in different parts through the different under strata.

The third class may be easily cured by close drains, at such distances and depths as will best carry off the surface-water. It may not be improper to observe, that where the different strata or measures crop out, that is, become gradually more and more shallow in some certain direction (as is often the case, till, one after the other, they all present themselves in succession on the surface of the earth), draining may often be much more easily and better effected by crossing with the drain the different strata or measures, where the levels and other circumstances will admit.

Some of the land drained was part of a common, in the parish of Church Bickenhill, in the county of Warwick; part of it was covered with moss and ling, had a peaty surface, about six inches deep, and produced little or no grass: in all wet seasons it was filled quite to the surface, and often overflowed, with water. Some of the land was much more unsound, deeper of peat, and covered with moss, in most parts nine inches long; another part was an absolute bog in all seasons.

Having dug or bored with a large auger into several parts of the land, Mr Wedge found peat, gravel, and sand mixed, and a quicksand almost uniformly. The quicksand in every part, after getting an inch or two into it, seemed almost as fluid as water, Judging from this, that no materials for a drain could be laid in the quicksand, but what it would immediately bury, he dug a trench almost to the quicksand, leaving gravel, &c. of sufficient strength to bear up the materials for a hollow drain; these materials were two sides and a cover of stone, with a peat-turf on the top to keep out the soil. At every seven yards forward, by the side of this drain, he dug a hole in the quicksand as deep as it would permit. From these holes the water rose freely into the hollow drain, and was by it discharged at a proper level. It may be proper to remark, that the stone made use of for this drain, and all others here mentioned, was a red sand and rag-stone, which easily split into proper sizes for the purpose, and is very durable; it cost about sixpence per ton getting, exclusive of carriage. The drain thus formed ran on the whole rather freely, and made the land dry for a few yards on each side thereof, but was far from having the effect he improperly expected; for it evidently appears that the drain could only take a very small portion of the water from so large a quicksand, which it did not penetrate more than two inches; and that it could drain only to its own depth, or, at most, to that depth in the fountain which supplied the quicksand. His purpose was then defeated; and his motive for mentioning this error cannot, he hopes, be mistaken.

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He now did what he says he ought to have done before, that is, he examined the different strata to a greater depth, particularly on the bog, and at the upper edges thereof, and found the bog to be what has been described under the first class. He therefore determined to attempt the cure in the manner before prescribed for that class, namely, to cut through the whole of the stratum (in this instance, of quicksand), through which he found the water pass. This he effected as follows: The summer being dry, and favourable for the purpose, and having previously made his main open drain, he began his main close drain the first week in June 1791, three feet wide, on the declivity near the edge of the great bog. In the first operation he dug through the peat, the hard sand, and gravel, and one spade's graft (about nine inches deep and seven inches wide) into the quicksand, the whole length of this drain, which was 73 perches, of eight yards to the perch, in length. The drain thus dug ran copiously, not less than 60 gallons per minute. In this state he left it about nine days: the effect of it was rapid, both above the drain and on the bog below. Upon examination, he now found about three inches on the top of the spade's graft which had been made into the quicksand, perfectly dry. He then dug out these three inches of dry sand, to nearly the whole width of the drain, three feet; and at the same time dug out, as before, another spade's graft, from the top of the quicksand, as near the middle of the drain as possible. This was left to run a few days, as before, and had the same effect, namely, three or four inches more of the top of the quicksand became dry and hard. The same operation was repeated again and again with the same effect, till the purpose of getting through this quicksand was completed, so far at least as the level of the main open drain would permit. The stream of water continued increasing during the whole operation; the bog below the drain was quite dry, and the land above perfectly so. The drain which was first made, and continued running for some time during the progress of the main close drain, became gradually dry; and has not, since that drain was finished, discharged one single drop of water. Great care was necessary, in making the main close drain, to keep the stream of water in the middle of it, otherwise the current would have undermined the sides, as it sometimes had done, and caused them to fall in. For this reason it was necessary, when the dry sand was taken from the top of the quicksand, immediately to take out a spade's graft from the middle thereof, in order to divert the current from the sides.

The main close drain thus made was three feet wide at top, about nine feet deep on the average, and, bevelling a little from the top, it was about one foot ten inches wide at the bottom. The stone and other materials were put into this drain in the following manner: 1. Where the drain went through the quicksand into the stratum of clay below it, as in most places it did, the bottom, and in some instances the sides, wanted no particular security; but where it did not go quite through the quicksand, which the level of his main open drain in some places would not admit, the bottom of the drain was covered half an inch thick with ling; then peat turfs, one foot wide and three or four inches thick, were cut in convenient lengths, and placed on their edges on each side of the bottom of the drain, forming two sides of a trough of peat; then side stones about eight inches high, and a stone coverer, were put in upon the ling between the peat turfs; a large peat-turf, near two feet wide and four inches thick, was then cut and firmly placed over the whole: this left in the bottom of the drain an open space, of more than six inches square, for the water to pass. The whole was then completed by filling in the upper part of the drain.

In this way the author drained for about 80l. thirty acres of land, which from being of no value whatever, became worth at least 14 shillings per acre of yearly rent. He likewise hollow-drained nine acres by the method prescribed for the third class of wet land. These drains were made a few yards below that part of each field where the dry and wet land separate, about 22 inches deep, with sides and a coverer of stone, and ling on the top of it, to keep the earth from running in. The length of these drains was 880 yards, and the expence of labour and materials three halfpence per yard. The drains, in wet weather, discharge a large quantity of water; and will, he has no doubt, answer the intended purpose. Thus far relates to land in his own occupation.

Nine acres of the land in the earl of Aylesford's occupation was almost an entire pulp. This bog was of the second class, namely, water passing through a quicksand, and confined by a stratum of clay below, and another stratum of clay above it. The water thus confined, being pressed by its fountain, and forced up through the weakest parts of the clay, had formed a bog of irregular thickness on the surface, in some places six feet deep, in others not more than two. As there is a considerable fall in this land from east to west, he thought it expedient to put two drains into it; and this appears to him to have been necessary, from a consideration that both these drains continue to run in the same proportions as when first opened. The manner in which these drains were executed was, by digging through the different upper strata, and as deep into the clay as the main open drain would admit; then digging or boring through the remaining part of that clay into the quicksand, at the distance of about six yards, in a progressive manner.

The water rising rapidly through these holes into the close drains, has effected a complete cure of this land, every part of which will now bear a horse to gallop upon it. These drains discharge 3660 gallons an hour; which is much less than they did at first, as must be the case in all bogs. This land will be worth 20s. per acre. The draining cost 25l.; and the length of the under-ground drains is eight hundred and fourteen yards.

Mr Wedge had just finished (January 1792) draining another piece of land, about forty-three acres. As this was intended to answer two purposes, one, to drain the land, the other to give an additional supply of water to a mill-pool, and as a circumstance arose in the execution of the work which frequently happens in draining land, namely, a sudden alteration in the position of the under strata; a description thereof will not probably be thought tedious. This draining was begun at the level of a mill-pool, and continued, without any great difficulty, to the distance of about thirty-two chains, in the manner before described as a cure

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for the ſecond claſs of boggy land: but at or near that place the under ſtrata altered their poſition; the quickſand which conveyed the water now became of twice its former thickneſs; and the clay, which had hitherto been above that quickſand, for ſome diſtance diſappeared. From the quickſand thus becoming ſo much deeper, he could not, with the level of the mill-pool, cut through it; nor indeed, from the wetneſs of the ſeaſon, would ſuch an operation have been proper. He therefore continued a ſhallow drain to ſome diſtance, making ſide-holes into the quickſand, which ran freely; but as this could not cure the whole of the bog below, he branched out another drain (which was made by the method deſcribed for curing the ſecond claſs of wet or boggy land), by ſinking a cloſe drain through the upper ſtrata into the upper clay, and then, at a ſmall diſtance on one ſide of this cloſe drain, boring a hole with an auger through the remaining part of that clay into the quickſand; and at every eight yards, as this cloſe drain advanced, ſtill boring other holes, in the manner before deſcribed: through many of theſe holes the water ruſhed with great rapidity. The water diſcharged by theſe drains into the mill-pool is 168 gallons per minute, or 3780 hogſheads in a day; which is after the rate of 1,379,700 hogſheads in a year.

About ſix acres of this land were always ſound; about twelve acres on the north ſide were an abſolute pulp, and the remaining twenty-ſix acres very unſound. The whole is now ſound, and will when cultivated be worth 16s. per acre. This land would have been drained at a much leſs expence into the main open drain; but then the water, which was much wanted for the mill, would have been loſt. Theſe cloſe drains are in length 1452 yards, and coſt 100l. of which about 30l. ought to be charged to the mill.

189 Draining of land-locked bogs.

With regard to the drainage of land-locked bogs, which are often ſituated ſo much lower than the ground around them, that the cutting a main drain would coſt more than the value of the land when drained; the mode of proceeding, with a view at once cheaply and effectually to relieve them from the ſuperfluous moiſture which renders them uſeleſs to agriculture, is the following: A ſpot in the middle or loweſt part of the bog muſt be ſelected, towards which all the drains muſt be conducted, as radii to a common centre. When this central ſpot is properly cleared out to the top of the clay, or retentive ſubſtratum, which in this caſe muſt not be affected by water from below, but only by ſurface or rain water, a number of perforations muſt be made with the auger, to give an outlet downwards for the water, which will be abſorbed by the porous ſtratum below. A conduit ſhould be formed over the auger holes, by looſe ſtones, placed in ſuch a manner as to prevent their being afterwards filled up by any rubbiſh: or rather auger holes may not be ſufficient; and it may be a preferable plan to make a large pit, or well, in the loweſt part of the bog, dug through into the porous ſubſtrata. This pit ought to be filled with large ſtones, and the drains from the reſt of the field conducted to that ſpot, as mentioned in the following quotation from the Agricultural Report of Hertfordſhire.—"If a pit is ſunk 20 or 30 feet deep in the middle of a field, through the Hertfordſhire red, flinty, and impervious clay, into the chalk below; when the uſual quantity of chalk is taken out, the pit ſhaft is filled up with the flint taken out of the chalk and clay, and the top drainage of this part of the field is much ſhortened for ever afterwards, by making principal drains from the part of the field above the level of the top of the pit terminate therein, as the ſuperabundant moiſture will eſcape through the flints in the pit ſhaft to the chalk below. And if a drain is carried into a limeſtone quarry, it is ſeldom neceſſary to carry it further.

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"In dells or hollows, of conſiderable extent, covered with an impervious ſtratum, and from which there is no natural drainage, ſuch as the valley between Mold, the ſhire-town of Flintſhire, and the adjoining high land, a pit about four feet diameter, and 15 feet deep, more or leſs, as the caſe may require, is ſunk through the impervious ſuperſtratum, into a pervious ſtratum of gravel, and the rain water, and that of ſome adjoining ſprings, are carried from the ſurface thereby; the pit is railed round to prevent cattle from falling into it. I muſt here remark, that though in this, as well as in many other inſtances that may be given, the top water eſcaped through the pervious ſubſtratum, the effect might have been directly the contrary. I therefore recommend the impervious ſuperſtratum, in all ſuch caſes, to be perforated by bore-rods, as the hole made by them is eaſily ſtopped up."

190 German mode of draining land-locked bogs.

In Dr Nugent's travels through Germany, publiſhed in 1768, a mode of draining marſhes upon ſimilar principles is deſcribed, as having been practiſed in that country. He had only ſeen it performed on moor grounds, though it is alſo ſucceſsful with regard to lakes. "It is the nature, ſays he, of moors in general, that beneath the turf or moſs there is a loam which hinders the moiſture from penetrating; and this indeed is what makes the marſh, and cauſes the luxuriant growth of the turf or moſs; but this loam or clay is only a ſtratum, and far from being of an immenſe depth; under it is generally a ſand, or ſome other ſtony or looſe ſoil.

"Here reaſon readily informs us, that a middling moraſs may be drained by perforating the clay, and thus making way for the moiſture to penetrate. In order to this, a pit is dug in the deepeſt part of the moor, till they come below the obſtructing clay, and meet with ſuch a ſpongy ſtratum as, in all appearance, will be ſufficient to imbibe the moiſture of the marſh above it. Into this pit the ebbing of the moraſs is conveyed through a trench, and both the trench and the pit are filled up after the firſt drain with large broad ſtones, ſetting them edgewiſe, ſo as to leave interſtices for carrying off the water; then ſuch ſtones are laid over breadthwiſe, and theſe covered with looſe earth like that on the ſurface: when no ſuch ſtones are to be had, ſtrong piles are rammed down the ſides of the trench, and broad boards laid acroſs; and theſe are covered with earth to a height fit for culture. This is a matter of no great expence, the pit being as near the moraſs as the water will admit, and the trenches but ſhort; then they have a drain unperceived, which leaves the ſurface of the trenches for the plough; and in middling marſhes, eſpecially in ſuch moors as are only wet and damp, this method, though ſometimes ſlow, never fails taking effect; and many tracts are thereby made ſerviceable to the farmer or grazier."

191 Draining Roxburgſhire.

The writer of the Roxburghſhire Agricultural Report repreſents

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represents himself as having successfully adopted a similar mode of draining. In that part of the country, such of the waste lands, as are capable of being drained so as to become arable, have, at the distance of from one to six feet below the surface, a large stratum or seam of a black slaty or metallic substance, generally from 20 to 25 feet in thickness. Below this is a layer of whinstone rock of unknown depth. The black slaty or metallic substance has no chinks or fissures, and is impenetrable to water; but the whinstone rock beneath it abounds with chinks and fissures, and will swallow up any quantity of water poured into its bosom. The uppermost surface of the soil is of a light mossy nature, upon which the water stagnates in winter, so as to swell and enlarge it to a considerable degree. In the spring months, when dried by the sun and the wind, the moss becomes tolerably firm, and produces a coarse unprofitable grass, mixed with short heather; neither of which are of any value as food for sheep or cattle. In the year 1784 the writer of the Report ploughed up 20 acres of the waste lands of the above description, a part of them being situated on a level. This last part was gathered in small ridges, and ploughed pretty deep, and the stones removed. Thus it lay till midsummer 1785; but, during the spring, the sheep and cattle were frequently driven upon it to tread it to a firm consistence. At midsummer it was gathered up again; and, to get the water out of the hollows of the ridges, a pair of boring rods were obtained, which were put down through the slaty substance to the whinstone rock at sundry places. This effectually answered the purpose. The tops of the holes were kept open with baskets of loose stones over them, which were allowed to remain or removed at pleasure, as the weather proved more or less wet. In spring 1786 the land was in a condition to sow almost as early as any other part of the farm, the winter rains having found their way down into the whinstone rock through the slaty substance, and the land speedily became and continued very valuable.

192 Draining of quarries and mines.

We may here add, that the modes of draining now stated are also valuable for other purposes than those of agriculture. Quarries, for example, and marl pits may often be cleared of water, by cutting off the springs by which they are incommoded, or by letting down the water into the next porous stratum. The same may be often done, with regard to deep mines, the working of which may frequently be thus greatly facilitated. A colliery, for example, in Yorkshire had been wrought for several years, and the water was raised from it about 60 yards by a steam engine. The proprietors having bored about ten yards farther, to ascertain the thickness of a seam of coals; as soon as the boring rods were withdrawn, the water from the works, which usually ran across that place, began to sink into the holes made by the rods; and continuing to do so, the steam engine became useless, as its pump had no longer any water to draw. It must be observed, that the situation was higher than the nearest valleys, or the level of the sea; but this example shows of what extensive importance a knowledge of the principles upon which the above modes of draining proceed may hereafter become.

3. Of rendering Mosses fit for Cultivation.

In many parts of the country a very serious obstruction to the cultivation of large portions of territory arises from the existence of mosses. It is, therefore, of much importance to consider their nature, and how they are to be rendered fertile. Preparation of Land.

193 Nature and origin of mosses.

With regard to the nature and origin of moss, the celebrated Dr Anderson, whose works we have already frequently quoted, advances this opinion, that moss is a vegetable, or an assemblage of vegetables, growing or living below, while at the top it is dead. Hence, he distinguishes moss into two kinds; quick moss from which peats are dug, on which no vegetables grow, and in which no animals exist, while in its natural situation; and dead moss, which frequently covers the former, and upon which heath and fog and coarse grasses grow, and insects and other animals are found. Mr Headrick states various objections to this opinion, some of which appear to have great force. Thus, it is observed, that the moss here supposed to be alive below the soil, has every mark of utter deadness and partial dissolution. When tossed about in a very dark night, it emits light like half rotten wood, giving rise to frequent terrors in those who live in the vicinity of peat bogs. It also seems a strange circumstance, and contrary to the whole analogy of nature, to suppose that a vegetable should grow, should form ligneous fibres, and acquire inflammability, without the influence of the sun, or contact with the air, during any period of its growth. The true history of the origin of mosses seems to be this: What are called the moss plants, amount to about three hundred in number. They are extremely hardy, and are capable of flourishing in the most cold and bleak situations, providing only they are surrounded by abundance of stagnating water. Accordingly, wherever water stagnates in a moderate quantity, they grow up, and, by spreading themselves around, they increase the stagnation. When they have arisen in this manner, with the water around them, to a considerable height, the lower part of their stems being continually soaked or macerated in water, cease to vegetate, and give forth their juices to the surrounding fluid. As the moss plants are extremely astringent, and contain large quantities of the gallic acid and tanning principle, the moss water acquires these qualities, or becomes astringent, in a great degree, and prevents any process of putrefaction from taking place, or the stems of the moss plants from suffering any proper process of rottenness or chemical decomposition. Hence it is, that moss water has sometimes been used for tanning leather, in the same manner as the liquor of oak bark. In the mean time, while the stems of the moss plants remain in this manner dead, but prevented from rotting, or becoming the habitation of animals which cannot live in a vegetable astringent liquor, the tops of the plants that are at the surface of the water continue to grow, or new plants rise upon the summits of the dead ones, and continue their ascending progress; the whole being perhaps a sort of parasitical plants, which can grow upon each other. *Communications to the Board of Agriculture*, vol. ii.

In this way, a moss proceeds, rising higher and higher, till from the nature of the adjoining country, and the declivities in it, the water cannot stagnate to any greater depth. After the moss has come to this height, its farther growth is prevented, its plants, unable to live or grow without abundance of water, wither and die; the upper part of them being exposed to the action of the air, suffers an ordinary process of decomposition,

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like other vegetable remains, and is converted into a ſort of ſoil, upon which a few plants and reptiles are ſometimes found; while at a ſmall depth, that is to ſay, below the ſurface of the ſtagnating water, the whole ſtems of the ancient moſs plants continue macerated in their own liquor, and preſerved from putrefaction by it.

194 Black and yellow moſs.

There are, however, two general kinds of moſſes; black moſs, and whitiſh or yellow moſs. The black moſs is originally of a mahogany colour, but ſpeedily becomes black upon expoſure to the air. The yellowiſh, or foggy moſs, is much leſs compact than the former, and retains a light or yellowiſh colour after it is dried. It does not appear to be in ſuch a perfect ſtate of maceration as the black moſs, has leſs variety of plants, and is never ſo ſolid. It is uſually produced in low warm ſituations, and appears to have grown rapidly; whereas, the black moſs is moſt commonly found in cold elevated lands, and ſeems to have conſiſted of a greater number of leſs luxuriant plants. Thus, moſs may be regarded as bearing ſome reſemblance to timber, which is always of a compact grain, and cloſe texture, in proportion to the ſeverity of the climate of which it is the product, or rather in proportion to the length of time which it has taken to grow.

From what has been here ſtated, it will not be difficult to underſtand the mode in which moſſes come originally to find an exiſtence, or to cover a piece of territory in any country. When a pool of water is ſpeedily, or in a ſhort time, formed to a great depth, no moſs appears; but when a gradual ſtagnation to a ſmall depth takes place, upon any ſpot, eſpecially in a cold and expoſed ſituation, there the moſs plants (being the only ones capable of ſubſiſting on ſuch a ſoil) ſpeedily grow up, and occupy the place of every other. Though the quantity of water that originally ſtagnated there might not be great, it is increaſed by degrees, in conſequence of the additional obſtruction produced by the roots, ſtems, and leaves of the moſs plants, till at laſt it forms a bog of very great depth.—We have already mentioned the nature and cauſe of the ſtagnation of water. It may either occur in conſequence of the figure and quality of the ſoil making it tenaciouſly to retain the falling rains, or it may be the conſequence of ſprings or reſervoirs of water pent up or confined in the bowels of the earth by an incumbent maſs of clay. Struggling to riſe up through this clay, it will wet every part of it, and will ſlowly ooze through all its leſs adheſive parts, and will form a ſoil fit only for the reception of moſs plants, which will there, by obſtructing the departure of the moiſture, which is conſtantly riſing, in the courſe of years rear up the ſurface into a complete and perfect peat-bog.

195 Moſſes produced by cutting down foreſts.

But moſſes not only ariſe in particular ſituations, in conſequence of theſe operations of nature: They are alſo produced as the reſult of certain exertions of human induſtry. In almoſt all our moſſes in this country great numbers of trees of various ſorts are found. They remain, like the inferior parts or roots of moſs plants, infuſed and macerated in the moſs water, but not rotted. The trees and ſhrubs found at the bottom of moſſes in Scotland, exhibit, perhaps the whole variety of the native trees and ſhrubs. Of trees, are found the oak, the elm, the birch, the willow, the alder, and fir. Of ſhrubs, we find the hazel, the dwarf willow, the gall plant, and laſtly, the heath plant. This laſt is of ſo hardy a nature, that it often continues to riſe upon the moſs during the whole period of its exiſtence. Now, if it ſhould be ſuppoſed, that at any time extenſive foreſts of theſe trees were ſuddenly cut down by the exertions of man, they would undoubtedly produce a ſtagnation of water, and a bleakneſs of climate, that would render the ſituation fit only to be inhabited by moſs plants, which would therefore ſpeedily riſe up, and form a peat-bog, in which multitudes of trees and ſhrubs would be found ſoaked in their own juice, and in the aſtringent liquor reſulting from the maceration of the ſtems of the moſs plants. That in ancient times old foreſts were thus deſtroyed by the efforts of man, we have every reaſon to believe. Not only in this country, but alſo in England and Ireland, there are found in moſſes vaſt numbers of trees ſtanding with their ſtumps erect, and their roots piercing the ground in a natural poſture as when growing. Many of thoſe trees are broken or cut off near the roots, and lie along, and this uſually in a north-eaſt direction. People who have been willing to account for this, have uſually reſolved it into the effect of the deluge in the days of Noah; but this is a very wild conjecture, and is proved falſe by many unanſwerable arguments. The waters of this deluge might indeed have waſhed together a great number of trees, and buried them under loads of earth; but then they would have lain irregularly and at random; whereas, in this caſe, the trees all lie lengthwiſe from ſouth-weſt to north-eaſt, and the roots all ſtand, in their natural perpendicular poſture, as cloſe as the roots of trees in a foreſt.

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Beſides, theſe trees are not all in their natural ſtate, but many of them have the evident marks of human workmanſhip upon them, ſome being cut down with an axe; ſome ſplit, and the wedges ſtill remaining in them; ſome burnt in different parts, and ſome bored through with holes. Theſe things are alſo proved to be of a later date than the deluge, by other matters found among them, ſuch as utenſils of ancient people, and coins of the Roman emperors.

It appears from the whole, that all the trees which we find in this foſſil ſtate, originally grew in the very places where we now find them, and have only been thrown down and buried there, not brought from elſewhere. It may appear indeed an objection to this opinion, that moſt of theſe foſſil trees are of the fir kind; and that Cæſar ſays expreſsly, that no firs grew in Britain in his time: but this is eaſily anſwered by obſerving that theſe trees, though of the fir kind, yet are not the ſpecies uſually called the *fir*, but pitch tree; and Cæſar has nowhere ſaid that pitch trees did not grow in England. Norway and Sweden yet abound with theſe trees; and there are at this time whole foreſts of them in many parts of Scotland, and a large number of them wild upon a hill at Wareton in Staffordſhire to this day.

In Hatfield marſh, where ſuch vaſt numbers of the foſſil trees are now found, there has evidently once been a whole foreſt of them growing. The laſt of theſe was found alive, and growing in that place, within 70 years laſt paſt, and cut down for ſome common uſe.

It is alſo objected by ſome to the ſyſtem of the firs growing where they are found foſſil, that theſe countries

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tries are all bogs and moors, whereas theſe ſorts of trees grow only in mountainous places. But this is founded on an error; for though in Norway and Sweden, and ſome other cold countries, the fir kinds all grow upon barren and dry rocky mountains, yet in warmer places they are found to thrive as well on wet plains. Such are found plentifully in Pomerania, Livonia, Courland, &c.; and in the weſt parts of New England there are vaſt numbers of fine ſtately trees of them in low grounds. The whole truth ſeems to be, that theſe trees love a ſandy ſoil; and ſuch as is found at the bottoms of all the moſſes where theſe trees are found foſſil. The roots of the fir kind are always found fixed in theſe; and thoſe of oaks, where they are found foſſil in this manner, are uſually found fixed in clay: ſo that each kind of tree is always found rooted in the places where they ſtand in their proper ſoil; and there is no doubt to be made but that they originally grew there. When we have thus found that all the foſſil trees we meet with once grew in the places where they are now buried, it is plain that in theſe places there were once noble foreſts, which have been deſtroyed at ſome time; and the queſtion only remains how and by whom they were deſtroyed. This we have reaſon to believe, by the Roman coins found among them, was done by the people of that empire, and that at the time when they were eſtabliſhed or eſtabliſhing themſelves here.

Their own hiſtorian tells us, that when their armies purſued the wild Britons, theſe people always ſheltered themſelves in the miry woods and low watery foreſts. Cæſar expreſsly ſays this; and obſerves, that Caſſibelan and his Britons, after their defeat, paſſed the Thames, and fled into ſuch low moraſſes and woods that there was no purſuing them: and we find that the Silures ſecured themſelves in the ſame manner when attacked by Oſtorius and Agricola. The ſame thing is recorded of Venutius king of the Brigantes, who fled to ſecure himſelf into the boggy foreſts of the midland part of this kingdom: and Herodian expreſsly ſays, that in the time of the Romans puſhing their conqueſts in theſe iſlands, it was the cuſtom of the Britons to ſecure themſelves in the thick foreſts which grew in their boggy and wet places, and when opportunity offered, to iſſue out thence and fall upon the Romans. The conſequence of all this was the deſtroying all theſe foreſts; the Romans finding themſelves ſo plagued with parties of the natives iſſuing out upon them at times from the foreſts, that they gave orders for the cutting down and deſtroying all the foreſts in Britain which grew on boggy and wet grounds. Theſe orders were punctually executed; and to this it is owing that at this day we can hardly be brought to believe that ſuch foreſts ever grew with us as are now found buried.

The Roman hiſtories all join in telling us, that when Suetonius Paulinus conquered Angleſea, he ordered all the woods to be cut down there, in the manner of the Roman generals in England: and Galen tells us, that the Romans, after their conqueſt in Britain, kept their ſoldiers conſtantly employed in cutting down foreſts, draining of marſhes, and paving of bogs. Not only the Roman ſoldiers were employed in this manner, but all the native Britons made captives in the wars were obliged to aſſiſt in it: and Dion Caſſius tells us, that the emperor Severus loſt no leſs than 50,000 men in a few years time in cutting down the woods and draining the bogs of this iſland. It is not to be wondered at, that ſuch numbers executed the immenſe deſtruction which we find in theſe buried foreſts. One of the greateſt ſubterranean treaſures of wood is that near Hatfield; and it is eaſy to prove, that theſe people, to whom this havock is thus attributed, were upon the ſpot where theſe trees now lie buried. The common road of the Romans out of the ſouth into the north, was formerly from Lindum (Lincoln) to Segelochum (Little Burrow upon Trent), and from thence to Danum (Doncaſter), where they kept a ſtanding garriſon of Criſpinian horſe. A little off on the eaſt, and north-eaſt of their road, between the two laſt named towns, lay the borders of the greateſt foreſt, which ſwarmed with wild Britons, who were continually making their ſallies out, and their retreats into it again, intercepting their proviſions, taking and deſtroying their carriages, killing their allies and paſſengers, and diſturbing their garriſons. This at length ſo exaſperated the Romans, that they were determined to deſtroy it; and to do this ſafely and effectually, they marched againſt it with a great army, and encamped on a great moor not far from Finningly: this is evident from their fortifications yet remaining.

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There is a ſmall town in the neighbourhood called *Oſterfield;* and as the termination *field* ſeems to have been given only in remembrance of battles fought near the towns whoſe names ended with it, it is not improbable that a battle was fought here between all the Britons who inhabited this foreſt and the Roman troops under Oſtorius. The Romans ſlew many of the Britons, and drove the reſt back into this foreſt, which at that time overſpread all this low country. On this the conquerors taking advantage of a ſtrong ſouth-weſt wind, ſet fire to the pitch-trees, of which this foreſt was principally compoſed; and when the greater part of the trees was thus deſtroyed, the Roman ſoldiers and captive Britons cut down the remainder, except a few large ones which they left ſtanding as remembrances of the deſtruction of the reſt. Theſe ſingle trees, however, could not ſtand long againſt the winds, and theſe falling into the rivers which ran through the country, interrupted their currents; and the water then overſpreading the level country, made one great lake, and gave origin to the moſſes or moory bogs, which were afterwards formed there, by the workings of the waters, the precipitation of earthy matter from them, and the putrefaction of rotten boughs and branches of trees, and the vaſt increaſe of water moſs and other ſuch plants which grow in prodigious abundance in all theſe ſorts of places. Thus were theſe burnt and felled trees buried under a new formed ſpongy and watery earth, and afterwards found on the draining and digging through this earth again.

Hence it is not ſtrange that Roman weapons and Roman coins are found among theſe buried trees; and hence it is that among the buried trees ſome are found burnt, ſome chopped and hewn; and hence alſo it is that the bodies of the trees all lie by their proper roots, and with their tops lying north-eaſt, that is, in that direction in which a ſouth-weſt wind would have blown them down: hence alſo it is, that ſome of the trees

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are found with their roots lying flat, these being not cut or burned down, but blown up by the roots afterwards when left single; and it is not wonderful, that such trees as these should have continued to grow even after their fall, and shoot up branches from their sides which might easily grow into high trees. (*Phil. Trans.* N° 275.).

By this system it is also easily explained why the moor soil in the country is in some places two or three yards thicker than in others, or higher than it was formerly, since the growing up of peat earth or bog ground composed of moss plants is well known, and the soil added by overflowing of waters is not a little.

As the Romans were the destroyers of this great and noble forest, so they were probably also of the several other ancient forests; the ruins of which furnish us with the bog wood of Staffordshire, Lancashire, Yorkshire, and other counties. But as the Romans were not much in Wales, in the Isle of Man, or in Ireland, it is not to be supposed that forests cut down by these people gave origin to the fossil wood found there; but though they did not cut down these forests, others did; and the origin of the bog wood is the same with them and with us. Holinshead informs, that Edward I. being not able to get at the Welsh because of their hiding themselves in boggy woods, gave orders at length that they should all be destroyed by fire and by the axe; and doubtless the roots and bodies of trees found in Pembrokeshire under ground, are the remains of the execution of this order. The fossil wood in the bogs of the island of Man is doubtless of the same origin, though we have not any accounts extant of the time or occasion of the forests there being destroyed; but as to the fossil trees of the bogs of Ireland, we are expressly told, that Henry II. when he conquered that country, ordered all the woods to be cut down that grew in the low parts of it, to secure his conquests, by cutting away the places of resort of rebels.

The tendency of our climate to produce in cold and damp situations moss plants, which gradually form around themselves a liquor which is the enemy of all putrefaction, may be considered as a fortunate circumstance, upon the whole, for the preservation of the health of men and animals, as well as contributing to other valuable purposes. In considering the nature of moss, "I cannot dismiss the subject (says Mr Headrick) without suggesting my admiration at the beneficence of Providence, in having provided the moss plants for the situations in which they grow: they afford an immediate supply of fuel, and are the source from which pit-coal derives its origin, though trees, and all the plants which abound in oils and carbon also contribute to the supply of pit-coal. Were the places now occupied by mosses divested of vegetables, or stored with vegetables of a different character, they would become noisome fens, which, by the emission of putrid gasses, would spread all around them pestilence and death. Mosses emit no noxious gasses, but rather, by growing at the surface, where the plants are acted upon by the sun's rays, they perpetually throw out oxygen, and thus contribute to the salubrity of the atmosphere. The only defect with which they are chargeable is forming magazines of moisture, which by its exhalation generates cold, and spreads rheumatism and intermitting fevers among all the animals within its reach. The perpetual evaporation of this moisture not only tends to chill the moss, but it descends in hoar-frost and mildews upon all the lands that are lower in point of situation. These last mentioned disadvantages are more than amply compensated by the consideration that moss is not only an inexhaustible magazine of manure for other soils, but may be converted into a most fertile soil itself. After it is so converted, none of the defects already stated are any longer applicable to it."

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This gentleman analyzed chemically some specimens of moss. He found that a small portion of Berkshire peat of great hardness exhibited, when pounded in a mortar and infused in warm water, a liquor that had some slight marks of acidity by test paper. Gypsum and sulphat of magnesia appeared to exist in it. A purified potash produced an abundant precipitation of various substances. A portion of this peat being burned, gave forth at the close of the operation a sulphureous smell and flame. The white ashes, after some days, assumed a rusty colour, from iron contained in them. Being washed, the liquor appeared to contain sulphates of lime, magnesia, alumine, and iron. Black hard peat of Swinridgemuir, in Ayrshire, when burned, gave brown ashes which were attracted by the magnet. An infusion of them in water exhibited no mark of acid or of alkali, and the ingredients contained in it appeared to be the same as in the Berkshire peat. Foggy or yellow peat yielded a smaller quantity of ashes, which were white, and did not obey the magnet.

Moss water, obtained by squeezing light peats, contained gallic acid and tanning principle in great quantities. Quicklime appeared to be the most powerful agent in precipitating every substance from the moss water, and in rendering moss a compact and solid substance; a fact which, as will be afterwards noticed, has been successfully taken advantage of in practice.

There are two ways in which a tract of territory that is covered by moss may be reduced under the dominion of the plough, or rendered fit for the purposes of agriculture. The one consists of altogether removing the mossy substance, or the whole wrecks of the moss plants that have been accumulating for ages, and endeavouring thereafter to cultivate the subsoil. The other mode consists of converting the substance of the moss into vegetable mould fit for bearing crops of grain.

The first of these plans has been adopted with regard to the moss of Kincardine, and the other has been successfully practised by Mr Smith of Swinridgemuir, in Ayrshire; and in imitation of him by various other persons in different districts of the country. To each of these we shall give attention.

196 The moss of Kincardine removed by human labour

The moss of Kincardine is a remarkable tract of ground in the shire of Perth, in Scotland, which deserves particular notice, both as a topographical curiosity or subject of natural history, and for the information, equally uncommon and important, which it affords, respecting agricultural improvements, and the promotion of industry and population.

The moss of Kincardine is situated in the parish of the same name, comprehended between the rivers Forth and Teith, and in that district of Perthshire called *Monteith*. The moss begins about a mile above the confluence of these rivers; from thence it extends in length

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length about four miles, and from one to two in breadth; and before the commencement of the operations (an account of which is to be given), comprehended near 2000 Scots acres, of which about 1500 belong to the eſtate of Blair Drummond, the property of the late Lord Kames, by his marriage with Mrs Drummond of Blair Drummond.

As moſſes are extremely various in their nature; before entering upon the improvements made in Kincardine moſs, it will be proper to give a ſhort deſcription of that moſs, and of the ſubjacent ſoil which is the object of theſe improvements.

The moſs lies upon a field of clay, which is a continuation of thoſe rich extenſive flats in the neighbourhood of Falkirk and Stirling, diſtinguiſhed by the name of *carſes*. This clay, which is one uniform homogeneous maſs ſinking to a great depth, is found near the ſurface, conſiſts of different colours, and is diſpoſed in layers. The uppermoſt is gray; the next is reddiſh; and the loweſt, which is the moſt fertile, is blue. Through the whole maſs not a pebble is to be found. The only extraneous bodies it contains are ſea-ſhells, which occur in all the varieties peculiar to the eaſtern coaſt of Scotland. They are diſpoſed ſometimes in beds, ſometimes ſcattered irregularly at different depths. By attending to theſe circumſtances, it cannot be doubted that the ſea has been the means of the whole accumulation, and that it was carried on in a gradual manner by the ordinary ebb and flow of the tide. Upon any other ſuppoſition, why ſhould there not have been a congeries of all the different materials that compoſe the ſurface of the ſurrounding heights? But to whatever cauſe the origin of this accumulation may be aſcribed, certain it is that no ſoil whatever is more favourable to vegetation, or carries more abundant crops of every kind.

The ſurface of the clay, which, upon the retreat of the ſea, had been left in an almoſt level plane, is everywhere thickly covered with trees, chiefly oak and birch, many of them of a great ſize. Theſe trees ſeem to have been the firſt remarkable produce of the carſe; and it is probable they were propagated by diſſemination from the ſurrounding eminences. They are found lying in all directions beſide their roots, which ſtill continue firm in the ground in their natural poſition; and from impreſſions ſtill viſible, it is evident they have been cut with an axe or ſome ſimilar inſtrument. For the cutting of wood, the two common purpoſes are, either to apply it to its proper uſe, or that the ground it occupies may be cultivated. In the preſent caſe, however, neither of theſe ends had been propoſed, ſince the trees, by being juſt left as they were cut, were not only entirely loſt, but the ground was rendered totally unfit for cultivation. Hence it is evident, that the downfal of this wood muſt be aſcribed to ſome more extraordinary cauſe; and to none more probably than to that expedient, which, as we learn from Dion Caſſius and other hiſtorians, the Romans put ſo extenſively in practice to diſlodge from their foreſts the ancient inhabitants of the Britiſh iſlands, as already explained.

This hypotheſis acquires no ſmall degree of force from a circumſtance that occurred in May 1768, when a large round veſſel of thin braſs and curious workmanſhip, 25 inches in diameter, and 16 inches in height, was diſcovered upon the ſurface of the clay buried under the moſs. This veſſel, found upon the eſtate of John Ramſay, Eſq. of Ochtertyre, was by that gentleman preſented to the Antiquarian Society of Edinburgh; in whoſe muſeum it remains depoſited for preſervation. And in a liſt of the various donations preſented to that ſociety, publiſhed by them in 1782, it is there denominated a *Roman camp kettle*.

Between the clay and the moſs is found a ſtratum nine inches thick, partly dark brown and partly of a colour approaching to black. This is a vegetable mould, accumulated probably by the plants that covered the ground previous to the growth of the wood, and by leaves from the trees thereafter. The difference of colour muſt be owing to a difference in the vegetable ſubſtances that compoſe it. The brown mould is highly fertile; the other, eſpecially in a dry ſeaſon, is very unproductive. The crop that had occupied this mould when the trees were felled is found ſtill entire. It conſiſts chiefly of heath; but ſeveral other ſmaller plants are alſo very diſtinguiſhable.

Immediately above this ſtratum lies the moſs, to the height, upon an average, of ſeven feet. It is compoſed of different vegetables arranged in three diſtinct ſtrata. Of theſe the firſt is three feet thick. It is black and heavy, and preferable to the others for the purpoſe of fuel. It conſiſts of bent graſs (*agroſtis*), which ſeems to have grown up luxuriantly among the trees after they were felled. The ſecond ſtratum alſo is three feet thick. It is compoſed of various kinds of moſſes, but principally of bog-moſs (*ſphagnum*). It is of a fallow or iron colour, and remarkably elaſtic. It is commonly called *white peat*; and for fuel is conſidered as much inferior to that above mentioned. The third ſtratum is compoſed of heath and a little bent graſs, but chiefly of the deciduous parts of the former. It is about a foot thick, and black.

By far the greateſt part of the moſs in queſtion is, upon an average, full ſeven feet deep, and has in all probability lain undiſturbed ſince its formation: this is called the *High Moſs*. The remainder, called the *Low Moſs*, lies to a conſiderable breadth around the extremities of the high; and is, upon an average, not above three feet in depth, to which it has been reduced by the digging of peats. Theſe are formed of that ſtratum of the moſs only that lies four feet below the ſurface and downwards; the reſt is improper for the purpoſe, and is thrown aſide.

Before the introduction of the plan which is now purſued, two methods chiefly were employed to gain land from the moſs. 1ſt, The ſurrounding farmers marked off yearly a portion of the low moſs next to their arable land, about 15 feet broad. This they removed with carts and ſpread upon their fields, ſome acres of which they for that end left unſown. Here it lay till May or June; when, being thoroughly dry, it was burnt to aſhes to ſerve as a manure. By this means they added to their farms about half a rood of land yearly. But this plan proved unſucceſsful; for by the repeated application of theſe aſhes, the ſoil was rendered ſo looſe that the crops generally failed. 2dly, Many farmers were wont to *trench down* the low moſs, and to cover it *furrow deep* with clay taken out of the trench. This, though commendable as an attempt to improve,

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improve, proved likewiſe an unavailing method; becauſe in a dry ſeaſon the ſuperficial covering of clay retains ſo little moiſture that the crop commonly fails.

It has been attempted to cover the moſs with clay brought from the adjacent grounds. But what from the neceſſary impoveriſhment of the ground from which the clay was carried, and the ſoftneſs of the moſs, this was ſoon found to be impracticable.

Draining has alſo been propoſed as another mode of improvement: and it muſt be acknowledged, that, by means of draining, many moſſes have been converted both into arable and meadow grounds, which in the end became intereſting improvements. But in a moſs, ſuch as that of Kincardine, this method would be ineffectual; as for ſeveral feet deep it is of ſuch a nature, that upon being dry, and divided into parts, it would blow with the wind like chaff; and when thrown aſide in the operation of digging peats, it lies for years without producing a ſingle vegetable, except only a few plants of ſorrel.

Hence it was thought evident, that all attempts to *improve* this moſs muſt ever prove abortive; and that the object to be had in view was the acquiſition of the valuable ſoil lying underneath; to which end nothing leſs was requiſite than the total abolition of the moſs.

By the methods above deſcribed from 100 to 200 acres of moſs had been removed. When the preſent plan was introduced, there ſtill remained covered with moſs from 1300 to 1400 acres of carſe clay—a treaſure for which it muſt be ever intereſting to dig.

In the year 1766 Lord Kames entered into poſſeſſion of the eſtate of Blair Drummond. Long before that period he was well acquainted with the moſs, and often lamented that no attempt had ever been made to turn it to advantage. Many different plans were now propoſed; at length it was reſolved to attempt, by means of water as the moſt powerful agent, entirely to ſweep off the whole body of moſs.

That moſs might be floated in water, was abundantly obvious; but to find water in ſufficient quantity was difficult, the only ſtream at hand being employed to turn a corn mill. Convinced of the ſuperior conſequence of dedicating this ſtream to the purpoſe of floating off the moſs, Lord Kames having made an agreement with the tenant who farmed the mill, and the tenants thirled conſenting to pay the rent, he immediately threw down the mill, and applied the water to the above purpoſe.

In order to determine the beſt manner of conducting the operation, workmen were now employed for a conſiderable time upon the low moſs both by the day and by the piece, to aſcertain the expence for which a given quantity of moſs could be removed. It was then agreed to operate at a certain rate per acre; and in this manner ſeveral acres were removed.

But this was to be a very expenſive proceſs. The ground gained might, indeed, be afterwards let to tenants; but every acre would require an expenditure from 12l. to 15l. before it could be ready for ſowing; ſo that the acquiſition of the whole, computing it at a medium to be 1350 acres, would ſink a capital of nearly 20,000l. ſterling.

One other method ſtill remained; namely, to attempt letting portions of the moſs, as it lay, for a term of years ſufficient to indemnify tenants for the expences incurred in removing it. For ſome time both theſe plans were adopted; but ſeveral reaſons made the latter preferable: 1. The quantity of water to be had was ſmall; and being alſo uncertain, it was very inconvenient for an undertaker; neither were there any houſes near the ſpot, which occaſioned a great loſs of time in going and coming: but when a man ſhould live upon the ſpot, then he could be ready to ſeize every opportunity. 2. The moſs was an uſeleſs waſte. To let it to tenants would increaſe the population of the eſtate, and afford to a number of induſtrious people the means of making to themſelves a comfortable livelihood.

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In the mean time it was determined, till as many tenants ſhould be got as could occupy the whole water, to carry on the work by means of undertakers.

But before proceeding farther, it will be neceſſary to deſcribe the manner of applying water to the purpoſe of floating the moſs.

A ſtream of water ſufficient to turn a common corn-mill will carry off as much moſs as 20 men can throw into it, provided they be ſtationed at the diſtance of 100 yards from each other. The firſt ſtep is to make in the clay, alongſide of the moſs, a drain to convey the water: and for this operation the carſe clay below the moſs is peculiarly favourable, being perfectly free from ſtones and all other extraneous ſubſtances, and at the ſame time, when moiſt, ſlippery as ſoap; ſo that not only is it eaſily dug, but its lubricity greatly facilitates the progreſs of the water when loaded with moſs. The dimenſions proper for the drain are found to be two feet for the breadth and the ſame for the depth. If ſmaller, it could not conveniently receive the ſpadefulls of moſs; if larger, the water would eſcape, leaving the moſs behind. The drain has an inclination of one foot in 100 yards; the more regularly this inclination is obſerved throughout, the leſs will the moſs be liable to obſtructions in its progreſs with the water. The drain being formed, the operator marks off to a convenient extent alongſide of it a ſection of moſs, 10 feet broad; the greateſt diſtance from which he can heave his ſpadeful into the drain. This he repeatedly does till the entire maſs be removed down to the clay. He then digs a new drain at the foot of the moſs bank, turns the water into it, and proceeds as before, leaving the moſs to purſue its courſe into the river Forth, a receptacle equally convenient and capacious; upon the fortunate ſituation of which, happily forming for ſeveral miles the ſouthern boundary of the eſtate, without the interpoſition of any neighbouring proprietor, depended the very exiſtence of the whole operations.

When the moſs is entirely removed, the clay is found to be encumbered with the roots of different kinds of trees ſtanding in it as they grew, often very large: their trunks alſo are frequently found lying beſide them. All theſe the tenants remove, often with great labour. In the courſe of their operations they purpoſely leave upon the clay a ſtratum of moſs ſix inches thick. This, in ſpring, when the ſeaſon offers, they reduce to aſhes, which in a great meaſure enſures the firſt crop. The ground thus cleared is turned over, where the dryneſs admits, with a plough, and, where too ſoft, with a ſpade. A month's expoſure to the ſun, wind, and froſt, reduces the clay to a powder fitting

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fitting it for the ſeed in March and April. A crop of oats is the firſt, which ſeldom fails of being plentiful, yielding from eight to ten bolls after one.

In the year 1767 an agreement was made with one tenant for a portion of the low moſs. This, as being the firſt ſtep towards the intended plan, was then viewed as a conſiderable acquiſition. The ſame terms agreed upon with this tenant have ever ſince been obſerved with all the reſt. They are as follow:

The tenant holds eight acres of moſs by a tack of 38 years; he is allowed a proper quantity of timber, and two bolls of oatmeal to ſupport him while employed in rearing a houſe; the firſt ſeven years he pays no rent; the eighth year he pays one merk Scots; the ninth year two merks; and ſo on with the addition of one merk yearly till the end of the firſt 19 years; during the laſt five years of which he alſo pays a hen yearly. Upon the commencement of the ſecond 19 years, he begins to pay a yearly rent of 12s. for each acre of land cleared from moſs, and 2s. 6d. for each acre not cleared, alſo two hens yearly: A low rent indeed for ſo fine a ſoil; but no more than a proper reward for his laborious exertions in acquiring it.

In the year 1768 another tenant was ſettled. Theſe two were tradeſmen; to whom the preference was always given, as having this great advantage to recommend them, that even when deprived of water they need never want employment. The motives that induced theſe people to become ſettlers were, 1ſt, The proſpect of an independent eſtabliſhment for a number of years. 2dly, The moſs afforded them great abundance of excellent fuel; to which was added the comfortable conſideration, that, while buſied in providing that neceſſary article, they had the double advantage of promoting, at the ſame time, the principal object of their ſettlement.

Notwithſtanding theſe inducements, ſtill ſettlers offered ſlowly: to which two circumſtances chiefly contributed: 1ſt, The whole farmers ſurrounding the moſs threw every poſſible obſtruction in their way. 2dly, By people of all denominations the ſcheme was viewed as a chimerical project, and became a common topic of ridicule. The plan, however ſupported itſelf; and in the year 1769 five more tenants agreed for eight acres each; and thus 56 acres of low moſs were diſpoſed of. From the progreſs made by the firſt ſettlers, and the addition of theſe, the obloquy of becoming a moſs tenant gradually became leſs regarded; ſo that in the year 1772 two more were added; in 1773, three; and in 1774, one; in all 13: which diſpoſed of 104 acres; all the low moſs to which water could then be conveyed. As water is the mainſpring of the operation, every tenant, beſides the attention neceſſary to his ſhare of the principal ſtream, collected water by every poſſible means, making ditches round his portion of the moſs, and a reſervoir therein to retain it till wanted.

The tenants in the low moſs having now begun to raiſe good crops, in the year 1774 ſeveral perſons offered to take poſſeſſions in the high moſs, upon condition that acceſs to it ſhould be rendered practicable. The high moſs wanted many advantages that the low poſſeſſed. To the low moſs, lying contiguous to the ſurrounding arable lands, the acceſs was tolerably good; but from the arable lands the high moſs was ſeparated by 300 or 400 yards of the low, which even to a man, affords but indifferent footing, and to horſes is altogether impracticable. The low moſs is in general only three feet deep; the high moſs is from ſix to twelve feet in depth.

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It will appear at firſt ſight, that without a road of communication the high moſs muſt forever have proved unconquerable. Without delay, therefore, a road was opened to the breadth of 12 feet, for ſeveral hundred yards in length, by floating off the moſs down to the clay.

This being effected, and at the ſame time an opening given to admit water, in the year 1775 twelve tenants agreed for eight acres of high moſs each. In conſideration of the greater depth of this part of the moſs, it was agreed, that during the firſt 19 years they ſhould pay no rent; but for the ſecond 19 years the terms of agreement were the ſame as thoſe made with the tenants in the low moſs. To the above-mentioned tenants every degree of encouragement was given; as upon their ſucceſs depended, in a great meaſure, the diſpoſal of the great quantity of moſs ſtill remaining. But their ſucceſs, however problematical, was ſuch, that next year, 1776, ſix more took eight acres each; in 1777, one; in 1778, four; in 1779, three; in 1780, one; in 1781, one; in 1782, one:—In all, including thoſe upon the low moſs, 42 tenants, occupying 336 acres.

Though for ſome time the diſpoſal of the high moſs went but ſlowly on, it was not for want of tenants; but the number of operators was already ſufficient for the quantity of water; to have added more would evidently have been imprudent.

In the year 1783 Mr Drummond entered into the poſſeſſion of the eſtate of Blair Drummond, and went fully into the plan adopted by his predeceſſor for ſubduing the moſs. At this time there ſtill remained undiſpoſed of about 1000 acres of high moſs. As water was the great deſideratum, it was determined, that to obtain that neceſſary article neither pains nor expence ſhould be wanting. Steps were accordingly taken to aſcertain in what manner it might be procured to moſt advantage.

Meanwhile, to prepare for new tenants, a ſecond road parallel to the former, at the diſtance of half a mile, was immediately begun and cut, with what water could be got, down to the clay, 12 feet broad and 2670 yards long, quite acroſs the moſs. This opening was previouſly neceſſary, that operators might get a drain formed in the clay to direct the water; and it was to remain as a road that was abſolutely neceſſary, and which relieved ſettlers from an expence they were unable to ſupport. Theſe preparations, the progreſs of the former tenants, and the proſpect of a farther ſupply of water, induced 10 more to take poſſeſſions in the year 1783: in the year 1784, 18 more took poſſeſſions; and in 1785 no fewer than 27:—in all 55 tenants in three years: which diſpoſed of 440 acres more of the high moſs.

As the introduction of an additional ſtream to the moſs was to be a work both of nicety and expence, it was neceſſary to proceed with caution. For this reaſon ſeveral engineers were employed to make ſurveys and plans of the different modes by which it might be procured. In one point they all agreed, that the pro-

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per ſource for furniſhing that ſupply was the river Teith, a large and copious ſtream that paſſes within a mile of the moſs; but various modes were propoſed for effecting that purpoſe.

To carry a ſtream from the river by a cut or canal into the moſs was found to be impracticable; and Mr Whitworth (B) gave in a plan of a pumping machine, which he was of opinion would anſwer the purpoſe extremely well.

Soon after this Mr George Meikle of Alloa, a very ſkilful and ingenious millwright, gave in a model of a wheel for raiſing water entirely of a new conſtruction, of his own and his father's invention jointly. This machine is ſo exceedingly ſimple, and acts in a manner ſo eaſy, natural, and uniform, that a common obſerver is apt to undervalue the invention: But perſons ſkilled in mechanics view machinery with a very different eye; for to them ſimplicity is the firſt recommendation a machine can poſſeſs. Accordingly, upon ſeeing the model ſet to work, Mr Whitworth, with that candour and liberality of mind that generally accompany genius and knowledge, not only gave it the greateſt praiſe, but declared that, for the purpoſe required, it was ſuperior to the machine recommended by himſelf, and adviſed it to be adopted without heſitation.

The better to explain this machine, two ſketches are annexed, to the firſt of which the following letters refer. The explanation of the ſecond will be found upon the ſketch.

Plate XIII.

a, Sluice through which is admitted the water that moves the wheel.

b, *b*, Two ſluices through which is admitted the water raiſed by the wheel.

c, *c*, A part of one of two wooden troughs and an aperture in the wall, through which the above water is conveyed into the buckets. [The other trough is hid by two ſtone walls that ſupport the wheel.]

d, *d*, *d*, Buckets, of which 80 are arranged on each ſide of the arms of the wheel=160.

e, *e*, *e*, A ciſtern, into which the water raiſed by the buckets is diſcharged.

f, *f*, *f*, Wooden barrel pipes, through which the water deſcends from the ciſtern under ground to avoid the high road from Stirling, and the private approach to the houſe.

Sketch ſecond contains a plan of the ciſtern, and exhibits the manner in which the water is filled into the buckets.

The diameter of the wheel to the extremities of the float-boards is 28 feet; the length of the float-boards 10 feet. The wheel makes nearly four revolutions per minute; in which time it diſcharges into the ciſtern 40 hogſheads of water. But this is not all the wheel is capable of performing; for by ſeveral accurate trials by Meſſrs Whitworth and Meikle, in the reſult of which, though made ſeparately, they perfectly agreed, it was found that the wheel was able to lift no leſs than 60 hogſheads per minute; but that the diameter of the pipes through which the water deſcends from the ciſtern would not admit a greater quantity than what they already receive.

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To a perſon at all converſant in hydraulics, the reſemblance of this to the Perſian wheel muſt be obvious: and indeed it is probable, that from the Perſian wheel the firſt idea of this machine was derived. But admitting this, ſtill the ſuperiority of the preſent wheel is, in moſt reſpects, ſo conſpicuous, as to entitle it to little leſs praiſe than the firſt invention. For, 1ſt, In the Perſian wheel, the buckets being all moveable, muſt be conſtantly going out of order: in this wheel they are all immoveable, conſequently never can be out of order. 2dly, Inſtead of lifting the water from the bottom of the fall, as in the Perſian wheel, this wheel lifts it from the top of the fall, being from four to five feet higher; by which means ſome additional power is gained. 3dly, By means of the three ſluices (*a*, and *b*, *b*, fig. 1.) in whatever ſituation the river may be, the quantity of the water to be raiſed is ſo nicely adjuſted to that of the moving power, as conſtantly to preſerve the wheel in a ſteady and equable motion. In ſhort, as a regulator is to a watch, ſo are theſe ſluices to this wheel, whoſe movements would otherwiſe be ſo various, as ſometimes to carry the water clear over the ciſtern, ſometimes to drop it entirely behind, but ſeldom ſo as fully to diſcharge the whole contents of the buckets into the ciſtern.

It is however but candid to remark, that this machine labours under a ſmall defect, which did not eſcape the obſervation of Mr Whitworth; namely, that by raiſing the water about $3\frac{1}{2}$ feet higher than the ciſtern where it is ultimately delivered, a ſmall degree of power is loſt. To this, indeed, he propoſed a remedy; but candidly confeſſed, that as it would render the machine ſomewhat more complex, and would alſo increaſe the friction, he thought it more adviſable to keep it in its preſent ſtate. At the ſame time he juſtly obſerved, that as the ſtream by which the wheel is moved is at all times copious and powerful, the ſmall loſs of power occaſioned by the above circumſtance was of little or no avail.

This ſtream is detached from the Teith at the place where that river approaches neareſt to the moſs. The ſurface of the latter is about 15 feet higher than that of the former; the ciſtern is therefore placed 17 feet above the ſurface of the ſtream, ſo as to leave a declivity ſufficient to deliver the water upon the ſurface of the moſs.

The pipes through which the water deſcends from the ciſtern are compoſed of wooden barrels hooped with iron, 4 feet long and 18 inches in diameter within.

In theſe pipes, having been conveyed under ground for 354 yards from the ciſtern, the water at once emerges into an open aqueduct. This aqueduct, which was formed according to a plan by Mr Whitworth, is conſtructed wholly of earth or clay; and in order to keep the water on a level with the ſurface of the moſs, it is for nearly two-thirds of its courſe elevated from 8 to 10 feet above the level of the adjacent grounds; the baſe being 40 feet broad, the ſummit 18 feet, and the water

(B) This gentleman was ſuperintendant of the London water-works, and an engineer of great reputation in England. He was ſeveral years employed in Scotland in completing the great canal.

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water courſe 10 feet broad. It commences at the termination of the pipes; from whence extending above 1400 yards, it diſcharges the water into a canal formed for its reception on the ſurface of the moſs.

For raiſing the water to this height there were two reaſons: 1ſt, That not only where it was delivered on the moſs, but even after being conveyed to the moſt diſtant corners, it might ſtill retain ſufficient power to tranſport the moſs to the river Forth. 2dly, That reſervoirs of a ſufficient height might be formed in the moſs to retain the water delivered during night.

In conſequence of Mr Whitworth's advice, a contract was entered into with Mr Meikle in ſpring 1787; and by the end of October in that year, the wheel, pipes, and aqueduct, were all completely finiſhed; and what, in ſo complex and extenſive an undertaking, is by no means common, the different branches of the work were ſo completely executed, and ſo happily adjuſted to each other, that upon trial the effect anſwered the moſt ſanguine expectations. The total expence exceeded 1000l. ſterling.

To induce the proprietor to embark in this undertaking, the moſs tenants had of their own accord previouſly come under a formal engagement to pay the intereſt of any ſum that might be expended in procuring a ſupply of water. But he was determined they ſhould not enjoy by halves the ſweets of this long wiſhed for acquiſition. With a view, therefore, not only to reward their paſt induſtry, but to rouſe them to future exertion, he at once ſet them free from their engagement; nor has any intereſt ever been demanded.

This new ſupply was a moſt acceptable boon to the moſs tenants. In order to make an equitable diſtribution, the water raiſed through the day was allotted to one diviſion of operators; that raiſed during the night to another. To retain the latter, a canal was formed, extending almoſt three miles through the centre of the moſs. From place to place along the ſides are inſerted ſluices to admit water to the reſervoirs of the poſſeſſors; each ſluice having an aperture proportioned to the number of operators to be ſupplied from the reſervoir which it fills. For the water raiſed through the day no reſervoirs are neceſſary; as it is immediately uſed by the diviſion to which it is allotted.

This additional ſtream, though highly beneficial, yet is not more than ſufficient to keep 40 men at conſtant work. But ſuch a quantity as would give conſtant work is not neceſſary: the operators muſt be often employed in making and repairing their drains, grubbing up roots of trees, &c.; ſo that a quantity ſufficient to give five or ſix hours work per day to the whole inhabitants is as much as would be wanted. But as the quantity procured was ſtill inſufficient for this purpoſe, a ſmall ſtream that deſcended from the higher grounds was diverted from its courſe and brought into the moſs. From want of level this ſtream could not be delivered to the greateſt advantage; namely, upon the ſurface of the moſs. Yet by making, at a conſiderable expence, a drain half a mile long, and a reſervoir for the night water, it was rendered of much importance: and during the whole winter months, as well as in ſummer, after every fall of rain, it keeps 15 perſons fully employed.

In the year 1787, two more tenants agreed for eight acres each; in 1788, four; in 1789, eight; in 1790, four tenants, all agreed for the ſame number of acres. Preparation of Land.

The whole moſs was now diſpoſed of, except that part called *Flow Moſs*, which comprehended about 400 acres. Here it is twice the uſual breadth, ſo fluid that a pole may be thruſt with one hand to the bottom; and the interior part, for near a mile broad, is three feet above the level of all the reſt of the moſs. Hitherto the many and various difficulties that preſented themſelves had been overcome by perſeverance and expence. But here the extraordinary elevation of the moraſs, joined to its great fluidity, ſeemed to exclude all poſſibility of admitting a ſtream of water; and it was the general opinion that the moſs operations had now arrived at their *ne plus ultra*, and that this moraſs was doomed to remain a nuiſance for ages to come.

But the proprietor had now advanced ſo far that he could not ſubmit to retreat: and he conſidered himſelf as in ſome meaſure pledged to the country for the completion of this undertaking. To detail the various methods practiſed to introduce a ſtream of water into that moraſs, would prove tedious. It is ſufficient to ſay, that after a thouſand unſucceſsful efforts, attended with much trouble and conſiderable expence, the point at laſt was gained, and a ſtream of water was brought in, and carried fairly acroſs the centre of the moraſs.

The greateſt obſtacle was now indeed overcome; but ſtill another remained of no ſmall moment, namely, the diſcouragement given to ſettlers from the total impoſſibility of erecting habitations upon the ſurface of this moraſs. To find a remedy for this evil was difficult. Happily a reſource at laſt occurred. This was to bargain with a certain number of the old tenants, whoſe habitations were neareſt, to take leaſes of portions of the moraſs. But as ſome additional aid was here neceſſary, it was agreed that 12l. ſterling ſhould be gradually advanced to each tenant till he ſhould accompliſh the clearing of an acre, for which he or his ſucceſſor is bound to pay 12s. of yearly rent, equal to five per cent. upon the ſum advanced. When this point ſhall be gained, they are bound to diſpoſe, as moſt agreeable to themſelves, either of their old or of their new poſſeſſion; for which, when once an acre is cleared, purchaſers will not be wanting.

In conſequence of the above arrangement, during the year 1791 no fewer than 35 of the old tenants agreed, upon the foreſaid conditions, for eight acres each of the flow moſs. Thus 1200 acres are now diſpoſed of to 115 tenants. But when theſe 35 tenants ſhall each have cleared their acre, then, according to agreement, 35 additional tenants will ſpeedily be acquired; and the moſs will then contain in all 150 families.

To the leaſes at firſt granted to the tenants in the high moſs, it was afterwards determined to add a further period of 19 years (making in all 57 years), during which they are to pay one guinea per acre; a rent not greater than the land is worth even at preſent, but greatly below its probable value at that diſtant period. This, it is hoped, will prove to the tenants a ſufficient incite-

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ment to continue their operations till their poſſeſſions are completely cleared from moſs.

Having now gone through, in detail, the whole progreſs of the colony for many years after its firſt ſettlement in the year 1767, it ſtill remains to take a general view of the effects produced by that eſtabliſhment.

For ſeveral years, at firſt, the water was uſed chiefly to carry off moſs, in the forming of new roads, and preparing reſervoirs; which conſiderably retarded the principal object, of gaining land. Nevertheleſs there have been cleared full 300 acres of excellent land, producing wheat, barley, oats, and clover, yielding from ſix to twelve bolls after one.

From the nature of the undertaking, there is good reaſon to ſuppoſe that the operations will yearly advance with greater rapidity; eſpecially as the greater number of the ſettlers have only of late begun to operate. Many, beſides maintaining their families otherwiſe by occaſional employments, have in the high moſs cleared in a year one rood of land; ſome have cleared two, ſome three roods, and in the low moſs an acre.

It was a remark often made, even by perſons of ſome obſervation, that by collecting together ſuch a number of people, Kincardine would be overſtocked; and the conſequence would be their becoming a burden on the pariſh: for as the bulk of them were labourers not bred to any trade, and poſſeſſed of little ſtock, it was foreſeen, that, for ſome time, they could not afford to confine themſelves ſolely to the moſs, from which the return muſt be ſlow; but behoved, for immediate ſubſiſtence, to work for daily hire. Happily theſe predictions have proved entirely groundleſs; for ſuch is the growing demand for hands in this country, that not only do the whole of theſe people find employment whenever they chooſe to look for it, but their wages have been yearly increaſing from the time of their firſt eſtabliſhment. In ſhort, they have proved to the corner where they are ſet down a moſt uſeful nurſery of labourers; and thoſe very farmers who, at firſt, ſo ſtrongly oppoſed their ſettlement, now fly to them as a ſure reſource for every purpoſe of agriculture. Still they conſider the moſs operations as their principal buſineſs; none pay them ſo well; and when they do leave it to earn a little money, they return with cheerfulneſs to their proper employment. Many of them already raiſe from 10 to 60 bolls of grain, and have no occaſion to go off to other work; which will ſoon be the caſe with the whole. Their original ſtock, indeed, did not often exceed 25l. and ſome had not even 10l.; but what was wanting in ſtock is compenſated by induſtry.

Of the whole inhabitants full nine tenths are Highlanders, from the neighbouring pariſhes of Callander, Balquhidder, &c.; a ſober, frugal, and induſtrious people, who, inured to hardſhips in their own country, are peculiarly qualified to encounter ſo arduous an undertaking. From this circumſtance, too, ariſes a very happy conſequence; that wearing a different garb and ſpeaking a different language from the people amongſt whom they are ſettled, they conſider themſelves in a manner as one family tranſported to a foreign land: and hence upon all occaſions of difficulty, they fly with alacrity to each others relief. Neither ought it to be forgotten, that, from their firſt ſettlement to the preſent day, not a ſingle inſtance has occurred amongſt them of theft, bad neighbourhood, or of any other miſdemeanour, that required the interpoſition of the civil magiſtrate. Nor, however poor in circumſtances, has any one of them ever ſtooped to ſolicit aſſiſtance from the funds of the pariſh appropriated to that purpoſe.

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Though few of the tenants entered with a large ſtock, one only has been obliged to leave the moſs from incapacity to proceed. Many indeed have ſpent their ſmall ſtocks, and even run a little in debt: but in this caſe they have been permitted to ſell their tacks upon the following conditions: 1ſt, That the purchaſer ſhall be a good man; 2dly, That the ſeller ſhall take another poſſeſſion. By this manœuvre a new inhabitant is gained; while the old one, relieved from debt, and aided by paſt experience, recommences his operations with double ſpirit upon a new poſſeſſion. The moneyed man again has at once a houſe and a piece of ground, the want of which chiefly ſtartled new beginners.

Some have even made a kind of trade of ſelling; inſomuch, that from the year 1774 to the year 1792, no fewer than fifty ſales have taken place, producing in all the ſum of 849l. ſterling. This proved from time to time a moſt ſeaſonable recruit to the colony, and gave new vigour and ſpirits to the whole.

The number of the ſettlers is productive of an excellent effect; that although ſome are generally abſent, enough ſtill remain to occupy the water conſtantly. In a favourable day, there may be ſeen hundreds, men, women, and children, labouring with the utmoſt aſſiduity. The women declare they can make more by working at the moſs than at their wheel; and ſuch is the general attachment to that employment, that they have frequently been diſcovered working by moonlight.

Another happy conſequence ariſing from their numbers is the great quantity of moſs they conſume for fuel. There are in all 115 families. Each family requires at an average 10 dargues (c) of peats yearly. Each dargue uncovers a ſpace equal to 10 ſquare yards of clay; ſo that, by caſting peats, the moſs tenants gain yearly about 6 roods of land.

The advantage, too, of providing their fuel with ſo little trouble, is very great. They require yearly 1150 dargues of peats; which, as each dargue when dried and ſtacked is valued at five ſhillings, are worth 287l. 10s. ſterling; a ſum which otherwiſe muſt have been expended on the prime coſt and carriage of coals.—Many of them caſt peats for ſale; and 100l. worth are yearly diſpoſed of in the town of Stirling, the village of Down, &c.

Though moſs work be laborious, it is at the ſame time amuſing. The operator moves the moſs five feet only at a medium; and the water, like carts in other caſes,

(c) A dargue (or darg) of peats, is the quantity that one man can caſt and two can wheel in a day to the field where they are ſpread out to dry.

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caſes, carrying it off as faſt as it is thrown in, excites him to activity. Still he muſt ſubmit to be wet from morning to night. But habit reconciles him to this inconvenience; while his houſe and arable land fill his eye and cheer his mind. Nor is it found that the health of the inhabitants is in the ſmalleſt degree injured either by the nature of the work or the vicinity of the moſs.

The quantity of moſs that one man can move in a day is ſurpriſing; when he meets with no interruption, ſeldom leſs than 48 cubic yards, each weighing 90 ſtones. The weight, then, of moſs moved per day is no leſs than 4320 ſtones. A cubic yard is moved into the water, and of courſe carried into the river Forth for one farthing. It follows, that the expence of moving 48 cubic yards is one ſhilling. But the ſame quantity moved to the ſame diſtance by carts would coſt 24 ſhillings. Hence the advantage derived from the poſſibility of floating moſs in water, and the great importance of having water for that purpoſe.

The moſs, when contraſted with the rich lands ſurrounding, appeared, eſpecially before the improvements, a very dreary ſpot; one wide unvaried wild, totally unproductive, unfit even to furniſh ſuſtenance to any animal, except here and there a few wretched ſtraggling ſheep. Beſides, it entirely cut off all connexion betwixt the farms on either ſide; among which no intercourſe was practicable but by a circuit of ſeveral miles.

The ſcene is already greatly changed. The following are the numbers of the inhabitants who ſome years ago reſided in the moſs; alſo of their cows and horſes, and of the acres gained by them from the moſs, together with their produce.

Men - - - -	115
Women - - -	113
Boys - - -	199
Girls - - - -	193
Total	620
Number of cows, at leaſt, -	115
Ditto of horſes and carts, - -	34
Ditto of acres cleared from moſs, -	300

The produce in bolls cannot be exactly aſcertained: out, conſidering the goodneſs of the ſoil, may be fairly ſtated at 8 bolls per acre. *Inde* 2400 bolls.

As oats are the ſtaple commodity, the calculation ſhall be confined to that grain. According to the fiars of Stirlingſhire, crop 1790, carſe oats are valued at 14s. per boll. *Inde* 2400 bolls at 14s. is 1680l. Of late this price has at times been doubled.

A tract of ground ſo conſiderable, formerly a nuiſance to the country, thus converted into a fertile field, filled with inhabitants, comfortable and happy, cannot ſurely be ſurveyed with an eye of indifference by any perſon whoſe mind is at all ſuſceptible of feeling or of public ſpirit.

An excellent gravelled road, 20 feet wide and a mile and a half long, is now carried quite acroſs the moſs. By this means, in the firſt place, a ſhort and eaſy intercourſe is eſtabliſhed between two conſiderable parts of the eſtate, formerly as little connected as if ſeparated by a lake or an arm of the ſea. Secondly, The inhabitants of the moſs, to whom, hitherto, all paſſage with carts or horſes was impracticable for at leaſt one half of the year, have now obtained the eſſential advantage of being able, with eaſe, to tranſport all the different commodities at every ſeaſon of the year. This road was entirely formed by the hands of the moſs tenants, and gravelled by their own carts and horſes: a work which, it will not be doubted, they performed with much alacrity; when it is conſidered that, to the proſpect of procuring a laſting and material benefit to themſelves, there was joined the additional inducement of receiving an immediate ſupply of money, the whole being done at the proprietor's expence.

The poſſeſſions are laid off in the manner beſt fitted for the operations; and are divided by lanes running in ſtraight lines parallel to each other. Parallel to theſe again the drains are carried; and this ſtraight direction greatly facilitates the progreſs of the water with its load of moſs. Upon the bank of moſs fronting the lanes, the operation of floating is begun; and twenty or thirty people are ſometimes ſeen heaving moſs into the ſame drain. That the water may be the more conveniently applied, the lanes include between them the breadth of two poſſeſſions only. The new houſes are erected upon each ſide of theſe lanes at the diſtance of 100 yards from each other.

Before the formation of lanes and roads, and while yet no ground was cleared, the firſt ſettlers were obliged to erect their houſes upon the ſurface of the moſs. Its ſoftneſs denied all acceſs to ſtones; which, at any rate, are at ſuch a diſtance as would render them too expenſive. Settlers, therefore, were obliged to conſtruct their houſes of other materials. Upon the low moſs there is found for this purpoſe great plenty of ſod or turf, which accordingly the tenants uſe for the walls of their houſes. For the rudeneſs of the fabric nature in ſome meaſure compenſates, by overſpreading the outſide with a luxuriant coating of heath and other mooriſh plants, which have a very picturesque appearance.

But upon the high moſs there is no ſod to be found. There the tenant muſt go differently to work. Having choſen a proper ſituation for his houſe, he firſt digs four trenches down to the clay, ſo as to ſeparate from the reſt of the moſs a ſolid maſs, containing an oblong rectangular area, ſufficiently large for his intended houſe. This being done, he then ſcoops out the middle of the maſs, leaving on all ſides the thickneſs of three feet for walls; over which he throws a roof, ſuch as that by which other cottages are commonly covered.

Upon the ſofteſt parts of the moſs, even theſe walls cannot be obtained. In ſuch places the houſes are built with peat dug out of the moſs, and cloſely compreſſed together while in a humid ſtate (D). It is neceſſary

(D) This does not apply to the *moraſs*, upon the ſurface of which, it has already been obſerved, it is impoſſible to erect houſes in any ſhape.

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ceſſary even to lay upon the ſurface a platform of boards to prevent the walls from ſinking; which they have frequently done when that precaution was neglected. After all, to ſtamp with the foot will ſhake the whole fabric as well as the moſs for fifty yards around. This, at firſt, ſtartled the people a good deal; but cuſtom ſoon rendered it familiar.

The coloniſts have now made conſiderable advancement in rearing better habitations for their comfort and convenience. Their huts of turf are but temporary lodgings. As ſoon as they have cleared a little ground, they build houſes of brick: when the proprietor a ſecond time furniſhes them with timber gratis. It has alſo been found neceſſary to relieve them entirely from the payment of the burdenſome tax upon brick; a tax which ſurely was never intended to fall on ſuch poor induſtrious adventurers; and which, without this aſſiſtance, would have proved a moſt effectual bar to the employment of theſe materials.

There are now erected in the moſs 69 brick houſes, ſubſtantially built with lime. The total expence amounted to 1033l. ſterling. And it is a very comfortable circumſtance, that the money expended upon theſe houſes is moſtly kept in circulation among the inhabitants themſelves; for as a number of them have learned not only to manufacture but alſo to build bricks, and as others who have horſes and carts furniſh the carriage of lime and coals, they thus interchange ſervices with each other.

With a view to excite the exertion of the coloniſts, the following premiums were alſo offered: 1. To the perſon who ſhall in the ſpace of one year remove the greateſt quantity of moſs down to the clay, a plough of the beſt conſtruction. 2. To the perſon who ſhall remove the next greateſt quantity, a pair of harrows of the beſt kind. 3. For the next greateſt quantity, a ſpade of the beſt kind, and 10lb. of red clover ſeed. But as theſe premiums, if conteſted for by the whole inhabitants, could reach but a very few of the number, they were therefore divided into ſix diſtricts according to their ſituation; and the above premiums were offered to each diſtrict.

The eſtabliſhment of this colony was no doubt attended with a very conſiderable ſhare of expence and difficulty; for the undertaking was altogether new, and there were many prejudices againſt it, which it was neceſſary to overcome. At the ſame time it was noble and intereſting; it was to make a valuable addition to private property: it was to increaſe the population of the country, and to give bread to a number of people; many of whom having been turned out of their farms and cottaries in the Highlands, might otherwiſe, by emigration, have been loſt to their country; and that too, at a time when, owing to the great enlargement of farms, depopulation prevails but too much even in the low countries. And it was to add to the arable lands of the kingdom, making many thouſand bolls of grain to grow where none ever grew before.

Theſe conſiderations have hitherto preponderated with the proprietors againſt the various obſtacles that preſent themſelves to the execution of ſo extenſive an undertaking. Should their example tend in any degree to ſtimulate others, who both in Scotland and in England poſſeſs much ground equally uſeleſs to the country, to commence ſimilar improvements, it would be a moſt grateful conſideration ſuperadded to the pleaſure already ariſing from the progreſs of the infant colony.

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After all, it will probably hereafter be thought, that the great efforts of ingenuity, and of perſevering induſtry, which were requiſite in the above operation, might all have been avoided, and the work much eaſier performed, had the art been found out of converting moſs into fruitful ſoil, according to the plan practiſed, and undoubtedly brought to great perfection in Ayrſhire, by the gentleman already mentioned, John Smith, Eſq. of Swinridgemuir, near Beith. On a part of moſs in this gentleman's property, a quantity of lime had been ſpread in conſequence of the miring of ſome carts in wet weather; to relieve which, their load was laid over the ground in their neighbourhood, though this was accounted at that period an abſurd operation, as it was believed that lime would have the effect of conſuming and rendering moſſy ground uſeleſs for ever. The proprietor, Mr Smith, was then in the army, towards the cloſe of the American war. On returning home the ſucceeding ſummer, and being informed of the accident, he was ſurpriſed to find that as good a crop grew upon the patch of moſs on which the lime had been ſcattered, as upon another ſpot that had been pared and burned, in conſequence of inſtructions that he had tranſmitted home for that purpoſe, from having peruſed ſome treatiſes in which burning of moſs was recommended. He alſo remarked, that upon the places which had neither been burned nor limed, nothing grew, and that the crop upon the burned ſoil was inferior to that where the lime had been laid, being almoſt choked with ſorrel. Mr Smith purſued the hint thus obtained: He reclaimed by means of lime every portion of moſs in his own poſſeſſion, and having ſatisfied his tenants of the utility of the practice, he allowed them to dig limeſtone gratis, and gave them the refuſe of his coal at prime coſt to burn it. Thus, in a ſhort time, every part of the moſs upon his eſtate was reduced under cultivation, and rendered highly valuable.

197 Mr Smith mode of improving moſs.

When Mr Smith began his operations, he met the fate of innovators in agriculture, that is, he was ridiculed by all his neighbours. His ſucceſs, however, at length made ſome converts, and though the new ſyſtem at firſt advanced ſlowly, it was at laſt univerſally approved of, and extenſively imitated. The reſult has been, that what was once the worſt land in the country, is now become the moſt productive and fertile.

The following is a conciſe ſtatement of Mr Smith's practice, and conſequently of the Ayrſhire practice, of actually converting moſs into vegetable mould, capable of bearing rich crops of corn, hay, potatoes, &c. which we ſhall give in the words of Mr Headrick.

"1. When they enter upon the improvement of a moſs in its natural ſtate, the firſt thing to be done is, to mark and cut main or maſter drains, eight feet in width, by four and a half in depth, and declining to two and a half at bottom; theſe coſt 1s. per fall of ſix Scots ells. In ſome inſtances, it will be found neceſſary to cut thoſe drains much deeper, conſequently at a greater expence. Theſe drains almoſt in every inſtance can be, and are ſo conducted, as to divide the field into regular and proper incloſures. They always make it a rule to finiſh off as much of a drain as they have broken

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broken up, before they leave it at night; becauſe, if a part is left dug, ſuppoſe half way, the oozing of water from the ſides would render the bottom ſo ſoft, that they could neither ſtand upon it nor lift it with the ſpade. When the moſs is ſo very ſoft, that the preſſure of what is thrown out of the drain may cauſe its ſides to fall in again, they throw the clods from the drain a conſiderable way back, and ſometimes have a man to throw them ſtill further back, by a ſpade or the hand; for this reaſon too, they always throw the ſtuff taken from a drain as equally as poſſible on each ſide of it. In digging the drains, the workmen ſtand upon ſmall boards to prevent them from ſinking, and move them forward as the work advances.

"When the moſs lies in a hollow, with only one outlet, it is neceſſary to lead up a drain, ſo as to let the water paſs this outlet, and then conduct it along the loweſt or wetteſt part of the moſs: this middle drain is afterwards ſloped, and the ſtuff thrown back into the hollows that may occur; upon it the ridges are made to terminate on each ſide, while a ring drain, ſerving the purpoſe of a fence, is thrown round the moſs at the line where the riſing ground commences. This can generally be ſo managed as to divide the moſs into a ſquare field, leaving ſtraight lines for the ſides of the contiguous fields. The ring drain intercepts the ſurface water from the higher grounds, and conducts it into the lower part of the outlet, while the ſloped drain in the centre receives and diſcharges all the water that falls upon the moſs.

"After the moſs collapſes in conſequence of liming and culture, it is often neceſſary to clean out theſe drains a ſecond time, and to dig them to a greater depth: their ſides become at laſt like a wall of peat, which few animals will venture to paſs.

"2. The drains being thus completed, they mark out the ridges, either with a long ſtring or with three poles ſet in a line. Mr Smith has tried ſeveral breadths of ridges, but now gives a decided preference to thoſe that are ſeven yards in breadth. The ridges are formed with the ſpade in the following manner: In the centre of each intended ridge, a ſpace of about two feet is allowed to remain untouched; on each ſide of that ſpace a furrow is opened, which is turned over ſo as completely to cover that ſpace, like what is called *veering* or *ſeering* of a gathered ridge; the work, thus begun, is continued by cutting furrows with the ſpade, and turning them over from end to end of the ridge on each ſide, until they arrive at the diviſion furrows. The breadth of the ſlices thus cut, may be about 12 inches, and each piece is made as long as it may ſuit to turn over: the ridge, when finiſhed, has the appearance of having been done with a plough. The diviſion furrow is two feet in breadth, which, if neceſſary to draw off ſuperfluous water, is partly cut and thrown upon the ſides, or into hollows in the ridges on each ſide. The depth of the diviſion furrows is regulated by circumſtances, ſo as not to lay the ridges at firſt too dry, but at the ſame time, to bleed, as it were, the moſs, and conduct the ſuperfluous water into the maſter drains.

"3. The next operation is to top-dreſs the ridges with lime. The ſooner this is done after the ridges are formed, the better. When the moſs appears dry, experienced farmers throw on the lime, but do not clean out the diviſion furrows until the enſuing winter. When it is ſoaked in water, they clean the diviſion furrows as ſoon as the lime is ready, and after the water has run off apply the lime immediately. It is of great importance to have the lime applied while the moſs is ſtill moiſt, and the lime in as cauſtic a ſtate as poſſible. For this purpoſe, they have the lime conveyed from the kiln in parcels, ſlaked and laid on as faſt as the ridges are formed. Being dropped from carts, and ſlaked at the neareſt acceſſible ſtation, it is carried to the moſs by two men on light handbarrows, having a hopper and bottom of thin boards, and there ſpread with ſhovels as equally as poſſible. During the firſt and ſecond years, the crop is generally carried off in the ſame way. In ſome places where a moſs is covered with coarſe herbage, and acceſſible by carts in dry weather, I ſaw them give a good doſe of lime to the moſs before it was turned up with the ſpade, and another after the ridges were formed. It is ſurpriſing how quickly they execute theſe operations with the handbarrows. In other places where coarſe boards can be procured, they lay a line of them along the crown of a ridge, and convey the lime upon them in wheelbarrows."

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"The proportion of lime allowed to the acre is various, being from three to eight chalders. Improvers are much leſs ſparing of this ingredient now than formerly, and much greater proportions have been applied with good effect. Suppoſe 120 bolls, or 480 Wincheſter buſhels, of ſlaked or powdered lime allowed to every Scots acre, this would coſt at the ſale kilns 40s.; and thus the reader may be enabled to calculate the expence of lime in this diſtrict at every given proportion: But moſt of the farmers here burn lime for themſelves in vaſt kilns of ſod, and think they have it much cheaper than it could be got from a ſale kiln. In many places, limeſtone abounds ſo much, that houſes, fences, and roads are conſtructed with it; and when a farmer burns the limeſtone within his premiſes, he at leaſt ſaves the expence of carriage.

"In ſome caſes, after the limeſtone is laid on, they go over the ground with hoes, or with ſpades, hacking and mangling the clods, and mixing the lime more completely with the ſuperficial ſoil; but where there is much to do, and hands are ſcarce, they never think of theſe operations.

"4. The field thus prepared is ready to receive the ſeed, which is ſown at the proper ſeaſon whether it be *wet* or *dry*, and harrowed in with a ſmall harrow drawn by two men. Four men will with eaſe harrow at leaſt five or ſix roods per day, two and two dragging the harrow by turns, and two breaking and dividing the mould with ſpades. When the lime has been applied early the preceding ſummer, a good crop of oats may generally be expected; but if it has been recently applied, the firſt crop of oats frequently miſgives, as the lime has not time to combine with the moſs, and form it into a ſoil.

"The early Dutch or Poliſh oats are always preferred by moſs improvers, as the common Scots or late oats are too apt to run into ſtraw, and lodge before the grain arrives at maturity. The ſame proportion of ſeed is allowed per acre that is uſual in other places. The great deſideratum is, to procure plants which will throw up a ſufficient quantity of herbage, ſo as to ſhield the

Preparation of Land. the ſurface from the winds and ſun's rays, and thus to keep it moiſt during the firſt ſummer after a moſs is reclaimed.

" This deſideratum is effectually ſupplied by the potato, which thrives well on moſs at all times, whether recently opened up and limed, or at any future period of its cultivation; only it requires a proportion of ſtable dung. It is now become the general practice in Ayrſhire, to plant potatoes on thoſe moſſes which have been but recently turned up and limed; and where dung can be procured, it is generally the firſt crop on all their moſſes.

" The method of planting potatoes, whether they be the firſt crop or ſucceed the firſt crop of oats, is by lazy beds. If they be the firſt crop, the moſs having been delved into ridges, and limed as before directed, ſpaces of from five to ſix feet in breadth are marked out acroſs the ridges, having intervals of about two feet, from which the moſs is taken to cover the ſets. Theſe ſpaces or beds are covered over with a thin *ſtratum* of dung, laid upon the ſurface of the lime at the rate of about ſixteen tons to the Scots acre. The cuttings of the potatoes are laid or placed upon the ſaid beds, about ten or twelve inches aſunder; and the whole are covered over with moſs, taken from the intervals which are thus converted into ditches, to be followed by another covering about the time the potato plants begin to make their appearance, the covering in the whole amounting to about four or five inches: at the ſame time, the diviſion furrows are cleaned out to cover the ſets that are contiguous to them. The whole field is thus divided into ſpaces or lazy beds, like a chequered board. During ſummer, they cut the moſs with hoes, and draw it up a little towards the ſtems of the plants. Few weeds appear, except what are conveyed by the dung. This is the practice univerſally followed when potatoes are planted on moſs for the firſt time; but after the moſs is finely pulverized and reduced, they either plant them in rows acroſs the ridges, or plant and dreſs them with the plough in the uſual manner.

" Potatoes planted as the firſt crop never miſgive, and they are the beſt and moſt certain method at once to reclaim a moſs, not owing ſo much perhaps to the dung aiding the putrid fermentation which the lime has already excited, as to their roots puſhing and dividing the moſs, while their leaves ſhelter it from the ſun, cauſe a ſtagnation of air, and thus keep it in that degree of moiſture which is moſt favourable to the action of lime upon moſs. The practice of making potatoes the firſt crop is now univerſally followed, in ſo far as the farmers can command dung. The produce is from 40 to 60 bolls per acre, the potato meaſure being eight Wincheſter buſhels a little heaped to the boll. Moſſes that are fully reclaimed yield from 60 to 70 bolls of potatoes at an average, and in ſome places where manures are abundant, they have been known to yield from 80 to 100 bolls per acre, of the above meaſure.

" Mr Smith is about to try yams upon his moſſes, from the opinion that prevails among ſome of the Mid-Lothian farmers, where this plant is much cultivated, that they require little or no dung, and that the ſuperior breadth of their leaves, will prove more favourable than thoſe of potatoes, for ſheltering the ground.

" When the potato crop is removed, the ridges are again put into their original form; in doing which, care is taken to preſerve the mould that is acquired uppermoſt; this is done by moving the ſubfurrow on each ſide with a ſtrong ſpade, half way into the intermediate ditch from which the lazy beds were covered, and ſcattering the mould equally over the whole ſurface. This operation coſts 18s. per acre. It is not eaſy to calculate the expence of planting the potatoes forming the lazy beds, &c. as this is ſeldom executed by contract; but the lazy beds being thus reduced, the land is ready for a crop of corn. Preparat of Lanc

" Though a crop of oats frequently miſgives upon moſs that has been but recently limed, yet in other caſes, when the lime has lain ſeveral months upon the land, it proves a good crop, and is ſufficient to cover all the expence with a little profit. The crops of ſucceeding years are ſufficient to afford from their ſtraw putreſcent manure for ſuch land in order that it may be cleaned with potatoes, and prepared for graſs ſeeds.

" But after potatoes of the firſt year, with the ſlight operation of reducing the lazy-beds, from 10 to 12 bolls of oats are at an average produced per acre. The oats are excellent, and yield from 18 to 20 pecks of meal per boll; they would ſell upon the ground for 10l. or 12l. per acre. The ground continues to yield oats of the ſame quality for ſeveral years, without any apparent diminution of fertility, and without receiving any additional manure: the only apparent bar to the continuance of this crop is, the ſoil becoming graſſy. When the graſs begins to contend with the crop for pre-eminence, the land is thrown into paſture, and would let ever after in that ſtate at from 20s. to 25s. per acre. Daiſies, white clover, &c. &c. now ſpring up in moſſes, where their exiſtence was never before ſuſpected; at the ſame time, thiſtles and other weeds for ſome time infeſt the paſture.

" The better practice is, to take another crop of potatoes with a little dung and lime, and give it a trench-delving, to bury the weeds and bring up new ſoil; after the potatoes, to ſow barley and graſs ſeeds.

" Rye-graſs is univerſally ſown here, and it attains amazing perfection upon moſs properly prepared; along with this, white and yellow clover are ſometimes ſown, and thrive remarkably well. Red clover has been tried, but did not ſucceed, and is hence diſcredited for moſs-lands: perhaps it may have been unjuſtly cenſured, becauſe it is certain that the ſeaſons in which it was tried, proved very unfavourable to red clover in all parts of the country, moſt of it having died during winter.

" 5. We have already deſcribed the levelling of the lazy beds. All future delvings of the moſs are performed from one end of the ridge to the other; by this method the ſlices that had been cut and turned over in the firſt operation of forming the ridge, are again cut acroſs, and conſtantly reduced into ſmaller pieces, till they moulder into earth.

" The expence of delving a moſs for the firſt time, where the ſurface is tolerably ſmooth, is 2½d. per fall, or 1l. 13s. 4d. per Scots acre; but where inequalities occur, which muſt be thrown down by the ſpade into hollows, it coſts about 2l. per acre. If there be eminences, which muſt be removed into hollows by wheelbarrows running upon boards, the firſt expence is great-

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er according to circumſtances. The ſecond delving, where potatoes have not intervened, coſts from 1l. to 1l. 6s. per Scots acre, the diviſion-furrows being at the ſame time cleaned out. The third delving and cleaning of the diviſion-furrows coſts 1l. per acre; but the moſs is now ſo friable, that it may be wrought with the greateſt eaſe and rapidity. At the above rates, an ordinary workman will earn 1s. 6d. per day, and an able and experienced one, from that to 2s. 6d. per day. They uſe a ſtrong ſpade, edged with ſteel, and have always a gritſtone near them for ſharpening the ſpade. In the evening they repair its edge upon a grindſtone; and when the ſteel is worn away, they lay it again with new ſteel. Sometimes the moſs is ſo ſoft that they walk upon boards while they are turning it over.

"Mr Smith has found, by long experience, that it is improper to make the ridges too high or too narrow: when they are too high, they throw the water off from their ſides without admitting it to penetrate their ſubſtance; the top of courſe gets too dry: when too narrow, there is a loſs of ſurface from too many diviſion-furrows; the breadth already mentioned is found to be the beſt: and when the improvement is completed, the ridges appear like ſegments of wide circles, with a clean well defined diviſion-furrow between each of them. The moiſture is thus cauſed ſlowly to filtrate through the moſs rendered friable by lime until it reaches the diviſion-furrows, and is diſcharged. As the moſs ſubſides for ſome time, and cloſes in towards the furrows, it is generally neceſſary to clean theſe out before winter, and at the time the crop is ſown, until the moſs acquire ſolidity.

"Some moſſes may be ploughed the ſecond year to within two bouts or four ſlices of the diviſion-furrows, and every operation performed by the force of horſes, except turning over with the ſpade the narrow ſtripes next to the diviſion-furrows. In other moſſes it requires three years before this can be done; and it ſeldom happens but every moſs may be wrought by the plough after it has been wrought four years by the ſpade. When moſs is wrought by the ſpade, it ſeems of no conſequence whether it be wrought wet or dry; but when it is wrought by the plough, opportunities muſt be watched, as horſes cannot walk upon it for ſome years during wet weather.

"6. With reſpect to the quality of the potatoes thus produced upon moſſes, I do not ſcruple to pronounce it moſt excellent. Potatoes have been tried with dung alone; but they are always watery, and frequently hollow or rotten in the heart: thoſe raiſed upon moſſes that have been well limed, are frequently ſo dry and farinaceous, that it is difficult to boil them without reducing them to powder; and they are often obliged to lift them with ſpoons: they come clean out of the ground; keep remarkably well in heaps covered with moſs in the field; and are remarkably well flavoured.

"No ſuch diſeaſe as the curl was ever known among moſs potatoes; and, indeed, if Dr Coventry's opinion be true, that the curl is cauſed by overloading the ſets with too much earth, or from the earth becoming too hard around them; no ſuch thing can take place in moſs. But to whatever cauſe the curl may be owing, it is certainly propagated by diſeaſed ſeed; it would, therefore, appear advantageous to transfer the potatoes raiſed upon moſs as ſeed for ſolid land. They have a remarkably good ſpecies of potato in this diſtrict, which was brought from Virginia to Largs about eight years ago; and whether it be owing to the beneficial nature of a moſſy ſoil, or to its own intrinſic merits, this potato has long been ſo much diſtinguiſhed by the good quality and large quantity of its produce, that it has ſuperſeded the uſe of every other ſpecies. There ſeems to be no occaſion for moſs improvers to change their ſeed. Some perſons in this diſtrict, who have but ſmall patches of moſs, have kept them conſtantly in potatoes more than ten years, without changing the ſeed, and without any ſenſible diminution either in the quantity or quality of the crop."

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A moor, how to be cultivated.

To improve a moor, let it be opened, if poſſible, in winter, when it is wet, which has one convenience, that the plough cannot be employed in any other work. It is always ſuppoſed, however, that the moiſture has been ſufficiently removed by draining, to render this practicable. In ſpring, after the froſt is over, a ſlight harrowing will fill up the interſtices with mould, to keep out the air and rot the ſod. Thus it may be ſuffered to lie during the following ſummer and winter, which will tend more to rot the turf than if laid open to the air by ploughing. Next April, let it be croſs-ploughed, braked, and harrowed, till it be ſufficiently pulverized for turnip-ſeed, to be ſown broadcaſt, or in drills, after being manured, and the manure mixed with the ſoil by repeated harrowings.

It ſometimes happens, however, that the heath which grows upon a mooriſh ſoil, is ſo ſtrong and vigorous as to be ſubdued with great difficulty. It has been obſerved, that after land is drained and the heath burnt upon the ſurface, this plant is in time extirpated by ſheep. Theſe animals are extremely fond of the tender ſhoots and flowers of heath, but they will not taſte it after it runs into ſeed, unleſs compelled by extreme hunger. For ſubduing it by a ſhorter proceſs, lime is the beſt remedy, as it ſeems a mortal enemy to heath. A ſtrong doſe of cauſtic lime therefore laid upon the ſurface of the land after it is firſt ploughed, is attended with the beſt effect in conſuming the roots of heath and of coarſe graſſes, and rendering the ſoil friable, which it accompliſhes in about ſix months. Economy in the uſe of this ingredient, therefore, at the firſt breaking up of moor land, is extremely miſapplied. Accordingly ſome ſkilful farmers lay one doſe of lime upon the land before it is ploughed, and another after it, that the furrow ſlices, being wholly ſurrounded by it, may be ſooner brought into a friable ſtate. But, although a very conſiderable doſe of lime is abſolutely neceſſary, when ſuch land is newly reduced from a ſtate of nature, it ought not to be ſolely truſted to. To render the land permanently fertile, it ſoon becomes neceſſary to aid the ſoil, by vegetable or putreſcent manure.

The turnip crop may be conſumed upon the ground by ſheep, which affords an excellent preparation for laying down the field with graſs ſeeds; a point which every improver ought to have in view, on account of the command of dung which it gives him. It is even ſaid to be an improvement upon this method, to take two or even three ſucceſſive crops of turnips, all con-

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fumed in the ſame way. No dung will be neceſſary for the two laſt crops, and the ſoil will be greatly thickened and enriched.

199 Swampy lands, how to be cultivated.

With regard to ſwampy lands and a ſoil covered with ruſhes, ant hills, and coarſe graſſes; after draining, the beſt procedure which can be adopted, conſiſts of paring and burning. When land is pared, a thin ſod is taken off, either by a paring ſpade or paring plough, over the whole ſurface. The ſods being dried, are collected into ſmall heaps and burned, and the aſhes are ſcattered over the field. Swampy land that is overrun with ruſhes and coarſe graſſes, and lands that are covered with heath and other coarſe plants, ſuit beſt for paring and burning. In this way theſe coarſe plants are deſtroyed at once, and the land may be ploughed and cropped immediately, without waiting for the rotting of the turf, as in the former caſe. It is alſo ſaid, that this practice deſtroys all ſlugs and other vermin that infeſt the ſoil. It is more eſpecially valuable in ſituations where lime and other manures cannot be procured. Where lime is to be found in abundance, however, it might probably be a better practice, inſtead of burning the turf that has been cut from the ſurface of the coarſe land, to collect it all into heaps in different parts of the field, and make it up into compoſt with lime. The whole heaps in ſuch caſes ought to be thoroughly moiſtened, and the maſs to be frequently turned and mixed. In this way, by uſing lime in place of fire, the whole roots and coarſe herbage would be deſtroyed, and reduced at once into a moſt valuable manure for enriching the ſoil. In the mean time it is to be obſerved, that paring and burning is ſo evidently advantageous to the immediately ſucceeding crops, that it has ſometimes been abuſed by overcropping after it, and by extending it, perhaps unneceſſarily, to all ſoils, upon breaking them up from graſs, though formerly cultivated and in good order: though even in ſuch caſes it may be found valuable, where lime cannot eaſily be obtained. The following remarks upon the ſubject, in the Report of the Agriculture of the county of Northumberland, by J. Bayley and G. Culley, are worthy of attention. "Paring and burning is not much practiſed in the eaſtern and northern parts of the county: in the middle and ſouthern parts it is moſt prevalent; but, even there, it is confined to old ſwards, and coarſe, rough, ruſhy, and heathy lands. For the firſt breaking up of ſuch ground, it is certainly very convenient, and preferable to any other mode we have ever ſeen; but though we are fully convinced of its beneficial effects in ſuch ſituations, yet we have our doubts whether it could be uſed with advantage upon lands that have lain a few years in graſs, and that would produce good crops of grain immediately on being ploughed out, which is not the caſe with coarſe rough heathy lands, or even very old ſwards on rich fertile ſoils; it being found that crops on the latter are frequently very much injured by *leaping* for two or three years, which paring and burning entirely obviate, and enſure full crops to the farmer, who need not be under any apprehenſion of his ſoil being ruined by it, provided he purſue the following courſe: 1. Turnips; 2. Oats; 3. Fallow well limed for turnips; 4. Barley ſown up with clover and graſs ſeeds, and depaſtured with ſheep for three or four years. It is the injudicious cropping, more than the ill effects derived from paring and burning, that has been the chief cauſe of bringing ſuch an odium on this practice, which is certainly an excellent one in ſome ſituations, and when properly conducted; but, like the fermented juice of the grape, may be too often repeated and improperly applied.

200 Paring and burning, how far uſeful.

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"The popular clamour againſt this practice, "that it deſtroys the ſoil," we can by no means admit; and are inclined to believe, that not a ſingle atom of ſoil is abſtracted, though the bulk of the ſod or turf be diminiſhed. This ariſes from the burning of the roots or vegetable ſubſtances, which, by this proceſs, afford a conſiderable portion of alkaline ſalts, phlogiſtic or carbonic matter, and probably other principles friendly to vegetation; as we find thoſe aſhes produce abundant crops of turnips, which fatten ſtock much quicker than thoſe after any other dreſſing or manure we have ever ſeen; and the ſucceeding crops of corn are ſo very luxuriant as to tempt the injudicious cultivator to purſue it too far; who, for the ſake of a temporary gain, may be ſaid to rip it up, as the boy did his gooſe that laid golden eggs."

But where the ground is dry, and the ſoil ſo thin as that the ſurface cannot be pared, the beſt way of bringing it into tilth from the ſtate of nature, as mentioned above, is to plough it with a feathered ſock, laying the graſſy ſurface under. After the new ſurface is mellowed with froſt, fill up all the ſeams by harrowing croſs the field, which by excluding the air will effectually rot the ſod. In this ſtate let it lie ſummer and winter. In the beginning of May after, a croſs ploughing will reduce all to ſmall ſquare pieces, which muſt be pulverized with the brake, and make it ready for a May or June crop. If theſe ſquare pieces be allowed to lie long in the ſap without breaking, they will become tough, and not be eaſily reduced.

5. Forming Ridges.

201 Of ridges.

The firſt thing that occurs on this head, is to conſider what grounds ought to be formed into ridges, and what ought to be tilled with a flat ſurface. Dry ſoils, which ſuffer by lack of moiſture, ought to be tilled flat, which tends to retain moiſture. And the method for ſuch tilling, is to go round and round from the circumference to the centre, or from the centre to the circumference. This method is advantageous in point of expedition, as the whole is finiſhed without once turning the plough. At the ſame time, every inch of the ſoil is moved, inſtead of leaving either the crown or the furrow unmoved, as is commonly done in tilling ridges. Clay ſoil, which ſuffers by water ſtanding on it, ought to be laid as dry as poſſible by proper ridges. A loamy ſoil is the middle between the two mentioned. It ought to be tilled flat in a dry country, eſpecially if it incline to the ſoil firſt mentioned. In a moiſt country, it ought to be formed into ridges, high or low according to the degree of moiſture and tendency to clay.

In grounds that require ridging, an error prevails, that ridges cannot be raiſed too high. High ridges labour under ſeveral diſadvantages. The ſoil is heaped upon the crown, leaving the furrows bare: the crown is too dry, and the furrows too wet: the crop, which is always beſt on the crown, is more readily ſhaken with the wind, than where the whole crop is of an equal

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equal height: the half of the ridge is often covered from the ſun, a diſadvantage which is far from being ſlight in a cold climate. High ridges labour under another diſadvantage, in ground that has no more level than barely ſufficient to carry off water: they ſink the furrows below the level of the ground; and conſequently retain water at the end of every ridge. The furrows ought never to be ſunk below the level of the ground. Water will more effectually be carried off by leſſening the ridges both in height and breadth: a narrow ridge, the crown of which is but 18 inches higher than the furrow, has a greater ſlope than a very broad ridge where the difference is three or four feet.

Next, of forming ridges where the ground hangs conſiderably. Ridges may be too ſteep as well as too horizontal: and if to the ridges be given all the ſteepneſs of a field, a heavy ſhower may do irreparable miſchief. To prevent ſuch miſchief, the ridges ought to be ſo directed croſs the field, as to have a gentle ſlope for carrying off water ſlowly, and no more. In that reſpect, a hanging field has greatly the advantage of one that is nearly horizontal; becauſe, in the latter, there is no opportunity of a choice in forming the ridges. A hill is of all the beſt adapted for directing the ridges properly. If the ſoil be gravelly, it may be ploughed round and round, beginning at the bottom and aſcending gradually to the top in a ſpiral line. This method of ploughing a hill requires no more force than ploughing on a level; and at the ſame time removes the great inconvenience of a gravelly hill, that rains go off too quickly; for the rain is retained in every furrow. If the ſoil be ſuch as to require ridges, they may be directed to any ſlope that is proper.

In order to form a field into ridges that has not been formerly cultivated, the rules mentioned are eaſily put in execution. But what if ridges be already formed, that are either crooked or too high? After ſeeing the advantage of forming a field into ridges, people were naturally led into an error, that the higher the better. But what could tempt them to make their ridges crooked? Certainly this method did not originate from deſign; but from the lazineſs of the driver ſuffering the cattle to turn too haſtily, inſtead of making them finiſh the ridge without turning. There is more than one diſadvantage in this ſlovenly practice. Firſt, the water is kept in by the curve at the end of every ridge, and ſours the ground. Next, as a plough has the leaſt friction poſſible in a ſtraight line, the friction muſt be increaſed in a curve, the back part of the mouldboard preſſing hard on the one hand, and the coulter preſſing hard on the other. In the third place, the plough moving in a ſtraight line, has the greateſt command in laying the earth over. But where the ſtraight line of the plough is applied to the curvature of a ridge in order to heighten it by gathering, the earth moved by the plough is continually falling back, in ſpite of the moſt ſkilful ploughman.

The inconveniences of ridges high and crooked are ſo many, that one would be tempted to apply a remedy at any riſk. And yet, if the ſoil be clay, it would not be adviſeable for a tenant to apply the remedy upon a leaſe ſhorter than two nineteen years. In a dry gravelly ſoil, the work is not difficult nor hazardous. When the ridges are cleaved two or three years ſucceſſively in the courſe of cropping, the operation ought to be concluded in one ſummer. The earth, by reiterated ploughings, ſhould be accumulated upon the furrows, ſo as to raiſe them higher than the crowns: they cannot be raiſed too high, for the accumulated earth will ſubſide by its own weight. Croſs ploughing once or twice, will reduce the ground to a flat ſurface, and give opportunity to form ridges at will. The ſame method brings down ridges in clay ſoil: only let care be taken to carry on the work with expedition; becauſe a hearty ſhower, before the new ridges are formed, would ſoak the ground in water, and make the farmer ſuſpend his work for the remainder of that year at leaſt. In a ſtrong clay, we would not venture to alter the ridges, unleſs it can be done to perfection in one ſeaſon. On this ſubject Mr Anderſon has the following obſervations *.

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* *Eſſays on Agriculture*, vol. i. p. 146.

202 Inconveniences in the common methods of levelling.

"The difficulty of performing this operation properly with the common implements of huſbandry, and the obvious benefit that accrues to the farmer from having his fields level, has produced many new inventions of ploughs, harrows, drags, &c. calculated for ſpeedily reducing the fields to that ſtate; none of which have as yet been found fully to anſwer the purpoſe for which they were intended, as they all indiſcriminately carry the earth that was on the high places into thoſe that were lower; which, although it may in ſome caſes render the ſurface of the ground tolerably ſmooth and level, is uſually attended with inconveniences far greater, for a conſiderable length of time, than that which it was intended to remove.

203 Vegetable mould becomes inert by being long buried.

"For experience ſufficiently ſhows, that even the beſt vegetable mould, if buried for any length of time ſo far beneath the ſurface as to be deprived of the benign influences of the atmoſphere, loſes its *vis vitæ*, if I may be allowed that expreſſion; becomes an inert, lifeleſs maſs, little fitted for nouriſhing vegetables; and conſtitutes a ſoil very improper for the purpoſes of the farmer. It therefore behoves him, as much as in him lies, to preſerve, on every part of his fields, an equal covering of that vegetable mould that has long been uppermoſt, and rendered fertile by the meliorating influence of the atmoſphere. But, if he ſuddenly levels his high ridges by any of theſe mechanical contrivances, he of neceſſity buries all the good mould that was on the top of the ridges in the old furrows; by which he greatly impoveriſhes one part of his field, while he too much enriches another; inſomuch that it is a matter of great difficulty, for many years thereafter, to get the field brought to an equal degree of fertility in different places; which makes it impoſſible for the farmer to get an equal crop over the whole of his field by any management whatever: and he has the mortification frequently, by this means, to ſee the one half of his crop rotted by an over-luxuriance, while other parts of it are weak and ſickly; or one part ripe and ready for reaping, while the other is not properly filled; ſo that it were, on many occaſions, better for him to have his whole field reduced at once to the ſame degree of poorneſs as the pooreſt of it, than have it in this ſtate. An almoſt impracticable degree of attention in ſpreading the manures may indeed in ſome meaſure get the better of this: but it is ſo difficult to perform this properly, that I have frequently ſeen fields that had been thus levelled, in which, after thirty years of continued culture and repeated dreſſings, the marks of the old

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ridges could be diſtinctly traced when the corn was growing, although the ſurface was ſo level that no traces of them could be perceived when the corn was off the ground.

" But this is a degree of perfection in levelling that cannot be uſually attained by following this mode of practice, and therefore is but ſeldom ſeen. For all that can be expected to be done by any levelling machine, is to render the ſurface perfectly ſmooth and even in every part, at the time that the operation is performed: but as, in this caſe, the old hollows are ſuddenly filled up with looſe mould to a great depth, while the earth below the ſurface upon the heights of the old ridges remains firm and compact, the new raiſed earth after a ſhort time ſubſides very much, while the other parts of the field do not ſink at all; ſo that in a ſhort time the old furrows come to be again below the level of the other parts of the field, and the water of courſe is ſuffered in ſome degree to ſtagnate upon them; inſomuch that, in a few years, it becomes neceſſary once more to repeat the ſame levelling proceſs, and thus renew the damage that the farmer ſuſtains by this pernicious operation.

204 Levelling ſometimes not to be attempted.

" On theſe accounts, if the farmer has not a long leaſe, it will be found in general to be much his intereſt to leave the ridges as he found them, rather than to attempt to alter their direction; and, if he attends with due caution to moderate the height of theſe old ridges, he may reap very good crops, although perhaps at a ſomewhat greater expence of labour than he would have been put to upon the ſame field, if it had been reduced to a proper level ſurface, and divided into ſtraight and parallel ridges.

" But, where a man is ſecure of poſſeſſing his ground for any conſiderable length of time, the advantages that he will reap from having level and well laid out fields, are ſo conſiderable as to be worth purchaſing, if it ſhould even be at a conſiderable expence. But the loſs that is ſuſtained at the beginning, by this mechanical mode of levelling ridges, if they are of conſiderable height, is ſo very great, that it is perhaps doubtful if any future advantages can ever fully compenſate it. I would therefore adviſe, that all this levelling apparatus ſhould be laid aſide; and the following more efficacious practice be ſubſtituted in its ſtead: A practice that I have long followed with ſucceſs, and can ſafely recommend as the very beſt that has yet come to my knowledge.

205 Beſt method of levelling.

" If the ridges have been raiſed to a very great height, as a preparation for the enſuing operations, they may be firſt *cloven*, or *ſcalded* out, as it is called in different places; that is, ploughed ſo as to lay the earth on each ridge from the middle towards the furrows. But if they are only of a moderate degree of height, this operation may be omitted. When you mean to proceed to level the ground, let a number of men be collected, with ſpades, more or fewer as the nature of the ground requires, and then ſet a plough to draw a furrow directly acroſs the ridges of the whole field intended to be levelled. Divide this line into as many parts as you have labourers, allotting to each one ridge or two, or more or leſs, according to their number, height, and other circumſtances. Let each of the labourers have orders, as ſoon as the plough has paſſed that part aſſigned him, to begin to dig in the bottom of the furrow that the plough has juſt made, about the middle of the ſide of the old ridge, keeping his face towards the old furrow, working backwards till he comes to the height of the ridge; and then turn towards the other furrow, and repeat the ſame on the other ſide of the ridge, always throwing the earth that he digs up into the deep old furrow between the ridges, that is directly before him; taking care not to dig deep where he firſt begins, but to go deeper and deeper as he advances to the height of the ridge, ſo as to leave the bottom of the trench he thus makes acroſs the ridge entirely level, or as nearly ſo as poſſible. And when he has finiſhed that part of the furrow allotted to him that the plough has made in going, let him then go and finiſh in the ſame manner his own portion of the furrow that the plough makes in returning. In this manner, each man performs his own taſk through the whole field, gradually raiſing the old furrows as the old heights are depreſſed. And, if an attentive overſeer is at hand, to ſee that the whole is equally well done, and that each furrow is raiſed to a greater height than the middle of the old ridges, ſo as to allow for the ſubſiding of that looſe earth, the operation will be entirely finiſhed at once, and never again need to be repeated.

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" In performing this operation, it will always be proper to make the ridges, formed for the purpoſe of levelling, which go acroſs the old ridges, as broad as poſſible; becauſe the deep trench that is thus made in each of the furrows is an impediment in the future operations, as well as the height that is accumulated in the middle of each of theſe ridges; ſo that the fewer there are of theſe, the better it is. The farmer, therefore, will do well to advert to this in time, and begin by forming a ridge by always turning the plough to the right hand, till it becomes of ſuch a breadth as makes it very inconvenient to turn longer in that manner; and then, at the diſtance of twice the breadth of this new-formed ridge from the middle of it, mark off a furrow for the middle of another ridge, turning round it to the right hand, in the ſame manner as was done in the former, till it becomes of the ſame breadth with it; and then, turning to the left hand, plough out the interval that was left between the two new-formed ridges. By this mode of ploughing, each ridge may be made of 40, 50, or 60 yards in breadth, without any great inconvenience; for although ſome time will be loſt in turning at the ends of theſe broad ridges, yet as this operation is only to be once performed in this manner, the advantage that is reaped by having few open furrows, is more than ſufficient to counterbalance it. And, in order to moderate the height that would be formed in the middle of each of theſe great ridges, it will always be proper to mark out the ridges, and draw the furrow that is to be the middle of each, ſome days before you collect your labourers to level the field; that you may, without any hurry or loſs of labour, clear out a good trench through the middle of each of the old ridges; as the plough, at this time, going and returning nearly in the ſame track, prevents the labourers from working properly without this precaution.

" If theſe rules are attended to, your field will be at once reduced to a proper level, and the rich earth that formed the ſurface of the old ridges be ſtill kept upon the

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the ſurface of your field; ſo that the only loſs that the poſſeſſor of ſuch ground can ſuſtain by this operation, is merely the expence of performing it."

He afterwards makes a calculation of the different expences of levelling by the plough and by the ſpade, in which he finds the latter by far the cheapeſt method.

206 Proper direction of the ridges.

Let it be a rule to direct the ridges north and ſouth, if the ground will permit. In this direction, the eaſt and weſt ſides of the ridges, dividing the ſun equally between them, will ripen at the ſame time.

207 Narrow ridges an advantage.

It is a great advantage in agriculture, to form ridges ſo narrow, and ſo low, as to admit the crowns and furrows to be changed alternately every crop. The ſoil neareſt the ſurface is the beſt; and by ſuch ploughing, it is always kept near the ſurface, and never buried. In high ridges, the ſoil is accumulated at the crown, and the furrows left bare. Such alteration of crown and furrow is eaſy where the ridges are no more but ſeven or eight feet broad. This mode of ploughing anſwers perfectly well in ſandy and gravelly ſoils, and even in loam; but it is not ſafe in clay ſoil. In that ſoil, the ridges ought to be 12 feet wide, and 20 inches high; to be preſerved always in the ſame form by caſting, that is, by ploughing two ridges together, beginning at the furrow that ſeparates them, and ploughing round and round till the two ridges be finiſhed. By this method, the ſeparating furrow is raiſed a little higher than the furrows that bound the two ridges. But at the next ploughing, that inequality is corrected by beginning at the bounding furrows, and going round and round till the ploughing of the two ridges be completed at the ſeparating furrow.

6. Clearing Ground of Weeds.

208 Cleaning harrow. Plate VIII. fig. 6.

For this purpoſe a new inſtrument, termed a *cleaning harrow*, has been introduced by Lord Kames, and is ſtrongly recommended (E). It is one entire piece like the firſt of thoſe mentioned above, conſiſting of ſeven bulls, four feet long each, two and one-fourth inches broad, two and three-fourths deep. The bulls are united together by ſheths, ſimilar to what are mentioned above. The intervals between the bulls being three and three-fourths inches, the breadth of the whole harrow is three feet five inches. In each bull are inſerted eight teeth, each nine inches free below the wood, and diſtant from each other ſix inches. The weight of each tooth is a pound, or near it. The whole is firmly bound by an iron plate from corner to corner in the line of the draught. The reſt as in the harrows mentioned above. The ſize, however, is not invariable. The cleaning harrow ought to be larger or leſs, according as the ſoil is ſtiff or free.

To give this inſtrument its full effect, ſtones of ſuch a ſize as not to paſs freely between the teeth ought to be carried off, and clods of that ſize ought to be broken. The ground ought to be dry, which it commonly is in the month of May.

In preparing for barley, turnip, or other ſummer-crop, begin with ploughing and croſs ploughing. If the ground be not ſufficiently pulverized, let the great brake be applied, to be followed ſucceſſively with the 1ſt and 2d harrows. In ſtiff ſoil, rolling may be proper, once or twice between the acts. Theſe operations will looſen every root, and bring ſome of them to the ſurface. This is the time for the 3d harrow, conducted by a boy mounted on one of the horſes, who trots ſmartly along the field, and brings all the roots to the ſurface: there they are to lie for a day or two, till perfectly dry. If any ſtones or clods remain, they muſt be carried off in a cart. And now ſucceeds the operation of the cleaning harrow. It is drawn by a ſingle horſe, directed by reins, which the man at the oppoſite corner puts over his head, in order to have both hands free. In this corner is fixed a rope, with which the man from time to time raiſes the harrow from the ground, to let the weeds drop. For the ſake of expedition, the weeds ought to be dropt in a ſtraight line croſs the field, whether the harrow be full or not; and ſeldom is a field ſo dirty, but that the harrow may go 30 yards before the teeth are filled. The weeds will be thus laid in parallel rows, like thoſe of hay raked together for drying. A harrow may be drawn ſwiftly along the rows, in order to ſhake out all the duſt; and then the weeds may be carried clean off the field in carts. But we are not yet done with theſe weeds: inſtead of burning, which is the ordinary practice, they may be converted into uſeful manure, by laying them in a heap with a mixture of hot dung to begin fermentation. At firſt view, this way of cleaning land will appear operoſe; but, upon trial, neither the labour nor expence will be found immoderate. At any rate, the labour and expence ought not to be grudged; for if a field be once thoroughly cleaned, the ſeaſons muſt be very croſs, or the farmer very indolent, to make it neceſſary to renew the operation in leſs than 20 years. In the worſt ſeaſons, a few years paſture is always under command; which effectually deſtroys triennial plants, ſuch as thiſtles and couch graſs.

Preparation of Land. Plate VIII. fig. 3, 4. fig. 5.

7. On the Nature of different Kinds of Soils, and the Plants proper to each.

209 Clay ſoil.

1. Clay, which is in general the ſtiffeſt of all ſoils, and contains an unctuous quality. But under the terms *clays*, earths of different ſorts and colours are included. One kind is ſo obſtinate, that ſcarcely any thing will ſubdue it; another is ſo hungry and poor, that it abſorbs whatever is applied, and turns it into its own quality. Some clays are fatter than others, and the fatteſt are the beſt; ſome are more ſoft and ſlippery. But all of them retain water poured on their ſurface, where it ſtagnates, and chills the plants without ſinking into the ſoil. The cloſeneſs of clay prevents the roots and fibres of plants from ſpreading in ſearch of nouriſhment. The blue, the red, and the white clay, if ſtrong, are unfavourable to vegetation. The ſtony and looſer ſorts are leſs ſo; but none of them are worth any thing till their texture is ſo looſened by a mixture of other ſubſtances, and opened, as to admit the influence of the ſun, the air, and froſts. Among the manures recommended for clay, ſand is of all

(E) In his *Gentleman Farmer*; to which performance the practical part of this article is materially indebted.

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all others to be preferred; and ſea ſand is the beſt of all where it can be obtained: This moſt effectually breaks the coheſion.

The reaſon for preferring ſea ſand is, that it is not formed wholly (as moſt other ſands are) of ſmall ſtones; but contains a great deal of calcareous matter in it, ſuch as ſhells grated and broken to pieces by the tide, and alſo of ſalts. The ſmaller the ſand is, the more eaſily it penetrates the clay; but it abides leſs time in it than the larger.

The next beſt ſand is that waſhed down by rains on gravelly ſoils. Thoſe which are dry and light are the worſt. Small gritty gravel has alſo been recommended by the beſt writers on agriculture for theſe ſoils; and in many inſtances we have found it to anſwer the purpoſe.

Shell marl, aſhes, and all animal and vegetable ſubſtances, are very good manures for clay; but they have been found moſt beneficial when ſand is mixed with them. Lime has been often uſed; but the writer of this ſection would not recommend it, for he never found any advantage from it ſingly, when applied to clays.

The crops moſt ſuitable for ſuch lands are, wheat, beans, cabbages, and rye-graſs. Clover ſeldom ſucceeds, nor indeed any plants whoſe roots require depth and a wide ſpread in the earth.

210 Chalky ſoil.

2. Chalk. Chalky ſoils are generally dry and warm, and if there be a tolerable depth of mould, fruitful; producing great crops of barley, rye, peaſe, vetches, clover, trefoil, burnet, and particularly ſainfoin. The latter plant flouriſhes in a chalky ſoil better than any other. But if the ſurface of mould be very thin, this ſoil requires good manuring with clay, marl, loam, or dung. As theſe lands are dry, they may be ſown earlier than others.

When your barley is three inches high, throw in 10lb. of clover, or 15lb. of trefoil, and roll it well. The next ſummer mow the crop for hay: feed off the aftermath with ſheep; and in winter give it a top-dreſſing of dung. This will produce a crop the ſecond ſpring, which ſhould be cut for hay. As ſoon as this crop is carried off, plough up the land, and in the beginning of September ſow three buſhels of rye per acre, either to feed off with ſheep in the ſpring or to ſtand for harveſt. If you feed it off, ſow winter vetches in Auguſt or September, and make them into hay the following ſummer. Then get the land into as fine tilth as poſſible, and ſow it with ſainfoin, which, with a little manure once in two or three years, will remain and produce good crops for 20 years together.

211 Light poor ſoil.

3. Light poor land, which ſeldom produces good crops of any thing till well manured. After it is well ploughed, ſow three buſhels of buck-wheat per acre, in April or May: When in bloom, let your cattle in a few days to eat off the beſt, and tread the other down; this done, plough in what remains immediately. This will ſoon ferment and rot in the ground; then lay it fine, and ſow three buſhels of rye per acre. If this can be got off early enough, ſow turnips; if not, winter vetches to cut for hay. Then get it into good tilth, and ſow turnip-rooted cabbages, in rows three feet apart. This plant ſeldom fails, if it has ſufficient room, and the intervals be well horſe-hoed; and you will find it the beſt ſpring feed for ſheep when turnips are over.

Preparation of Land.

The horſe-hoeing will clean and prepare the land for ſainfoin; for the ſowing of which April is reckoned the beſt ſeaſon. The uſual way is to ſow it broad-caſt, four buſhels to an acre; but the writer prefers ſowing it in drills two feet aſunder; for then it may be horſe-hoed, and half the ſeed will be ſufficient.

The horſe-hoeing will not only clean the crop, but earth up the plants, and render them more luxuriant and laſting.

If you ſow it broad-caſt, give it a top-dreſſing in December or January, of rotten dung or aſhes, or, which is ſtill better, of both mixed up in compoſt.

From various trials, it is found that taking only one crop in a year, and feeding the after-growth, is better than to mow it twice. Cut it as ſoon as it is in full bloom, if the weather will permit. The hay will be the ſweeter, and the ſtrength of the plants leſs impaired, than if it ſtand till the ſeed is formed.

212 Light rich land.

4. Light rich land, being the moſt eaſy to cultivate to advantage, and capable of bearing moſt kinds of grain, pulſe, and herbage, little need be ſaid upon it. One thing however is very proper to be obſerved, that ſuch lands are the beſt adapted to the drill huſbandry, eſpecially where machines are uſed, which require ſhallow furrows to be made for the reception of the ſeed. This, if not prone to couch graſs, is the beſt of all ſoils for lucerne; which, if ſown in two feet drills, and kept clean, will yield an aſtoniſhing quantity of the moſt excellent herbage. But lucerne will never be cultivated to advantage where couch graſs and weeds are very plentiful; nor in the broad-caſt method, even where they are not ſo; becauſe horſe-hoeing is eſſential to the vigorous growth of this plant.

213 Coarſe rough land.

5. Coarſe rough land. Plough deep in autumn; when it has lain two weeks, croſs-plough it, and let it lie rough through the winter. In March give it another good ploughing; drag, rake, and harrow it well, to get out the rubbiſh, and ſow four buſhels of black oats per acre if the ſoil be wet, and white oats if dry. When about four inches high, roll them well after a ſhower: This will break the clods; and the fine mould falling among the roots of the plants will promote their growth greatly.

Some ſow clover and rye-graſs among the oats, but this appears to be bad huſbandry. If you deſign it for clover, ſow it ſingle, and let a coat of dung be laid on in December. The ſnow and rain will then dilute its ſalts and oil, and carry them down among the roots of the plants. This is far better than mixing the crops on ſuch land, for the oats will exhauſt the ſoil ſo much that the clover will be impoveriſhed. The following ſummer you will have a good crop of clover; which cut once, and feed the after-growth. In the winter plough it in, and let it lie till February: Then plough and harrow it well; and in March, if the ſoil be moiſt, plant beans in drills of three feet, to admit the horſe-hoe freely. When you horſe-hoe them a ſecond time, ſow a row of turnips in each interval, and they will ſucceed very well. But if the land be ſtrong enough for ſowing wheat as ſoon as the beans are off, the turnips may be omitted.

SECT. III.

Culture of particular Plants.

Sect. III. *Culture of particular Plants.*

The articles hitherto inſiſted on, are all of them preparatory to the capital object of a farm, that of raiſing plants for the nouriſhment of man and of other animals. Theſe are of two kinds; culmiferous and leguminous; differing widely from each other. Wheat, rye, barley, oats, rye-graſs, are of the firſt kind: of the other kind are, peaſe, beans, clover, cabbage, and many others.

214 Culmiferous plants.

Culmiferous plants, ſays Bonnet, have three ſets of roots. The firſt iſſue from the ſeed, and puſh to the ſurface an upright ſtem; another ſet iſſue from a knot in that ſtem; and a third from another knot, nearer the ſurface. Hence the advantage of laying ſeed ſo deep in the ground as to afford ſpace for all the ſets.

215 Leguminous plants.

Leguminous plants form their roots differently. Peaſe, beans, cabbage, have ſtore of ſmall roots, all iſſuing from the ſeed, like the undermoſt ſet of culmiferous roots; and they have no other roots. A potato and a turnip have bulbous roots. Red clover has a ſtrong tap-root. The difference between culmiferous and leguminous plants with reſpect to the effects they produce in the ſoil, will be inſiſted on afterward, in the ſection concerning rotation of crops. As the preſent ſection is confined to the propagation of plants, it falls naturally to be divided into three articles; firſt, Plants cultivated for fruit; ſecond, Plants cultivated for roots; third, Plants cultivated for leaves.

I. Plants Cultivated for Fruit.

1. Wheat and Rye.

216 Fallowing for wheat.

Any time from the middle of April to the middle of May, the fallowing for wheat may commence. The moment ſhould be choſen, when the ground, beginning to dry, has yet ſome remaining ſoftneſs: in that condition, the ſoil divides eaſily by the plough, and falls into ſmall parts. This is an eſſential article, deſerving the ſtricteſt attention of the farmer. Ground ploughed too wet, riſes, as we ſay, *whole-fur*, as when paſture-ground is ploughed: where ploughed too dry, it riſes in great lumps, which are not reduced by ſubſequent ploughings; not to mention, that it requires double force to plough ground too dry, and that the plough is often broken to pieces. When the ground is in proper order, the farmer can have no excuſe for delaying a ſingle minute. This firſt courſe of fallow muſt, it is true, yield to the barley-ſeed; but as the barley-ſeed is commonly over the firſt week of May, or ſooner, the ſeaſon muſt be unfavourable if the fallow cannot be reached by the middle of May.

As clay ſoil requires high ridges, theſe ought to be cleaved at the firſt ploughing, beginning at the furrow, and ending at the crown. This ploughing ought to be as deep as the ſoil will admit: and water-furrowing ought inſtantly to follow; for if rain happen before water-furrowing, it ſtagnates in the furrow, neceſſarily delays the ſecond ploughing till that part of the ridge be dry, and prevents the furrow from being mellowed and roaſted by the ſun. If this firſt ploughing be well executed, annual weeds will riſe in plenty.

About the firſt week of June, the great brake will looſen and reduce the ſoil, encourage a ſecond crop of annuals, and raiſe to the ſurface the roots of weeds moved by the plough. Give the weeds time to ſpring, which may be in two or three weeks. Then proceed to the ſecond ploughing about the beginning of July; which muſt be croſs the ridges, in order to reach all the ſlips of the former ploughing. By croſs-ploughing the furrows will be filled up, and water-furrowing be ſtill more neceſſary than before. Employ the brake again about the 10th of Auguſt, to deſtroy the annuals that have ſprung ſince the laſt ſtirring. The deſtruction of weeds is a capital article in fallowing: yet ſo blind are people to their intereſt, that nothing is more common than a fallow field covered with charlock and wild muſtard, all in flower, and 10 or 12 inches high. The field having now received two harrowings and two brakings is prepared for manure, whether lime or dung, which without delay ought to be incorporated with the ſoil by a repeated harrowing and a gathering furrow. This ought to be about the beginning of September, and as ſoon after as you pleaſe the ſeed may be ſown.

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217 Dreſſing loam for wheat.

As in ploughing a clay ſoil it is of importance to prevent poaching, the hinting furrows ought to be done with two horſes in a line. If four ploughs be employed in the ſame field, to one of them may be allotted the care of finiſhing the hinting furrows.

Loam, being a medium between ſand and clay, is of all ſoils the fitteſt for culture, and the leaſt ſubject to chances. It does not hold water like clay; and when wet, it dries ſooner. At the ſame time, it is more retentive than ſand of that degree of moiſture which promotes vegetation. On the other hand, it is more ſubject to couch graſs than clay, and to other weeds; to deſtroy which, fallowing is ſtill more neceſſary than in clay.

Beginning the fallow about the firſt of May, or as ſoon as barley ſeed is over, take as deep a furrow as the ſoil will admit. Where the ridges are ſo low and narrow as that the crown and furrow can be changed alternately, there is little or no occaſion for water-furrowing. Where the ridges are ſo high as to make it proper to cleave them, water-furrowing is proper. The ſecond ploughing may be at the diſtance of five weeks. Two crops of annuals may be got in the interim, the firſt by the brake and the next by the harrow; and by the ſame means eight crops may be got in the ſeaſon. The ground muſt be cleared of couch graſs and knot-graſs roots, by the cleaning harrow deſcribed above. The time for this operation is immediately before the manure is laid on. The ground at that time being in its looſeſt ſtate, parts with its graſs roots more freely than at any other time. After the manure is ſpread, and incorporated with the ſoil by braking or harrowing, the ſeed may be ſown under furrow, if the ground hang ſo as eaſily to carry off the moiſture. To leave it rough without harrowing has two advantages: it is not apt to cake with moiſture, and the inequalities make a ſort of ſhelter to the young plants againſt froſt. But if it lie flat, it ought to be ſmoothed with a ſlight harrow after the ſeed is ſown, which will facilitate the courſe of the rain from the crown to the furrow.

218 Dreſſing a ſandy ſoil.

A ſandy ſoil is too looſe for wheat. The only chance for a crop is after red clover, the roots of which bind the ſoil; and the inſtructions above given for loam are applicable

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applicable here. Rye is a crop much fitter for ſandy ſoil than wheat; and like wheat, it is generally ſown after a ſummer fallow.

219 Time for ſowing.

Laſtly, Sow wheat as ſoon in the month of October as the ground is ready. When ſown a month more early, it is too forward in the ſpring and apt to be hurt by froſt: when ſown a month later, it has not time to root before froſt comes on; and froſt ſpews it out of the ground.

220 Setting of wheat,

Setting of wheat, a method which by ſome is reckoned one of the greateſt improvements in huſbandry that has taken place this century. It ſeems to have been firſt ſuggeſted by planting grains in a garden from mere curioſity, by perſons who had no thought or opportunity of extending it to a lucrative purpoſe. Nor was it attempted on a larger ſcale, till a little farmer near Norwich began it, about 25 years ſince, upon leſs than an acre of land. For two or three years only a few followed his example; and theſe were generally the butt of their neighbours merriment for adopting ſo ſingular a practice. They had, however, conſiderably better corn and larger crops than their neighbours: this, together with the ſaving in ſeed, engaged more to follow them: while ſome ingenious perſons, obſerving its great advantage, recommended and publiſhed its utility in the Norwich papers. Theſe recommendations had their effect. The curioſity and inquiry of the Norfolk farmers particularly round Norwich were excited, and they found ſufficient reaſon to make general experiments. Among the reſt was one of the largeſt occupiers of lands in that county, who ſet 57 acres in one year. His ſucceſs, from the viſible ſuperiority of his crop, both in quantity and quality, was ſo great, that the following autumn he ſet 300 acres, and has continued the practice ever ſince. This noble experiment eſtabliſhed the practice, and was the means of introducing it generally among the intelligent farmers in a very large diſtrict of land; there being few who now ſow any wheat, if they can procure hands to ſet it. It has been generally obſerved, that although the ſet crops appear very thin during the autumn and winter, the plants ſide-ſhoot and ſpread prodigiouſly in the ſpring. The ears are indiſputably larger, without any dwarfiſh or ſmall corn; the grain is of a larger bulk, and ſpecifically heavier *per* buſhel than when ſown.

221 a capital improvement in agriculture.

222 Method.

The lands on which this method is particularly proſperous, are either after a clover ſtubble, or on which trefoil and graſs ſeed were ſown the ſpring before the laſt. Theſe grounds, after the uſual manuring, are once turned over by the plough in an extended flag or turf, at ten inches wide; along which a man, who is called a *dibbler*, with two ſetting irons, ſomewhat bigger than ramrods, but conſiderably bigger at the lower end, and pointed at the extremity, ſteps backwards along the turf, and makes the holes about four inches aſunder every way, and an inch deep. Into theſe holes the droppers (women, boys, and girls) drop two grains, which is quite ſufficient. After this, a gate buſhed with thorns is drawn by one horſe over the land, and cloſes up the holes. By this mode, three pecks of grain is ſufficient for an acre; and being immediately buried, it is equally removed from vermin or the power of froſt. The regularity of its riſing gives the beſt opportunity of keeping it clear from weeds, by weeding or hand-hoeing.

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Wheat-ſetting is a method peculiarly beneficial when corn is dear; and, if the ſeaſon be favourable, may be practiſed with great benefit to the farmer. Sir Thomas Beevor of Hethel-Hall in Norfolk, found the produce to be two buſhels per acre more than from the wheat which is ſown; but having much leſs ſmall corn intermixed with it, the ſample is better, and always fetches a higher price, to the amount generally of two ſhillings per quarter.

223 Peculiar advantage

This method, too, ſaves to the farmer and to the public ſix pecks of ſeed wheat in every acre; which, if nationally adopted, would of itſelf afford bread for more than half a million of people.

Add to theſe conſiderations, the great ſupport given to the poor by this *ſecond* harveſt, as it may be called, which enables them to diſcharge their rents and maintain their families without having recourſe to the pariſh.—The expence of ſetting by hand is now reduced to about ſix ſhillings per acre; which, in good weather, may be done by one dibbler, attended by three droppers, in two days. This is five ſhillings per day; of which if the dibbler gives to the children ſixpence each, he will have himſelf three ſhillings and ſixpence for his day's work, which is much more than he can poſſibly earn by any other labour ſo eaſy to himſelf. But put the caſe, that the man has a wife who dibbles with him, and two or three of his own children to drop to him, you ſee his gains will then be prodigious, and enough to enſure a plenty of candidates for that work, even in the leaſt populous parts of the country.

It is, however, to be obſerved with regard to this method, that in ſeaſons when ſeed-corn is very cheap, or the autumn particularly unfavourable to the practice, it muſt certainly be leſſened. In light lands, for inſtance, a very dry time prevents dibbling; as the holes made with the inſtruments will be filled up again by the mould as faſt as the inſtrument is withdrawn. So, again, in a very wet ſeaſon, on ſtrong and ſtiff clays, the ſeeds in the holes cannot be well and properly covered by the buſhes drawn over them. But theſe extremes of dry and wet do not often happen, nor do they affect lands of a moderately conſiſtent texture, or both light and heavy ſoils at the ſame time; ſo that the general practice is in fact never greatly impeded by them.

224 Propagating of wheat by dividing the roots

Propagating of wheat by dividing and tranſplanting its roots. In the Philoſophical Tranſactions for 1768, we meet with a very important experiment, of which the following is an abſtract. On the 2d of June 1766, Mr C. Miller ſowed ſome grains of the common red wheat; and on the 8th of Auguſt a ſingle plant was taken up and ſeparated into 18 parts, and each part planted ſeparately. Theſe plants having puſhed out ſeveral ſide-ſhoots, by about the middle of September; ſome of them were then taken up and divided, and the reſt of them between that time and the middle of October. This ſecond diviſion produced 67 plants. Theſe plants remained through the winter, and another diviſion of them, made between the middle of March and the 12th of April, produced 500 plants. They were then divided no further, but permitted to remain. The plants were in general ſtronger than any of the wheat in the fields. Some of them produced upwards of

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of 100 ears from a ſingle root. Many of the ears meaſured ſeven inches in length, and contained between 60 and 70 grains.

The whole number of ears which, by the proceſs above mentioned, were produced from one grain of wheat, was 21,109, which yielded three pecks and three quarters of clean corn, the weight of which was 47lb. 7 ounces; and from a calculation made by counting the number of grains in an ounce, the whole number of grains was about 386,840.

By this account we find, that there was only one general diviſion of the plants made in the ſpring. Had a ſecond been made, Mr Miller thinks the number of plants would have amounted to 2000 inſtead of 500, and the produce thereby been much enlarged.

The ground was a light blackiſh ſoil, upon a gravelly bottom; and, conſequently, a bad ſoil for wheat. One half of the ground was well dunged, the other half had no manure. There was, however, not any difference diſcoverable in the vigour, or growth, or produce, of the plants.

It muſt be evident, that the expence and labour of ſetting in the above manner by the hand, will render it ſcarcely practicable upon a large ſcale ſo as to be productive of any utility. A correſpondent of the Bath Society, therefore, (Robert Bogle, Eſq. of Daldowin, near Glaſgow), with a view to extend the practice, has propoſed the uſe of the harrow and roller until ſome better implements be invented. This method occurred to him from attending to the practice uſual with farmers on certain occaſions, of harrowing their fields after the grain is ſprung up. Upon inveſtigating the principles upon which theſe practices are founded, he found them confined merely to that of pulverizing the earth, without any attention to Mr Miller's doctrine. They ſaid, "that after very heavy rains, and then exceſſive dry weather, the ſurface of their lands was apt to be caked, the tender fibres of the young roots were thereby prevented from puſhing, and of courſe the vegetation was greatly obſtructed; in ſuch inſtances, they found very great benefit from harrowing and rolling."

225 Method propoſed by Mr Bogle.

Theſe principles he acknowledges to be well founded, ſo far as relates to pulverizing; but contends, that the benefit ariſing from harrowing and rolling is not derived from pulverizing entirely, but alſo from ſubdividing and enabling the plants to tiller (as it is termed). "The harrow (he obſerves) certainly breaks the incruſtation on the ſurface, and the roller crumbles the clods; but it is alſo obvious, that the harrow removes a great many of the plants from their original ſtations; and that if the corn has begun to tiller at the time it is uſed, the roots will be, in many inſtances, ſubdivided, and then the application of my ſyſtem of diviſibility comes into play. The roller then ſerves to plant the roots which have been torn up by the harrow."

226 Objections.

But on this the Society obſerve, that the teeth of a harrow are too large to divide roots ſo ſmall and tenacious as are thoſe of grain; and whenever ſuch roots (however tillered) ſtand in the line any tooth makes, they will, if ſmall, be only turned on one ſide by the earth yielding to their lateral preſſure, or, if large, the whole root will probably be drawn out of the ground. The principal uſes, therefore, derived from harrowing and rolling theſe crops are, opening the ſoil between the plants, earthing them up, breaking the clods, and cloſing the earth about their roots.

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In a ſubſequent letter, Mr Bogle, without conteſting theſe points, further urges the ſcheme of propagating wheat by dividing and tranſplanting its roots. "I have converſed (ſays he) much with many practical farmers, who all admit that my plan has the appearance not only of being practical, but advantageous. I have alſo ſeen, in the ninth number of Mr Young's Annals of Agriculture, the account of an experiment which ſtrongly corroborates my theory. It was made by the Rev. Mr Pike of Edmonton. From this, and other experiments which have been made under my own eye, I foreſee clearly, that the ſyſtem is practicable, and will certainly be productive of great benefit, ſhould it become general. Beſides the ſaving of nine-tenths of ſeed in the land ſown broad-caſt, other very important advantages will attend the ſetting out of wheat from a feed-bed: ſuch as an early crop; the certainty of good crops; rendering a ſummer-fallow unneceſſary; ſaving dung; and having your wheat perfectly free from weeds without either hand or horſe-hoeing. Five hundred plants in April produced almoſt a buſhel of grain. My gardener ſays, he can ſet one thouſand plants in a day, which is confirmed by the opinion of two other gardeners. Mr Miller found no difference in the produce of what was planted on lands that had dung, and on what had none, except where the land was improper for wheat at all."

227 Practicability of the ſcheme of ſetting.

On this letter we have the following note by the ſociety: "Mr Bogle will ſee, by the ſociety's premium book this year, that by having offered ſeveral premiums for experiments of the kind he ſo earneſtly recommends, we wiſh to have his theory brought to the teſt of practice. Our reaſon for this, as well as for printing Mr B's letter, was rather to excite deciſive trials by ingenious perſons, than from any expectation of the practice ever becoming a general one. General, indeed, it never can be. A ſufficient number of hands could not be found to do it. Unkindly ſeaſons at the time of tranſplanting and dividing the roots would frequently endanger and injure, if not deſtroy, the crops. But admitting the mode generally practicable, we very much doubt whether all the advantages he has enumerated would be derived from this mode of culture. Why ſhould dividing and tranſplanting the roots of wheat cauſe the crop to be early, or afford a *certainty* of its being *a good one?* We cannot think that *leſs manure* is neceſſary in this method than either in drilling or broad-caſt; nor can we by any means admit, ſuch crops would 'be perfectly free from weeds without either hand or horſe-hoeing.' We readily agree with Mr Bogle, that by this mode of culture on a general ſcale, an immenſe quantity of ſeed-corn would be annually ſaved to the nation; and in this, we believe, the advantage, were it practicable, would principally conſiſt."

228 Bath Society's obſervations.

Upon the ſame ſubject, and that of harrowing all kinds of corn, we are informed, Mr Bogle afterwards communicated to the Society his thoughs more at large, together with authentic accounts which were made at his inſtance, and which were attended with very great ſucceſs. Theſe muſt undoubtedly be regarded as of very great importance, and accordingly the ſociety, conceiving his ſyſtem may be attended with

229 Further obſervations of Mr Bogle.

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with conſiderable advantages if brought into general practice, have given, at the end of their third volume a few of his leading principles. Mr Bogle ſtates, 1. That he has known many inſtances of very great crops having been obtained by harrowing fields of corn after they were ſprouted; and therefore recommends the practice very warmly.

2. That he has alſo received an authentic account of one inſtance where the ſame good effects were produced by ploughing the field.

3. On the ſyſtem of tranſplanting, he ſtates, that a very great proportion of the ſeed will be ſaved, as a farmer may have a nurſery, or ſmall patch of plants, from which his fields may be ſupplied; he calculates that one acre will yield plants ſufficient for 100 acres.

4. That a very great increaſe of crops may be obtained by this method, probably a double crop, nay perhaps a triple quantity of what is reaped either by drilling or by the broad-caſt huſbandry.

5. That a great part of the labour may be performed by infirm men and women, and alſo by children, who are at preſent ſupported by the pariſh charity; and that of courſe the poor's rates may be conſiderably reduced.

6. That the expence will not exceed from 20s. to 30s. per acre, if the work be performed by able-bodied men and women; but that it will be much lower, if that proportion of the work which may be done by employing young boys and girls ſhould be allotted to them.

7. That in general he has found the diſtance of nine inches every way a very proper diſtance for ſetting out the plants at; but recommends them to be tried at other ſpaces, ſuch as 6, 8, or even 12 inches.

8. That he conceives an earlier crop may be obtained in this manner that can be obtained by any other mode of cultivation.

9. That a clean crop may alſo be procured in this way, becauſe if the land be ploughed immediately before the plants are ſet out, the corn will ſpring much quicker from the plants than the weeds will do from their ſeeds; and the corn will thereby bear down the growth of the weeds.

10. That ſuch lands as are overflowed in the winter and ſpring, and are of courſe unfit for ſowing with wheat in the autumn, may be rendered fit for crops of wheat by planting them in the ſpring, or even in the ſummer.

11. That he has known inſtances of wheat being tranſplanted in September, October, November, February, March, April, and even as late as the middle of May, which have all anſwered very well.

12. That he has known an early kind of wheat ſown as late as the middle of May, which has ripened in very good time; and from that circumſtance he conceives, if the plants ſhould be taken from that early kind, the ſeaſon of tranſplanting might be prolonged at leaſt till the 1ſt of July, perhaps even later.

13. That he has reaſon to think wheat, oats, and barley, are not annuals, but are perennials, provided they are eaten down by cattle and ſheep, or are kept low by the ſcythe or ſickle; and are prevented from ſpindling or coming to the ear.

14. That one very prevalent motive with him in proſecuting this plan, is, that he is of opinion it may enable government to deviſe means of ſupporting the vagrant poor, both old and young, who are now to be met with everywhere, both in towns and in the country, and who are at preſent a burden on the community: but if ſuch employment could be ſtruck out for them, a comfortable ſubſiſtence might be provided for them by means of their own labour and induſtry; and not only ſave the public and private charitable contributions, but may alſo render that claſs of people uſeful and profitable ſubjects; inſtead of their remaining in a uſeleſs, wretched, and perhaps a profligate and vicious courſe of life.

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Laſtly, Mr Bogle has hinted at a ſecondary object which he has in view, from this mode of cultivation, which he apprehends may in time, with a ſmall degree of attention, prove extremely advantageous to agriculture.—It is, that, in the firſt place, the real and intrinſic value of different kinds of grain may be more accurately aſcertained by making a compariſon of it with a few plants of each kind ſet out at the ſame time, than can be done when ſown in drills or broad-caſt; and when the moſt valuable kinds of wheat, oats, or barley, are diſcovered, he ſtates, that in a very ſhort time (not exceeding four or five years) a ſufficient quantity of that valuable kind may be procured to ſupply the kingdom with ſeed from a ſingle grain of each kind; for he calculates, that 47,000 grains of wheat may be produced by diviſibility in two years and three months.

230 Obſervation of the Bath Society.

Upon theſe propoſitions the Society obſerves, "That although Mr Bogle appears to be too ſanguine in his expectations of ſeeing his plan realized in *general practice*, it certainly merits the attention of gentlemen farmers. We wiſh them to make fair experiments, and report their ſucceſs. Every grand improvement has been, and ever will be, progreſſive. They muſt neceſſarily originate with gentlemen; and thence the circle is extended by almoſt imperceptible degrees over provinces and countries. At all events, Mr Bogle is juſtly entitled to the thanks of the Society, and of the public for the great attention he has paid to the ſubject."

231 Culture of wheat in Norfolk.

There is perhaps no part of Great Britain where this ſpecies of grain is cultivated to more perfection than in Norfolk. Mr Marſhall informs us, that the ſpecies raiſed in that country is called the *Norfolk red*, and weighs heavier than any other which has yet been introduced, though he owns that its appearance is much againſt the aſſertion, it being a long thin grain, reſembling rye more than well-bodied wheat. About 15 or 20 years ago a new ſpecies was introduced, named the *Kentiſh coſh*; againſt which the millers were at firſt very much prejudiced, though this prejudice is now got over. A remarkable circumſtance reſpecting this grain is, that though upon its introduction into the county the *coſh* or huſk be perfectly white, yet ſuch is the power either of the ſoil or of the mode of cultivation to produce what the botaniſts call *varieties*, that the grain in queſtion is ſaid to loſe every year ſomewhat of the whiteneſs of its huſks, until they become at laſt equally red with thoſe of the former kind. The ſouthern and ſouth-eaſtern parts of the county generally enjoy a ſtronger and richer ſoil than the more northerly, and therefore are more proper for the cultivation of that ſpecies of grain. In the northern parts are ſome farms of very light ſoil, where the farmers ſow

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only a ſmall quantity of wheat; and theſe light lands are called *barley farms*.

The greateſt part of the wheat in Norfolk is ſown upon a ſecond year's ley; ſometimes it is ſown upon a firſt year's ley; ſometimes on a ſummer fallow; after peaſe, turnips, or buck harveſted or ploughed under. The practice adopted by thoſe who are looked upon as ſuperior huſbandmen in the county of Norfolk is as follows: The ſecond year's leys having finiſhed the bullocks, and brought the ſtock cattle and horſes through the fore part of ſummer, and the firſt year's leys having been made ready to receive his ſtock, the farmer begins to break up his old land or ley ground by a peculiar mode of cultivation named *rice-balking*, in which the furrow is always turned toward the unploughed ground, the edge of the coulter paſſing always cloſe by the edge of the flag laſt turned. This is done at firſt with an even regular furrow; opportunity being taken for performing the operation after the ſurface has been moiſtened by a ſummer ſhower. In this ſtate his ſummer leys remain until towards the end of harveſt, when he harrows and afterwards ploughs them acroſs the balks of the former ploughing, bringing them now up to the full depth of the ſoil. On this ploughing he immediately harrows the manure, and ploughs it in with a ſhallow furrow. The effects of this third ploughing are to mix and effectually pulverize the ſoil and manure; to cut off and pulverize the upper ſurfaces of the furrows of the ſecond ploughing; and thus, in the moſt effectual manner, to eradicate or ſmother the weeds which had eſcaped the two former ones. Thus it lies until the ſeed time, when it is harrowed, rolled, ſown, and gathered up into ridges of ſuch width as the farmer thinks moſt proper. Thoſe of ſix furrows are moſt common, though ſome very good farmers lay their wheat land into four-furrow and others into ten-furrow ridges; "which laſt (ſays our author) they execute in a ſtyle much ſuperior to what might be expected from wheel ploughs." They excel, however, in the ſix-furrow ploughing; of which Mr Marſhall gives a particular account. When ploughing in this manner, they carry very narrow furrows; ſo that a ſix-furrow ridge, ſet out by letting the off-horſe return in the firſt-made furrows, does not meaſure more than three feet eight or nine inches.

232 Succeſſion of crops, &c.

233 Rice-balking, a particular mode of culture, explained.

When wheat is cultivated after the firſt year's ley, the ſeed is generally ſown upon the flag or furrow turned over. After peaſe, one or two ploughings are given; the other parts of the management being the ſame with that after the ſecond year's ley already mentioned. After buck harveſted he ſeldom gives more than two, and ſometimes but one, ploughing. In the former caſe he ſpreads his manure on the ſtubble, and ploughs it in with a ſhallow furrow; harrows, rolls, ſows, and gathers up the ſoil into narrow work. The manure is in like manner ſpread on the ſtubble after once ploughing; and the ſeed is then ſown among the manure, the whole ploughed in together, and the ſoil gathered up into narrow ridges, as if it had undergone the operations of a fallow. An inconvenience attending this practice is, that the buck which is neceſſarily ſhed in harveſting ſprings up among the wheat, and becomes a weed to it, at the ſame time that the rooks, if numerous, pull up both buck and wheat, leaving ſeveral patches quite bare. This is obviated in a great meaſure by firſt ploughing in the manure and ſelf-ſown buck with a ſhallow furrow; in conſequence of which the buck vegetates before the wheat.

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It is likewiſe a favourite practice with the Norfolk farmers to raiſe wheat after buck ploughed under. They plough under the buck by means of a broom made of rough buſhes fixed to the ſure tackle of the plough between the wheels, which bears down the plant without lifting the wheels from the ground. Sometimes, when the buck is ſtrong, they firſt break it down with a roller going the ſame way that the plough is intended to go; afterwards a good ploughman will cover it ſo effectually that ſcarce a ſtalk can be ſeen. Sometimes the ſurface of the ground is left rough, but it is more eligible to harrow and roll it. The practice of ſummer fallowing ſeldom occurs in Norfolk; though ſometimes, when the ſoil has been much worn down by cropping, and overrun by weeds, it is eſteemed a judicious practice by many excellent huſbandmen, and the practice ſeems to be daily gaining ground. After turnips the ſoil is ploughed to a moderate depth, and the ſeed ſown over the firſt ploughing: but if the turnips be got in early, the weeds are ſometimes firſt ploughed in with a ſhallow furrow, and the ſeed ploughed under with a ſecond ploughing, gathering the ſoil into narrow ridges.

234 Manuring the ground in Norfolk.

With regard to the manuring of the ground for wheat in Norfolk, that which has been recently clayed or marled is ſuppoſed to need no other preparation any more than that which has received 15 or 20 loads of dung and mould for turnips; the firſt year's ley having been teathed in autumn, and the ſecond fed off. Where the ſoil is good, and the wheat apt to run too much to ſtraw, it is the practice of ſome judicious farmers to ſet their manure upon the young clover, thereby depriving the wheat in ſome degree of its rankneſs; but it is moſt common to ſpread it upon the broken ground; or if the ſeed be ſown upon the turned furrow, to ſpread it on the turf and plough it under; or to ſpread it on the ploughed ſurface, and harrow it in with the ſeed as a top-dreſſing. A ſmaller quantity of manure is generally made uſe of for wheat than for turnips. From eight to ten cart loads (as much as three horſes can conveniently draw) are reckoned ſufficient for an acre; three or four chaldrons of lime to one acre, or 40 buſhels of ſoot to the ſame quantity of ground; or about a ton of rape-cake to three acres.

235 Time of ſowing.

In this county they never begin to ſow wheat till after the 17th of October, and continue till the beginning of December, ſometimes even till Chriſtmas. They give as a reaſon for this late ſowing, that the wheat treated in this manner is leſs apt to run to ſtraw than when ſown earlier. The ſeed is generally prepared with brine, and candied in the uſual manner with lime. The following method of preparing it is ſaid to be effectual in preventing the ſmut. "The ſalt is diſſolved in a very ſmall quantity of water, barely ſufficient for the purpoſe. The lime is ſlaked with this ſolution, and the wheat candied with it in its hotteſt ſtate, having been previouſly moiſtened with pure water." According to our author's obſervation, the crops of thoſe farmers who uſe this preparation are in general more free from ſmut than thoſe who make uſe of any other.

236 Of preparing the ſeed.

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The practice of dibbling or ſetting of wheat has not as yet become general throughout Norfolk, the common broad-caſt method being uſually followed, except on the Suffolk ſide of the county. Some few make uſe of dibbling and flating rollers; but drilling is almoſt entirely unknown, notwithſtanding the great aptitude of ſoil for the practice. Ploughing in the ſeed under furrow is the favourite mode of the Norfolk farmers, and is performed in the following manner: "The land having been harrowed down level, and the ſurface rendered ſmooth by the roller, the head ploughman (it at leiſure) marks out the whole piece in narrow ſlips of about a ſtatute rood in width. This he does by hanging up the plough in ſuch a manner, that no part of it except the heel touches the ground; and this makes a ſure mark for the ſeedſman, which he cannot by any means miſtake. In caſe the ploughs are all employed, the ſeedſman himſelf marks the ground, by drawing a piece of wood or other heavy body behind him." Mr Marſhall prefers this to the Kentiſh method of ſetting up ſticks in the form of a lane, as being leſs liable to produce miſtakes.

237 Method of ſowing.

238 Ploughing the ſeed under furrow deſcribed.

239 Inſtruments for dibbling wheat deſcribed.

In thoſe places where wheat is dibbled, they make uſe of iron inſtruments for the purpoſe. The acting part is an egg-ſhaped knob, ſomewhat larger than a pigeon's egg; the ſmaller end is the point of the dibble, the larger having a rod of iron riſing from it about half an inch ſquare, and two feet and a half long; the head being received into a croſs piece of wood reſembling the crutch of a ſpade or ſhovel, which forms the handle. The dibbler uſes two of theſe inſtruments, one in each hand; and, bending over them, walks backward upon the turned furrows, making two rows of holes in each of them. Thoſe rows are uſually made at the diſtance of four inches from each other; the holes being two and a half or three inches diſtant, viz. four in each length of the foot of the dibbler. The great art in making theſe lies in leaving them firm and ſmooth in the ſides, ſo that the looſe mould may not run in to fill them up before the ſeeds are depoſited. This is done by a circular motion of the hand and wriſt; making a ſemi-revolution every ſtroke; the circular motion beginning as the bit enters, and continuing until it is entirely diſengaged from the mould. The operation is not perfect unleſs the dibbles come out clean and wear bright. It is ſomewhat difficult to make the holes at equal diſtances; but more eſpecially to keep the two ſtraight and parallel to each other, ſome practice being required to guide the inſtruments in ſuch a manner as to correſpond exactly with each other; but though couples have been invented to remedy this inconvenience to keep them at a proper diſtance, the other method is ſtill found to be preferable. A middling workman will make four holes in a ſecond. One dibbler is ſufficient for three droppers; whence one man and three children are called a *ſet*. The dibbler carries on three flags or turned furrows; going on ſome yards upon one of the outſide furrows, and returning upon the other, after which he takes the middle one; and thus keeps his three dibblers conſtantly employed, and at the ſame time is in no danger of filling up the holes with his feet. The droppers put in two or three grains of wheat into each hole; but much time and patience is neceſſary to teach them to perform the buſineſs properly and quickly. An expert dibbler will hole half an acre in a day; though one third of an acre is uſually reckoned a good day's work. The ſeed is covered by means of a buſh harrow; and from one buſhel to ſix pecks is the uſual quantity for an acre. Notwithſtanding the advantages of ſaving ſeed, as well as ſome others which are generally reckoned undeniable, it is here aſſerted by ſome very judicious farmers, that dibbling of wheat on the whole is not really a profitable practice. It is particularly ſaid to be productive of weeds unleſs dibbled very thick: which indeed may probably be the caſe, as the weeds are thus allowed a greater ſpace to vegetate in. Mr Marſhall himſelf is of opinion, that "the dibbling of wheat appears to be peculiarly adapted to rich deep ſoils, on which three or four pecks dibbled early may ſpread ſufficiently for a full crop; whereas light, weak, ſhallow ſoils, which have lain two or three years, and have become graſſy, require an additional quantity of ſeed, and conſequently an addition of labour, otherwiſe the plants are not able to reach each other, and the graſſes of courſe find their way up between them, by which means the crop is injured and the ſoil rendered foul."

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240 Objections againſt the practice of dibbling.

241 Culture of wheat in the midland diſtrict.

The ſame author has likewiſe given an account of the method of cultivating wheat practiſed in other Engliſh counties. In the midland diſtrict, including part of Staffordſhire, Derbyſhire, Warwick, and Leiceſterſhire, we are informed that the ſpecies uſually ſown is that called *Red Lammas*, the ordinary red wheat of the kingdom: but of late a ſpecies named the *Eſſex dun*, ſimilar to the *Kentiſh white coſh* of Norfolk, and the *Hertfordſhire brown* of Yorkſhire, has been coming into vogue. Cone-wheat, formerly in uſe in this diſtrict, is now out of faſhion. Spring wheat is cultivated with remarkable ſucceſs, owing principally to the time of ſowing; viz. the cloſe of April. Our author was informed by an excellent farmer in theſe parts, that by ſowing early, as in the beginning of March, the grain was liable to be ſhrivelled, and the ſtraw to be blighted; while that which was ſown towards the end of April, or even in the beginning of May, produced clean plump corn. At the time he viſited this county, however, it ſeemed to be falling into diſrepute; though he looks upon it, in ſome ſituations, eſpecially in a turnip country, to be eligible. In the ordinary ſucceſſion in this part of the kingdom, wheat comes after oats; and there is perhaps nine-tenths of the wheat in this diſtrict ſown upon oat-ſtubble. Our author has alſo ſeen a few examples of wheat being ſown upon turf of ſix or ſeven years leying; and ſeveral others on clover ley once ploughed, as well as ſome after turnips. The beſt crops, however, produced in this, or perhaps in any other diſtrict, are after ſummer fallow. The time of ſowing is the month of October, little being ſown before Michaelmas; and in a favourable ſeaſon, little after the cloſe of the month. Much ſeed is ſown here without preparation. When any is made uſe of, it is the common one of brine candied with lime. The produce is very great, the medium being full three quarters per acre, ſometimes four or five; and one farmer, in the year 1784, had on 50 acres of land together, no leſs than 45 buſhels per acre.

242 In the v of Glouc ſter.

In the Vale of Glouceſter, the *cone-wheat*, a variety of the *triticum turgidum*, is cultivated, as well as the lammas

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mas and ſpring wheats. It is not, however, the true cone wheat which is cultivated here, the ears being nearly cylindrical; but our author met with the true ſpecies in North-Wiltſhire. Beans in this country are the common predeceſſors of wheat, and ſometimes peaſe; but here the farmers cultivate wheat upon every ſpecies of ſoil. The time of ſowing is in November and December, and the ſeed is thought to be ſown in ſufficient time if it is done before Chriſtmas. In this country it is thought that late ſown crops always produce better than thoſe which are ſown early; but Mr Marſhall accounts for this by the vaſt quantity of weeds the latter have to encounter, and which the late ſown crops eſcape by reaſon of the weakneſs of vegetation at that time of the year. The produce, however, throughout the Vale of Glouceſter, is but very indifferent.—Setting of wheat is not practiſed, but hoeing univerſally.—In harveſting, Mr Marſhall obſerves, that the grain is allowed to ſtand until it be unreaſonably ripe, and that it is bound up into very ſmall ſheaves.

243 Remarkably ſmall ſheaves.

The practice of making double bands is unknown in this diſtrict; ſo that the ſheaves are no bigger than can be contained in the length of ſingle ſtraw. The inconveniences of this method are, that the crop requires more time to ſtook, load and unload, and ſtack: the advantages are, that the trouble of making bands is avoided; and that if rainy weather happens to intervene, the ſmall ſheaves dry much ſooner than the large ones. Here the crop is cut very high, the ſtubble and weeds being mown off in ſwaths for litter ſoon after the crop is cut; and ſometimes ſold as high as 5s. per acre.—Mr Marſhall is at a loſs to account for the little quantity produced in this country: it being hardly poſſible to derive it from the nature of the ſoil, almoſt all of it being proper for the cultivation of the grain.

244 In the Cotſwold hills.

Among the Cotſwold hills of Glouceſter the lammas and cone wheats are ſown; and a new variety of the latter was raiſed not long ago by picking out a ſingle grain of ſeed from among a parcel. The body is very long and large, but not ſightly.—The Cotſwold hills are almoſt proverbial for early ſowing of wheat. The general rule is to begin ploughing in July, and ſowing the firſt wet weather in Auguſt; ſo that here the ſeed-time and harveſt of wheat coincide. If, in conſequence of this early ſowing the blade becomes rank in autumn, it is ſuppoſed to be proper to eat it down by putting a large flock of ſheep upon it at once. Eating it in ſpring is conſidered as pernicious. It is uſually weeded with ſpud-hooks; not hoed, as in the

245 Inſtance of the good effects of hoeing wheat.

Vale. One inſtance, however, is mentioned by our author, in which a very thin crop full of ſeed-weeds hoed in autumn with uncommon ſucceſs, occurred in the practice of a ſuperior manager in this diſtrict; as well as others in which wheat has been weeded in autumn with great advantage. He alſo met with another well authenticated inſtance of the good effect of

246 Of cutting mildewed wheat very green.

cutting mildewed wheat while very green. "A fine piece of wheat being lodged by heavy rains, and being ſoon after perceived to be infected with the mildew, was cut, though ſtill in a perfectly green ſtate; namely, about three weeks before the uſual time of cutting. It lay ſpread abroad upon the ſtubble until it became dry enough to prevent its caking in the ſheaf; when it was bound and ſet up in ſhocks. The reſult of this treatment was, that the grain, though ſmall, was of a fine colour, and the heavieſt wheat which grew upon the ſame farm that ſeaſon; owing, no doubt, to the thinneſs of its ſkin. What appears much more remarkable, the ſtraw was perfectly bright, not a ſpeck upon it.—In this part of the country, the produce of wheat is ſuperior to that in the Vale; but Mr Marſhall is of opinion, that the ſoil is much more fit for barley than wheat.

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247 Cultivation of wheat in Yorkſhire.

In Yorkſhire, though generally a graſs land country, and where of conſequence corn is only a ſecondary concern, yet ſeveral kinds of wheat are cultivated, particularly *Zealand*, *Downy Kent*, *Common White*, *Hertfordſhire Brown*, *Yellow Kent*, *Common Red*. All theſe are varieties of winter wheat; beſides which they cultivate alſo the *ſpring* or *ſummer wheat*. Here our author makes ſeveral curious obſervations concerning the raiſing of *varieties* of plants. "It is probable, ſays he, that time has the ſame effect upon the varieties of wheat and other grains as it has on thoſe of cultivated fruits, potatoes, and other vegetable productions. Thus to produce an early pea, the gardener marks the plants which open firſt into bloſſom among the moſt early kind he has in cultivation. Next year he ſows the produce of thoſe plants, and goes over the coming crop in the manner he had done the preceding year, marking the earlier of this early kind. In a ſimilar manner new varieties of apples are raiſed, by chooſing the broadeſt leaved plants among a bed of ſeedlings riſing promiſcuouſly from pippins. Huſbandmen, it is probable, have heretofore been equally induſtrious in producing freſh varieties of corn; or whence the endleſs variety of winter wheats? If they be naturally of one ſpecies, as Linnæus has deemed them, they muſt have been produced by climature, ſoil, or induſtry; for although nature ſports with individuals, the induſtry of man is requiſite to raiſe, eſtabliſh, and continue a permanent variety. The only inſtance in which I have had an opportunity of tracing the *variety* down to the *parent individual*, has occurred to me in this diſtrict. A man of acute obſervation, having, in a piece of wheat, perceived a plant of uncommon ſtrength and luxuriance, diffuſing its branches on every ſide, and ſetting its cloſely-ſurrounding neighbours at defiance; marked it; and at harveſt removed it ſeparately. The produce was 15 ears, yielding 604 grains of a ſtrong-bodied liver-coloured wheat, different, in general appearance, from every other variety he had ſeen. The chaff was ſmooth, without awns, and of the colour of the grain; the ſtraw ſtout and reedy. Theſe 604 grains were planted ſingly, nine inches aſunder, filling about 40 ſquare yards of ground, on a clover ſtubble, the remainder of the ground being ſown with wheat in the ordinary way; by which means extraordinary trouble and deſtruction by birds were avoided. The produce was two gallons and a half, weighing 20¼ lb. of prime grain for ſeed, beſides ſome pounds of ſeconds. One grain produced 35 ears, yielding 1235 grains; ſo that the ſecond year's produce was ſufficient to plant an acre of ground. What deters farmers from improvements of this nature is probably the miſchievouſneſs of birds: from which at harveſt it is ſcarcely poſſible to preſerve a ſmall patch of corn, eſpecially in a garden or other ground ſituated near a habitation; but by carrying on the improvement in a field of corn of the ſame nature, that inconvenience is

248 Obſervations on raiſing varieties of plants.

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got rid of. In this ſituation, however, the botaniſt will be apprehenſive of danger from the floral farina of the ſurrounding crop. But from what obſervations I have made, I am of opinion his fears will be groundleſs. No evil of this kind occurred, though the cultivation of the above variety was carried on among *white* wheat. But this need not be brought as an evidence; it is not uncommon here to ſow a mixture of red and white wheats together; and this, it is confidently aſſerted, without impairing even the colour of either of them. The ſame mode of culture is applicable to the improvement of varieties; which perhaps would be more profitable to the huſbandman than raiſing new ones, and more expeditious."

249 Preparation of wheat with arſenic.

In Yorkſhire the very ſingular preparation of ſeed wheat prevails which we formerly mentioned, viz. the ſteeping it in a ſolution of *arſenic*, as a preventive of ſmut. Marſhall was informed by one farmer, that he had made uſe of this preparation for 20 years with ſucceſs, having never during that long ſpace of time ſuffered any ſenſible injury from ſmut. Our author ſeems inclined to believe the efficacy of this preparation; but thinks there may be ſome reaſon to apprehend danger in the uſe of ſuch a pernicious mineral, either through the careleſſneſs of ſervants, or handling of the ſeed by the perſon who ſows it. The farmer above mentioned, however, during all the time he uſed it, never experienced any inconvenience either to himſelf, the ſeedſman, or even to the poultry; though theſe laſt, we ſhould have thought, would have been peculiarly liable to accidents from arſenicated ſeed. The preparation is made by pounding the arſenic extremely fine, boiling it in water, and drenching the ſeed with the decoction. "In ſtrictneſs, ſays Mr Marſhall, the arſenic ſhould be levigated ſufficiently fine to be taken up and waſhed over with water, reducing the ſediment until it be fine enough to be carried over in the ſame manner. The uſual method of preparing the liquor is to boil one ounce of white arſenic, finely powdered, in a gallon of water, from one to two hours: and to add to the decoction as much water or ſtale urine as will increaſe the liquor to two gallons. In this liquor the ſeed is, or ought to be, immerged, ſtirring it about in ſuch a manner as to ſaturate effectually the downy end of each grain. This done, and the liquor drawn off, the ſeed is conſidered as fit for the ſeed baſket, without being candied with lime, or any other preparation. A buſhel of wheat has been obſerved to take up about a gallon of liquor. The price of arſenic is about 6d. per pound; which, on this calculation, will cure four quarters of ſeed. If no more than three quarters be prepared with it, the coſt will be only a farthing per buſhel; but to this muſt be added the labour of pounding and boiling. Nevertheleſs, it is by much the cheapeſt, and perhaps, upon the whole, adds Mr Marſhall, the beſt preparation we are at preſent acquainted with. In this county it is believed, that a mixture of wheat and rye, formerly a very common crop in theſe parts, is never affected with mildew; but our author does not vouch for the truth of this aſſertion.

250 Wheat and turnips ſown together.

We muſt not here omit to take notice of a new mode of cultivating wheat contrived by Mr E. Walker of Harpley, Norfolk; which mode of culture we ſhall alſo afterwards have occaſion to notice when we come to treat of the culture of turnips. Mr Walker thus explains his mode of procedure in a letter addreſſed to the publiſher of the Annals of Agriculture. "I ſow in broad-caſt, after the turnips have been once hoed, two buſhels of wheat or two buſhels of rye per acre; and then hoe the ſame in with the ſecond hoeing: if it be hoed by the day it may be beſt, as it will be better done by the ſhort ſtrokes or cuts with the hoes than otherwiſe. It is recommended to be done ſoon after the firſt hoeing, for many reaſons: It becomes a fine herbage, and keeps the land very clean, without any injury to the turnips, or to the wheat or rye. I began to feed in laſt September, the turnips, &c. the firſt of the mouth, and ſhall continue till all are done. I have fed off with all ſorts of ſtock mixed, and have drawn out the turnips in lines to ſet the hurdles, as is uſual, and fed off the turnips and growing corn in wet and dry weather; but find that dry weather, and ſheep, is the propereſt time and ſtock; and that ſheep and light beaſts are the beſt for light lands, which, on the whole, this method will greatly improve.

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"All my experiments have been made without mucking, or any manure, for the turnip and wheat crop; and on thoſe parts where I have fed off at the time it has been dry weather, though with all ſorts of ſtock mixed, and drawing as above, I have grown at the rate of one coomb of wheat per acre, and at the rate of eight coomb of rye per acre; and ſome was almoſt totally deſtroyed by feeding off in wet weather, as I was determined not to deſiſt, that I might know the bad or good effects from feeding off the turnips with the corn in different weather, as well as the different months; all which I ſhall be able to give information of next year, to thoſe who wiſh to know. I find the ſeed nearly worth the coſt of the ſeed corn, which is a material conſideration in caſe you plough the land for barley or other ſummer corn; but if the wheat or rye ſtands a crop to your mind, it will do better to harrow it in the ſpring, at which time you may ſow your graſs ſeeds, which I find anſwer very well; or plough the ſtubble early in the autumn, and ſow with clover or other ſeeds."

The well-known author of the Annals of Agriculture has given a farther account of this method of cultivation. The idea which led to Mr Walker's experiments was this: Wheat requires a certain degree of ſtiffneſs and compactneſs in the ſoil upon which it is reared. Of this compactneſs, ſandy ſoils are apt to be deficient in proportion to the degree of tillage they receive. Hence it occurred to Mr Walker, that if wheat could be ſown without any ploughing at all, there would be a better chance of a crop upon certain ſoils, than after the moſt expenſive ſyſtem of tillage. Accordingly, in 1784, he executed his ſcheme on ſix acres of turnips, which were fed during the ſucceeding winter by bullocks and ſheep, like the reſt of his turnip fields, without making the leaſt diſtinction on account of the wheat that had been ſown and was growing among them. It is known, that turnip-land, when fed off, is left highly manured and much trodden; and the queſtion was, whether the firſt of theſe circumſtances would not counterbalance the laſt? and, whether even the treading itſelf might not prove advantageous. The ſucceſs juſtified the project, and, in 1785, Mr Walker extended it to 35 acres, a part of which was ſown with

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rye. The management was the ſame as before; the wheat did better than the rye, and the beſt crop was where the turnips were eaten in the drieſt weather. In 1786, the ſame culture was extended to 70, and in 1797 to 100 acres, with complete ſucceſs; but the crop was not better than that raiſed in the common way, though in general as good. The effect of this mode of culture, or the profit ariſing from it, conſiſted chiefly in this, that upon a farm of 600 acres, the labour of five horſes was ſaved, and at the time of the barley-ſowing, when all his neighbours were in the greateſt hurry, he was at his eaſe quietly ſtirring his turnip fallows. The chief difficulty attending this mode of cultivating wheat aroſe from the wetneſs of the ſeaſon at the time of feeding, as the ground was apt to be too much trodden and poached, particularly when the crop of turnips was very large, ſo as to keep the cattle long upon them. On the contrary, in dry or froſty weather nothing of this kind happened. The greater the crop of turnips, and the more treading that occurred, the crop of wheat ſeemed afterwards to proſper the better. In a wet ſeaſon, however, the evil ariſing from the treading was diminiſhed when ſheep alone without bullocks were introduced to conſume the turnips. Under this huſbandry, the following rotation was uſed: Two years graſs put in among the wheat-ſtubble, ploughed once, and harrowed both in autumn and ſpring with the whole dung of the farm; Third year, oats; Fourth, turnips; Fifth, wheat.

2. Oats.

251 Effect of froſt upon tilled land.

As winter-ploughing enters into the culture of oats, we muſt remind the reader of the effect of froſt upon tilled land. Providence has neglected no region intended for the habitation of man. If in warm climates the ſoil be meliorated by the ſun, it is no leſs meliorated by froſt in cold climates. Froſt acts upon water, by expanding it into a larger ſpace. Froſt has no effect upon dry earth; witneſs ſand, upon which it makes no impreſſion. But upon wet earth it acts moſt vigorouſly; it expands the moiſture, which requiring more ſpace puts every particle of the earth out of its place, and ſeparates them from each other. In that view, froſt may be conſidered as a plough ſuperior to any that is made, or can be made, by the hand of man: its action reaches the minuteſt particles; and, by dividing and ſeparating them, it renders the ſoil looſe and friable. This operation is the moſt remarkable in tilled land, which gives free acceſs to froſt. With reſpect to clay ſoil in particular, there is no rule in huſbandry more eſſential than to open it before winter in hopes of froſt. It is even adviſable in a clay ſoil to leave the ſtubble rank; which, when ploughed in before winter, keeps the clay looſe, and admits the froſt into every cranny.

To apply this doctrine, it is dangerous to plough clay ſoil when wet; becauſe water is a cement for clay, and binds it ſo as to render it unfit for vegetation. It is, however, leſs dangerous to plough wet clay before winter than after. A ſucceeding froſt corrects the bad effects of ſuch ploughing; a ſucceeding drought increaſes them.

252 Culture of Oats.

The common method is, to ſow oats on new-ploughed land in the month of March, as ſoon as the ground is tolerably dry. If it continues wet all the month of March, it is too late to venture them after. It is much better to ſummer-fallow, and to ſow wheat in the autumn. But the preferable method, eſpecially in clay ſoil, is to turn over the field after harveſt, and to lay it open to the influences of froſt and air, which leſſen the tenacity of clay, and reduce it to a free mould. The ſurface-ſoil by this means is finely mellowed for reception of the ſeed; and it would be a pity to bury it by a ſecond ploughing before ſowing. In general, the bulk of clay ſoils are rich; and ſkilful ploughing without dung, will probably give a better crop, than unſkilful ploughing with dung.

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Hitherto of natural clays. We muſt add a word of carſe clays which are artificial, whether left by the ſea, or ſweeped down from higher grounds by rain. The method commonly uſed of dreſſing carſe clay for oats, is, not to ſtir it till the ground be dry in the ſpring, which ſeldom happens before the 1ſt of March, and the ſeed is ſown as ſoon after as the ground is ſufficiently dry for its reception. Froſt has a ſtronger effect on ſuch clays than on natural clay. And if the field be laid open before winter, it is rendered ſo looſe by froſt as to be ſoon drenched in water. The particles at the ſame time are ſo ſmall, as that the firſt drought in ſpring makes the ſurface cake or cruſt. The difficulty of reducing this cruſt into mould for covering the oat-ſeed, has led farmers to delay ploughing till the month of March. But we are taught by experience, that this ſoil ploughed before winter, is ſooner dry than when the ploughing is delayed till ſpring; and as early ſowing is a great advantage, the objection of the ſuperficial cruſting is eaſily removed by the firſt harrow above deſcribed, which will produce abundance of mould for covering the ſeed. The ploughing before winter not only procures early ſowing, but has another advantage: the ſurface-ſoil that had been mellowed during winter by the ſun, froſt, and wind, is kept above.

The dreſſing a loamy ſoil for oats differs little from dreſſing a clay ſoil, except in the following particular, that being leſs hurt by rain, it requires not high ridges, and therefore ought to be ploughed crown and furrow alternately.

Where there is both clay and loam in a farm, it is obvious, from what is ſaid above, that the ploughing of the clay after harveſt ought firſt to be deſpatched. If both cannot be overtaken that ſeaſon, the loam may be delayed till the ſpring with leſs hurt.

Next of a gravelly ſoil; which is the reverſe of clay, as it never ſuffers but from want of moiſture. Such a ſoil ought to have no ridges; but be ploughed circularly from the centre to the circumference, or from the circumference to the centre. It ought to be tilled after harveſt: and the firſt dry weather in ſpring ought to be laid hold of to ſow, harrow, and roll; which will preſerve it in ſap.

The culture of oats is the ſimpleſt of all. That grain is probably a native of Britain: it will grow on the worſt ſoil with very little preparation. For that reaſon, as already noticed, before turnip was introduced, it was always the firſt crop upon land broken up from the ſtate of nature.

Upon ſuch land, may it not be a good method, to build upon the crown of every ridge, in the form of a wall, all the ſurface-earth, one ſod above another, as in a fold for ſheep? After ſtanding in this form

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all the ſummer and winter, let the walls be thrown down, and the ground prepared for oats. This will ſecure one or two good crops; after which the land may be dunged for a crop of barley and graſs-ſeeds. This method may anſwer in a farm where manure is ſcarce.

253 Norfolk cultivation of oats.

In Norfolk this kind of grain is much leſs cultivated than barley; and the only ſpecies obſerved by Mr Marſhall is a kind of white oat, which grows quickly, and ſeems to be of Dutch extraction. Oats are cultivated occaſionally on all kinds of ſoils, but more eſpecially on cold heavy land, or on very light, unproductive, heathy ſoils. They may frequently ſucceed wheat, or ley ground barley: "but (ſays our author) there are no eſtabliſhed rules reſpecting any part of the culture of this time-ſerving crop." The culture of the ground is uſually the ſame with that of barley; the ground generally undergoing a winter fallow of three or four ploughings, though ſometimes they are ſown after one ploughing. They are more commonly ſown above furrow than barley. The ſeed-time is made ſubſervient to that of barley, being ſometimes ſooner and ſometimes later than barley ſeed-time: and Mr Marſhall obſerves, that he has ſometimes ſeen them ſown in June; it being obſervable, that oats ſown late ripen earlier than barley ſown at the ſame time. The quantity of ſeed in Norfolk is from four to five buſhels per acre; but he does not acquaint us with the produce. He mentions a very ſingular method of culture ſometimes practiſed in this county, viz. ploughing down the oats after they begin to vegetate, but before they have got above ground; which is attended with great ſucceſs, even though the ground is turned over with a full furrow. By this method weeds of every kind are deſtroyed, or at leaſt checked in ſuch a manner as to give the crop an opportunity of getting above them; and the poroſity communicated to the ſoil is excellently well adapted to the infant plants of barley; which probably might frequently receive benefit from this operation.

254 Method of ploughing down oats.

255 Wild oats a weed in the Vale of Glouceſter.

In the Vale of Glouceſter, Mr Marſhall obſerves, that the wild oat is a very troubleſome weed, as well as in Yorkſhire; and he is of opinion, that it is as truly a native of Great Britain as any other arable weed, and is perhaps the moſt difficult to be extirpated. It will lie a century in the ſoil without loſing its vegetable quality. Ground which has lain in a ſtate of graſs time immemorial, both in Glouceſter and Yorkſhire, has produced it in abundance on being broken up. It is alſo endowed with the ſame ſeemingly inſtinctive choice of ſeaſons and ſtate of the ſoil as other ſeeds of weeds appear to have. Hence it is exceſſively difficult to be overcome; for as it ripens before any crop of grain, it ſheds its ſeed on the ſoil, where the roughneſs of its coat probably ſecures it from birds. The only methods of extirpating this plant are fallowing, hoeing, and handweeding, where the laſt is practicable, after it has ſhot its panicle.

256 Oats not cultivated in the Vale of Glouceſter.

No oats are cultivated in the Vale of Glouceſter; though the wild oat grows everywhere as already ſaid. Mr Marſhall is of opinion that it is better adapted to oats than to barley. The reaſon he aſſigns for the preference given to the latter is, that in this part of the country the monks were formerly very numerous, who probably preferred *ale* to oaten cake.—He now, however, recommends a trial of the grain on the ſtronger cold lands in the area of the Vale, as they ſeldom can be got ſufficiently fine for barley. The fodder from oats he accounts much more valuable than that from barley to a dairy country; and the grain would more than balance in quantity the comparative difference in price.

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257 Cultivation in the Midland diſtrict.

In the midland diſtrict the *Poland oat*, which was formerly in vogue, has now given place to the *Dutch* or *Frieſland* kind. It is conſtantly ſown after turf; one ploughing being given in February, March, or April. The ſeed-time is the latter end of March and beginning of April, from four to ſeven buſhels an acre; the produce is in proportion to the ſeed, the medium being about ſix quarters.

258 In Yorkſhire.

In Yorkſhire the Frieſland oats are likewiſe preferred to the Poland, as affording more ſtraw, and being thinner ſkinned than the latter. The *S.berian* or *Tartarian* oat, a ſpecies unnoticed by Linnæus, is likewiſe cultivated in this country: the *reed* oat is known, but has not yet come into any great eſtimation. The grain is light, and the ſtraw too ready to be affected by cattle.

Oats are particularly cultivated in the weſtern diviſion of the Vale of Yorkſhire; where the ſoil is chiefly a rich ſandy loam, unproductive of wheat. Five or ſix buſhels, or even a quarter of oats, are ſometimes ſown upon an acre; the produce from ſeven to ten quarters. In this country they are threſhed in the open air, and frequently even upon the bare ground, without even the ceremony of interpoſing a cloth. The reaſons aſſigned for this ſeemingly ſtrange practice are, that if pigs and poultry be employed to eat up the grain which eſcapes the broom, there will be little or no waſte. Here the market is always very great for new oats, the manufacturing parts of Weſt Yorkſhire uſing principally oat-bread. The only objection to this practice is the chance of bad weather; but there is always plenty of ſtraw to cover up the threſhed corn, and it is found that a little rain upon the ſtraw does not make it leſs agreeable to cattle.

259 Singular method of threſhing

In an experiment made by Mr Bartley near Briſtol, upon black oats, we are informed that he had the prodigious increaſe of 98½ Wincheſter buſhels from four on the acre: the land was a deep, mellow, ſandy loam. It had caried potatoes the former year, and received one ploughing for a winter fallow. Another ploughing was given it in February, and the ſeed was ſown on the 27th and 28th of the month. The ſucceſs of the experiment was ſuppoſed to be owing partly to the early ſowing and partly to a good deep tillage.

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260 Experiment on black oats.

3. Barley.

261 Culture of barley.

This is a culmiferous plant that requires a mellow ſoil. Upon that account, extraordinary care is requiſite where it is to be ſown in clay. The land ought to be ſtirred immediately after the foregoing crop is removed, which lays it open to be mellowed with the froſt and air. In that view, a peculiar ſort of ploughing has been introduced, termed *ribbing*; by which the greateſt quantity of ſurface poſſible is expoſed to the air and froſt. The obvious objection to this method is, that half of the ridge is left unmoved. And to obviate that objection, the following method is offered, which moves the whole ſoil, and at the ſame time expoſes the ſame quantity of ſurface to the froſt and air.

262 Ribbing

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As ſoon as the former crop is off the field, let the ridges be gathered with as deep a furrow as the ſoil will admit, beginning at the crown and ending at the furrows. This ploughing looſens the whole ſoil, giving free acceſs to the air and froſt. Soon after, begin a ſecond ploughing in the following manner: Let the field be divided by parallel lines croſs the ridges, with intervals of thirty feet or ſo. Plough once round an interval, beginning at the edges, and turning the earth toward the middle of the interval; which covers a foot or ſo of the ground formerly ploughed. Within that foot plough another round ſimilar to the former; and, after that, other rounds, till the whole interval be finiſhed, ending at the middle. Inſtead of beginning at the edges, and ploughing toward the middle, it will have the ſame effect to begin at the middle, and to plough toward the edges. Plough the other intervals in the ſame manner. As by this operation the furrows of the ridges will be pretty much filled up, let them be cleared and water-furrowed without delay. By this method, the field will be left waving like a plot in a kitchen garden, ridged up for winter. In this form, the field is kept perfectly dry; for beſide the capital furrows that ſeparate the ridges, every ridge has a number of croſs furrows that carry the rain inſtantly to the capital furrows. In hanging grounds retentive of moiſture, the parallel lines above mentioned ought not to be perpendicular to the furrows of the ridges, but to be directed a little downward, in order to carry rain water the more haſtily to theſe furrows. If the ground be clean, it may lie in that ſtate winter and ſpring, till the time of ſeed-furrowing. If weeds happen to riſe, they muſt be deſtroyed by ploughing, or braking, or both; for there cannot be worſe huſbandry, than to put the ſeed into dirty ground.

263 A better method.

This method reſembles common ribbing in appearance, but is very different in reality. As the common ribbing is not preceded by a gathering furrow, the half of the field is left untilled, compact as when the former crop was removed, impervious in a great meaſure to air or froſt. The common ribbing at the ſame time lodges the rain-water on every ridge, preventing it from deſcending to the furrows; which is hurtful in all ſoils, and poiſonous in a clay ſoil. The *ſtitching* here deſcribed, or *ribbing*, if you pleaſe to call it ſo, prevents theſe noxious effects. By the two ploughings the whole ſoil is opened, admitting freely air and froſt; and the multitude of furrows lays the ſurface perfectly dry, giving an early opportunity for the barley-ſeed.—

264 Advantages of this method.

But further, as to the advantage of this method: When it is proper to ſow the ſeed, all is laid flat with the brake, which is an eaſy operation upon ſoil that is dry and pulverized; and the ſeed-furrow which ſucceeds, is ſo ſhallow as to bury little or none of the ſurface earth: whereas the ſtirring for barley is commonly done with the deepeſt furrow; and conſequently buries all the ſurface ſoil that was mellowed by the froſt and air. Nor is this method more expenſive; becauſe the common ribbing muſt always be followed with a ſtirring furrow, which is ſaved in the method recommended. Nay, it is leſs expenſive; for after common ribbing, which keeps in the rain-water, the ground is commonly ſo ſoured, as to make the ſtirring a laborious work.

265 Management of ſeed in a dry ſeaſon.

It is well known that barley is leſs valuable when it does not ripen equally; and that barley which comes up ſpeedily in a duſky ſoil, muſt gain a great advantage over ſeed-weeds. Therefore, firſt take out about one-third of the contents of the ſacks of ſeed barley or bear, to allow for the ſwelling of the grain. Lay the ſacks with the grain to ſteep in clean water; let it lie covered with it for at leaſt 24 hours. When the ground is ſo dry as at preſent, and no likelihood of rain for 10 days, it is better to lie 36 hours. Sow the grain wet from ſteeping, without any addition of powdered quicklime, which, though often recommended in print, can only poiſon the ſeed, ſuck up part of its uſeful moiſture, and burn the hands of the ſower. The ſeed will ſcatter well, as clean water has no tenacity; only the ſower muſt put in a fourth or a third more ſeed in bulk than uſual of dry grain, as the grain is ſwelled in that proportion: harrow it in as quickly as poſſible after it is ſown; and though not neceſſary, give it the benefit of freſh furrow, if convenient. You may expect it up in a fortnight at fartheſt.

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The following experiment by a correſpondent of the Bath Society being conſidered as a very intereſting one, is here ſubjoined.

266 Important experiments on ſeed-barley.

"The laſt ſpring (1783) being remarkably dry, I ſoaked my ſeed-barley in the black water taken from a reſervoir which conſtantly receives the draining of my dung heap and ſtables. As the light corn floated on the top, I ſkimmed it off, and let the reſt ſtand 24 hours. On taking it from the water, I mixed the ſeed grain with a ſufficient quantity of ſifted wood-aſhes, to make it ſpread regularly, and ſowed three fields with it. I began ſowing the 16th, and finiſhed the 23d of April. The produce was 60 buſhels per acre, of good clean barley, without any *ſmall* or *green* corn, or weeds, at harveſt. No perſon in this country had better grain.

I ſowed alſo ſeveral other fields with the ſame ſeed dry, and without any preparation; but the crop, like thoſe of my neighbours, was very poor; not more than twenty buſhels per acre, and much mixed with *green* corn and weeds when harveſted. I alſo ſowed ſome of the ſeed dry on one ridge in each of my former fields, but the produce was very poor in compariſon of the other parts of the field."

267 Time of ſowing.

Where the land is in good order, and free of weeds, April is the month for ſowing barley. Every day is proper, from the firſt to the laſt.

The dreſſing loamy ſoil and light ſoil for barley, is the ſame with that deſcribed; only that to plough dry is not altogether ſo eſſential as in dreſſing clay ſoil. Loam or ſand may be ſtirred a little moiſt: better, however, delay a week or two, than to ſtir a loam when wet. Clay muſt never be ploughed moiſt, even though the ſeaſon ſhould eſcape altogether. But this will ſeldom be neceſſary; for not in one year of 20 will it happen, but that clay is dry enough for ploughing ſome time in May. Froſt may correct clay ploughed wet after harveſt; but when ploughed wet in the ſpring, it unites into a hard maſs, not to be diſſolved but by very hard labour.

268 Miſcellaneous obſervations concerning the cultivation of barley.

On the cultivation of this grain we have the following obſervations by a Norfolk farmer.

The beſt ſoil, he obſerves, is that which is dry and healthy, rather light than ſtiff, but yet of ſufficient tenacity and ſtrength to retain the moiſture. On this kind

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kind of land the grain is always the beſt bodied and coloured, the nimbleſt in the hand, and has the thinneſt rind. Theſe are qualities which recommend it moſt to the maltſter. If the land is poor, it ſhould be dry and warm; and when ſo, it will often bear better corn than richer land in a cold and wet ſituation.

In the choice of your ſeed, it is needful to obſerve, that the beſt is of a pale lively colour, and brightiſh caſt, without any deep redneſs or black tinge at the tail. If the rind be a little ſhrivelled, it is the better; for that ſlight ſhrivelling proves it to have a thin ſkin, and to have ſweated in the mow. The neceſſity of a change of ſeed by not ſowing two years together what grew on the ſame ſoil, is not in any part of huſbandry more evident than in the culture of this grain, which, if not frequently changed, will grow coarſer and coarſer every ſucceeding year.

It has generally been thought, that ſeed-barley would be benefited by ſteeping; but liming it has, in many inſtances, been found prejudicial. Sprinkling a little ſoot with the water in which it is ſteeped has been of great ſervice, as it will ſecure the ſeed from inſects. In a very dry ſeed time, barley that has been wetted for malting, and begins to ſprout, will come up ſooner, and produce as good a crop as any other.

If you ſow after a fallow, plough three times at leaſt. At the firſt ploughing, lay your land up in ſmall ridges, and let it remain ſo during the winter, for the froſt to mellow it; the ſecond ploughing ſhould be the beginning of February. In March ſplit the ridges, and lay the land as flat as poſſible, at the ſame time harrowing it fine. But in ſtrong wet lands (if you have no other for barley) lay it round, and make deep furrows to receive the water.

"I have often (continues he), taken the following method with ſucceſs: On lands tolerably manured, I ſowed clover with my barley, which I reaped at harveſt; and fed the clover all the following winter, and from ſpring to July, when I fallowed it till the following ſpring, and then ſowed it with barley and clover as before. Repeating this method every year, I had very large crops, but would not recommend this practice on poor light land.

"We ſow on our lighteſt lands in April, on our moiſt lands in May; finding that thoſe lands which are the moſt ſubject to weeds produce the beſt crops when ſown late.

"The common method is to ſow the barley-ſeed broad-caſt at two ſowings; the firſt harrowed in once, the ſecond twice; the uſual allowance from three to four buſhels per acre. But if farmers could be prevailed on to alter this practice, they would ſoon find their account in it. Were only half the quantity ſown equally, the produce would be greater, and the corn leſs liable to lodge: For when corn ſtands very cloſe, the ſtalks are drawn up weak; and on that account are leſs capable of reſiſting the force of winds, or ſupporting themſelves under heavy rains.

"From our great ſucceſs in ſetting and drilling wheat, ſome of our farmers tried theſe methods with barley; but did not find it anſwer their expectations, except on very rich land.

"I have myſelf had 80 ſtalks on one root of barley, which all produced good and long ears, and the grain was better than any other; but the method is too expenſive for general practice. In poor land, ſow thin, or your crop will be worth little. Farmers who do not reaſon on the matter will be of a different opinion; but the fact is indiſputable." Culture of particular Plants.

When the barley is ſowed and harrowed in, he adviſes that the land be rolled after the firſt ſhower of rain, to break the clods. This will cloſe the earth about the roots, which will be a great advantage to it in dry weather.

When the barley has been up three weeks or a month, it is a very good way to roll it again with a heavy roller, which will prevent the ſun and air from penetrating the ground to the injury of the roots. This rolling, before it branches out, will alſo cauſe it to tiller into a greater number of ſtalks; ſo that if the plants be thin, the ground will be thereby filled, and the ſtalks ſtrengthened.

If the blade grows too rank, as it ſometimes will in a warm wet ſpring, mowing is a much better method than feeding it down with ſheep; becauſe the ſcythe takes off only the rank tops, but the ſheep being fond of the ſweet end of the ſtalk next the root, will often bite ſo cloſe as to injure its future growth.

269 Cultivation of barley in Norfolk.

The county of Norfolk, according to Mr Marſhall, is peculiarly adapted to the cultivation of this grain, the ſtrongeſt ſoil not being too heavy, and the lighteſt being able to bear it; and ſo well verſed are the Norfolk farmers in the cultivation of it, that the barley of this country is deſired for ſeed throughout the whole kingdom. It is here ſown after wheat or turnips, and in ſome very light lands it is ſown after the ſecond year's ley. After wheat, the ſeed time of the latter being finiſhed, and the ſtubble trampled down with bullocks, the land is ploughed with a ſhallow furrow for a winter fallow for barley. In the beginning of March the land is harrowed and croſs-ploughed; or if it be wet, the ridges are reverſed. In April it receives another ploughing lengthwiſe; and at ſeed time it is harrowed, rolled, ſowed, and the ſurface rendered as ſmooth and level as poſſible. After turnips the ſoil is broken up as faſt as the turnips are taken off; if early in winter by *rice-balking*, a practice already explained; but if late, by a plain ploughing. It is common, if time will permit, to plough three times; the firſt ſhallow, the ſecond full, and the third a mean depth; with which laſt the ſeed is ploughed in. Sometimes, however, the ground is ploughed only once, and the ſeed ſown above, but more frequently by three ploughings, though, perhaps, the farmer has not above a week to perform them in. After ley, the turf is generally broken by a winter fallow, and the ſoil treated as after wheat.

This grain is ſeldom manured for, except when ſown after ley, when it is treated as wheat. No manure is requiſite after turnips or wheat, if the latter has been manured for. If not, the turnip crop following immediately, the barley is left to take its chance, unleſs the opportunity be embraced for winter marling.

Little barley is ſown by the Norfolk farmers before the middle of April, and the ſeed time generally continues till the middle of May; though this muſt in ſome meaſure depend on the ſeaſon; which, ſays Mr Marſhall, is more attended to in Norfolk than perhaps in all the world beſides." In the very backward ſpring

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spring of 1782, barley was sown in June with success. No preparation is used. It is all sown broadcast, and almost all under furrow; that is, the surface having been smoothed by the harrow and roller, the seed is sown and ploughed under with a shallow furrow; but if the season be wet, and the soil cold and heavy, it is sometimes sown above; but, if the spring be forward, and the last piece of turnips eaten off late, the ground is sometimes obliged to be ploughed only once, and to be sown above: though in this case Mr Marshall thinks it the most eligible management, instead of turning over the whole thickness of the soil, to *two-furrow* it, and sow between. This is done by only skimming the surface with the first plough, sowing the seed upon this, and then covering it with the bottom furrow brought up by the second plough. Three bushels are usually sufficient for an acre.

The barley, as well as the wheat, in Norfolk, is allowed to stand till very ripe. It is universally mown into swath, with a small bow fixed at the heel of the scythe. If it receive wet in the swath in this county, it is not turned, but *lifted*; that is, the heads or ears are raised from the ground, either with a fork or the teeth of a rake, thereby admitting the air underneath the swaths; which will not fall down again to the ground so close as before, so that the air has free access to the under side; and this method of lifting is supposed not to be inferior to that of turning, which requires more labour, besides breaking and ruffling the swaths.

270 In the Vale of Gloucester.

In the Vale of Gloucester the quantity of barley cultivated is very inconsiderable; the only species is the common long-eared barley, *hordeum zeocriton*. In this county the grain we speak of is used, on the every year's lands, as a cleansing crop. It is sown very late, viz. in the middle or end of May; sometimes the beginning or even the middle of June. The reason of this is, that the people of the Vale think, that if a week or ten days of fine weather can be had for the operation of harrowing out couch, and if after this a full crop of barley succeed, especially if it should fortunately take a reclining posture, the business of fallowing is effectually done, insomuch that the soil is cleaned to a sufficient degree to last for a number of years. A great quantity of seed is made use of, viz. from three to four bushels to an acre; under the idea, that a full crop of barley, especially if it lodge, smothers all kinds of weeds, couch-grass itself not excepted. Our author acknowledges this effect in some degree, but does not recommend the practice. "If the land, says he, be tolerably clean, and the season favourable, a barley fallow may no doubt be of essential service. But there is not one year in five in which even land which is tolerably clean can be sown in season, and at the same time be much benefited by it for future crops." The barley in this county is all hand-weeded. It is harvested loose, mown with the naked scythe, lies in swath, till the day of carrying, and is cocked with common hay forks. The medium produce is three quarters per acre. Its quality is preferable to that of the hill-barley.

271 Lots-ord.

The common long-eared species is sown among the Cotswold hills. It is sown in the latter end of March and beginning of April, in the quantity of three bushels to an acre, producing from 20 bushels to four quarters to an acre; "which, says our author, is a low produce. It must be observed, however, that this produce is from land deficient in tillage; and that barley delights in a fine pulverous tilth."

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272 In the midland district.

In the midland district they cultivate two species of barley, viz. the *zeocriton* or common long-eared, and the *distichon* or sprat barley; the latter not being of more than 50 years standing, but the former of much older date. The sprat is the more hardy, and requires to be more early sown; but the long-ear yields the better produce. It succeeds wheat and turnips; but on the strong lands of this district, the crop after wheat is much less productive, as well as less certain, than after turnips: which circumstance is likewise observed in Norfolk. It is sometimes also sown with success upon turf. When sown after wheat, the soil is winter fallowed by three ploughings; the first lengthwise in November; the second across in March; the last, which is the seed-ploughing, lengthwise. Between the two last ploughings the soil is harrowed, and the twitch shaken out with forks; after which it is left loose and light to die upon the surface, without being either burnt or carried off. After turnips the soil has commonly three ploughings; the reason of which is, that the turnips being commonly folded off with sheep, the soil, naturally of a close texture, receives a still greater degree of compactness, which it is proper to break down, to render it porous. The seed time is the two last weeks of April and the first of May; from two bushels and a half to three bushels an acre, sometimes even as much as four bushels: the produce very great, sometimes as high as seven or even eight quarters an acre; but the medium may be reckoned from four to four and a half quarters. Mr Marshall remarks, that the culture of barley is extremely difficult. "Something, says he, depends on the nature of the soil, much on the preparation, much on the season of sowing, and much on harvesting. Upon the whole, it may be deemed, of corn crops, the most difficult to be cultivated with certainty.

273 Culture of barley difficult.

274 In Yorkshire.

In Yorkshire there are four kinds of barley cultivated, viz. the *zeocriton* or long-eared; the *distichon* or sprat; the *vulgare*, big, four-rowed or spring barley; and the *hexastichon*, six-rowed or spring barley. The first and third sorts are principally cultivated; the winter barley is as yet new to the district. Battledoor barley was formerly very common, but is now almost entirely disused. Mr Marshall observes, that less than a century ago, barley was not saleable until it was malted; there were neither maltsters nor public houses, but every farmer malted his own grain, or sold it to a neighbour who had a malt kiln. Brakes cut from the neighbouring commons were the fuel commonly used upon this occasion; and a certain day for cutting them was fixed, in order to prevent any one from taking more than his share. The case is now totally reversed, even public malt-houses being unknown, and the business of malting entirely performed by maltsters, who buy the barley from the farmer, and sell him what malt he may want for his family.

275 Importance of barley to the revenue.

To give some idea of the importance of this grain, we shall here state the amount of the revenue which the public draws from an acre of land when cultivated for barley, independent altogether of the profits reaped from it by the landlord and tenant. Supposing an

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acre to produce eight bolls of barley, and the whole to be made into ordinary ſmall beer, the taxes paid by it ſtand thus in 1802.

	L.	s.	d.
8 bolls of barley made into malt, allowing 7 buſhels per boll, at 1s. 7¾d. per buſhel of malt duty	4	12	2
The whole may produce 40 barrels of ſmall beer, the duty upon each of which is 2s.	4	0	0
Borough impoſt, which is impoſed in Scotland, but not in England, at 1s. 3d. per barrel	2	10	0
	L. 11	2	2

4. Buck-Wheat.

276 Culture of buck-wheat.

The uſes of this plant have already been ſufficiently noticed. It delights in a mellow ſandy ſoil; but ſucceeds well in any dry looſe healthy land, and moderately ſo in a free loamy ſtone braſh. A ſtiff clay is its averſion, and it is entirely labour loſt to ſow it in wet poachy ground. The proper ſeaſon for ſowing is from the laſt week of May or the beginning of June. It has been ſown, however, ſo early as the beginning of April, and ſo late as the 22d of July, by way of experiment; but the latter was rather extreme to be choſen, and the former was in danger from froſt. In an experiment upon a ſmall piece of ground, the grain of two different crops was brought to maturity in the ſummer 1787.—After ſpring feedings, a crop of turnip-rooted cabbage, or vetches, there will be ſufficient time to ſow the land with buck-wheat. Probably, in hot dry ſummers, a crop of vetches might even be mown for hay early enough to introduce a crop of this grain after it.

In the year 1780, about ſeven acres of a ſandy ſoil on Briſſington common (F), having been firſt tolerably well cleanſed from brambles, furze, &c. received one ploughing. To reduce the irregularities of the ſurface, it was rolled; and on the 9th of June in that year, two buſhels and a half of buck-wheat per acre ſown, the ground rolled again without harrowing.

277 Advantages of this cropping.

The vegetation appeared in five or ſix days, as is conſtantly the caſe, be the weather wet or dry. The growth was ſo rapid, that the fern, with which this land greatly abounded, was completely kept under. About the middle of September the crop was mown; but by reaſon of a great deal of rain about that time, it was not ſecured until the beginning of October; hence a loſs of a great part of the grain by ſhedding, as well as ſome eaten by birds. However, there were ſaved about 24 Wincheſter buſhels per acre; and, notwithſtanding its long expoſure to the weather, received no ſort of damage, only perhaps that the fineſt and moſt perfect grain was the firſt to fall from the plant. The ground after this had almoſt the appearance of a fallow, and was immediately ploughed.

When it had lain a moderate time to meliorate, and to receive the influences of the atmoſphere, it was harrowed, ſown with Lammas wheat, and ploughed in under furrow, in a contrary direction to the firſt ploughing. Thus a piece of land, which in the month of April was altogether in a ſtate of nature, in the following November was ſeen under a promiſing crop of what is well ſtyled the king of grain, and this without the aid of manure, or of any very great degree of tillage. Nor was the harveſt by any means deficient; for ſeveral perſons converſant in ſuch things eſtimated the produce from 26 to 30 buſhels per acre. As ſoon as the wheat crop was taken off, the ground had one ploughing, and on the firſt of September following was ſown with turnip ſeed. The turnips were not large, but of an herbage ſo abundant as in the following ſpring to ſupport 120 ewes with their lambs, which were fed on it by folding four weeks. After this it was manured with a compoſition of rotten dung and natural earth, about 20 putt loads per acre, and planted with potatoes. The crop ſold for 138l. beſides a conſiderable number uſed in the family, and a quantity reſerved with which ten acres were planted the following ſeaſon. The enſuing autumn it was again ſown with wheat, and produced an excellent crop. In the ſpring of 1784, it was manured and planted with potatoes, as in the preceding inſtance; the crop, (though tolerably good) by no means equal to the former, producing about 100 ſacks per acre only. In ſpring 1785, the land was now for a third time under a crop of wheat, it being intended to try how far this mode of alternate cropping, one year with potatoes and another with wheat, may be carried.

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From the ſucceſs of the preceding and other experiments, by Nehemiah Bartley, Eſq. of Briſtol, as detailed in the Bath Society Papers, it would ſeem, that the culture of this plant ought in many caſes to be adopted inſtead of a ſummer fallowing: for the crop produced appears not only to be ſo much clear gain in reſpect to ſuch practice, but alſo affords a conſiderable quantity of ſtraw for fodder and manure; beſide that a ſummer fallowing is far from being ſo advantageous a preparation for a ſucceeding crop.

5. Pease.

278 Culture of peaſe.

Peaſe are of two kinds; the white and the gray. The cultivation of the latter only belongs to this place.

There are two ſpecies of the gray kind, diſtinguiſhed by their time of ripening. One ripens ſoon, and for that reaſon is termed *hot ſeed:* the other, which is ſlower in ripening, is termed *cold ſeed.*

Peaſe, a leguminous crop, is proper to intervene between two culmiferous crops; leſs for the profit of a peaſe crop than for meliorating the ground. Peaſe, however, in a dry ſeaſon, will produce ſix or ſeven bolls each acre; but, in an ordinary ſeaſon, they ſeldom reach above two, or two and a half. Hence, in a moiſt climate, which all the weſt of Britain is, red clover ſeems a more beneficial crop than peaſe; as it makes as good winter food as peaſe, and can be cut green thrice during ſummer.

A field intended for cold ſeed ought to be ploughed in October or November; and in February, as ſoon as the ground is dry, the ſeed ought to be ſown on the winter furrow. A field intended for hot ſeed ought to be

(F) A very rough piece of land, at that time juſt encloſed.

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be ploughed in March or April, immediately before ſowing. But if infeſted with weeds, it ought to be alſo ploughed in October or November.

Peaſe laid a foot below the ſurface will vegetate; but the moſt approved depth is ſix inches in light ſoil, and four inches in clay ſoil; for which reaſon, they ought to be ſown under furrow when the ploughing is delayed till ſpring. Of all grain, beans excepted, they are the leaſt in danger of being buried.

Peaſe differ from beans, in loving a dry ſoil and a dry ſeaſon. Horſe-hoeing would be a great benefit, could it be performed to any advantage; but peaſe grow expeditiouſly, and ſoon fall over and cover the ground, which bars ploughing. Horſe-hoeing has little effect when the plants are new ſprung; and when they are advanced to be benefited by that culture, their length prevents it. Faſt growing at the ſame time is the cauſe of their carrying ſo little ſeed: the ſeed is buried among the leaves; and the ſun cannot penetrate to make it grow and ripen. The only practicable remedy to obtain grain, is thin ſowing; but thick ſowing produces more ſtraw, and mellows the ground more. Half a boll for an Engliſh acre may be reckoned thin ſowing; three firlots thick ſowing.

Notwithſtanding what is ſaid above, Mr Hunter, a noted farmer in Berwickſhire, began ſome time ago to ſow all his peaſe in drills; and never failed to have great crops of corn as well as of ſtraw. He ſowed double rows at a foot interval, and two feet and a half between the double rows, which admit horſe-hoeing. By that method, he had alſo good crops of beans on light land.

Peaſe and beans mixed are often ſown together, in order to catch different ſeaſons. In a moiſt ſeaſon, the beans make a good crop; in a dry ſeaſon, the peaſe.

The growth of plants is commonly checked by drought in the month of July; but promoted by rain in Auguſt. In July, graſs is parched; in Auguſt, it recovers verdure. Where peaſe are ſo far advanced in the dry ſeaſon as that the ſeed begins to form, their growth is indeed checked, but the ſeed continues to fill. If only in the bloſſom at that ſeaſon, their growth is checked a little; but they become vigorous again in Auguſt, and continue growing without filling till ſtopped by froſt. Hence it is, that cold ſeed, which is early ſown, has the beſt chance to produce corn: hot ſeed, which is late ſown, has the beſt chance to produce ſtraw.

The following method is practiſed in Norfolk, for ſowing peaſe upon a dry light ſoil, immediately opened from paſture. The ground is pared with a plough extremely thin, and every ſod is laid exactly on its back. In every ſod a double row of holes is made. A pea dropt in every hole lodges in the flay'd ground immediately below the ſod, thruſts its roots horizontally, and has ſufficient moiſture. This method enabled Norfolk farmers, in the barren year 1740, to furniſh white peaſe at 12s. per boll.

279 In ſetting peaſe in drills.

In the Bath Papers, vol. i. p. 148. we have an account of the ſucceſs of an experiment by Mr Pavier near Taunton, on ſowing peaſe in drills. The ſcale on which this experiment was made, however, being ſo ſmall, it would perhaps be raſh to infer from it what might be the event of planting a large piece of ground in the ſame manner. The ſpace was only 16 ſquare yards, but the produce ſo great, that by calculating from it, a ſtatute acre would yield 600, or at the leaſt 500 pecks of green peaſe at the firſt gathering; which, at the high price they bore at that time in the country about Taunton, viz. 16d. per peck, would have amounted to 33l. 6s. 8d. On this the ſociety obſerve, that though they doubt not the truth of the calculation, they are of opinion, that ſuch a quantity as 500 or 600 pecks of green peaſe would immediately reduce the price in any country market. "If the above-mentioned crop (ſay they) were ſold only at ninepence per peck, the farmer would be well paid for his trouble." In a letter on the drill huſbandry by Mr Whitmore, for which the thanks of the ſociety were returned, he informs us, that drilled peaſe muſt not be ſown too thin, or they will always be foul: and in an experiment of this kind, notwithſtanding careful hoeing, they turned out ſo foul, that the produce was only eight buſhels to the acre.—From an experiment related in the 5th volume of the ſame work, it appears that peaſe, however meliorating they may be to the ground at firſt, will at the laſt totally exhauſt it, at leaſt with regard to themſelves. In this experiment they were ſown on the ſame ſpot for ten years running. After the firſt two years the crop became gradually leſs and leſs, until at laſt the ſeed would not vegetate, but became putrid. Strawberries were then planted without any manure, and yielded an excellent crop.

280 Peaſe muſt not be ſown too often on the ſame ſpot.

281 Mr Marſhall's obſervations.

On the Norfolk culture of peaſe, Mr Marſhall makes two obſervations. "Leys are ſeldom ploughed more than once for peaſe; and the ſeed is in general dibbled in upon the flag of this one ploughing But ſtubbles are in general broken by a winter-fallow of three or four ploughings; the ſeed being ſown broadcaſt and ploughed in about three inches deep with the laſt ploughing."—In the Vale of Glouceſter they are planted by women, and hoed by women and children, once, twice, and ſometimes thrice; which gives the crop, when the ſoil is ſufficiently free from root-weeds, the appearance of a garden in the ſummer time, and produces a plentiful crop in harveſt. The diſtance between the rows varies from 10 to 14 inches, but 12 may be conſidered as the medium; the diſtance in the rows two inches. In the Cheltenham quarter of the diſtrict, they ſet the peaſe not in continued lines, but in clumps; making the holes eight or ten inches diſtant from one another, putting a number of peaſe into each hole. Thus the hoe has undoubtedly greater freedom; all the diſadvantage is, that in this caſe the ſoil is not ſo evenly and fully occupied by the roots as when they are diſpoſed in continued lines.—In Yorkſhire it is common to ſow beans and gray peaſe together, under the name of *blendings*; and ſometimes fitches (probably, ſays Mr Marſhall, a gigantic variety of the *ervum lens*) are ſown among beans. Such mixtures are found to augment the crop, and the different ſpecies are eaſily ſeparated by the ſieve.

6. Beans.

The propereſt ſoil for beans is a moiſt and deep clay, but they may alſo be raiſed upon all heavy ſoils. They are cultivated in two ways, either in the old way by broad-caſt, or, according to the more recent practice, they

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they are drilled in distinct rows. Of each of these we shall give a very short account.

282 Culture of beans by broad-cast.

When the mode of cultivating beans by broad-cast is adopted, it is to be observed, that as this grain is early sown, the ground intended for it should be ploughed before winter, to give access to the frost and air; beneficial in all soils, and necessary in a clay soil. Take the first opportunity after January, when the ground is dry, to loosen the soil with the harrow first described, till a mould be brought upon it. Sow the seed, and cover it with the second harrow. The third will smooth the surface, and cover the seed equally. These harrows make the very best figure in sowing beans: which ought to be laid deep in the ground, not less than six inches. In clay soil, the common harrows are altogether insufficient. The soil, which has rested long after ploughing, is rendered compact and solid: the common harrows skim the surface: the seed is not covered; and the first hearty shower of rain lays it above ground. Where the farmer overtakes not the ploughing after harvest, and is reduced to plough immediately before sowing, the plough answers the purpose of the first harrow; and the other two will complete the work. But the labour of the first harrow is ill saved; as the ploughing before winter is a fine preparation, not only for beans, but for grain of every kind. If the ground ploughed before winter happen by superfluity of moisture to cake, the first harrow going along the ridges, and crossing them, will loosen the surface, and give access to the air for drying. As soon as the ground is dry, sow without delaying a moment. If rain happen in the interim, there is no remedy but patience till a dry day or two come.

Carse clay, ploughed before winter, seldom fails to cake. Upon that account, a second ploughing is necessary before sowing: which ought to be performed with an ebb furrow, in order to keep the frost-mould as near the surface as possible. To cover the seed with the plough is, with regard to this as well as other grain, expressed by the phrase *to sow under furrow*. The clods raised in this ploughing are a sort of shelter to the young plants in the chilly spring months.

The foregoing method will answer for loam. And as for a sandy or gravelly soil, it is altogether improper for beans.

283 Culture of beans in drills.

Previous to the year 1770, beans were seldom sown in Scotland, unless upon the very rich clays; but since that time, by adopting the plan of raising them in drills, or distinct rows, they have been successfully cultivated upon all the heavy loams, and in many farms they now constitute a regular branch of rotation. With very few exceptions, beans are constantly drilled at intervals of from 20 to 27 inches. Of these modes, the last is the most prevalent, because it admits the ground to be ploughed with a horse, in the most sufficient manner. Very little hand-hoeing is given; nor is it required, as the kind of land which is best adapted for their growth, and upon which they are commonly sown, has not naturally a tendency to the production of annual weeds, and fine crops of wheat generally follow, provided due attention has been given to working the bean crop. The necessity of summer fallow, which the present high price of labour, and the loss of a year's crop, render an expensive affair to the farmer, is consequently much lessened: for if land is once thoroughly cleaned, and afterwards kept in an alternate course of leguminous and culmiferous crops, it will remain in good order for a considerable number of years. Culture of particular Plants.

As beans delight in a moist soil, and have no end of growing in a moist season, they cover the ground totally when sown broad-cast, keep in the dew, and exclude the sun and air: the plants grow to a great height; but carry little seed, and that little not well ripened. This displays the advantage of drilling; which gives free access to the sun and air, dries the ground, and affords plenty of ripe seed.

II. Plants Cultivated for Roots.

1. Potatoes.

These, next to the different kinds of grain, may be looked upon as the crop most generally useful for the husbandman; affording not only a most excellent food for cattle, but for the human species also; and they are perhaps the only substitute that could be used for bread with any probability of success. In the answer by Dr Tillot to M. Linguet already mentioned, the former objects to the constant use of them as food; not because they are pernicious to the body, but because they hurt the faculties of the mind. He owns, that those who eat maize, potatoes, or even millet, may grow tall and acquire a large size; but doubts if any such ever produced a literary work of merit. It does not, however, by any means appear, that the very general use of potatoes in our own country has at all impaired either the health of body or vigour of mind of its inhabitants. The question then, as they have already been shown to be an excellent food for cattle, comes to be merely with regard to the profit of cultivating them; and this seems already to be so well determined by innumerable experiments, as well as by the general practice of the country, that no room appears left for doubt. 284 Are not prejudicial to mankind.

285 General culture.

The choice of soil is not of greater importance in any other plant than in a potato. This plant in clay soil, or in rank black loam lying low without ventilation, never makes palatable food. In a gravelly or sandy soil, exposed to the sun and free air, it thrives to perfection, and has a good relish. But a rank black loam, though improper to raise potatoes for the table, produces them in great plenty; and the product is, as already observed, a palatable food for horned cattle, hogs, and poultry.

The spade is a proper instrument for raising a small quantity, or for preparing corners or other places inaccessible to the plough; but for raising potatoes in quantities, the plough is the only instrument.

As two great advantages of a drilled crop are, to destroy weeds, and to have a fallow at the same time with the crop, no judicious farmer will think of raising potatoes in any other way. In September or October, as soon as that year's crop is removed, let the field have a rousing furrow, a cross-braking next, and then be cleared of weeds by the cleaning harrow. Form it into three-feet ridges, in that state to lie till April, which is the proper time for planting potatoes. Cross-brake it, to raise the furrows a little. Then lay well digested horse-dung along the furrows, upon which lay the roots at eight inches distance. Cover up these roots with the plough, going once round every row. This makes a warm bed for the potatoes; hot dung below, and

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a looſe covering above, that admits every ray of the ſun. As ſoon as the plants appear above ground, go round every row a ſecond time with the plough, which will lay upon the plants an additional inch or two of mould, and at the ſame time bury all the annuals; and this will complete the ploughing of the ridges. When the potatoes are ſix inches high, the plough, with the deepeſt furrow, muſt go twice along the middle of each interval in oppoſite directions, laying earth firſt to one row, and next to the other. And to perform this work, a plough with a double mouldboard will be more expeditious. But as the earth cannot be laid cloſe to the roots by the plough, the ſpade muſt ſucceed, with which four inches of the plants muſt be covered, leaving little more but the tops above ground; and this operation will at the ſame time bury all the weeds that have ſprung ſince the former ploughing. What weeds ariſe after muſt be pulled up with the hand. A hoe is never to be uſed here: it cannot go ſo deep as to deſtroy the weeds without cutting the fibres of the plants; and if it ſkim the ſurface, it only cuts off the heads of the weeds, and does not prevent their puſhing again.

286 Particular methods.

In the Bath Society Papers, we have the following practical obſervations on the culture and uſe of potatoes, given as the reſult of various experiments made for five years ſucceſſively on that valuable root, the growth of which cannot be too much encouraged.

When the potato crop has been the only object in view, the following method is the moſt eligible.

The land being well pulverized by two or three good harrowings and ploughings, is then manured with 15 or 20 cart loads of dung per acre, before it receives its laſt earth. Then it is thrown into what the Suffolk farmers call the *trench balk*, which is narrow and deep ridge-work, about 15 inches from the centre of one ridge to the centre of the other. Women and children drop the ſets in the bottom of every furrow 15 inches apart; men follow and cover them with large hoes, a foot in width, pulling the mould down ſo as to bury the ſets five inches deep; they muſt receive two or three hand-hoeings, and be kept free from weeds; always obſerving to draw the earth as much as poſſible to the ſtems of the young plants. By repeated trials, the firſt or ſecond week in April is found the moſt advantageous time for planting.

In the end of September or the beginning of October, when the haulm becomes withered, they ſhould be ploughed up with a ſtrong double-breaſted plough. The workman muſt be cautioned to ſet his plough very deep, that he may ſtrike below all the potatoes, to avoid damaging the crop. The women who pick them up, if not carefully attended to, will leave many in the ground, which will prove detrimental to any ſucceeding corn, whether wheat or barley. To avoid which inconvenience, let the land be harrowed, and turn the ſwine in to glean the few that may be left by their negligence.

By this method, the ſets will be 15 ſquare inches from each other; it will take 18 buſhels to plant an acre; and the produce, if on a good mixed loamy ſoil, will amount to 300 buſhels.

If the potatoes are grown as a preparation for wheat, it is preferable to have the rows two feet two inches from each other, hand-hoeing only the ſpace from plant to plant in each row; then turning a ſmall furrow from the inſide of each row by a common light plough, and afterwards, with a double-breaſted plough with one horſe, ſplit the ridge formed by the firſt ploughing thoroughly to clean the intervals. This work ſhould not be done too deep the firſt time, to avoid burying the tender plants; but the laſt earth ſhould be ploughed as deep as poſſible; and the cloſer the mould is thrown to the ſtems of the plants, the more advantageous it will prove. Thus 15 buſhels will plant an acre, and the produce will be about 300 buſhels; but the land, by the ſummer ploughings, will be prepared to receive ſeed wheat immediately, and almoſt enſure a plentiful crop.

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287 To prevent the grub.

The potato ſets ſhould be cut a week before planting, with one or two eyes to each, and the pieces not very ſmall; two buſhels of freſh-ſlaked lime ſhould be ſown over the ſurface of the land as ſoon as planted, which will effectually prevent the attacks of the grub.

The expence attending an acre of potatoes well cultivated in the firſt method, ſuppoſing the rent 20 ſhillings, tithe and town charges rather high (as in Suffolk), taking up, and every thing included, will be about ſix pounds. In the laſt method, it would be ſomewhat reduced.

"When predilections for old cuſtoms are ſubdued (adds the author), I hope to ſee the potato admitted in the conſtant courſe of crops by every ſpirited huſbandman. The moſt beneficial effects will, I am certain, accrue from ſuch a ſyſtem. The advantages in my neighbourhood are apparent; I cultivated and fed my own children upon them, and my poorer neighbours ſenſibly followed the example. A great proportion of every cottager's garden is now occupied by this root, and it forms a principal part of their diet. Potatoes are cheap and excellent ſubſtitutes for peaſe in ſoups and broths, allowing double the quantity.

288 A cheap preparation for the poor.

"Although it is nearly a tranſcript of the directions given by a very ingenious author, yet I ſhall take the liberty of inſerting a receipt for making a potato-ſoup, which I have weekly diſtributed among the poor to their great relief.

	s.	d.
An ox's head - - - -	2	9
Two pecks of potatoes - -	0	6
Quarter of a peck of onions - -	0	3
Three quarters of a pound of ſalt -	0	1
An ounce and a half of pepper -	0	3
Total	3	10

Ninety pints of water to be boiled with the above ingredients on a ſlow fire until reduced to 60, which requires one peck of coals, value threepence. I have added the expence of every article according to their prices with me, that gentlemen may clearly perceive at how eaſy a rate they can feed 60 of their poor neighbours. I find from experience, a pint of this ſoup, with a ſmall piece of the meat, is ſufficient to ſatisfy a hearty working man with a good meal. If vegetables are plentiful, ſome of every ſort may be added, with a few ſweet herbs.

"I hope my inſerting the above will not be eſteemed improper; though ſomewhat deviating from the culture of potatoes, it may poſſibly be a means of rendering them more extenſively uſeful."

At

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A premium having been offered by the above-mentioned ſociety for the cultivation of potatoes by farmers, &c. whoſe rent does not exceed 40l. per annum, the following methods were communicated, by which thoſe who have only a ſmall ſpot of ground may obtain a plentiful crop.

289 Methods of cultivating potatoes on ſmall ſpots.

Firſt, then, the earth ſhould be dug 12 inches deep, if the ſoil will allow of it; after this, a hole ſhould be opened about ſix inches deep, horſe dung or long litter ſhould be put therein about three inches thick; this hole ſhould not be more than 12 inches in diameter; upon this dung or litter a potato ſhould be planted whole, upon which a little more dung ſhould be caſt, and then earth muſt be put thereon. In like manner the whole plot of ground muſt be planted, taking care that each potato be at leaſt 16 inches apart; and when the young ſhoots make their appearance, they ſhould have freſh mould drawn round them with a hoe; and if the tender ſhoots are covered, it will prevent the froſt from injuring them: they ſhould again be earthed when the ſhoots make a ſecond appearance, but not be covered, as in all probability the ſeaſon will then be leſs ſevere. A plentiful ſupply of mould ſhould be given them, and the perſon who performs this buſineſs ſhould never tread upon the plant, or the hillock that is raiſed round it; as the lighter the earth is, the more room the potato will have to expand. From a ſingle root thus planted, very near 40 pounds weight of large potatoes were obtained, and from almoſt every other root upon the ſame plot of ground from 15 or 20 pounds weight; and except the ſoil be ſtony or gravelly, 10 pounds or half a peck of potatoes may almoſt always be obtained from each root, by purſuing the foregoing method. But note, cuttings or ſmall ſets will not do for this purpoſe.

290 Methods of culture adapted to ſmall farms.

The ſecond method will ſuit the indolent, or thoſe who have not time to dig their ground; and that is, where weeds much abound and have not been cleared in the winter, a trench may be opened in a ſtraight line the whole length of the ground, and about 6 inches deep: in this trench the potatoes ſhould be planted about ten inches apart; cuttings or ſmall potatoes will do for this method. When they are laid in the trench, the weeds that are on the ſurface may be pared off on each ſide about ten inches from it, and be turned upon the plants; another trench ſhould then be dug, and the mould that comes out of it turned carefully on the weeds. It muſt not be forgot, that each trench ſhould be regularly dug, that the potatoes may be throughout the plot 10 or 12 inches from each other. This ſlovenly method will in general raiſe more potatoes than can be produced by digging the ground twice, and dibbling in the plants; and the reaſon is, that the weeds lighten the ſoil, and give the roots room to expand. They ſhould be twice hoed, and earthed up in rows. And here note, that if cut potatoes are to be planted, every cutting ſhould have two eyes, for though fewer ſets will be obtained, there will be a greater certainty of a crop, as one eye often fails or is deſtroyed by grubs in the earth.

Where a crop of potatoes fails in part (as will ſometimes be the caſe in a dry ſeaſon), amends may ſtill be made by laying a little dung upon the knots of the ſtraw or haulm of thoſe potatoes that do appear, and covering them with mould: each knot or joint thus ordered will, if the weather prove wet afterwards, produce more potatoes than the original roots.

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From the ſmalleſt potatoes planted whole, from four to ſix pounds at a root were obtained, and ſome of the ſingle potatoes weighed near two pounds. Theſe were dug in as before mentioned, in trenches where the ground was covered with weeds, and the ſoil was a ſtiff loamy clay.

A good crop may be obtained by laying potatoes upon turf at about 12 or 14 inches apart, and upon beds of about ſix feet wide; on each ſide of which a trench ſhould be opened about three feet wide, and the turf that comes from thence ſhould be laid with the graſſy ſide downwards upon the potatoes; a ſpit of mould ſhould next be taken from the trenches, and be ſpread over the turf; and in like manner the whole plot of ground that is deſigned to be planted muſt be treated. And remark, that when the young ſhoots appear, another ſpit of mould from the trenches ſhould be ſtrewed over the beds ſo as to cover the ſhoots; this will prevent the froſt from injuring them, encourage them to expand, and totally deſtroy the young weeds; and when the potatoes are taken up in the autumn, a careful perſon may turn the earth again into the trenches, ſo as to make the ſurface level; and it will be right to remark, that from the ſame ground a much better crop of potatoes may be obtained the following year.

For field planting, a good (if not the beſt) method is to dung the land, which ſhould be once ploughed previous thereto; and when it is ploughed a ſecond time, a careful perſon ſhould drop the potato plants before the plough in every third furrow at about eight or ten inches apart. Plants that are cut with two eyes are beſt for this purpoſe. The reaſon for planting them at ſo great a diſtance as every third furrow, is, that when the ſhoots appear, a horſe-hoe may go upon the two vacant furrows to keep them clean; and after they are thus hoed, they ſhould be moulded up in ridges; and if this crop be taken up about October or November, the land will be in excellent condition to receive a crop of wheat. Lands that are full of twitch or couch-graſs may be made clean by this method, as the horſe-hoeing is as good as a ſummer fallow; and if, when the potatoes are taken up, women and children were to pick out ſuch filth, not any traces of it would remain; and by laying it on heaps and burning it, a quantity of aſhes would be produced for manure.

After ploughing, none ſhould ever dibble in potatoes, as the perſons who dibble, plant, or hoe them, will all tread the ground; by which means it will become ſo bound, that the young fibres cannot expand, as has been already obſerved. Good crops have indeed been obtained by ploughing the land twice, and dropping the plants in every other furrow, and by hand-hoeing and earthing them up afterwards as the gardeners do peaſe; but this method is not equal to the other.

Vacant places in hedge-rows might be grubbed and planted with potatoes, and a good crop might be expected, as the leaves of trees, thorns, &c. are a good manure, and will ſurpriſingly encourage their growth, and gratify the wiſhes of the planter; who by cultivating ſuch places, will then make the moſt of his ground, and it will be in fine order to receive a crop of corn the following year.

Account

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291 Method of culture, &c. for which a premium was granted.

Account of the culture, expences, and produce of six acres of potatoes, being a fair part of near seventy acres, raised by John Billingsley, Esq. and for which the premium was granted him in the year 1784.

EXPENCES.

Ploughing an out-stubble in October 1783, at 4s. per acre	L.1	4	0
Cross-ploughing in March 1784	1	4	0
Harrowing, 2s. per acre	0	12	0
180 cart loads of compost, 3l. per acre	18	0	0
42 sacks of seed-potatoes (each sack weighing 240lb.) of the white sort	10	10	0
Cutting the sets, 6d. per sack	1	1	0
Setting on ridges eight feet wide, (leaving an interval of two feet for an alley) 6d for every 20 yards	10	12	0
Hoeing, at 5s. per acre	1	10	0
Digging up the two feet interval, and throwing the earth on the plants, at 10s. per acre	3	0	0
Digging up the crop at 8d. for every 20 yards in length, the breadth being 8 feet	14	6	0
Labour and expence of securing in pits, wear and tear of baskets, straw, reed, spikes, &c. 10s. per acre	3	0	0
Rent	6	0	0
Tithe	1	10	0
	72	9	0
Profit	73	11	0
	L.146	0	0

PRODUCE.

600 sacks of best potatoes at 4s.	L. 120	0	0
120 sacks middle-sized, 3s. 6d.	11	0	0
50 of small, 2s.	5	0	0
N. B. Each sack 240lb.	L. 146	0	0

The field on which the above experiment was made, was an out-stubble in the autumn of 1783. In October it was ploughed, and left in a rough state during the winter. In April it was cross-ploughed and harrowed. On the 8th of May the field was marked out into beds or ridges eight feet wide, leaving a space of two feet wide for an alley between every two ridges. The manure (a compost of stable dung, virgin earth, and scrapings of a turnpike road) was then brought on the land, and deposited in small heaps on the centre of each ridge, in the proportion of about thirty cart-loads to each acre. A trench was then opened with a spade, breadth-way of the ridge, about four inches deep; in this trench the potato sets were placed, at the distance of nine inches from each other; the dung was then spread in a trench on the sets, and a space or split of 14 inches in breadth dug in upon them. When the plants were about six inches high, they were carefully hoed, and soon after the two feet intervals between the ridges were dug, and the contents thrown around the young plants. This refreshment, added to the ample manuring previously bestowed, produced such a luxuriance and rapidity of growth, that no weed could show its head.

292 Best method of taking them up

The shortest and most certain method of taking up potatoes, is to plough once round every row at the distance of four inches, removing the earth from the plants, and gathering up with the hand all the potatoes that appear. The distance is made four inches, to prevent cutting the roots, which are seldom found above that distance from the row on each side. When the ground is thus cleared by the plough, raise the potatoes with a fork having three broad toes or claws; which is better than a spade, as it does not cut the potatoes. The potatoes thus laid above ground must be gathered with the hand. By this method scarce a potato will be left.

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293 Of preserving them.

As potatoes are a comfortable food for the common people, it is of importance to have them all the year round. For a long time, potatoes in Scotland were confined to the kitchen garden; and after they were planted in the field, it was not imagined at first that they could be used after the month of December. Of late years, they have been found to answer even till midsummer; which has proved a great support to many a poor family, as they are easily cooked, and require neither kiln nor mill. But there is no cause for stopping there. It is easy to preserve them till the next crop: When taken out of the ground, lay in the corner of a barn a quantity that may serve till April, covered from frost with dry straw pressed down: bury the remainder in a hole dug in dry ground, mixed with the husks of dried oats, sand, or the dry leaves of trees, over which build a stack of hay or corn. When the pit is opened for taking out the potatoes, the eyes of what have a tendency to push must be cut out; and this cargo will serve all the month of June. To be still more certain of making the old crop meet the new, the setting of a small quantity may be delayed till June, to be taken up at the ordinary time before frost. This cargo, having not arrived at full growth, will not be so ready to push as what are set in April.

If the old crop happen to be exhausted before the new crop is ready, the interval may be supplied by the potatoes of the new crop that lie next the surface, to be picked up with the hand; which, far from hurting the crop, will rather improve it.

In the Transactions of the Society for the encouragement of Arts, a number of experiments are related by Mr Young on that kind called the *clustered* or *hog potato*, which he strongly recommends as food for the poor, in preference to the kidney or other more expensive kinds. The following is the result of the most remarkable of his experiments.

294 Mr Young's experiments on the clustered potato.

In the first week of March 1780, two acres and a quarter of barley stubble were sown with the cluster potato, which appeared on the 23d of May. A sharp frost on the 7th of June turned them as black as they usually are by the frosts of November and December. In time, however, they recovered; and by the end of October produced 876 bushels from the 2¼ acres; which, when cleaned, were reduced to 780, or 350 bushels per acre; thus affording, when only valued at 6d. per bushel, a clear profit of 7l. 14s. 4d. per acre. The experiment, however, in his opinion, would have been still more profitable, had it not been for the following circumstances: 1. The soil was not altogether proper. 2. The crop was grievously injured by the frost already mentioned, which, in our author's opinion, retarded the growth for about six weeks. 3. The dung was not of his own raising, but purchased; which cannot but be supposed to make a great difference, not only on account of the price, but likewise of the quality,

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lity, as happened to be the caſe at preſent. He is of opinion, however, that potatoes, at leaſt this kind of them, are an exhauſting crop. Having ſown the field after this large crop of potatoes with wheat, his neighbours were of opinion that it would be too rank; but ſo far was this from being the caſe, that the wheat ſhowed not the leaſt ſign of luxuriance, nor the leaſt ſuperiority over the parts adjacent which were ſown without dung. He was willing to account for this by the poverty of the dung, and the ſevere cropping which the ground had undergone while in the poſſeſſion of the former tenant. In another experiment, however, in which the ground had been likewiſe exhauſted by ſevere cropping, the ſucceeding crop of wheat ſhowed no luxuriance; ſo that the former ſuſpicion of the exhauſting quality of the cluſter potato was rather confirmed. The ground was a fine turnip loam; but though the produce was even greater than in the former caſe, viz. 356 buſhels from an acre, the profit was much leſs, viz. only 4l. 15s. 6d. An acre of ley ground was ſown at the ſame time with the turnip loam, but the produce from it was only 200 buſhels. Mr Young ſuppoſes that the produce would have been greater if the potatoes had been planted with an iron dibble, as the turf, in ploughing, lay too heavy upon the ſeed. A few rows of other potatoes, planted along with the cluſtered kind, did not vegetate at all; which ſhows that the latter have a more powerful vegetative faculty.

295 Experiments on a larger ſcale.

Having ſucceeded ſo well with his experiments on this kind of potato hitherto, Mr Young determined to try the culture of them upon a larger ſcale: and therefore, in the year 1782, ſowed 11 acres: but being obliged to commit the care of ſowing them to an ignorant labourer, his unſkilfulneſs, together with the exceſſive cold and moiſture of that ſeaſon, ſo diminiſhed the produce, that he had only a ſingle acre out of the whole. This produced 180 buſhels, which yielded of clear profit 4l. 2s. 6d. From this experiment he draws the following concluſions: 1. "That the poor loam, on which theſe potatoes were ſown, will yield a crop of cluſter-potatoes, though not of any other kind. 2. That the manure for potatoes ought to be carted and ſpread upon all ſoils inclinable to wet before the planting ſeaſon, either in autumn preceding, or elſe during a hard froſt." In 1783 he ſucceeded till worſe; for having that year ſown three acres and a half, the profit did not exceed 11s. 4d. per acre. The produce was about 224 buſhels per acre. He gives two reaſons for the failure of this crop: 1. The cluſtered potato thrives beſt in wet years; but the ſummer of 1783 was dry and hot. 2. The ſpring froſt, by interrupting the hoeing, not only greatly raiſed the expences, but very much injured the crop by encouraging the growth of weeds. Barley was ſown after the laſt crop, and produced well: ſo that our author thinks the potatoes ſeem to be a better preparation for ſpring corn than wheat. His experiment in 1784 produced a clear profit of 2l. 0s. 4d.; the produce being 250 buſhels per acre. Still, however, an error was committed, by employing an old man and woman to cut the ſets, by whoſe unſkilfulneſs there were many great gaps among the potatoes as they came up; ſo that, on the whole he reckons that he thus loſt from 500 to 800 buſhels. On the whole, however, his opinion is favourable to the cluſter potato. "With ſmall crops (ſays he), and at the low rate of value which is produced by conſuming them at home, they are clearly proved to be a crop which will pay the expence of manuring, and very ample tillage and hoeing. This is, after all, the chief object of modern huſbandry; for if a man can rely upon this potato for the winter conſumption for his yard in fattening or keeping hogs, in feeding his horſes, and fattening his bullocks, he has made one of the greateſt acquiſitions that can be deſired; ſince he can do all this upon land much too ſtiff and wet for turnips; houſes his crops before the winter rains come on; and conſequently without doing any of that injury to his land which the turnip culture is known to entail, and from which even cabbages are not free. Thoſe who know the importance of winter food on a turnip farm, cannot but admit the magnitude of this object on wet ſoils."

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297 Mr Marſhall's remarks

Mr Marſhall, in his Rural Economy of Yorkſhire, has ſeveral very intereſting remarks on the potato. Its varieties, he ſays, are endleſs and tranſitory. The rough ſkinned Ruſſian potato, which was long a favourite of the Yorkſhire farmers, he is of opinion, has now no longer an exiſtence, more than many others which flouriſhed for a time. "There is ſome reaſon to believe (ſays he) that the diſeaſe which has of late years been fatal to the potato crop in this and in other diſtricts, under the name of CURLED TOPS, has ariſen from too long a continuance of declining varieties. Be this as it may, it appears to be an eſtabliſhed opinion here, that *freſh varieties*, raiſed from ſeed, are not liable to that diſeaſe." Our author, however, does not look upon this to be a fact abſolutely eſtabliſhed: though one inſtance fell under his obſervation, in which its removal was in all probability owing to the introduction of new varieties. It made its appearance between 40 and 50 years ago, and ſpread in ſome degree over the whole kingdom. In ſome places it continued but a ſhort time, ſo that its effects are almoſt forgotten. It is ſeldom obvious at the firſt coming up of the plants; but attacks them as they increaſe in ſize; the entire top becoming dwarfiſh and ſhrivelled as if affected by drought or loaded with inſects: they nevertheleſs live and increaſe, though ſlowly, in ſize; but the roots are unproductive. Some crops have been almoſt wholly deſtroyed by this diſeaſe. In Yorkſhire the Morelands are in a manner free from it, but the Vale is in ſome meaſure infected. Plants procured from the Morelands remain free from it in the Vale the firſt year; but, being continued, become liable to the diſeaſe. Where the attack has been partial, weeding out the diſeaſed plants as they failed, is ſaid to have had a good effect; and it is ſaid the Morelanders got rid of the diſeaſe by this means.

298 on the cur

299 Method of raiſing varieties from ſeed.

In Yorkſhire ſome intelligent huſbandmen are acquainted with the method of raiſing potatoes from ſeed; which is as follows: "In autumn when the apples are beginning to fall ſpontaneouſly, they are gathered by hand, and preſerved among ſand until the ſpring, when they are maſhed among the ſand or among freſh mould; ſeparating the ſeeds and mixing them evenly with the mould. As ſoon as the ſpring froſts are judged to be over, they are ſown in fine garden mould; and as faſt as the plants get into rough leaf, and are ſtrong enough to be handled without injury, they

296 Concluſion favourable to the cultivation of this kind.

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they are transplanted into another bed of rich mould in rows, which are kept clean during summer. In autumn, bunches of small potatoes are found at the roots of these plants; varying in size, the first year, from a hazel nut to that of a crab. These being planted next spring, produce potatoes of the middle size; but they do not arrive at their fullest bulk until the third or fourth year. Where the use of the stove or the garden frame can be had, this process may be shortened. The seeds being sown within either of these early in the spring, the plants will be fit to be planted out as soon as the frosts are gone; by which means the size of the roots will be much increased the first year, and will in the second rise early to perfection."

Another account of the mode of raising potatoes from seed is given by Mr Henry Doby of Woodside Chapel, Allerton, near Leads. "Take the largest potato apples, of the kind you wish to renew, and string them on a very strong coarse thread, and hang them in a dry warm place till the latter end of February; when breaking them very small, and washing them in several waters, the seed is to be separated from the fleshy part and skins; this done, it should be spread on brown paper; and when dry, sow it in the beginning of March, or sooner, on a hot-bed, in lines about nine inches asunder, and one-third of an inch deep, and very thin: water between the lines frequently, and when the plants are risen a little height, introduce fine rich earth between the lines to strengthen them. They should have air admitted frequently, the better to enable them to bear being removed into the open air as soon as the weather shall be sufficiently temperate. Before they are transplanted they should be plentifully watered, to make them rise with a large ball at their roots; old rotten horse-dung and yellow moss are the best manures; plant them in trenches, as celery was formerly, with a space of four feet between the trenches, and 12 or 14 inches between each plant; as they grow up, draw the earth between the trenches to the stalks, but do not cover their tops. The ground, when brought to a level, should be dug, and the plants earthed until there are pretty deep trenches formed between the lines. With this treatment they will produce the first season from a pound weight to five pounds a plant; and many of the plants considerably more than a hundred potatoes a-piece; the produce of which for ten or twelve years after will be prodigious."

nnals of griculture, ol. xix.

300 Anderson's experiments.

In the 4th volume of the Bath Papers, Dr Anderson relates some experiments made on potatoes raised from seed. The first year they were of different sizes, from a pigeon's egg to that of a small pea. On planting these next year, it was invariably found, that the largest potatoes yielded the largest crop; and the same happened the third, when a few showed blossom; but not even these had bulbs equal to what would have been produced by very large potatoes. Whence he concludes, that it is impossible to assign any time in which these seedling potatoes will arrive at what is called *perfection*; but that it must depend very much on the nature of the soil and the culture bestowed upon them. From the practice of the Yorkshire farmers, however, and even from the experiments of the Doctor himself, it is evident, that potatoes raised in this way will at last grow to the usual size, as during the three years in which his experiments were continued they constantly increased in bulk. Dr Anderson likewise contends, that there is no reason for supposing that potatoes raised from bulbs in the ordinary way degenerate, or require to be renewed by seminal varieties; and he instances the universal practice of Britain and Ireland for a great number of years past. But this may be accounted for from an observation of Mr Marshall's, that varieties of potatoes, like those of corn, are partial to particular soils and situations. Hence, by transplanting all the different varieties of potatoes into all possible soils and situations, as has been done within this last century in the islands of Britain and Ireland, these varieties have continued for a much longer time than they would otherwise have done. In Yorkshire, Mr Marshall tells us, that "the old favourite sorts were driven until some of the individual plants barely produced their seed again." It is evident, therefore, that there is a necessity from time to time of renewing them from seed; though it deserves well to be considered whether it would not be more eligible to choose the seed from a plant in full vigour than from that which is so far degenerated that it can scarce produce its seed. "Potatoes raised from seed (says Mr Marshall) are a miscellany of endless varieties. Sometimes these varieties are planted miscellaneously; sometimes particular varieties are selected. In selecting varieties from seedling potatoes, two things are to be attended to; the intrinsic quality of the potato, and its productiveness. If these two desirable properties can be found in one plant, the choice is determined. To this species of attention and industry we are indebted for the many valuable kinds which have been and now are distributed throughout the island. It is observable, however, that varieties of potatoes, like those of corn, are partial to particular soils and situations. Hence the propriety of husbandmen raising potatoes from seed; as by this means, they obtain, with a degree of moral certainty, a sort adapted to their own particular soils and situations. Whoever has attended closely to the work of taking up potatoes, must have observed the great inequality in the productiveness of individual plants. The difference in the produce of adjoining roots, where no disparity of soil can influence, will sometimes be three or four fold. Hence it is evident, that each variety has its *sub-varieties*; through whose means it can hardly be doubted the parent variety may be improved, and its continuance be prolonged. Thus the farmer has another mean in his power of improving the quality and productiveness of his potato crop, by improving varieties; or, in other words, selecting sub-varieties, superiorly adapted to his soil and situation."

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301 Whether potatoes degenerate.

Sir Archibald Grant, Bart. of Monymusk, in a letter to the conductors of the Farmer's Magazine, has recently made known a mode practised by him with a view to the saving of seed, and the obtaining an early crop of potatoes. "In spring 1800, (says that gentleman), from a scarcity of seed, I followed a method sometimes used by gardeners, for forcing early potatoes, pease, and beans, viz. that of planting them out upon a small dunghill, in order to make them come sooner forward, and afterwards transplanting them into the ground. This I did, after they had upon the dunghill risen to be good plants, and the leaves about an inch

Farmer's Magazine, 1802.

302 How to obtain an early crop.

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long. The dunghill was about three feet broad and 18 inches high, with from 2 to 3 inches of earth upon the top of it, and as long as held about a peck and three quarters of a peck of Aberdeenſhire meaſure (or 32lb. Dutch to the peck) of ſmall potatoes, cut into ſets, ſtuck as cloſe to each other as poſſible in the rows, and each row about two inches aſunder. On the 17th of April, they were put upon the dunghill; on the 2d of May they were in leaf; and on the 14th and 15th of May were planted out into the field; each plant 3 feet aſunder each way. On the 12th June, they were earthed up with the plough, and were afterwards dreſſed in the ordinary method. On the 1ſt Monday of October, being taken up, they produced from 14 to 16 bolls Aberdeen meaſure. In June I obſerved, that potatoes which had been planted in the ordinary way in other parts of the pariſh, in the middle of April, were ſcarcely appearing above ground when theſe were ſo high as to require being earthed up with the plough; ſo that ſix weeks were gained in growth by this method."

303 Potatoes planted by ſcooping out the eyes.

During the late great dearth of all kinds of proviſions, a plan was adopted with a view to ſave for food a part of the potatoes uſed as ſeed, which conſiſted of not cutting them into pieces with one or more eyes in each piece, as uſual, but of ſlightly ſcooping out the eyes, which in that ſtate were planted while the greater part of the potato was preſerved for the uſe of man or cattle. This mode of planting potatoes was ſucceſsful with a great number of perſons; but in ſome inſtances, where the ground was not in an excellent ſtate of preparation, the crop is underſtood to have been more defective than when the uſual mode was adopted of cutting off large pieces of the potato along with the eye. The point, however, about the utility of this mode of practice muſt ſtill be conſidered as doubtful or worthy of farther inveſtigation. We are rather diſpoſed to think that the practice of ſlightly ſcooping out the eye will not ultimately prove beneficial, becauſe in ordinary caſes the plant will be left deſtitute of due nouriſhment from the parent root at too early a period of its growth, and before it is completely capable of deriving its ſubſiſtence from the ſoil around it; in the ſame manner, and for the ſame reaſon, that light ſeed is apt to produce a light crop of grain. This objection may not indeed hold good with regard to potatoes planted on a very fine ſoil, or upon a hot-bed, for tranſplanting after the manner adopted by Sir Archibald Grant above mentioned. But on poor lands, where the ſtrength of the young plants is more ſeverely tried, any defect in the ſize of the root planted will probably always be productive of bad effects.

2. Turnip.

304 Culture of turnip.

Turnip delights in a gravelly ſoil; and there it can be raiſed to the greateſt perfection, and with the leaſt hazard of miſcarrying. At the ſame time, there is no ſoil but will bear turnip when well prepared.

No perſon ever deſerved better of a country, than he who firſt cultivated turnip in the field. No plant is better fitted for the climate of Britain, no plant proſpers better in the coldeſt part of it, and no plant contributes more to fertility. In a word, there has not for two centuries been introduced into Britain a more valuable improvement.

Of all roots, turnip requires the fineſt mould; and to that end, of all harrows froſt is the beſt. In order to give acceſs to froſt, the land ought to be prepared by ribbing after harveſt, as above directed in preparing land for barley. If the field be not ſubject to annuals, it may lie in that ſtate till the end of May; otherwiſe, the weeds muſt be deſtroyed by a braking about the middle of April, and again in May, if weeds ariſe. The firſt week of June, plough the field with a ſhallow furrow. Lime it if requiſite, and harrow the lime into the ſoil. Draw ſingle furrows with intervals of three feet, and lay dung in the furrows. Cover the dung ſufficiently, by going round it with the plough, and forming the three feet ſpaces into ridges. The dung comes thus to lie below the crown of every ridge.

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305 Seaſon and method of ſowing.

The ſeaſon of ſowing muſt be regulated by the time intended for feeding. Where intended for feeding in November, December, January, and February, the ſeed ought to be ſown from the firſt to the 20th of June. Where the feeding is intended to be carried on to March, April, and May, the ſeed muſt not be ſown till the end of July. Turnip ſown earlier than above directed, flowers that very ſummer, and runs faſt to ſeed; which renders it in a great meaſure unfit for food. If ſown much later, it does not apple, and there is no food but from the leaves.

Though by a drill plough the ſeed may be ſown of any thickneſs; the ſafeſt way is to ſow thick. Thin ſowing is liable to many accidents, which are far from being counterbalanced by the expence that is ſaved in thinning. Thick ſowing can bear the ravage of the black fly, and leave a ſufficient crop behind. It is a protection againſt drought, gives the plants a rapid progreſs, and eſtabliſhes them in the ground before it is neceſſary to thin them.

The ſowing turnip broad-caſt is almoſt univerſal in England, and common in Scotland, though a barbarous practice. The eminent advantage of turnip is, that, beſides a profitable crop, it makes a moſt complete fallow; and the latter cannot be obtained but by horſe-hoeing. Upon that account, the ſowing turnip in rows at three feet diſtance is recommended. Wider rows anſwer no profitable end, ſtraiter rows afford not room for a horſe to walk in. When the turnip is about four inches high, annual weeds will appear. Go round every interval with the ſlighteſt furrow poſſible, at the diſtance of two inches from each row, moving the earth from the rows toward the middle of the interval. A thin plate of iron muſt be fixed on the left ſide of the plough, to prevent the earth from falling back and burying the turnip. Next, let women be employed to weed the rows with their fingers; which is better, and cheaper done, than with the hand-hoe. The hand-hoe, beſide, is apt to diſturb the roots of the turnip that are to ſtand, and to leave them open to drought by removing the earth from them. The ſtanding turnip are to be at the diſtance of twelve inches from each other: a greater diſtance makes them ſwell too much; a leſs diſtance affords them not ſufficient room. A woman ſoon comes to be expert in finger-weeding. The following hint may be neceſſary to a learner. To ſecure the turnip that is to ſtand, let her cover it with the left hand; and with the right pull up the turnip on both ſides. After thus freeing the ſtanding turnip, ſhe may ſafely uſe both hands. Let the field remain in this ſtate till the appearance of new annuals make a ſecond

ploughing

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ploughing neceſſary; which muſt be in the ſame furrow with the former, but a little deeper. As in this ploughing the iron plate is to be removed, part of the looſe earth will fall back on the roots of the plants; the reſt will fill the middle of the interval, and bury every weed. When weeds begin again to appear, then is the time for a third ploughing in an oppoſite direction, which lays the earth to the roots of the plants. This ploughing may be about the middle of Auguſt; after which, weeds riſe very faintly. If they do riſe, another ploughing will clear the ground of them. Weeds that at this time riſe in the row, may be cleared with a hand-hoe, which can do little miſchief among plants diſtant 12 inches from each other. It is certain, however, that it may be done cheaper with the hand (G). And after the leaves of turnips in a row meet together, the hand is the only inſtrument that can be applied for weeding.

In ſwampy ground, the ſurface of which is beſt reduced by paring and burning, the ſeed may be ſown in rows with intervals of a foot. To ſave time, a drill-plough may be uſed that ſows three or four rows at once. Hand-hoeing is proper for ſuch ground; becauſe the ſoil under the burnt *ſtratum* is commonly full of roots, which digeſt and rot better under ground than when brought to the ſurface by the plough. In the mean time, while theſe are digeſting, the aſhes will ſecure a good crop.

306 Properties of different ſorts of turnip.

In cultivating turnips to advantage, great care ſhould be taken to procure a good, bright, nimble, and well-dried ſeed, and of the beſt kinds.

The Norfolk farmers generally raiſe the oval white, the large green-topped, and the red or purple topped kinds, which from long experience they have found to be the moſt profitable.

The roots of the green-topped will grow to a large ſize, and continue good much longer than others. The red or purple-topped will alſo grow large, and continue good to the beginning of February; but the roots become hard and ſtringy ſooner than the former.

The green-topped growing more above ground, is in more danger of ſuſtaining injury from ſevere froſts than the red or purple, which are more than half covered by the ſoil; but it is the ſofteſt and ſweeteſt, when grown large, of any kind. We have ſeen them brought to table a foot in diameter, and equally good as garden turnips.

Turnips delight in a light ſoil, conſiſting of ſand and loam mixed; for when the ſoil is rich and heavy, although the crop may be as great in weight, they will be rank, and run to flower earlier in ſpring.

307 Obſervations with regard to ſeed.

Turnip-ſeed, like that of grain, will not do well without frequent changing. The Norfolk ſeed is ſent to moſt parts of the kingdom, and even to Ireland: but after two years it degenerates; ſo that thoſe who with to have turnips in perfection ſhould procure it freſh every year from Norwich, and they will find their account in ſo doing. For, from its known reputation, many of the London ſeedſmen ſell, under that character, ſeed raiſed in the vicinity of the metropolis, which is much inferior in quality.

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When the plants have got five leaves, they ſhould be hoed, and ſet out at leaſt ſix inches apart. A month afterward, or earlier if it be a wet ſeaſon, a ſecond hoeing ſhould take place, and the plants be left at leaſt 14 inches diſtant from each other, eſpecially if intended for feeding cattle; for where the plants are left thicker, they will be proportionably ſmaller, unleſs the land is very rich indeed.

308 Methods of culture in Norfolk.

Some of the beſt Norfolk farmers ſow turnips in drills three feet aſunder, and at a ſecond hoeing leave them a foot apart in the rows. By this means the trouble and expence of hoeing is much leſſened, and the crop is of equal weight as when ſown in the common method. The intervals may eaſily be cleared of weeds by the horſe-hoe.

Communications to the Board of Agriculture, vol. ii.

There has been laid before the Board of Agriculture, the reſult of ſome intereſting experiments, which we ſhall here ſtate, that were made by Mr W. Jobſon of Turvelaws, with a view to aſcertain the comparative merits of the two modes of rearing turnips by drill or broad-caſt. The trial was made upon a part of a field of 15 acres ſown in the month of June 1797. "The whole field, ſays Mr Jobſon, was in equal tilth, was manured as equally as poſſible immediately before ſowing with rotted fold-yard dung, at the rate of 17 cart loads per acre, each load containing about 28 Wincheſter buſhels; and in order to make the experiment perfectly fair, there were breadths of land of 20 yards each, ſown in broad-caſt and drills alternately, throughout the whole field. Part of the drills on one-bout ridges of 27 inches each, with the dung laid immediately underneath, where the row of ſeed was depoſited; the reſt of the drills upon a level ſurface, were ſown by Mr Bayley's machine at 21 inches diſtance. The produce per acre is calculated from the weight of four ſquare perches, or the fortieth part of a ſtatute acre of each, having firſt cut off the tails, or fibrous part of the root, and thrown them aſide, as unfit for food, and then taken the weight of the tops and roots ſeparately.

309 Culture of turnip by drill and broad-caſt compared.

"It is neceſſary to obſerve, that this field of turnip was but a middling crop, having been much hurt immediately after the firſt hoeing, by the *grub* (a ſmall worm which deſtroys the root), particularly the drilled part of the field, which, having had the plants ſet out, at the diſtances at which they were intended to remain before the grub ſeized them, was on that account rendered too thin and otherwiſe much injured; notwithſtanding which, it was found that thoſe on the one-bout ridges exceeded the others in weight; alſo, that theſe parcels of turnips were taken from an inferior (though not the worſt) part of the field, and may therefore be deemed to be a pretty fair average of the whole:

(G) Children under thirteen may be employed to weed turnips with the fingers. We have ſeen them go on in that work with alacrity; and a ſmall premium will have a good effect. For boys and girls above thirteen, a hand-hoe adapted to their ſize is an excellent inſtrument: it ſtrengthens the arms amazingly. In driving the plough, the legs only are exerciſed; but as the arms are chiefly employed in huſbandry, they ought to be prepared beforehand by gentle exerciſe.

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whole: there were alſo three other portions weighed, which were taken from a part of the field where the roots were larger, and a fuller crop, with a view to aſcertain what might have been expected, had not the grub ſeized them in the manner deſcribed; but unfortunately the paper containing their weight has been loſt or miſlaid, which puts it out of my power to furniſh you with it. There was alſo an account taken of the number (but not the weight) of loads which were produced upon a few acres of the worſt part of the field, which was in favour of the broad-caſt, in the proportion of ten of broad-caſt to nine of thoſe drills on one-bout ridges, and eight of Mr Bayley's drill.

"From this experiment (though defective from the reaſons aſſigned) we have reaſon to conjecture, though not to form a concluſion, that a heavier crop may be raiſed by ſowing in drills at 27 inches diſtance with the dung immediately beneath the plants, than in broad-caſt or in drills at 21 inches on a level ſurface: but whether the advantage ariſes from the ſituation in which the dung is depoſited, or from their having a freer circulation of air, or from both theſe united, it remains for future and repeated experiments to decide. Notwithſtanding this, it will be found, that each of theſe methods poſſeſſes peculiar advantages and diſadvantages, according to ſituations and circumſtances; the reaſons for which I deduce from the obſervations I have made reſpecting this as well as former crops. In the firſt place, the one-bout ridges I think preferrable for early ſowing, and eating off, through the winter months, even ſo late as the month of February, as they are more eaſily procured for food for cattle in deep ſnows; alſo in ſituations where it is difficult to procure a ſufficient number of experienced hoers, thoſe under the drill ſyſtem can be more eaſily managed and at leſs expence, as boys and girls may be readily taught to ſet out the plants with great regularity in very little time; but turnips under this ſyſtem are liable to the inconvenience of being more apt to be injured by ſevere froſts from their high expoſure. Another inconvenience I have alſo obſerved on wet and heavy lands, more eſpecially with little declivity, that although there ſhould, and poſſibly may, be a larger crop produced thereby, yet the land will unavoidably be ſo much poached by carrying them off, that the ſucceeding crop of corn will be leſſened more than the extra value of the turnips will compenſate. When it is attempted to raiſe turnips upon land of this deſcription, it will be found more advantageous to form it into ridges of ſufficient height to carry off the water with eaſe into the water furrows, and of ſufficient breadth (ſuppoſe fifteen feet) to allow a cart to paſs along them freely, without forcing the earth in to choke up theſe furrows. The turnips may be ſown either in broad-caſt or in drills, upon the ſurface of theſe ridges. If the land is addicted to annual weeds, they will be beſt in drills, which will expedite the hoeing; but if not, or if they be late in ſowing, or if the land be ſubject to the grub, broad-caſt will generally be found to produce a more certain crop, as they can be left ſo near to each other at the firſt hoeing as to admit of being thinned, and thereby give the opportunity of taking out unhealthy plants at the ſubſequent hoeings, and alſo that they grow more vigorouſly between the firſt and ſecond hoeings."

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The reſult of the experiment here alluded to, is ſtated in the following manner:

COMPARATIVE WEIGHT of ſix portions of Turnips, which were part of a Field of fifteen Acres: the whole of which was Sown in the Month of June 1797, as an experiment between the Drill and Broad-caſt ſyſtems.

	Time of weighing.	Number upon four ſquare perches.	Weight on four ſquare perches, or the 40th part of an acre. ROOTS. Cwt. qr. lib.	TOPS. cwt. qr. lb.	Weight per ſtatute acre. Tons cwt. qr. lib.	Average weight of each turnip. lb. oz.	Average diſtance of each turnip.
No I. Drilled on one-bout ridges, at 27 inches diſtance.	January	354	8 1 1	1 1 3	19 1 0 20	3 0¼	16½ in. by 27 in.
II. Drilled with Mr Bayley's machine, on a level ſurface, at 21 inches diſtance.	ditto	428	7 1 15½	1 1 5½	17 7 1 8	2 4¾	17 in. by 21 in.
III. Broad-caſt.	do.	568	7 2 12½	1 0 11½	17 8 1 26	1 11½	16¾ each way.
IV. Drilled on one-bout ridges, at 27 inches diſtance.	Mar. 2.	334	8 3 0	1 1 22	20 7 3 12	3 6½	17 by 27 in.
V. Broad-caſt. Theſe and the preceding were round white turnips.	do.	628	8 2 22	1 1 8	20 0 2 24	1 12½	16 each way.
VI. Broad-caſt (Red.)	do.	561	6 3 26½	2 3 5	19 11 1 0	1 15½	16½ each way.

"By noting the average diſtance of each turnip, as is done in the laſt column, is intended to ſhow, at one view, how many plants there were wanting in the drills to have made them a full crop; for, if 550 be ſtated as a medium number in a full crop, upon the 40th part of an acre, they will be found to occupy a ſpace of 17 inches each way in broad-caſt, 10½ by 27 inches on the one-bout ridges, and 13½ by 21 inches of thoſe drilled

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drilled on the level ſurface; from whence may be eaſily ſeen, how much thoſe were wider in the rows than they ought to have been."

Great quantities of turnips are raiſed in Norfolk every year for feeding black cattle, which turn to great advantage.

310 Value as food for cattle.

It is well known, that an acre of land contains 4840 ſquare yards, or 43,560 ſquare feet; ſuppoſe then that every ſquare foot contains one turnip, and that they weigh only two pounds each on an average, here will be a maſs of food, excellent in kind, of 46 tons per acre, often worth from four to five guineas, and ſometimes more.

Extraordinary crops of barley frequently ſucceed turnips, eſpecially when fed off the land. In feeding them off, the cattle ſhould not be ſuffered to run over too much of the ground at once, for in that caſe they will tread down and ſpoil twice as many as they eat. In Norfolk, they are confined by hurdles to as much as is ſufficient for them for one day. By this mode the crop is eaten clean, the ſoil is equally trodden, which if light is of much ſervice, and equally manured by the cattle.

A notion prevails in many places, that mutton fattened with turnips is thereby rendered rank and ill taſted; but this is a vulgar error. The beſt mutton in Norfolk (and few counties have better) is all fed with turnips. It is by rank paſtures, and marſhy lands, that rank mutton is produced.

If the land be wet and ſpringy, the beſt method is to draw and carry off your turnips to ſome dry paſture; for the treading of the cattle will not only injure the crop, but render the land ſo ſtiff, that you muſt be at an additional expence in ploughing.

311 Method of preſerving turnips.

To preſerve turnips for late ſpring feed, the beſt method, and which has been tried with ſucceſs by ſome of the beſt Engliſh farmers, is, To ſtack them up in dry ſtraw; a load of which is ſufficient to preſerve 40 tons of turnips. The method is eaſy, and is as follows:—

After drawing your turnips in February, cut off the tops and tap roots (which may be given to ſheep), and let them lie a few days in the field, as no weather will then hurt them.

Then, on a layer of ſtraw next the ground, place a layer of turnips two feet thick; and then another layer of ſtraw, and ſo on alternately, till you have brought the heap to a point. Care muſt be taken to turn up the edges of the layers of ſtraw, to prevent the turnips from rolling out; cover the top well with long ſtraw, and it will ſerve as a thatch for the whole.

In this method, as the ſtraw imbibes the moiſture exhaled from the roots, all vegetation will be prevented, and the turnips will be nearly as good in May as when firſt drawn from the field. If ſtraw be ſcarce, old haulm or ſtubble will anſwer the ſame purpoſe.

But to prevent this trouble and expence, perhaps farmers in all counties would find it moſt to their intereſt to adopt the method uſed by our neighbours the Norfolk farmers, which is, to continue ſowing turnips to the latter end of Auguſt; by which means their late crops remain good in the field till the latter end of April, and often till the middle of May.

The advantages of having turnips good till the ſpring feed is generally ready, are ſo obvious, and ſo great, that many of the moſt intelligent farmers (although at firſt prejudiced againſt the practice) are now come into it, and find their account in ſo doing.

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312 Their culture ſaid to be generally attended with no profit.

Turnips have long been in ſuch general uſe as food for cattle, that the profit on raiſing them might be reaſonably thought to be altogether certain; nevertheleſs, Mr Young, in the paper already quoted, informs us, that "turnips dunged for are univerſally a loſing crop; for if they are ſtated from 30s. to 40s. an acre, their value does not amount to the dung alone which is ſpread for potatoes; yet the latter pays that dung, all other expences, and leaves a profit ſometimes conſiderable. I admit that turnips fed upon the land will prepare better for corn; but that is by no means the queſtion. Would not the dung raiſed in the farmyard by the conſumption of the potatoes, ſuppoſing it ſpread on the potato acre, make that produce more than the turnip one? I have no doubt but it would give a ſuperiority. But turnips are liable to great failures, and cannot be relied on late in the ſpring: potatoes may; and are applicable to uſes to which the other root cannot be applied."—In the ſecond volume of the Bath Papers, p. 101. we have a comparative account of the value of turnips, turnip-rooted cabbage, and lucerne, as food for cattle. The reſult of this writer's obſervations is, that "when ſheep are allowed as many turnips as they can eat (which ſhould always be the caſe when they are fattening), they will, on an average, eat near 20 pounds each in 24 hours. An acre of turnips, twice hoed, will, if the land be good, produce about fifty tons; which will, on the above calculation, maintain 100 ſheep 52 days. The ſheep mentioned weigh 20 pounds per quarter. An acre of turnip-rooted cabbage will maintain 100 ſheep for a month, and ſometimes five weeks; but an acre of Scots cabbages will maintain 200 ſheep a full month." The number fed by lucerne is not determined.

313 Compared with other vegetables as food for cattle.

The greateſt diſadvantage which attends a crop of turnips, is their being ſo ready to be damaged by the fly, which ſometimes deſtroys them ſo completely, that they muſt be ſown over again two or three times the ſame ſeaſon, and even this without any certainty of ſucceſs. Innumerable methods of avoiding this evil have been projected, which may all be reduced to the following claſſes: 1. Steeping the ſeed in certain liquids. 2. Fumigation of the fields with the ſmoke of certain herbs. 3. Rolling. 4. Strewing ſoot, lime, aſhes, &c. on the ſurface of the ground. It is very difficult, however, to determine, with any degree of certainty, whether remedies of this kind are effectual or not; becauſe ſometimes the turnips are not injured though no precaution has been made uſe of: and when this happens to be the caſe, after the uſe of any ſuppoſed preventive, the preſervation of the crop is aſcribed to the uſe of that preventive, whether it be really efficacious or not. The virtues of ſteeps ſeem to have been fully aſcertained by Mr Winter Charlton near Briſtol, of whoſe experiments an account is given in the Tranſactions of the Society for Encouraging Arts, vol. v. The ſeeds were of the Dutch kind, ſowed on beds in the kitchen garden in drills, about twelve inches diſtant, an inch and a half deep, on the 11th of May 1786. The beds had been prepared with rotten dung in May 1785, and afterwards ſown with cabbages. The quality of the turnips is exhibited in the following table; the

314 The fly occaſions the great inconvenience in turnip culture.

315 Whether ſteeps for turnip-ſeed be of any uſe.

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the beſt being marked 1; and theſe of inferior quality, 2, 3, &c. The obſervations were taken on the 26th of June.

Seed without any preparation,	1
ſteeped in train oil, flouriſhed extremely,	
ſteeped in linſeed oil, ſomewhat inferior,	1
Seed mixed with foot and water,	2
with drainings of a dunghill,	2
with elder and barton draining,	2
with foot,	3
with elder leaf juice,	3
with elder and barton draining, foot being ſowed over the covered drills,	3
with ditto, and lime ſowed over the drills,	3
ſowed with foot ſcattered over, and then covered,	3
with barton draining,	4
an elder buſh drawn over when the plants appeared,	4
with ſtale human urine, very few plants appeared,	
with ſlaked lime ſcattered over, and then covered, very few plants appeared,	
with elder, barton-draining, and ſlaked lime, very few plants appeared,	
with lime and barton-draining did not vegetate.	

Another ſet of experiments was made with the green Norfolk turnip, drilled an inch and a half deep, the rows one foot diſtant, on beds eight feet three inches long, and two feet wide; half a drachm of ſeed allowed for each bed, ſteeped and mixed with various ſubſtances like the former. The ſeeds were drilled upon unmanured ground on the 20th of June 1786, and the obſervation made on the 17th of July. None of the beds were found free from the ravages of the fly; but the ſeed which had been ſteeped in train oil and linſeed oil were much more free from this injury than the others. The linſeed oil, as in the former experiment, was found inferior to the train oil, which was ſuppoſed to have been owing to its being kept in a bottle that had formerly held oil of turpentine. The leaves of the ſteeped ſeeds were of a much darker green than the others, appeared twice as thick in bulk and luxuriancy, and the plants were conſiderably larger than thoſe of the other kinds. The ſubſtances mixed with the reſt were ſoapers aſhes, wood aſhes, pounded gunpowder, brimſtone, ſlaked lime, ſoot, barton-draining; ſometimes mixed together in various proportions, and ſometimes with the addition of a portion of ſifted mould.

Theſe experiments ſhow, that no dependence can be had on ſteeps or mixtures of any kind with the turnip-ſeed; though the train oil and linſeed oil ſeem greatly to have forwarded the vegetation of the plant. It does not appear that fumigation has ever been tried; nor indeed does it ſeem eaſy to be tried in ſuch a manner as might enſure ſucceſs.—In the fourth volume of the Bath Papers, Mr Gullet of Devonſhire gives ſuch directions for performing the operation as he thinks would be productive of ſucceſs.—In a preceding paper he had explained the good effects of fumigating orchards; but the caſe with theſe muſt be very conſiderably different from a field of turnips. The trees in an orchard are elevated above the ground, and the ſmoke naturally aſcends, and is blown along their tops: but in fumigating a large field of turnips, it muſt creep along the ground in ſuch a manner as is by no means agreeable to its nature; and without an exceſſive degree of labour, as well as a vaſt quantity of burning materials, there cannot be the leaſt hope of ſucceſs. Mr Gullet's directions are as follow: "If the turnip-ground be ſpaded and burnt, or the weeds, &c. burnt without ſpading, the fumigation thereby may ſuffice to chaſe ſuch of the winged tribe from thence as are then there; but in all caſes, when the field is ploughed and ready for ſowing, let heaps be made at different places and intervals round by the hedges and boundaries of the turnip-ground, and ſome few ſcattered through the field; then, as ſoon as the ſeed is ſown, let the heaps on the windward ſide and the ſcattered ones be lighted and kept ſmothering during the continuance of the wind in that quarter; the leſs the fire, and the more the ſmoke, the better. Should the wind happen to ſhift, thoſe heaps on the quarter it ſhifts to muſt then be lighted and kept ſmothering in like manner; ſo that during the growth of the tender turnip leaf, and until it becomes rough and out of all danger, this fumigation and ſmoke, over and acroſs the field, muſt be continued from one quarter to the other; which I venture to aſſert, will effectually deter and prevent any winged inſect tribe from approaching the turnip-ground: nay more, if there already, it would moſt completely drive them from thence, as ſuch delicately formed inſects (which can only feed on the moſt tender leaf) would be ill able to continue long in ſuch a ſmother of fire and ſmoke. The conſequence is obvious and certain, that if the fly be kept from approaching the field, the turnip-crop is ſafe; and few, I believe, will diſagree with me, that *prevention is better than remedy*."

316 Mr Gullet's directions for fumigation.

Our author does not ſay that he has ever tried this method with turnips; but lays great ſtreſs upon his ſucceſs in a ſimilar experiment with cabbages, in order to preſerve them from the caterpillar. To make the matter more ſure, however, he recommends the trailing of a buſh of elder over the turnip field at the time of harrowing or bruſhing in the ſeed: but this remedy has by numberleſs experiments been found inſignificant, and by thoſe above related ſeems even to be pernicious: ſo that whatever good effects we can expect from this method, muſt depend on the fumigation alone; and even this is attended with very great uncertainties, as has already been obſerved.

317 Of rolling

Rolling promiſes to be of ſervice when the young turnips are attacked by ſnails, which frequently deſtroy them; but it cannot be ſuppoſed to have much effect in deſtroying flies, theſe being too numerous and too minute to be effectually cruſhed by the roller: and indeed, though this has been frequently recommended, we have no deciſive proofs of its having ever been attended with any good effect.

The ſtrewing of ſoot, lime, aſhes, &c. upon the ground, have been determined ineffectual by the experiments already related, at leaſt when applied before the turnips come up; and there ſeems to be little hope of their proving more effectual even when applied after the crop has appeared above ground. We may argue indeed

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indeed *à priori* about the taſte or ſmell of ſoot, lime, &c. being diſagreeable to inſects; but of this we have no proof; and even though this were the caſe, the leaf ſoon emerges from under this covering, or the inſects will feed on the under part of the leaves, where theſe ſubſtances cannot lie. It is evident, therefore, that very little can be expected from any of the methods hitherto propoſed either by way of cure or prevention. The more probable methods are,

318 Early ſowing recommended.

1. To ſow the turnips at ſuch a ſeaſon of the year that they may be well grown before the fly makes its appearance. In the Bath Papers, vol. iv. p. 132. Mr Wimpey obſerves, that in order to procure food for their cattle in the ſpring before the graſs is grown, farmers are obliged to poſtpone the ſowing of turnips beyond the natural time of vegetation: but were turnips to be ſown in April, as ſoon as the ſeaſon would permit, it is very probable that there would be as great a crop of them as of other vegetables uſually ſown in theſe months. On account of the delay in ſowing, however, for the reaſon already mentioned, the ſucceſs of the farmer becomes exceedingly precarious, unleſs he is ſo fortunate as to have a few rainy days, or cloudy weather and frequent ſhowers, ſoon after the ſeed is ſown: and this our author ſuppoſes to be the true reaſon why the turnip is a more uncertain article than any other. But though ſpeculations of this kind have a great ſhow of probability, there is not any experiment hitherto publiſhed, even by our author himſelf, by which the truth of the above conjecture can be abſolutely aſcertained. Our author, however, is of opinion, that none of the common methods propoſed can anſwer any good purpoſe, farther than as by means of them the vegetation of the plant may be invigorated. Mr Wimpey recommends aſhes, ſoot, or a rich compoſt of lime and dung, uſed in ſufficient quantities; but the method of uſing them is, either to ſow them with the ſeed, or rather by themſelves immediately before, and to harrow them well in, that they may be completely incorporated with the ſoil. This for the moſt part would ſo invigorate and encourage the growth of the plants, as to be an overmatch for the moſt vigorous attacks of the fly.

319 Sowing a great quantity of ſeed.

2. Another method propoſed for ſecuring turnips from the fly, is by ſowing ſuch a quantity of ſeed as will be more than ſufficient for the conſumpt of the inſects. This we find recommended in a letter to the Bath Society, by a gentleman-farmer in Eſſex, vol. ii. p. 238. His method is to make the land clean and fine as ſoon as the ſeaſon will permit, and to ſow four pints per acre. It may be objected, that if the fly does not take them, the plants will ſtand ſo thick, that they cannot eaſily be hoed; but this may be obviated by harrowing them firſt, which will make them fit for the hoe. There can be no expectation of a crop if the fly takes them when only a pint of ſeed is ſown per acre; but this gentleman remarks, that he has not in any one inſtance miſſed of a crop when he ſowed four pints; becauſe, though the fly has ſometimes deſtroyed more than one half, and much damaged the other, ſtill there was a ſufficient number left behind. He alſo agrees with other of the Society's correſpondents, that the ground ſhould be well dunged and manured previous to the ſowing of turnips, as this makes them grow vigorouſly, ſo that they quirkly get into the rough leaf, in which ſtate the fly will not touch them.

In the ſame volume, a gentleman of Norfolk remarks, that manuring the ground in autumn for turnips is preferable to the doing ſo in ſpring. This diſcovery he made in conſequence of the following accident.—"A neighbouring farmer, not having a ſufficient quantity of manure for all his turnip land, was under the neceſſity of ſowing four acres unmanured. The effect was, that the turnips on the manured part of the land were moſtly eaten off by the fly, while four acres unmanured eſcaped without injury." In conſequence of having obſerved this, the gentleman made a ſimilar experiment, by manuring five acres well for turnips, and tilling three acres and a half in the uſual way without any manure. The manured crops were almoſt all deſtroyed by the fly, ſo that he was obliged to ſow moſt of the land over again. The three acres and a half which had no manure were entirely free from injury, though the plants were much ſmaller than thoſe of the manured ground which came up. Not content with this trial, however, he repeated the experiment by manuring ſix acres of wheat ſtubble in autumn, ploughing it in immediately, and leaving it to incorporate with the earth during the winter: the turnips which grew upon this were as large as if the ground had been manured in the ſpring. This experiment was repeated with ſurpriſing ſucceſs in two ſucceeding years; whence he infers, that the fly is either engendered in the new dung or enticed by it. But when the manure is laid on in autumn it loſes its noxious qualities, though it ſtill retains its nutritive ones.—This concluſion, however, does not appear to be well founded; for it is certain from undoubted experience, that turnips which have been well manured in the common way, have ſometimes eſcaped any injury; while others, which have got no manure at all, have been almoſt totally deſtroyed. Another material advantage, however, which this correſpondent obſerves is to be derived from manuring in autumn is, that all the ſeeds contained in the manure, and which are of courſe carried to the land with it, vegetate almoſt immediately, and are moſtly killed by the cold of the ſucceeding winter, while the few that remain can ſcarce eſcape deſtruction from the ploughſhare.

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320 Manuring in autumn preferable to ſpring manure.

Mr Wimpey is alſo of opinion, that it is proper to ſow a large quantity of ſeed; but thinks two pounds will be ſufficient for an acre. A few ounces indeed would be ſufficient to ſtock the land; but as the article is ſo precarious, he thinks it by far the ſafeſt way to allow ſeed in plenty, and reduce the plants afterwards by harrowing. He obſerves alſo, that it is of great conſequence to have ſeed both good in quality and of the beſt ſpecies. He prefers the large and green topped, as being the moſt ſweet and juicy; others give the preference to the red or purple-topped, as being hardier: but at any rate, the ſeed from the largeſt and fineſt tranſplanted turnips, of whatever ſort, is greatly to be preferred, even though it ſhould coſt double or treble the price. Such as is ſold by the ſeedſmen in London he found generally of a mixed kind, and often in great part not worth cultivating. "Whether plants from new or old ſeed are moſt ſecure from the depredations of the fly (ſays he), is perhaps a queſtion which cannot be eaſily determined even by experiments; for concomitant circumſtances are frequently ſo much more operative and powerful, as to render the difference be-

321 Mr Wimpey's opinion of ſowing a great quantity of ſeed.

322 Of the quality of the ſeed.

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tween them, if there be any, imperceptible. It is, however, known to every practical man, that new feed ſprouts or vegetates ſeveral days before old; and I think more vigorouſly: and it is equally well known, that the healthy and vigorous plants eſcape the fly, when the ſtinted and ſickly ſeldom or never eſcape it. Hence it would ſeem, that new ſeed, *cæteris paribus*, is more ſecure from the fly than old; and for my own uſe I would always prefer it."

323 Of ſowing turnips with grain.

3. The ſowing of turnips along with grain.—This, of all others, ſeems to be the moſt eligible and efficacious. In the ſecond volume of Bath Papers, p. 210. a Hertfordſhire correſpondent gives an account of the ſucceſs of an experiment of drilling turnips with wheat. A ſmall field of ſpring-wheat was drilled in rows two feet apart; and in the month of May turnips were ſown by hand in the intervals. They came up very well, and were thinned once by the hoe. The crop of wheat turned out better than another field of the ſame ſoil ſown broad-caſt in autumn, though it ripened ſomewhat later. The turnips were no other way injured by cutting it, than having ſome of the large leaves trodden down by the reapers. After harveſt the weeds were cut up round the turnips with a hand-hoe, and they grew very large and vigorous. They were of the purple and white long kind, and the crop proved nearly as good as the ſame land produced in common. An excellent crop of barley and clover was got from the ſame field afterwards.

324 With wheat.

325 Mr Anderdon's experiments of ſowing them with beans.

In the third volume of the ſame work we find an account of ſeveral ſucceſsful experiments in ſowing turnips between rows of beans. The advantages of this method are ſtrongly ſet forth by R. P. Anderdon, Eſq; who made ſome of the experiments, and are as follow: "1. You may have a crop of beans and turnips on the ſame field the ſame year. 2. The bean crop being well horſe-hoed, no ploughing is wanted for turnips, for which the beſt Norfolk farmers give five ploughings. 3. It is hoed cheaper, more effectually, and conſequently more profitably, than in any other way. 4. The ground is kept clean from weeds. 5. It is in order for a Lent crop the ſucceeding year with one earth. 6. The ground is kept in heart, if not improved, by fallowing your alleys. 7. It brings the plant to perfection in poor ground, where it would not become ſo otherwiſe. 8. It doubles the crop in any ground which Mr Anderdon has had experience of. 9. You have the crops more within your own power in this than in any other method, let the ſeaſons turn out as they will. 10. You may have on the ſame ground a bean and turnip crop annually, if the land be ſuitable, and you think proper. 11. The clay farmer, by this mode, renders land which is naturally unfit for turnips, ſo free and open by ſeaſonable horſe-hoeings, that it will bring this uſeful plant to great perfection.

326 Objections by the Bath Society.

On this paper the ſociety made ſome remarks, and ſtated the following objections: 1. That the ſame ſoil cannot be proper for both crops. Scotch cabbages are more adapted for a bean ſoil; and they wiſhed him to repeat the experiment with cabbages inſtead of turnips betwixt his beans. 2. The Norfolk farmers rarely uſe more than three ploughings for turnips, inſtead of five, as Mr Anderdon repreſents, unleſs the ground be full of couch-graſs. 3. They think him too ſanguine in his expectations of having double crops on the ſame field. 4. Nothing renders a clay ſoil ſo free and open as to have it expoſed to froſts and ſnow by being laid up in high ridges in January and February; but, on Mr Anderdon's plan, this cannot be done, unleſs the turnips are leſſened in value by being fed off in autumn.

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327 Mr Anderdon's reply.

Theſe ſtrictures were ſent to Mr Anderdon before the papers were printed, but did not make any alteration in his opinion; and he replied to the following purpoſe.

1. *The ſame ſoil cannot be proper for beans and turnips*, &c.—Granted.—But had Mr Anderdon adhered rigorouſly to this rule, he would have ſowed no turnips at all, not having on his farm any ſoil altogether proper for that crop; "but (ſays he) while I can get in ſingle rows, four feet aſunder or more, from half a dozen to half a ſcore tons of turnips per acre, after, or rather between, a crop of beans in my heavy lands, I ſhall feel that product here more beneficial than to drop the mode. I believe the medium of the two, ſo far as I can judge by the eye or get information, to be ſuperior to the average produce of prepared fallow turnip crops in 10 miles round me."—On this the Society make the following remarks: "The queſtion here is, Whether, it inſtead of turnips, Mr Anderdon had planted his beans two feet diſtance only, the extra produce of his crop would not have exceeded in value that of his turnips? We think they would, as theſe intervals would freely admit his horſe-hoe between the beans."

Mr Anderdon then proceeds to acquaint the committee, that he had tried the experiment as they wiſhed with Scotch cabbages inſtead of turnips betwixt the rows of beans; but the crop of the turnips was ſo much preferable, that he found himſelf inclined to ſuppoſe the cabbage would not get to ſo great perfection there as to be profitably introduced on a large ſcale, for want of the great quantity of dung neceſſary for that crop, and which could not be procured in that part of the country. He further remarks in favour of turnips, that they have an abundance of very ſmall lateral fibrous roots, which run as far in ſearch of food, and feed as ravenouſly where they can penetrate, as thoſe of almoſt any other vegetable; and the plant certainly derives more nouriſhment from thoſe than from its tap-root (H). Thoſe fine fibrous roots, almoſt imperceptible to the eye, iſſue chiefly from the apple or body of the turnip, and get into the richeſt part of the ſoil near the ſurface, and will bring the plants to a conſiderable magnitude in heavy lands adapted to beans, when mellowed by the horſe-hoe. Some of his turnips weighed ten pounds each: and if he could have only two ſuch turnips on every ſquare yard, it would be at the rate of 43 tons per acre.

2. *The Committee doubt of the poſſibility of doubling the crop.* Mr Anderdon gives the following explanation.

"I

(H) Here the ſociety remark, that this is not the caſe with thoſe kinds of turnips which grow chiefly above ground, and which are generally the beſt crops, and moſt capable of reſiſting the froſts.

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" I have made many comparative trials on turnips between this mode and broad-caſt ſowing, and always found on *my ground* the horſe-hoed crops the beſt. But here, in denoting the benefits of the horſe-hoe by its *doubling* a crop, I wiſh to be underſtood, that if, *in ſoils like mine*, a crop be drilled, leaving proper intervals for horſe-hoeing, and one part be horſe-hoed the other not, the horſe-hoed part will double the other in product."

Mr Anderdon, in the courſe of his reply to the commitee, gives an account of another experiment he made in conſequence of being deficient in winter fodder for his cattle. By this neceſſity he was induced to ſow turnips wherever he could; and on the 18th of July drilled a ſingle row between his drilled wheat. On the 20th and 22d of Auguſt he drilled four rows of winter vetches in each interval between the turnips, at the rate of leſs than one peck and three quarters of ſeed to an acre. " The turnip crop (ſays he) is very acceptable, and my vetches ſucceed beyond my warmeſt expectation; are thick enough, and give me the pleaſing proſpect and hope, that I ſhall not, when my dry meat is gone, want a ſeaſonable ſuppy of early green fodder that will laſt me till my lucerne comes on."

328 Mr Pavier's opinion.

This ſubject is farther conſidered in the ſame volume by Mr Pavier, who viewed Mr Anderdon's turnips, and gave in a report of them to the commitee. He ſuppoſes a crop of beans drilled in ſingle rows at four feet diſtance, and the turnips drilled in the intervals, according to Mr Anderdon's method, there will then be four rows of 17 feet in length to make a ſquare perch; whereas Mr Anderdon's rows were only 15 feet 8 inches in length; and this diſparity in length will make a difference of weight on a perch from 230 to 249 pounds, and on an acre from 16 tons 8 cwt. 2 qrs. 8 lb. Mr Anderdon's produce, to 17 tons 15 cwt. 2 qrs. 24 lb.—Each turnip at this diſtance (viz. four feet from row to row, and nine inches in the rows) muſt occupy a ſpace of three ſquare feet; conſequently the greateſt number produced on an acre muſt be 14,520; but if ſown in broad-caſt, twice hoed, and the diſtance on an average 15 inches, each turnip will then occupy little more than one foot and an half, and the number produced on an acre may be about 27,920; an exceſs which may reaſonably be ſuppoſed to overbalance the value of the beans, let us ſuppoſe the crop as great as we can reaſonably do. Thus far the argument ſeems to lie againſt this method of cultivating beans and turnips together: but on the other hand, Mr Pavier conſiders it probable that the expence of drilling and horſe-hoeing the beans, together with drilling the turnips in the manner Mr Anderdon did, muſt be conſiderably leſs than that of fallowing and preparing the ground, and ſowing the turnips in broad-caſt; to which we muſt likewiſe add the facility of hoeing the drills in compariſon of the broad-caſt. But beſides theſe, the great advantage ariſing from this method, and which, if certain, gives it a decided ſuperiority, is, " the great chance, if not an almoſt certainty, of preſerving the turnips from the depredations of the fly." Mr Pavier was inclined to think that this muſt be the caſe, as Mr Anderdon had ſuch crops repeatedly without any damage of that kind; but the committee differ from him, and think that this muſt have proceeded from ſome other cauſe; though they do not aſſign any reaſon for this opinion. " The principal point (ſays Mr Pavier), in determining this queſtion, ſeems to me to be this; if the crop of beans drilled as above after deducting the ſeed, and ſome additional expence in taking the crop off the ground without injuring the turnips, can be, one year with another, ſuppoſed to be as valuable as the quantity of turnips that might be reaſonably expected in the broad-caſt method more than in the other, I ſhall not heſitate to declare in favour of drilling between the beans."

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Thus far the argument ſeems to be carried on *a priori*. Mr Wimpey, in the letter already quoted, inclines to the practice of ſowing turnips between beans planted in rows. " It exactly correſponds (ſays he) with all my obſervations on the ſucceſsful vegetation of that root. A conſiderable degree of moiſture is neceſſary to the rapid vegetation of that very juicy root, and nothing retains moiſture equal to ſhade: and ſhade can be obtained and ſecured by no means ſo effectually on a large ſcale as in the intervals of tall growing plants, as beans or wheat planted in drills." The ſucceſs of Mr Bult of Kingſton near Taunton, leaves little room to doubt of the propriety of the method, and its ſucceſs in preventing the fly. The beans were planted in drills not quite two feet aſunder, on two ploughings, horſe-hoed three times, and the turnips ſown in the intervals at the laſt-hoeing. The field meaſured ſix acres and a quarter, and was a very good clayey ſoil, but had not been manured, nor had any dreſſing laid upon it for ſix years before. It produced this year three quarters of beans per acre, and 37 tons 5 cwt. of turnips. This field was alſo viewed by Mr Pavier, who makes the following obſervations upon it. 1. The turnips were ſown promiſcuouſly among the beans at the laſt hoeing, which was given about midſummer; from which time nothing was done but drawing off the beans and carrying them off the land. 2. The crop of beans was believed to be conſiderably above 20 buſhels per acre, which is much more than was produced by any other method that ſeaſon in the neighbouring part of the country: and as Mr Pavier had this account before he ſaw the turnip crop, he did not expect any thing conſiderable from the latter; but as it turned out, the produce muſt be accounted highly profitable, when we conſider that there was no crop loſt, no preparation, dreſſing, nor any expence whatever, excepting the price of the ſeed and ſowing it. 3. This he conſiders as one of the ſtrongeſt recommendations of the drill huſbandry he ever knew or heard of; but he is of opinion that it never can anſwer, except where the ground is perfectly clean and free from weeds, by the crops having been horſe-hoed for a few years before. 4. He thinks the beans ought to have been planted at wider intervals, by which the ſun and air would be freely admitted, and the plants would alſo be leſs damaged by the operation of the hoe.

329 Other experiments on ſowing turnips among beans.

Mr Pavier likewiſe informs the Society of two other experiments on a ſimilar plan; but with this difference, that the turnips were ſown among the beans at the ſecond horſe-hoeing. The turnip crops were very good, and the beans more than *double* the value of thoſe raiſed in the uſual mode of huſbandry. " I think it is very evident (ſays he), that the beans preſerve the turnips from the fly; and as no expence or trouble attends

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of the practice, I apprehend it will ſoon become more general." The Society own, that the uncommon ſucceſs of Mr Bult's experiment *ſeems to militate* at leaſt againſt what they ſaid on Mr Anderdon's letter; but they inſiſt that the caſes are by no means ſimilar. "Though the land (ſay they), in both inſtances, is called a *heavy clay*, they are very different. Mr Anderdon's is poor, wet, and cold; the other a good rich clay; and we apprehend naturally mixed with a kind of marl, which is called clay by perſons not thoroughly acquainted with the nice diſtinction of ſoils apparently alike, but very different in their nature. Our principle therefore, that cold wet clay lands are unſuitable for turnips remains unaffected by this experiment; and general practice confirms the truth of the theory."

In another letter, Mr Pavier gives a more particular account of the two other crops of beans and turnips raiſed upon Mr Bult's plan. The beans were drilled in rows about 22 inches diſtance, twice horſe-hoed, and the produce from about 25 to 30 buſhels the computed acre, or from 30 to 36 buſhels the ſtatute acre. The preceding ſummer had been very unfavourable to beans, and the produce per acre in the common huſbandry did not, on an average, equal a third part of this quantity. One of theſe crops was ſuperior to that of Mr Bult: they were ſown upon a field of nine computed acres on the 10th of June, after the ſecond horſe-hoeing; but whether the ſecond hoeing was performed too ſoon, the ground not clear, or, whatever might be the cauſe, the beans were weeded twice by hand afterwards; and he is of opinion, that the turnips were ſomewhat benefited by it. Mr Pavier was aſſured by a very intelligent farmer, that this was the beſt crop of turnips he had ever ſeen. The turnip ſeed in the other crop was put in between the rows of beans by a hand drill; but the work was badly performed, the plants coming up in ſome places vaſtly too thick, and in others as much too thin; but wherever they happened to be of a proper thickneſs, the farmer told him it was one of the moſt profitable crops he ever had. The ſoil was wet, heavy, and not very favourable for turnips. Hence Mr Pavier deduces the following concluſion: 1. That with reſpect to beans in particular, the drilling and hoeing is vaſtly ſuperior to the common mode of huſbandry. 2. That the beans are undoubtedly a good preſervative of the turnips from the depredations of the fly. 3. That as by this method no crop is loſt, and conſequently no rent, but a mere trifle of expence (if any) chargeable to the turnip crop, it muſt be one of the moſt profitable as well as the moſt certain methods of propagating that uſeful root ever yet practiſed.—He ſtill inſiſts, however, that if he had an opportunity of trying this method, he would drill the beans in rows at a greater diſtance, that the turnips might be hand-hoed eaſily; and that he ſhould prefer the London tick-beans to any other, by reaſon of their ſhortneſs and being ſuch bearers; that he ſhould alſo take off their tops as ſoon as the under bloſſoms began to decay; which, he ſuppoſes, would be of great ſervice.

330 Inſtrument for tranſplanting turnips.

In this diſſertation on the culture of turnips, we cannot avoid taking notice of an inſtrument uſed in Norfolk for tranſplanting them, and thus filling up the gaps which frequently happen in fields from the failure of the plants in particular ſpots. It is repreſented on the margin; and the conſtruction and mode of uſing are obvious from the figure.—When the turnips are to be tranſplanted, the workman holds the long handle with the left hand, and the ſhort one with the right hand drawn up. Put the inſtrument then over the plant that is to be taken up, and with your foot force it into the ground; then give it a twiſt round, and by drawing it gently up, the earth will adhere to the roots of the plant in a ſolid body; then with another inſtrument of the ſame ſize take the earth out where the plant is to be put, and bringing the inſtrument with the plant in it, put it into the hole which has been made by the other; then keep your right hand ſteady, and draw up your left, and the earth and plant will be left in the hole with the roots undiſturbed. In this operation two men will be employed, each of them having an inſtrument of the form repreſented on the margin. One man takes up a plant, while the other fills his inſtrument with earth only, thereby making room for the depoſition of the plant; ſo that the hole which is made by taking up the plant is filled with the earth taken out where the plant is to be put; which being depoſited, he takes up a plant, and returns to the place he firſt ſet out from, the former man at the ſame time returning with the earth only; ſo that each man is alternately the planter, and each being employed both ways, the work goes on briſkly.—This inſtrument was the invention of Mr Cubitt Gray of Southrepps, Norfolk.

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Bath Papers, vol. iv. p. 126.

Turnips being the grand baſis of the Norfolk huſbandry, Mr Marſhall gives a very particular account of their culture in that county.—The ſpecies cultivated are, 1. The common *white ſtock*, called in many places the Norfolk turnip. 2. The *purple ſtock* is ſimilar to the former, but its rind is of a dark red or purple colour; its ſize in general ſmaller, and its texture cloſer and firmer than that of the common white-ſtock; it alſo ſtands the winter better, and is more ſucculent in the ſpring, but it is not ſo well reliſhed by cattle as the former; whence it is leſs generally cultivated. 3. The *pudding-ſtock*, the *tankard-turnip* of the midland counties, is in ſhape ſo perfectly different from the common ſort, that it might be ranked as a diſtinct ſpecies. It riſes in a cylindrical form, eight, ten, or twelve inches high, ſtanding in a manner wholly above ground; generally taking a rough irreguiar outline, and a ſomewhat reclining poſture. It very much reſembles the common turnip, and is by much its moſt formidable rival. In many reſpects it ſeems to be ſuperior, particularly in being readily drawn, and eaten off by ſheep with much leſs waſte than the common turnip.—The diſadvantage is, that they are liable to the attacks of froſt, by reaſon of their ſtanding ſo high above the ſurface of the ground; ſo that on the whole, Mr Marſhall concludes, that the common white turnip is to be preferred to every other.

331 Norfolk cultivation of turnips.

In Norfolk, turnips are ſown upon every ſpecies of arable land. Marl is found to be highly beneficial; and by means of this manure, a ſoil naturally unfit for turnips may be rendered proper for it. They ſucceed barley better than any other crop; ſome few are ſown on wheat or pea ſtubble after harveſt; but this is not a general practice. The manures in greateſt reputation for turnips are dung, with a greater or ſmaller

332 Advantage of uſing marl.

admixture

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admixture of mould; *malt-coombs* are alſo in good repute, and oil-cake is uſed by a few individuals; "but it may be ſaid that nine acres of ten of the turnips grown in eaſt Norfolk are manured with muck."—The quantity of dung ſet on for a crop of turnips generally depends on the quantity on hand, and the quantity of turnip ground to be manured. From 10 to 15 cart loads of muck are conſidered as a good dreſſing; and about a ton of oil cake to three acres; 50 or 60 buſhels of malt-coombs, and 40 or 50 buſhels of ſoot, to an acre.

333 Manures of different kinds.

334 Cultivation of turnips for early conſumption.

When the turnips are intended for early conſumption, the ſooner they can be got into the ground the better; but when they are intended to ſtand the winter, the beginning of July is thought ſoon enough. The moſt general rule is to begin ſowing about a week before midſummer, and continue till about a fortnight after, viz. from the 17th or 18th of June to the 7th or 8th of July.—Broad-caſt ſowing is univerſal, in the quantity of two pints to an acre. The ſeed is covered by two lines of a pair of light harrows drawn backward, in order to prevent the tines, which uſually point ſomething forward, from tearing up the clods, and burying the ſeed too deep. The horſes are univerſally *walked* one way, and *trotted* back again in the ſame place. This is an excellent cuſtom; the quick zig-zag motion of the harrows at once aſſiſting to level the ſurface, and to diſtribute the ſeeds more evenly.—They are univerſally hoed; and unleſs they be ſown very late, are generally hoed twice. The diſtance of time between the ſowing and the firſt hoeing depends upon the ſoil and ſeaſon; the ſize of the plants being the only guide. When turnips are ſuffered to grow too large before they are hoed, the plants are difficult to be ſet out ſingly, and are liable to be drawn up by weeds, thereby acquiring a ſlender upright tendency; whereas their natural growth, in their infant ſtate, is procumbent, ſpreading their firſt leaves on the ground, and taking the form of a roſe.—If the hoe be put in too ſoon, the plants which are ſet out are liable to be buried, and their tender roots diſturbed in the act of ſetting out the neighbouring plants. The time for hoeing, as directed by the moſt judicious huſbandmen, is when the plants, as they lie ſpread upon the ground, are about the ſize of the palm of the hand: if, however, ſeed-weeds be numerous and luxuriant, they ought to be checked before the turnips arrive at that ſize, leſt by being drawn up tall and ſlender they ſhould acquire a weak and ſickly habit. The proper diſtance depends upon the nature of the ſoil and the time of ſowing; ſuch as are ſown early, in a rich productive ſoil, require to be ſet out wider than thoſe ſown late on a ſoil of a contrary nature. If the ſoil be at par, the diſtance ought to be regulated by the time of ſowing: if this be at par, the nature or ſtate of the ſoil ſhould be the regulator.—Mr Marſhall complains of the conduct of the Norfolk farmers in general in this reſpect, who "hack out their turnips 14, 15, or perhaps 18 inches aſunder, without any regard to the ſtate of the ſoil, or time of ſowing. This practice was eſtabliſhed while the Norfolk ſoil was full of marl, and new to turnips; and when, it is probable, 11 or 12 inches in diameter was no uncommon ſize, with tops proportionally large and ſpreading; and 14 or 15 inches might then be a proper diſtance. But now, when the efficacy of marl is leſſened, and the ſoil no longer the favourite of turnips, which ſeldom reach more than ſeven or eight inches in diameter, it is ruinous and abſurd to continue the practice."

335 Method of ſowing, and culture.

Turnips are cultivated either for ſeed, for ſale, or for conſumption. When cultivated for ſeed, it is ſuppoſed in moſt parts of the kingdom that it ought always to be taken from tranſplanted roots; but in Norfolk they are frequently raiſed from ſuch as are untranſplanted. "It is a fact (ſays Mr Marſhall) well underſtood by every huſbandman here, that if the ſeed be gathered repeatedly from untranſplanted roots, the plants from this ſeed will become coarſe-necked and foul-rooted; and the fleſh of the root itſelf will become rigid and unpalatable. On the contrary, if it be gathered year after year from tranſplanted roots, the necks will become too fine, and the fibres too few; the entire plant acquiring a weak delicate habit, and the produce, though ſweet, will be ſmall. For the neck, or onſet of the leaves, being reduced to the ſize of the finger (for inſtance), the number and ſize of the leaves will be reduced in proportion; and in a ſimilar proportion will the number and ſize of the fibrils be reduced. From a parity of reaſoning, it may perhaps be inferred, that when the neck acquires a thickneſs equal to that of the wriſt, the ſize of the root will be in proportion.

336 Cultivation of turnips for ſeed.

"With reſpect to the fibres or rootlings, this is a juſt inference; but with reſpect to the bulb, it is in a great meaſure erroneous. For a few generations the ſize of the bulb will keep pace with the increaſe of leaves and fibres; but after having once reached the limits which nature has ſet to its magnitude, it begins to revert to its original ſtate of wildneſs, from which to its preſent ſtate it has undoubtedly been raiſed by tranſplantation. The farmer has therefore two extremes to avoid. The one is diſcoverable by the thickneſs and coarſeneſs of the neck, the ſcaly roughneſs of the bulb, the thickneſs of the rind in general, the foulneſs of its bottom, and the forkedneſs of its main or tap-root: the other by the ſlenderneſs of the neck, the fineneſs of the leaf, and the delicacy of the root. The former are unpalatable to cattle, and are therefore creative of waſte: The latter are unproductive, are difficult to be drawn, and do not throw out ſuch ample tops in the ſpring, as do thoſe which are, by conſtitution or habit, in a middle ſtate between theſe two extremes. There is not, however, any general rule reſpecting how many years turnips ought to be tranſplanted ſucceſſively, and how often they ought to be ſuffered to run up from the ſeed-bed: the ſoil and ſituation have, and other circumſtances may have, influence on the habit and conſtitution of vegetables as of animals; and the farmer muſt attend alone to the ſtate of the turnips themſelves. Whenever he judges, that, by repeated tranſplantation, they have paſſed the acme of perfection, then it is his duty and intereſt to let them run up to ſeed without tranſplantation. In Norfolk it has been found, by long experience, that tranſplanting two, three, or four years, and letting the plants run up the third, fourth, or fifth, will keep the ſtock in the deſired ſtate. The time of tranſplanting is from Old Chriſtmas to Old Candlemas. In the choice of plants, the farmer is not guided by ſize, but picks the cleaneſt plants without regard to ſize; or, more

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more accurately ſpeaking, he makes choice of ſuch as are near, but not at or above the ſtate of perfection. In almoſt every turnip-field there are plants in various ſtates: much judgement, therefore, is requiſite in the choice of plants. A piece of good ground near a habitation is generally choſen for this purpoſe; but the method of planting is various: the plants are generally ſet in rows, at uncertain diſtances from one another." Theſe diſtances our author has obſerved to be 16 or 18 inches, and the diſtance of the plants in them nine or ten inches; but the practice of a man who, he tells us, is indiſputably near the head of his profeſſion, is to plant them in rows two feet aſunder, the plants in the rows being contiguous. The only culture required, is to keep the intervals clean hoed; but when the ſeed begins to ripen, much care is requiſite to keep it from birds. If the plot be large, it is neceſſary to employ a boy to ſcare them; but if it be ſmall, and near the houſe, Mr Marſhall has known the following expedient uſed with ſucceſs. "On a ſlender poſt, riſing in the midſt of the patch of ſeed, was fixed a bell; from which a line paſſed into the kitchen: in the moſt frequented part of this hung the pull. Whoever paſſed the pull rung the bell; ſo that in a farm-houſe kitchen, where a miſtreſs and two or three maids were ſome of them almoſt always on the foot, an inceſſant peal was kept up; and the birds, having no reſpite from alarm, forſook their prey."

337 Method of planting.

338 Method of ſcaring away birds.

339 Of drawing the turnips.

The time of drawing commences about Michaelmas, and continues until the plants be in blow. The proceſs of drawing, he ſays, "is ſevere weather is an employment which nothing but cuſtom could reconcile to thoſe whoſe lot it is to go through it, namely, ſtout lads and youths; whoſe hands are frequently ſwelled until the joints are diſcernible only by the dimples they form;" nevertheleſs he never heard of any inſtance of bad effects from this circumſtance. When the tops will bear it, their method of pulling is very expeditious: they pull with both hands at once; and having filled each hand, they bring the two together with a ſmart blow to diſengage the ſoil from the roots, and with the ſame motion throw them into the cart. If the tops be cut off by the froſt, or if this be in the ground, the turnips are raiſed with two-tined forks named *crooms*. If the roots are buried under deep ſnow, it is removed by means of an implement called the *ſnow-ſledge*. This conſiſts of three deal-boards from one to two inches thick, 10 or 12 inches deep, and from ſeven to nine feet long, ſet upon their edges in the form of an equilateral triangle, and ſtrongly united with nails or ſtraps of iron at the angles; at one of which is faſtened, by means of a double ſtrap, a hook or an eye, to faſten the horſes to. This being drawn over a piece of turnips covered with ſnow, forces up the latter into a ridge on each ſide, while between the ridges a ſtripe of turnips is left bare, without having received any material injury from the operation. Though it is cuſtomary, in drawing, to clear the ground entirely, our author met with one inſtance in which the ſmall ones were left by a very good huſbandman on the ground, both to increaſe in ſize, and to throw out tops in the ſpring; it being obſervable, that a ſmall turnip ſends up a top nearly equal to one whoſe bulb is larger. There is one inconvenience, however, ariſing from this practice: the plough is prevented from entering upon the ſoil until late in the ſpring; which upon ſome ſoils is an unſurmountable objection; though it may be very proper upon land which will bring good barley with one ploughing after turnips.

340 Snow-ſledge deſcribed.

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341 Method o preſerving turnips.

Mr Marſhall relates the following ſimple method, by which a Norfolk farmer preſerved turnips through a conſiderable part of the winter ſeaſon. Having cut off their tops with a ſpade, he gave them to his cows, and carried the bulbs to a new-made ditch, into which he threw them, and then covered them up with ſtraw, laying over it a quantity of bramble kids. Here they lay until wanted in a froſt. They were then again carted by means of a fork, and given to the cattle, who ate them as well, or rather better than freſh drawn turnips; and in general they came out as freſh as they went in. Our author is of opinion, that this method might be extended to the preſervation of turnips till the ſpring.

3. Carrot.

342 Culture of carrot.

Of all roots, a carrot requires the deepeſt ſoil. It ought at leaſt to be a foot deep, all equally good from top to bottom. If ſuch a ſoil be not in the farm, it may be made artificially by trench-ploughing, which brings to the ſurface what never had any communication with the ſun or air. When this new ſoil is ſufficiently improved by a crop or two with dung, it is fit for bearing carrots. Beware of dunging the year when the carrots are ſown; for with freſh dung they ſeldom eſcape rotten ſcabs.

The only ſoils proper for that root are a loam and a ſandy ſoil.

The ground muſt be prepared by the deepeſt furrow that can be taken, the ſooner after harveſt the better; immediately upon the back of which, a ribbing ought to ſucceed, as directed for barley. At the end of March, or beginning of April, which is the time of ſowing the ſeed, the ground muſt be ſmoothed with a brake. Sow the ſeed in drills, with intervals of a foot for hand-hoeing; which is no expenſive operation where the crop is confined to an acre or two: but if the quantity of ground be greater, the intervals ought to be three feet, in order for horſe-hoeing.

In flat ground without ridges, it may be proper to make parallel furrows with the plough, ten feet from each other, in order to carry off any redundant moiſture.

At Parlington in Yorkſhire, from the end of September to the firſt of May, 20 work horſes, four bullocks, and ſix milk cows, were fed on the carrots that grew on three acres; and theſe animals never taſted any other food but a little hay. The milk was excellent: and, over and above, 30 hogs were fattened upon what was left by the other beaſts. We have this fact from undoubted authority.

Carrots have been greatly recommended as food for cattle, and, in this reſpect, bid fair to rival the potato; though, with regard to the human ſpecies, they are far inferior. The profit attending the cultivation of them, however, appears to be much more doubtful than that of potatoes. Mr Arthur Young informs us, that from Norden's Surveyor's Dialogue, publiſhed in 1600, it appears, that carrots were commonly cultivated at that time about Orford in Suffolk, and Norwich in Norfolk; *Bath Papers*, vol. p. 1.

ulture of ious other Plants.

343 uch cul- ated in folk and rt of orfolk.

344 hy the lture has t extend- itself.

folk; and he remarks, that the tract of land between Orford, Woodbridge, and Saxmundum, has probably more carrots in it than all the reſt of the kingdom put together." In 1779, few farmers in theſe parts had leſs than five or ſix acres; many from 10 to 20; and one had 36 acres: the ſtraight, handſome, and clean roots were ſent at 6d. per buſhel to London; the reſt being uſed at home, principally as food for horſes. In other counties, he obſerves, the culture of carrots has not extended itſelf; that ſome have begun to cultivate them in place of turnips, but have ſoon deſiſted; ſo that the culture ſeems in a manner ſtill confined to the angle of Suffolk, where it firſt began. In attempting to inveſtigate the cauſe of this general neglect, he obſerves, that "the charge of cultivation is not ſo great as is commonly imagined, when managed with an eye to an extenſive culture, and not a confined one for one or two particular objects." Two acres which our author had in carrots coſt 3l. 17s. 6d. per acre, including every expence; but had not the ſummer been dry, he obſerves, that his expences might have been higher; and when he tried the experiment 15 years before, his expences, through inadvertence, ran much higher. His difficulty this year aroſe chiefly from the *polygonum aviculare*, the predominant weed, which is ſo tough that ſcarcely any hoe can cut it. Some acres of turnips which he cultivated along with the carrots were all eaten by the fly; but had they ſucceeded, the expence of the crop would have been 18s. 5d. leſs per acre than the carrots. "But (adds our author) if we call the ſuperiority of expence 20s. an acre, I believe we ſhall be very near the truth: and it muſt at once be apparent that the expence of 20s. per acre cannot be the cauſe of the culture ſpreading ſo little; for, to anſwer this expence, there are favourable circumſtances, which

345 periority carrots turnips.

muſt not be forgotten. 1. They (the carrots) are much more impenetrable to froſt, which frequently deſtroys turnips. 2. They are not ſubject to the diſtempers and accidents which frequently affect turnips; and they are ſown at a ſeaſon when they cannot be affected by drought, which frequently alſo deſtroys turnips. 3. They laſt to April, when ſtock, and eſpecially ſheep farmers are ſo diſtreſſed, that they know not what reſource to provide. 4. The culture requiſite for turnips on a ſandy ſoil, in order to deſtroy the weeds, deſtroys alſo its tenacity, ſo that the crop cannot thrive; but with carrots the caſe is otherwiſe. Hence it appears, that the reaſon why the cultivation of carrots is ſtill ſo limited, does not ariſe from the expence, but becauſe the

346 fficulty aſcer- ning the lue.

value is not aſcertained. In places where theſe roots can be ſent to London, or ſold at a good price, the tops being uſed as food for cattle, there is not the leaſt doubt that they are profitable; and therefore in ſuch places they are generally cultivated: but from the experiments as yet laid before the public, a ſatisfactory deciſive knowledge of the value is not to be gained. The moſt conſiderable practice, and the only one of common farmers upon a large ſcale, is that of the ſands of Woodbridge; but here they have the benefit of a London market, as already mentioned. Amongſt thoſe whoſe experiments are publiſhed, Mr Billingſley ranks foremoſt. Here again the value of carrots is rather depreciated than advanced; for he raiſed great crops, and had repeated experience upon a large ſcale of their excellence in fattening oxen and ſheep; feeding cows, horſes, and hogs; and keeping ewes and lambs in a very ſuperior manner, late in the ſpring, after turnips were gone: but notwithſtanding theſe great advantages, he gave the culture up; from which we may conclude a deficiency in value. "In ſeveral experiments (though not altogether determinate), I found the value, upon an average of all applications, to be 13d. a buſhel, heaped meaſure; eſtimating which at 70lb. weight, the ton is 1l. 14s." The following are the valuations of ſeveral gentlemen of the value of carrot in the way of fattening cattle:

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	per ton.
Mr Meiſh of Elyth, a general valuation of horſes, cows, and hogs, -	L.1 0 0
Mr Stovin of Doncaſter, hogs bought lean, fatted, and ſold off,	4 0 0
Mr Moody of Ratford, oxen fatted, and the account accurate, - - -	1 0 0
Mr Taylor of Biſrons, ſaving of hay and corn in feeding horſes, - -	1 0 0
Mr Le Grand of Ath, fattening wethers,	0 13 9
Sir John Hobby Miſl of Biſhan, fattening hogs, - - - - -	1 6 0
Mr Billingſley, for fattening hogs, -	1 13 6

Some other gentlemen whom our author conſulted, could not make their carrots worth any thing: ſo that, on the whole, it appears a matter of the utmoſt doubt, ſo contradictory are the accounts, whether the culture of carrots be really attended with any profit or not. Thus Sir John Miſl, by fattening hogs, makes 1l. 6s. and Mr Stovin 4l.; but others could not fatten hogs upon them at all: and ſome of Mr Young's neighbours told him, that carrots were good for nothing except to *ſcour* hogs to death. The experiment of Mr Le Grand upon wethers appeared to be made with the greateſt accuracy; yet two circumſtances ſeem to militate againſt it. 1. The ſheep were put lean to them; whereas it is a fact well known, that if they are not half fat when put to turnips, no profit will reſult; and it is poſſible that the caſe may be the ſame with carrots. 2. He gave them alſo as much fine hay as they would eat.

347 New expe- riments re- commend- ed.

In this uncertain ſtate of the matter, the only thing that can be done is to make a number of experiments with as much accuracy as poſſible, in order to aſcertain the real value per ton: and our author endeavours to ſhow, that there is no danger of loſing much by experiments of this kind. "I have ſhown (ſays he), that they are to be cultivated for 4l. per acre, left on the ground for ſheep. Suppoſe the crop only two buſhels at 70lb. each per rood, 320 per acre, or ten tons; it will readily be agreed, that ſuch a produce is very low to calculate upon, ſince 20 tons are common among carrot-cultivators. It appears from Mr Le Grand's experiments, that a wether worth 2l. 5s. eats 16lb. of carrots, and four pounds of hay per day: dropping the hay, and calculating for ſheep of leſs than half that ſize (which are much more common), it will be perhaps an ample allowance to aſſign them 12lb. of carrots a day. If they are, as they ought to be, half fat when put up, they will be completely fattened in 100 days. At this rate, 20 wethers will, in 100 days, eat 11 tons, or very little more than one moderate acre. Now, let it be remembered, that it is a good acre of turnips which will fatten eight ſuch wethers, the common No folk calculation:

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calculation: from which it appears, that one acre of carrots is, for this purpoſe, of more value than two of turnips. Further, let us ſuppoſe horſes fed with them inſtead of oats: to top, cart and pack up, 10 tons of carrots, I know may be done for 20s.—An acre therefore (other expences included) coſts 5l. Fifty pounds weight of carrots are an ample allowance for a horſe a day: ten tons, at that rate, laſt three horſes for five months. But this 5l. laid out in oats at 16s. per quarter, will purchaſe little more than ſix quarters; which will laſt three horſes, at two buſhels each per week, no more than two months; a moſt enormous inferiority to the carrots."

348 Experiment on feeding lambs with them.

In the ſame volume, p. 187. Mr Young gives an account of another experiment made by himſelf on the feeding of lambs with carrots. The quantities they eat varied exceſſively at different times; thirty-ſix of them conſumed from five to ten buſhels per day; but on an average, he rates them at four buſhels of 56 pounds per day. In all, they conſumed 407 buſhels from November to April, when they were ſold and killed fat. At putting upon the carrots, the lambs were valued only at 18l. but were ſold in April at 25l. 4s.; ſo that the value of the carrots was exactly 7l. 4s. or about 4d. per buſhel. This price he ſuppoſes to be ſufficient to induce any one to attempt the culture of carrots, as thus he would have a clear profit of 40s. per acre; "which (ſays he) is greater than can attend the beſt wheat crops in this kingdom." The land on which the carrots grew was ſown next year with barley, and produced the cleaneſt in the pariſh; which contradicts an aſſertion our author had heard, that carrots make land foul. The graſs upon which the ſheep were fed with the carrots, and which amounted to about an acre, was very little improved for the crop of hay in 1781, owing to the dryneſs of the ſeaſon but in 1782 was greatly ſuperior to the reſt of the field, and more improved in quantity: "for, inſtead of an indifferent vegetation, ſcattered thick with the centaurea ſcabioſa, ſilago, rhinanthus, criſta galli, and linum catharticum, with other plants of little value, it encouraged a very beautiful ſheet of the beſt plants that can appear in a meadow, viz. the lathyrus pratenſis, achillea millefolium, trifolium repens, trifolium ochroleucrum, trifolium alpeſtie, and the plantago lanceolata.

349 Carrots compared with cabbages.

In the ſame volume of the Bath papers, p. 227, Mr Billingſley gives an account of the comparative profit of carrots and cabbages. Of the former, however, he obtained only ſeven tons, 15 cwt. per acre; the cabbages produced 36 tons: nevertheleſs, according to him, the profit of the former was 5l. 8s.; of the latter, only 3l. 11s. In a paper on the culture of carrots by Mr Kirby of Ipſwich, vol. iii. p. 84. he informs us that he never determined the weight of an acre, but reckons the produce from 200 to 500 buſhels; which, at 56lb. to the buſhel, is from five to ten tons and an half.

350 Culture of carrots preferred to potatoes.

In the ſame volume, p. 320, the Rev. Mr Onley ſeems to prefer the culture of carrots to potatoes. "However valuable (ſays he), from eaſe of culture, and greatneſs of produce to the poor, eſpecially in all ſmall ſpots, I doubt, unleſs near great towns, whether, on a farming plan, potatoes be ſo eligible as other herbage or roots, eſpecially as carrots, which I cannot but *furmiſe* (for my trial are too trivial to venture bolder language), deſerve every encouragement, even on ſoils hitherto thought too heavy for them.—I am from experience convinced, that an acre of carrots will double in the quantum, of equally hearty provender, the product of an acre of oats; and from the nature of their vegetation, the nice mode of cultivation, and even of taking them up (all of which, expenſive as they are, bear a very inferior proportion to the value of a medium crop), muſt leave the land, eſpecially if taken off it in an early period, ſo mellow for the plough, as to form a ſeed-bed for barley equally to any fallow-tilth."

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Mr Onley's deſideratum was a ſubſtitute for oats to feed horſes; of which great numbers are kept in his county (Eſſex). Potatoes, he obſerves, are excellent for *ſmall* pork, when baked or boiled, mixed with a little barley meal; but for large hogs, they are moſt profitably given raw, if theſe have at the ſame time the ſhack of the barn door in threſhing ſeaſon, &c. In the 5th volume he reſumes the ſubject, and acquaints us, that he applied a ſingle acre in his bean field to the culture of carrots, which generally produced 400 buſhels; and this he conſiders as a ſmall produce. "I am, however, ſenſible (ſays he) that they will amply repay every expence of the fineſt culture; and ſhould, from their extenſive utility on ſound, deep, and friable land, be everywhere attempted. Some of my neighbours, who have been induced to try them on rather a larger ſcale, with finer culture, and freſher ſoil, have raiſed from 600 to 900 buſhels per acre, and applied them more profitably, as well as more generally, than any other winter herbage, to deer, ſheep, bullocks, cows, and horſes. At the loweſt calculation, from our little trials, they are computed to exceed turnips in value one-third, as to quantity of food; but are far ſuperior in what ariſes from convenience for the ſtable; where to us they ſeem to be a ſubſtitute for corn to all horſes, at leaſt ſuch as are not uſed in any quick work; and partially ſo with corn for thoſe that are."

351 Superior to turnips and oats.

In making a compariſon betwixt the profit on oats and carrots, Mr Onley found the latter exceed by no leſs than 2l. 15s. 8d. per acre. His method of cultivation is to ſow them in March or April; to hoe them three times, harrowing after each hoeing. Sometimes he left them in the ground till after Chriſtmas, taking them up as wanted; but afterwards he took them up in October, in dry days, putting them directly into ſmall upright cocks of 10 buſhels each, covered entirely, with the tops cut off.—Thus, they appear to dry better than in any other way, and bear the weather with very little loſs. If, after being thus dried, they are carried into any barn or ſhed, it will be better, if they are in large quantities, not to pack them cloſe, on account of the danger of heating, but rather to throw them promiſcuouſly into heaps, with a little ſtraw over them. When perfectly dry, they do not in general require any waſhing, except for horſes regularly kept in the ſtable.

This root has been found ſo generally valuable as a ſubſtitute for grain in feeding horſes, that its uſe in that way is rapidly ſpreading into various parts of the country. By the quantity of ſaccharine matter which it contains, it is probably rendered extremely rich and ſtimulating to the ſtomach of that delicate animal, ſo that a leſs quantity of it goes to waſte than of any other food. We may remark that the gentleman already mentioned, Mr Onley, who had the merit of

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preſſing upon the public attention the importance and utility of this root, mentions an uſe to which we believe it is not unfrequently applied in the dairy. "In our dairies (ſays he) as many carrots are bruiſed before churning, as produce, ſqueezed through a cloth into as much cream as makes eight or ten pounds of butter, a half pint of juice; this adds ſomewhat to the colour, richneſs, and flavour of winter butter; and we think, where hay is allowed beſides, contributes much to counteracting the flavour from the ſeed of turnips. At preſent (our carrot ſeed being exhauſted) from turnips and hay, with this juice, our butter is equal to that of the Epping dairies."

Annals of Agriculture, vol. xii.

352 Carrots uſed to colour butter.

353 Carrots advantageouſly cultivated in young plantations.

We may conclude by taking notice here of an advantageous mode of cultivating carrots by making uſe of them with a view to ſtir the ground in young plantations. It was adopted by Thomas Walford, Eſq. of Birdbrooke, Eſſex, who gives the following account of it:—"It has been my conſtant practice for theſe laſt five years, wherever I made a plantation of firs, or deciduous trees, to ſow the ground in the ſpring with carrots, which I have found not only pay part of my expences, and frequently the whole, but much more beneficial to the trees than any other method I had before adopted.

"When I make a plantation of deciduous trees, the ground is dug two ſpits deep in October, and planted immediately, leaving it in that ſtate until the middle or latter end of March, or beginning of April; then, if neceſſary, chop it over with a hoe, and ſow my carrots; if for firs, I do not dig the ground until March, at which time I plant my trees, and ſow the carrots, having found my crop more luxuriant and productive upon ground freſh dug than that which was dug in the autumn.—I give for digging 8d. per rod; hoe only twice; the produce is generally four buſhels of clean carrots, which I ſell at 6d. per buſhel, the buyer to fetch them from their place of growth.

"The ſoil in ſome places looſe and hollow; the under ſtratum clay; in others a fine vegetable mould upon a red loam.

"I find, in taking up the carrots, leſs damage is done to the young fibres of the trees, than by digging between them; for it is impoſſible, with the greateſt care of your ſervants, not to cut off ſome of them by digging, and thereby injure the trees, beſides leaving the ground in no better ſtate than it is after carrots; for when the carrot is drawn, the cavity is filled immediately with looſe mould, through which the young fibres will ſtrike with great freedom, and very much accelerate the growth of the trees."

4. Parsnips.

354 The cultivation of parſnips too much neglected.

Parſnips have never in this country received from huſbandmen that attention to which they are well entitled from the eaſe with which they are cultivated, and the great quantity of ſaccharine or nouriſhing matter they are known to contain, which certainly abounds in them, in a much greater proportion than in almoſt any other vegetable with which we are at preſent acquainted.

Smith Parſ. vol. iv. 344.

To cultivate this root (ſays Mr Hazard) ſo as to make it advantageous to the farmer, it will be right to ſow the ſeed in the autumn immediately after it is ripe; by which means the plants will appear early the following ſpring, and get ſtrong before the weeds can riſe to injure them. Neither the ſeeds nor young plants are ever materially injured by froſts; on which account, as well as many others, the autumn is preferable to the ſpring ſowing. The beſt ſoil for them is a rich deep loam, and next to this ſand. They will thrive well in a black gritty ſoil, but not in ſtone-braſh, gravel, or clay; and they are always largeſt in the deepeſt earth. If the ſoil be proper, they do not require much manure. Mr Hazard obtained a very good crop for three years upon the ſame piece of ground without uſing any; but when he laid on about 40 cart loads of ſand per acre upon a ſtiff loam, and ploughed it in, he found it anſwer very well; whence he concludes, that a mixture of ſoils may be proper for this root. The ſeed may be ſown in drills at about 18 inches diſtance from one another, that the plants may be the more conveniently hand or horſe-hoed; and they will be more luxuriant if they undergo a ſecond hoeing, and are carefully earthed, ſo as not to cover the leaves. Such as have not ground to ſpare, or cannot get it in proper condition in autumn, may at that time ſow a plot in their garden, and tranſplant from thence in the latter end of April, or early in the month of May following. The plants muſt be carefully drawn, and the ground well pulverized by harrowing and rolling; after which a furrow ſhould be opened with the plough, about ſix or eight inches deep, in which the plants ſhould be regularly laid at the diſtance of about ten inches from each other, taking care not to let the root be bent, but for the plant to ſtand perpendicular after the earth is cloſed about it, which ought to be done immediately by means of perſons who ſhould for this purpoſe follow the planter with a hoe. Another furrow muſt be opened about 18 inches from the former, in the ſame direction, and planted as before; and ſo on in like manner until all the plants are depoſited, or the field be completely cropped; and when the weeds appear, hoeing will be neceſſary, and it will afterwards be proper to earth them; but if the leaves of the plants be covered with earth, the roots will be injured. Parſnips ought not to be planted by dibbling, as the ground thus becomes ſo bound, as ſeldom to admit the ſmall lateral fibres with which theſe roots abound to fix in the earth, by which they are prevented from expanding themſelves, and never attain a proper ſize. When circumſtances are properly attended to, there is little doubt that a crop of parſnips would anſwer much better than a crop of carrots. They are equal, if not ſuperior, in fattening pigs, as they make their fleſh whiter, and the animals themſelves are more fond of theſe roots than of carrots. Horſes eat them greedily when clean waſhed and ſliced among bran, and thrive very well upon them; and black cattle are ſaid likewiſe to approve of them.

Though parſnips are little uſed in Britain, they are highly eſteemed in France. In Britanny they are thought, as food for cattle, to be little inferior to wheat; and cows fed with them are ſaid to give as much milk, and of as good quality, as in the ſummer months. In the iſland of Jerſey they have long been conſidered as of the higheſt importance; and as the mode of cultivating them there ſeems worthy of attention, we ſhall here give an account of it, from a paper tranſmitted by

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355 Mr Hazard's method of cultivation.

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the Agricultural Society of Jerſey to the Britiſh Board of Agriculture.

" It is impoſſible, ſay theſe gentlemen, to trace the period when the cultivation of this plant was firſt introduced amongſt us. It has been known for ſeveral centuries, and the inhabitants have reaped ſuch benefit therefrom, that, for fattening their cattle and pigs, they prefer it to all the known roots of both hemiſpheres. The cattle fed therewith yield a juicy and exquiſite meat. The pork and beef of Jerſey are inconteſtably equal, if not ſuperior, to the beſt in Europe. We have obſerved, that the beef in ſummer is not equal to that in the autumn, winter, and ſpring periods, when the cattle are fed with parſnips; which we attribute to the excellency of that root.

356 Culture of parſnips with beans in Jerſey and Guernſey.

" All animals eat it with avidity, and in preference to potatoes. We are ignorant of the reaſon, having never made any analyſis of the parſnip. It would be curious, intereſting, and uſeful, to inveſtigate its characteriſtic principles: it is certain that animals are more fond of it than of any other root, and fatten more quickly. The parſnip poſſeſſes, without doubt, more nutritious juices than the potato. It has been proved that the latter contains eleven ounces and a half of water, and one groſs of earthy ſubſtance, French weight; therefore, there only remain four ounces and five gros of nutritive matter. Probably the parſnip does not contain near ſo much watery particles; nevertheleſs, they digeſt very eaſily in the animal's body. The cows fed with hay and parſnips during winter yield butter of a fine yellow hue, of a ſaffron tinge, as excellent as if they had been in the moſt luxuriant paſture."

Theſe gentlemen proceed to ſtate, that, in the iſland of Jerſey, parſnips are not cultivated alone, but along with beans, among which laſt peaſe are ſometimes mixed. There are three modes of cultivation: 1ſt, With the ſpade; 2d, With the plough and ſpade; and 3d, With two ploughs, the one called the ſmall and the other the great plough. This laſt method, as being the moſt economical and advantageous to the huſbandman, is the only one deſcribed. In the month of September, a ſlight ploughing and preparation is ſometimes given to the field deſtined for beans and parſnips in the enſuing year; but more generally the whole work is performed in high grounds about the middle of February, and in the middle of March in low land. A light plough cuts and turns the earth about four or five inches deep; then follows it a large plough conſtructed on purpoſe, and only uſed for this operation, which elevates the earth on the furrow laid open, and turns it over that which the ſmall plough turned up. The eſſential point is to plough deep and to cover the clods over again.

The field thus prepared, is ſuffered to remain 15 days, after which it is very lightly harrowed. On the ſame day, or on the enſuing, the beans are planted in the following manner. Straight lines muſt be drawn from north to ſouth with a gardeners rake at $4\frac{1}{2}$ feet diſtance. On theſe ſtraight lines, 19 inches in breadth, women plant four or five beans in rows 4 inches diſtant from each other, or the beans are planted in double rows all over the field, at the uſual depth, and 12 feet diſtance from each other, with the beans ſpaced out 18 inches from each other. When all this is done, the parſnips are ſown in broad-caſt over the field, after which it is well harrowed. In 15 days after, if the weather has been warm and rainy, or in three weeks if it has been cold and dry, the ground is harrowed again to cut up the weeds. In five or ſix weeks the beans ſhoot out, and the ground ſoon appears as if covered by hedges or laid out in paths for walking; for in the ſpaces between the lines where the beans were planted are as many alleys, where women and children weed with great facility. They generally weed the ground twice, and the operation is performed with a two-pronged fork, ſuch as is uſed in gardens. The firſt weeding is performed at the end of April or beginning of May, when the plants muſt be cleared out if they are too thick. When the beans are ripe, which is in Auguſt or September, they are immediately plucked up, not to incommode the parſnips. The crop of beans is not always certain. If high winds or fogs prevail when they are in flower, the produce will be ſcanty; but the parſnips in a manner never fail. They neither dread the inclemency of the weather, nor are affected by the hardeſt froſt, nor by any of thoſe accidents which at times will inſtantly deſtroy a whole crop.

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Parſnips grow till the end of September, but ſome give them to cattle they wiſh to fatten in the beginning of September. The people of theſe iſlands conſider the parſnip as the moſt juicy and nutritious of all roots known. Its cultivation is an excellent preparation for wheat, which is ſown there without manure after parſnips, and yields a plentiful crop. It muſt be obſerved, that though this cultivation of parſnips is expenſive where the price of labour is high, no dung or manure is neceſſary either for the parſnips or the wheat. They reckon 30 perches of parſnips, with a little hay, will fatten an ox of three or four years old, though ever ſo lean; he eats them in the courſe of three months as follows: they are given at ſix in the morning, at noon, and at eight at night, in rations of 40lb. each; the largeſt are ſlit into three or four pieces; but not waſhed unleſs very much covered with earth. In the intermediate hours, at nine in the morning, two in the afternoon, and nine at night, a little hay is given. Experience has ſhewn, that when cattle, pigs, or poultry, are fed with parſnips, they are ſooner fattened and are more bulky than with any other root or vegetable whatever. The meat of ſuch is moſt delicate and ſavoury. In ſpring the markets are furniſhed with the beſt and fatteſt beef from their feeding on parſnips. The crops of parſnips raiſed in Jerſey and Guernſey are very great. On an extent of 1000 feet, the produce of a field of beans and parſnips is about 1200lb. weight of parſnips, Rouen meaſure, and 30 cabots or half buſhels of beans, and three cabots and a half of peaſe; which altogether, according to the price at which theſe articles are actually ſold there, amount to the ſum of 256 livres French currency. The following information was alſo received from the preſident of the Jerſey Society on 1ſt March 1796, viz. " Since writing concerning the crop of beans and parſnips together, we have found that an individual who cultivates parſnips without ſowing either peaſe or beans along with them had a crop of 14,760lb. weight Rouen meaſure per vergee." The vergee is 40 perches in length and one perch in breadth.

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III. Plants cultivated for Leaves, or for both Leaves and Root.

I. Turnip-rooted Cabbage.

357 Cultivation of the turnip-rooted cabbage.

This plant may deſervedly be reckoned next in value to the turnip itſelf. Its advantages, according to Sir Thomas Beevor, are, "that it affords food for cattle late in the ſpring, and reſiſts mildew and froſt, which ſometimes deſtroy the common turnip;" whence he is of opinion that every farmer who cultivates the common turnip ſhould always have part of his farm laid out in the cultivation of this root. The importance and value of turnip-rooted cabbages ſeem only to have been lately aſcertained. In the Bath Society papers we have the following account of Sir Thomas Beevor's method of cultivating them; which from experience he found to be cheaper and better than any other.

"In the firſt or ſecond week of June, I ſow the ſame quantity of ſeed, hoe the plants at the ſame ſize, leave them at the ſame diſtance from each other, and treat them in all reſpects like the common turnip. In this method I have always obtained a plentiful crop of them; to aſcertain the value of which I need only inform you, that on the 23d day of April laſt, having then two acres left of my crop, ſound, and in great perfection, I divided them by fold hurdles into three parts of nearly equal dimenſions. Into the firſt part I put 24 ſmall bullocks of about 30 ſtone weight each (14lb. to the ſtone), and 30 middle-ſized fat wethers, which, at the end of the firſt week, after they had eaten down the greater part of the leaves, and ſome part of the roots, I ſhifted into the ſecond diviſion, and then put 70 lean ſheep into what was left of the firſt; theſe fed off the remainder of the turnips left by the fat ſtock; and ſo they were ſhifted through the three diviſions, the lean ſtock following the fat as they wanted food, until the whole was conſumed.

358 Their utility and value.

"The 24 bullocks and 30 fat wethers continued in the turnips until the 21ſt of May, being exactly four weeks: and the 70 lean ſheep until the 29th, which is one day over four weeks: ſo that the two acres kept me 24 ſmall bullocks and 110 ſheep four weeks (not reckoning the overplus day of keeping the lean ſheep); the value, at the rate of keeping at that ſeaſon, cannot be eſtimated in any common year at leſs than 4d. a-week for each ſheep, and 1s. 6d. per week for each bullock, which would amount together to the ſum of 14l. 10s. 8d. for the two acres.

"You will hardly, I conceive, think I have ſet the price of keeping the ſtock at too high a rate; it is beneath the price here in almoſt every ſpring, and in this laſt it would have coſt double, could it have been procured; which was ſo far from being the caſe, that hundreds of ſheep and lambs here were loſt, and the reſt greatly pinched, for want of food.

"You will obſerve, gentlemen, that in the valuation of the crop above mentioned I have claimed no allowance for the great benefit the farmer receives by being enabled to ſuffer his graſs to get into a forward growth, nor for the ſuperior quality of theſe turnips in fattening his ſtock; both which circumſtances muſt ſtamp a new and a great additional value upon them. But as their continuance on the land may ſeem to be injurious to the ſucceeding crop, and indeed will deprive the farmer totally of either oats or barley; ſo to ſupply that loſs I have always ſown buck-wheat on the firſt earth upon the land from which the turnips were thus fed off; allowing one buſhel of ſeed per acre, for which I commonly receive from five to ſix quarters per acre in return. And that I may not throw that part of my land out of the ſame courſe of tillage with the reſt, I ſow my clover or other graſs ſeeds with the buck-wheat, in the ſame manner as with the oat or barley crops, and have always found as good a *layer* (ley) of it afterwards.

"Thus you ſee, that in providing a moſt incomparable vegetable food for cattle, in that ſeaſon of the year in which the farmer is generally moſt diſtreſſed, and his cattle almoſt ſtarved, a conſiderable profit may likewiſe be obtained, much beyond what is uſually derived from his former practice, by the great produce and price of a crop raiſed at ſo eaſy an expence as that of buck-wheat, which with us ſells commonly at the ſame price as barley, oftentimes more, and but very rarely for leſs.

"The land on which I have uſually ſown turnip-rooted cabbages is a dry mixed ſoil, worth 15s. per acre."

359 Recommendation by the Bath Society.

To the preceding account the ſociety have ſubjoined the following note: "Whether we regard the importance of the ſubject, or the clear and practical information which the foregoing letter conveys, it may be conſidered as truly intereſting as any we have ever been favoured with: and therefore it is recommended in the ſtrongeſt manner to farmers in general, that they adopt a mode of practice ſo deciſively aſcertained to be in a high degree judicious and profitable."

360 To raiſe the turnip-rooted cabbage for tranſplanting.

To raiſe the turnip-rooted cabbage for tranſplanting, the beſt method yet diſcovered is, to breaſt-plough and burn as much old paſture as may be judged neceſſary for the ſeed bed; two perches well ſtocked with plants will be ſufficient to plant an acre. The land ſhould be dug as ſhallow as poſſible, turning the aſhes in; and the ſeed ſhould be ſown the beginning of April.

The land intended for the plantation to be cultivated and dunged as for the common turnip. About midſummer (or ſooner if the weather will permit) will be a proper time for planting, which is beſt done in the following manner: the land to be thrown into *one-bout* ridges, upon the tops of which the plants are to be ſet, at about 18 inches diſtance from each other. As ſoon as the weeds riſe, give a hand-hoeing; afterwards run the ploughs in the intervals, and fetch a furrow from each ridge, which, after lying a fortnight or three weeks, is again thrown back to the ridges; if the weeds riſe again, it is neceſſary to give them another hand-hoeing.

If the young plants in the ſeed-bed ſhould be attacked by the fly, ſow wood-aſhes over them when the dew is on, which will effectually prevent the ravages they would otherwiſe make.

In another letter from Sir Thomas Beevor, Bath Papers, vol. viii. p. 489. he expreſſes his hope that the turnip-rooted cabbages he had would laſt until he ſhould have plenty of graſs for all his ſtock. To make a comparative eſtimation of the quantity of food yielded by the turnip-rooted cabbage and the common turnip, he ſelected ſome of each kind, and having girted them with as much accuracy as poſſible, he found, that

361 Compariſon of the quantity of food in the and in the common turnip.

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a turnip-rooted cabbage of 18 inches in circumference weighed 5¼lb. and a common turnip of the same size only 3¼lb.; on trying others, the general result was found to be in that proportion. Had they been weighed with the tops, the superiority of the turnip-rooted cabbage would have been greater, the tops of them being remarkably bushy. They were weighed in the month of March; but had this been done at Christmas, our author is of opinion that the difference would not have been so great; though he reckons this very circumstance of their continuing so long to afford a nourishing food, an instance of their excellency above almost every other vegetable whatever.

362 Other experiments.

In the fourth volume of the same work, Sir Thomas gives an account of another experiment on five acres of turnip rooted cabbage, four of which were eaten upon the field, the other was pulled up and carried to the stables and ox-houses. They were sown and cultivated as other turnips; the beasts were put to them on the 12th of April, and continued feeding upon them till the 11th of May. The cattle fed for this space of time were, 12 Scotch bullocks weighing 40 stone each; eight homebreds, two years old; fifteen cows full-sized; 40 sheep; 18 horses; besides 40 store-hogs and pigs, which lived upon the broken pieces and offal, without any other allowance, for the whole four weeks. The whole value of the plant, exclusive of the feeding of the pigs, amounted, according to our author's calculation, to 18l.; and he says that the farmers would willingly give this sum in the spring for feeding as many cattle; "because it enables them to save the young shooting grass (which is so frequently injured by the tread of the cattle in the frosty nights) until it gets to such a length and thickness as to be afterwards but little affected by the summer's drought. Besides this, the tops or leaves are in the spring much more abundant, and much better food than those of the common turnip, as already observed; and they continue in full perfection after all the common turnips are rotten or worthless.

363 Disadvantages attending the cultivation of this plant.

The disadvantages attending the cultivation of turnip-rooted cabbages are, that they require a great deal of time and pains to take them up out of the ground, if they are to be carried off the field; and if fed where they grow, it requires almost an equal labour to take up the pieces left by the cattle. A great deal of earth is also taken up along with the root; and the substance of the latter is so firm and solid, that they must be cut in two in order to enable the cattle to eat them. To obviate some of these objections, it will be proper to sow the plants on rich and very light land; and as they are longer in coming to the hoe than the common turnip, it will be proper to sow them about the beginning of June.

364 Why every farmer ought to cultivate this plant.

In another experiment upon this plant by the same gentleman, the cabbages held out during the long and severe frost of 1788 without the least injury, though it destroyed three-fourths of all the common turnips in the neighbourhood. On the 21st of April 1789, the average produce of an acre was found to be somewhat more than 24½ tons, though the tops had not sprouted above three inches. Considering the precariousness of turnips and other crops, Sir Thomas is decisively of opinion, that all farmers ought to have as many turnip-rooted cabbages as would afford and ensure them a full provision for their cattle for about three or four weeks during the latter part of the spring. This quantity he reckons sufficient, as the consumption, particularly when drawn and carried off the land, is attended with more trouble and expence than that of common turnips, especially if the soil be wet and heavy. In another letter, dated May 3. 1790, Sir Thomas Beevor once more sets forth the advantages of having a crop of these vegetables during the spring season. "In consequence (says he) of the very cold weather we have had here, the grass is but just springing; as the turnips are wholly eaten up, it occasions much distress among the farmers for want of some green vegetable food for their sheep and cattle; whereas, by the assistance of my turnip-rooted cabbages, I have abundance of the best and most nutritive food that can be found them." He then proceeds to recommend their culture "for the support of almost all live stock for the three last weeks of April, or first week of May, when the grass shoots late."

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In the 4th volume of the Transactions of the Society for encouraging Arts, Mr Robins, who received a premium for raising the greatest quantity of this plant, informs us, that the soil on which it grew was a *stone brash*, inclining to sand, not worth more than 10s. per acre; the preparation the same as for turnips. The manure was a compost of earth and dung, which he finds to answer better than dung. The seed was sown about the beginning of April on a clean spot of ground; and he commonly uses an old pasture where the sheep-fold has been in the winter, after taking away the dung, and digging it very shallow; "as the roots of the young plants (says he) might soon reach the dung or salts, which must consequently be left, in order to force them out of the fly's way." These insects, our author observes, are extremely fond of the turnip-rooted cabbage; much more so, he believes, than of common turnips. About the middle of June they should be planted out upon one-bout ridges raised by a double plough made for the purpose. Seven thousand plants are sufficient for one acre; but if only six are used, the roots will be the larger.

365 Number of sheep fed by an acre of turnip-rooted cabbages.

To determine how many sheep might be kept upon an acre of turnip-rooted cabbage, our author shut up 200 ewes with their lambs upon a piece of poor pasture land of no great extent; the whole not exceeding ten acres. One ton was found sufficient for keeping them in sufficient health for a day. On giving them a larger piece of ground to run over, though it had been eaten all winter and late in the spring, yet, with this trifling assistance, 13 tons of turnip-cabbage were made to serve 18 days; at the end of which the ewes and lambs were found very much improved, which could not have been expected from four acres of turnips in the month of April, the time that these were fed.

366 Experiments at Cullen-house.

From some trials made on the turnip-rooted cabbage at Cullen House in the north of Scotland, it appears that the plant is adapted to the climate of every part of our island. The first trial was made in the year 1784. The seeds were sown about the middle of March in garden ground properly prepared. The cabbages were transplanted about the middle of March that year into a dry light soil, well cleaned and dunged with rotten cow-dung, in rows three feet distant from each other, and at the distance of 20 inches in the

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the rows. They were kept very clean, and the earth was hoed up to the roots of the plants; by which means they were probably prevented from attaining the hardneſs they would otherwiſe have arrived at; though, after all, it was neceſſary to cut the roots in two before the ſheep could eat them. When thus cut, the animals ate them greedily, and even preferred them to every other food. The roots continued good for at leaſt a month after the common turnips were unfit for uſe: ſome of them weighed from eight to ten pounds, and a few of them more. Other trials have ſince been made; and it now appears that the plant will thrive very well with the ordinary culture of turnips in the open fields, and in the uſual manner of ſowing broad-caſt. From a comparative trial made by the earl of Fife upon this root with ſome others, the quantities produced upon 100 ſquare yards of ground were as follows:

	ſtone.	lb.
Common turnips -	92	4
Turnip-rooted cabbage -	88	0
Carrots - -	95	0
Root of ſcarcity -	77	0

The turnip-rooted cabbage was planted in lines 20 inches aſunder; the common turnips ſown broad-caſt, and hand-weeded, ſo that they came up very thick, being not more than three or four inches aſunder when full grown. Two cows were fed for ſix weeks with the turnips, two with the turnip-rooted cabbage, and two with the root of ſcarcity for an equal time: the two fed with turnips gave moſt milk, and thoſe with the root of ſcarcity the leaſt. His lordſhip obſerves, however, that carrots thrive better on his farm than any other crop: that his horſes had been fed on them at the rate of two pecks a-day, with no corn, and little more than half the uſual quantity of hay. "They were kept at work every day from ſeven to eight hours, and were never in better order."

2. Swedish Turnip, or Roota Baga.

367 Of the Roota baga.

The roota baga, or Swediſh turnip, is a plant from which great expectations have been formed. It is ſaid to be hardier than the common turnip, and of greater ſweetneſs and ſolidity. It alſo preſerves its freſhneſs and ſucculence till a very late period of its growth, even after it has produced ſeed; on account of which property it has been recommended to the notice of farmers as an excellent kind of ſucculent food for domeſtic animals in the ſpring of the year, when common turnips and moſt other winter crops have failed, and before graſs has got up to furniſh an abundant bite for feeding beaſts. This peculiarity, ſo valuable, yet ſo ſingular as to have led many at firſt to doubt the fact, ſeems to be ſufficiently aſcertained by experiment. Dr J. Anderſon * in particular informs us, that it "begins to ſend out its flower-ſtems in the ſpring, nearly about the ſame time with the common turnip; but that the root, in conſequence of that change of ſtate, ſuffers very little alteration. I continued to uſe theſe turnips at my table every day till towards the middle of May; and had I never gone into the garden myſelf, I ſhould not even then have ſuſpected, from the taſte or appearance of the bulb itſelf, that it had been ſhot at all. The ſtems, however, at the ſeaſon I gave over uſing them, were from four to five feet high, and in full flower. I ſhould have continued the experiment longer, had not the quantity I had left for that purpoſe been exhauſted, and a few only left for ſeed.

The *Bee*, vol. iii. p. 71.

"This experiment, however, fully proves, that this kind of turnip may be employed as a ſucculent food for cattle till the middle of May at leaſt, in an ordinary year; and I have not the ſmalleſt doubt but it will continue perfectly good for that purpoſe till the end of May in any ſeaſon; at which time graſs and other ſpring crops can eaſily be had for bringing beaſts forward in fleſh. I can therefore, without heſitation, recommend this plant to the farmer as a moſt valuable ſpring feeding for cattle and ſheep; and for this purpoſe, I think no wiſe farmer ſhould be without a proportion of this kind of turnip to ſucceed the other ſorts after they fail. The profitable method of conſuming it, where it is to be kept very late, is, I am convinced, to cut off the tops with a ſcythe or ſickle when from one foot to eighteen inches high, to induce it to ſend out freſh ſtems, that will continue ſoft and ſucculent to the end; whereas, without this proceſs, the ſtems would become ſticky and uſeleſs.

"I cannot, however, recommend this kind of turnip, from what I have yet ſeen, as a general crop; becauſe I think it probable, that unleſs in particular circumſtances, the common field turnips grow to a much larger ſize, and afford upon the whole a more weighty crop. Theſe, therefore, ſhould ſtill continue to be cultivated for winter uſe, the other being reſerved only for ſpring conſumption.

"Experiments are ſtill wanting to aſcertain with certainty the peculiar ſoil and culture that beſt agree with this plant; but from the few obſervations I have hitherto had an opportunity of making upon it, it ſeems to me probable, that it thrives better, and grows to a larger ſize, on damp clayey ſoil, than on light ſandy land. But I would not wiſh to be underſtood as here ſpeaking poſitively, I merely throw it out as a hint for future obſervation: on ſpongy ſoil it proſpers.

"Though the uſes of this as a garden plant are of much ſmaller conſequence than thoſe above ſpecified, it may not be improper to remark, that its leaves form a very ſweet kind of greens at any time; and merely for the ſake of the experiment, I cauſed ſome of theſe to be picked off the ſtems of the plants coming to ſeed, on the 4th of June, the king's birth day, which, on being readied, were found perfectly ſweet, without the ſmalleſt tendency to bitterneſs, which moſt, if not all, other kinds of greens that have been hitherto cultivated are known to acquire after their ſtems are conſiderably advanced; no family, therefore, can ever be at a loſs for greens when they have any of this plant in ſeed.

"A root of this kind of turnip was taken up this day (June 15.); the ſeed-ſtalks were firm and woody, the pods full formed, and in ſome of them the ſeeds were nearly ripe. The root, however, was as ſoft and ſucculent as at any former period of its growth; nor was the ſkin, as I expected, hard or woody. It was made ready and brought to the table: ſome perſons there thought the taſte as good, if not better, than at any former period of its growth; but I myſelf, perhaps through prejudice, thought it had not quite ſo high a reliſh as in winter. At any rate, however, there

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can be no doubt, that if ever it could be neceſſary, it might, even now, be employed very properly as a feeding for cattle."

368 Culture of the roota baga in Nottinghamſhire.

This vegetable, from its obvious utility, is gradually coming to be much uſed in various quarters of the iſland. In the Agricultural Survey of Nottinghamſhire, the following deſcription of the modes in which it has been ſucceſsfully cultivated, is well worthy of attention. "The roota baga, or Swediſh turnip, is now cultivated by a few farmers in the diſtrict. It appears to be ſuperior to the common turnip in many reſpects, particularly in hardineſs, as it ſtood the laſt ſevere winter without the leaſt injury. It is eaten with greedineſs by all animals, from the horſe to the ſwine. Sheep prefer it to all others; but the material advantage that has been made of it, is the ſubſtituting it for corn in the food of draught horſes; in which it has been found to anſwer the wiſh of every perſon who has yet tried it. The turnips are put into a tub or barrel, and cut ſmall with an inſtrument like a hoe, with the blade put perpendicularly into the ſhaft; a man will cut in one hour as much as ſix horſes can eat in twenty-four. The tops and bottoms are previouſly cut off and given to the pigs. Horſes that are hard worked, look full as well when fed with this turnip and very little hay, as they formerly did when very high fed with corn. The Swediſh turnip ſhould be ſowed early, from the 15th of May to the 10th of June."—The following information on the culture of the roota baga, is given in the ſame Survey, upon the authority of J. Daiken, Eſq. of Nottingham.

Mr Daiken, about the 10th of May 1794, ſowed about four acres with the ſeed of roota baga, about 2lbs. per acre, on good ſand land, worth 20s. an acre, manured as for turnips, and having been ploughed four or five times; the reſt of the field, to the amount of nine acres in all, with common turnip and turnip-rooted cabbage, all broad-caſt. They were not tranſplanted, but hoed out nine inches aſunder, at three hocings, at 7s. 6d. an acre; no other culture. In November began to uſe them for horſes, giving at firſt clover and rye-graſs hay, oats and beans; but finding that the horſes did well upon them, left off all corn, and continued them on hay and the roots only; fifteen were thus fed for about two months, were conſtantly hard worked, and preſerved themſelves in very good condition. Mr Daiken is well convinced, that in this application they were worth 30l. an acre, that he would in future, if he could not get them otherwiſe, rather give that ſum per acre for one or two acres, than not have them for this uſe. They loſt their leaves entirely when the froſt ſet in; but the roots were not the leaſt affected, though the common turnips in the ſame field were totally deſtroyed. Paſſengers paſſing through the field, cut holes in them, which did not let the froſt injure them; nor were thoſe hurt which were damaged by cattle biting them. Some came to the weight of 16lbs. and Mr Daiken thinks the average of the crop 8lbs. and much to exceed in tonnage per acre common turnips.

Mr Daiken gave them alſo to hogs, cattle and ſheep. They are excellent for hogs; and ſheep being let into the field before the common turnips were deſtroyed, gave ſo decided a preference to the roota baga that they would not ſettle on the common turnips while the others were to be had.

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The method of giving them to horſes is to cut off the top-root, to waſh them, and to cut them roughly with a perpendicular hoe, and then given directly, without keeping them to dry. The horſes ate them with avidity, and ſeemed even to prefer them to corn. Their qualities appear to be ſingular, as they bind horſes inſtead of relaxing them as other roots do. One mare was kept entirely upon them and ſtraw, worked every day, did well, and never looked better; this mare was more bound by them than the reſt. They have a ſtrong effect upon making the coats fine, and one or two affected by the greaſe, were cured by them, as they act as a ſtrong diuretic. In this mode of application, one acre maintained fifteen about two months: and Mr Daiken is ſo well convinced of the utility of the plant, as well as many of his neighbours, that he intends, and they alſo, to increaſe the cultivation much.

Mr Daiken ſuſpects there are two ſorts of the roota baga, becauſe ſome, upon cutting, are white within, but in general yellow; otherwiſe of the ſame external appearance. The yellow is the beſt.

3. Turnip Cabbage.

This plant is as yet but little known. The ſeed is ſaid to have been brought from the Cape of Good Hope by Mr Haſtings, where it is very common, as well as in Holland. It has alſo had an exiſtence in Britain for many years, though not generally known. It has a much greater affinity to the cabbage than to the turnip; and is very hardy, bearing the winter as well, if not better, than common brocoli, and may therefore be conſidered as a valuable acquiſition to the kitchen garden as well as for cattle. The beſt time for ſowing it for the garden is the end of May or beginning of June, though none of the plants have ever been obſerved to run to ſeed though ſown ever ſo early. Even though ſown in Auguſt at the cauliflower ſeaſon, the greater part ſtood throughout the following ſummer, and did not ſeed till the ſecond ſpring. The plants require nearly the ſame management with brocoli as to diſtance, tranſplanting, &c. and are uſually moſt eſteemed when young, and about the ſize of a moderate garden turnip; thoſe ſown in June will continue all winter. The bulb muſt be ſtripped clean of its thick fibrous rind; after which it may be uſed as a common turnip. The crown or ſprout is very good, but eſpecially in the ſpring, when they begin to run to ſeed. Mr Broughton, from whoſe account in the Bath Papers, vol. v. this article is taken, thinks that the turnip-cabbage is more nutritious than the common turnip. The largeſt bulb he meaſured was 23 inches circumference; but the thickneſs of the rind is ſo great, that ſome farmers imagined that the bulb would be too hard for ſheep. The objection, however, was obviated by Mr Broughton, who gave ſome of the oldeſt and toughеſt bulbs to his ſheep, and found that they not only penetrated through the rind, but even devoured the greateſt part of it.

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4. Cabbage.

The cabbage has been recommended by long experience

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rience as an excellent food for cattle. Its uſes as part of human food are alſo well known. It is therefore an intereſting article in huſbandry. It is eaſily raiſed, is ſubject to few diſeaſes, reſiſts froſts more than turnip, is palatable to cattle, and ſooner fills them than turnip, carrot, or potatoes.

370 Culture of cabbage.

The ſeaſon for ſetting cabbage depends on the uſe it is intended for. If intended for feeding in November, December, and January, plants procured from ſeed ſown the end of July the preceding year muſt be ſet in March or April. If intended for feeding in March, April, and May, the plants muſt be ſet the firſt week of the preceding July, from ſeed ſown in the end of February or beginning of March the ſame year. The late ſetting of the plants retards their growth; by which means they have a vigorous growth the following ſpring. And this crop makes an important link in the chain that connects winter and ſummer green food. Where cabbage for ſpring food happens to be neglected, a few acres of rye, ſown at Michaelmas, will ſupply the want. After the rye is conſumed, there is time ſufficient to prepare the ground for turnip.

And now to prepare a field for cabbage. Where the plants are to be ſet in March, the field muſt be made up after harveſt in ridges three feet wide. In that form let it lie all winter, to be mellowed with air and froſt. In March, take the firſt opportunity, between wet and dry, to lay dung in the furrows. Cover the dung with a plough, which will convert the furrow into a crown, and conſequently the crown into a furrow. Set the plants upon the dung, diſtant from each other three feet. Plant them ſo as to make a ſtraight line croſs the ridges, as well as along the furrows, to which a gardeners line ſtretched perpendicularly croſs the furrows will be requiſite. This will ſet each plant at the diſtance preciſely of three feet from the plants that ſurround it. The purpoſe of this accuracy is to give opportunity for ploughing not only along the ridges, but croſs them. This mode is attended with three ſignal advantages: it ſaves hand-hoeing, it is a more complete dreſſing to the ſoil, and it lays earth neatly round every plant.

If the ſoil be deep and compoſed of good earth, a trench ploughing after the preceding crop will not be amiſs; in which caſe, the time for dividing the field into three-feet ridges, as above, ought to be immediately before the dunging for the plants.

If weeds happen to riſe ſo cloſe to the plants as not to be reached by the plough, it will require very little labour to deſtroy them with a hand-hoe.

Unleſs the ſoil be much infeſted with annuals, twice ploughing after the plants are ſet will be a ſufficient dreſſing. The firſt removes the earth from the plants: the next, at the diſtance of a month or ſo, lays it back.

Where the plants are to be ſet in July, the field muſt be ribbed as directed for barley. It ought to have a ſlight ploughing in June before the planting, in order to looſen the ſoil, but not ſo as to bury the ſurface-earth; after which the three-feet ridges muſt be formed, and the other particulars carried on as directed above with reſpect to plants that are to be ſet in March.

In a paper already quoted from thoſe of the Bath Society, Scots cabbages are compared, as to their utility in feeding cattle, with turnips, turnip-rooted cabbage, and carrots. In this trial the cabbages ſtand next in value to the carrots; and they are recommended as not liable to be affected by froſt, if they be of the true flat-topped firm kind. Fifty-four tons have been raiſed upon an acre of ground not worth more than 12 ſhillings. There is likewiſe an advantage attending the feeding of cattle with cabbages, viz. that their dung is more in proportion than when fed with turnips or with hay; the former going off more by urine, and the latter having too little moiſture. They alſo impoveriſh the ground much leſs than grain. Mr Billingſley accounts 46 tons per acre a greater crop than he ever read of; but Mr Vagg, in the 4th volume of Bath Papers, gives an account of a crop for which he received a premium from the Society, which was much ſuperior to that of Mr Billingſley. Its extent was 12 acres; the produce of the worſt was 42, and of the beſt 68 tons. They were manured with a compoſt of lime, weeds, and earth, that lay under the hedges round the field, and a layer of dung, all mixed and turned together. About 25 cart loads of this were ſpread upon an acre with the uſual ploughing given to a common ſummer fallow; but for this, he ſays, "admitting ſuch crop to exhauſt the manure in ſome degree by its growth, an ample reſtoration will be made by its refuſe ploughed in, and by the ſtirring and cleaning of the ground." The whole expence of an acre, excluſive of the rent, according to Mr Vagg's calculation, amounts to 11. 14s. 1d. only four ounces of ſeed being requiſite for an acre. The 12 acres, producing as above mentioned, would feed 45 oxen, and upwards of 60 ſheep, for three months; improving them as much as the graſs in the beſt months of the year, May, June, and July. He recommends ſowing the ſeed about the middle of Auguſt, and tranſplanting the young cabbages where they may be ſheltered from the froſt; and to the neglect of this he aſcribes the partial failure, or at leaſt inferiority of one part of his ground in the crop juſt mentioned, the young plants not being removed till near midſummer, and then in ſo dry a time, that they were almoſt ſcorched up.

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371 Quantity raiſed on an acre, &c.

372 Of watering cabbages.

In the Farmer's Magazine, vol. ii. p. 217. we have ſeveral pertinent remarks upon the culture of this uſeful plant, particularly with regard to watering. "It is a rule (ſays this correſpondent) never to water the plants, let the ſeaſon be as dry as it may; inſiſting that it is entirely uſeleſs. If the land is in fine tilth and well dunged, this may be right, as the expence muſt be conſiderable; but it is probable, in very dry ſeaſons, when the new ſet plants have nothing but a burning ſun on them, that watering would ſave vaſt numbers, and might very well anſwer the expence, if a pond is near, and the work done with a water-cart." He takes notice alſo of another uſe of cabbages, which has not met with the attention it merits, viz. the planting of lands where turnips have failed. A late ſown crop of theſe ſeldom turns to any account; but cabbages planted on the ground without any ploughing would prove very beneficial for ſheep late in the ſpring; in all probability (unleſs on light, ſandy, or limeſtone ſoils) of greater value than the turnips, had they ſucceeded.

Mr Marſhall obſerves, that in the midland diſtrict, a valuable

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valuable ſort of large green cabbage " is propagated, if not raiſed, by Mr Bakewell, who is not more celebrated for his breed of rams than for his breed of cabbages. Great care is obſerved here in raiſing the ſeed, being careful to ſuffer no other variety of the braſſica tribe to blow near ſeed cabbages; by which means they are kept true to their kind. To this end, it is ſaid that ſome plant them in a piece of wheat; a good method, provided the ſeed in that ſituation can be preſerved from birds."

373 Cabbages cultivated in the midland diſtrict.

374 Diſtance at which they ought to be placed.

The advantage of having large cabbages is that of being able to plant them wide enough from each other, to admit of their being cleaned with the plough, and yet to afford a full crop. The proper diſtance depends in ſome meaſure on the natural ſize of the ſpecies and the ſtrength of the ſoil; the thinner they ſtand, the larger they will grow: but our author is of opinion that cabbages, as well as turnips, are frequently ſet out too thin. Four feet by two and a half, according to Mr Marſhall, are a full diſtance for large cabbages on a rich ſoil.

375 Method of tranſplanting and earthing them.

Annals of Agriculture, vol. xv.

We think it of importance to take notice of the following mode of tranſplanting cabbages, or earthing them, as being conſiſtent with the beſt mode of practice, and coming from the moſt reſpectable practical authority, Mr George Cully of Fenton. " We plant the cabbages, ſays he, not only in right lines but equidiſtant every way, ſo that we can plough between the rows, both long-ways and croſs over; which, by looſening the earth ſo effectually on all ſides, very much promotes their growth. But the matter I wiſhed to inform you of, is the taking them up by the roots in the autumn whenever they have completed their growth, and putting them into the neareſt ſtubble field you have, where a plough is ready to draw a ſtraight furrow in the moſt convenient place; and at twenty yards diſtance, more or leſs, the ploughman makes another furrow parallel to the firſt. The cabbages are now turned out of the carts as conveniently as may be for a ſufficient number of women to lay them along theſe furrows as cloſe one to another as poſſible. The ploughman begins again where he firſt ſtarted, and turns a large furrow upon the cabbages which is trodden down and righted by one, two or more as occaſion requires, with each a ſpade in his hand to aſſiſt where the plough has by chance or accident not thrown earth enough. Thus the work goes on till all is finiſhed."

" We think we derive two advantages by the above proceſs. In the firſt place the cabbages keep ſufficiently well through the winter in their new ſituation, while they do not draw or exhauſt the land ſo much where they were growing: and, ſecondly, that land is at liberty to be ſown with wheat as ſoon as cleared of the cabbages; which grain, in general, anſwers well after that green crop."

376 How protected from caterpillars.

Cabbages and greens in general are apt to be infeſted by caterpillars. They may uſually however be protected againſt thoſe vermin by pulling off the large undermoſt leaves, which may be given to cows in the month of Auguſt, or when the common white butterflies begin to appear in numbers. Theſe butterflies lay their eggs, which produce the cabbage caterpillar on the under ſide of the largeſt leaves of the cabbage plants. There is alſo ſaid to be another remedy. It conſiſts of ſowing beans among the cabbages, which will greatly prevent the breeding of theſe worms; for it is ſaid that the butterflies have an antipathy to the flavour of beans.

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5. The Root of Scarcity.

377 Culture o the root c ſcarcity.

The *racine de diſette*, or root of ſcarcity (*Betacia*), delights in a rich loamy land well dunged. It is directed to be ſown in rows, or broad-caſt, and as ſoon as the plants are of the ſize of a gooſe quill, to be tranſplanted in rows of 18 inches diſtance, and 18 inches apart, one plant from the other: care muſt be taken in the ſowing, to ſow very thin, and to cover the ſeed, which lies in the ground about a month, an inch only. In tranſplanting, the root is not to be ſhortened, but the leaves cut at the top; the plant is then to be planted with a ſetting ſtick, ſo that the upper part of the root ſhall appear about half an inch out of the ground: this laſt precaution is very neceſſary to be attended to. Theſe plants will ſtrike root in twenty-four hours, and a man a little accuſtomed to planting will plant with eaſe 1800 or 2000 a-day. In the ſeed-bed, the plants, like all others, muſt be kept clear of weeds: when they are planted out, after once hoeing, they will take care of themſelves, and ſuffocate every kind of weed near them.

The beſt time to ſow the ſeed is from the beginning of March to the middle of April: it is, however, adviſed to continue ſowing every month until the beginning of July, in order to have a ſucceſſion of plants. Both leaves and roots have been extolled as excellent both for man and beaſt. This plant is ſaid not to be liable, like the turnip, to be deſtroyed by inſects; for no inſect touches it, nor is it affected by exceſſive drought, or the changes of ſeaſons. Horned cattle, horſes, pigs, and poultry, are exceedingly fond of it when cut ſmall. The leaves may be gathered every 12 or 15 days; they are from 30 to 40 inches long, by 22 to 25 inches broad. This plant is excellent for milch cows, when given to them in proper proportions, as it adds much to the quality as well as quantity of their milk; but care muſt be taken to proportion the leaves with other green food, otherwiſe it would abate the milk, and fatten them too much, it being of ſo exceeding a fattening quality. To put all theſe properties beyond doubt, however, further experiments are wanting.

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378 Of laying down fiel to graſs.

The latter end of Auguſt, or the beginning of September, is the beſt ſeaſon for ſowing graſs ſeeds, as there is time for the roots of the young plants to fix themſelves before the ſharp froſts ſet in. It is ſcarce neceſſary to ſay, that moiſt weather is beſt for ſowing; the earth being then warm, the ſeed will vegetate immediately; but if this ſeaſon prove unfavourable, they will do very well the middle of March following.

If you would have fine paſture, never ſow on foul land. On the contrary, plough it well, and clear it from the roots of couch-graſs, reſt-harrow, fern, broom, and all other noxious weeds. If theſe are ſuffered to remain, they will ſoon get above and deſtroy your young graſs. Rake theſe up in heaps, and burn them on the land, and ſpread the aſhes as a manure. Theſe ploughings and harrowings ſhould be repeated in dry weather.

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weather. And if the ſoil be clayey and wet, make ſome under-drains to carry off the water, which, if ſuffered to remain, will not only chill the graſs, but make it ſour. Before ſowing, lay the land as level and fine as poſſible. If your graſs ſeeds are clean (which ſhould always be the caſe), three buſhels will be ſufficient per acre. When ſown, harrow it in gently, and roll it in with a wooden roller. When it comes up, fill up all the bare ſpots by freſh ſeed, which, if rolled to fix it, will ſoon come up and overtake the reſt.

In Norfolk they ſow clover with their graſſes, particularly with rye-graſs; but this ſhould not be done except when the land is deſigned for graſs only three or four years, becauſe neither of theſe kinds will laſt long in the land. Where you intend it for a continuance, it is better to mix only ſmall white Dutch clover, or marl graſs, with your other graſs ſeed, and not more than eight pounds to an acre. Theſe are abiding plants, ſpread cloſe on the ſurface, and make the ſweeteſt feed of any for cattle. In the following ſpring, root up thiſtles, hemlock, or any large plants that appear. The doing this while the ground is ſoft enough to permit your drawing them up by the roots, and before they ſeed, will ſave you infinite trouble afterwards.

The common method of proceeding in laying down fields to graſs is extremely injudicious. Some ſow barley with their graſſes, which they ſuppoſe to be uſeful in ſhading them, without conſidering how much the corn draws away the nouriſhment from the land.

Others take their ſeeds from a foul hay rick; by which means, beſides filling the land with rubbiſh and weeds, what they intend for dry ſoils may have come from moiſt, where it grew naturally, and *vice verſa*.

379 Different kinds of graſs.

The conſequence is, that the ground, inſtead of being covered with a good thick ſward, is filled with plants unnatural to it. The kinds of graſs moſt eligible for paſture lands are, the annual meadow, creeping, and fine bent, the fox's tail, and the creſted dog's tail, the poas, the feſcues, the vernal oat-graſs, and the ray or rye-graſs. We do not, however, approve of ſowing all theſe kinds together; for not to mention their ripening at different times, by which means you can never cut them all in perfection and full vigour, no kind of cattle are fond of all alike.

Horſes will ſcarcely eat hay which oxen and cows will thrive upon; ſheep are particularly fond of ſome kinds, and refuſe others. The darnel-graſs, if not cut before ſeveral of the other kinds are ripe, becomes ſo hard and wiry in the ſtalks, that few cattle care to eat it.

As the ſubject of paſtures is very important, we ſhall firſt take notice of the general mode of improving ordinary paſtures, and of the particular graſs plants that ought to be cultivated in them. After which we ſhall mention the celebrated modern improvements upon graſs lands, by flooding them artificially with water.

Paſture land is of ſuch advantage to huſbandry, that many prefer it even to corn land, becauſe of the ſmall hazard and labour that attends it; and as it lays the foundation for moſt of the profit that is expected from the arable land, becauſe of the manure afforded by the cattle which are fed upon it. Paſture ground is of two ſorts: the one is meadow land, which is often overflowed; and the other is upland, which lies high and dry. The firſt of theſe will produce a much greater quantity of hay than the latter, and will not require manuring or dreſſing ſo often: but then the hay produced on the upland is much preferable to the other; as is alſo the meat which is fed in the upland more valued than that which is fatted in rich meadows; though the latter will make the fatter and larger cattle, as is ſeen by thoſe which are brought from the low rich lands in Lincolnſhire. But where people are nice in their meat, they will give a much larger price for ſuch as hath been fed on the downs, or in ſhort upland paſture, than for the other, which is much larger. Beſides this, dry paſtures have an advantage over the meadows, that they may be fed all the winter, and are not ſo ſubject to poach in wet weather; nor will there be ſo many bad weeds produced; which are great advantages, and do in a great meaſure recompenſe for the ſmallneſs of the crop.

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380 How to improve upland paſtures.

The firſt improvement of upland paſture is, by fencing it, and dividing it into ſmall fields of four, five, ſix, eight, or ten acres each, planting timber trees in the hedge-rows, which will ſcreen the graſs from the dry pinching winds of March, which will prevent the graſs from growing in large open lands; ſo that if April proves a dry month, the land produces very little hay; whereas in the ſheltered fields, the graſs will begin to grow early in March, and will cover the ground, and prevent the ſun from parching the roots of the graſs, whereby it will keep growing, ſo as to afford a tolerable crop if the ſpring ſhould prove dry. But in fencing of land, the incloſure muſt not be made too ſmall, eſpecially where the hedge rows are planted with trees; becauſe, when the trees are advanced to a conſiderable height, they will ſpread over the land; and where they are cloſe, will render the graſs ſo ſour, that inſtead of being of an advantage, it will greatly injure the paſture.

The next improvement of upland paſture is, to make the turf good, where, either from the badneſs of the ſoil, or for want of proper care, the graſs hath been deſtroyed by ruſhes, buſhes, or mole-hills. Where the ſurface of the land is clayey and cold, it may be improved by paring it off, and burning it; but if it is a hot ſandy land, then chalk, lime, marl, or clay, are very proper manures to lay upon it; but theſe ſhould be laid in pretty good quantities, otherwiſe they will be of little ſervice to the land.

If the ground is overrun with buſhes or ruſhes, it will be of great advantage to the land to grub them up towards the latter part of ſummer, and after they are dried to burn them, and ſpread the aſhes over the ground juſt before the autumnal rains; at which time the ſurface of the land ſhould be levelled, and ſown with graſs ſeed, which will come up in a ſhort time, and make good graſs the following ſpring. So alſo, when the land is full of mole-hills, theſe ſhould be pared off, and either burnt for the aſhes, or ſpread immediately on the ground when they are pared off, obſerving to ſow the bare patches with graſs ſeed juſt as the autumnal rains begin.

Where the land has been thus managed, it will be of great ſervice to roll the turf in the months of February and March with a heavy wooden roller; always obſerving to do it in moiſt weather, that the roller may make an impreſſion; this will render the ſurface level

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level, and make it much eaſier to mow the graſs than when the ground lies in hills; and will alſo cauſe the turf to thicken, ſo as to have what people uſually term a *good bottom*. The graſs likewiſe will be the ſweeter for this huſbandry, and it will be a great help to deſtroy bad weeds.

Another improvement of upland paſtures is, the feeding of them; for where this is not practiſed, the land muſt be manured at leaſt every third year; and where a farmer hath much arable land in his poſſeſſion, he will not care to part with his manure to the paſture. Therefore every farmer ſhould endeavour to proportion his paſture to his arable land, eſpecially where manure is ſcarce, otherwiſe he will ſoon find his error; for the paſture is the foundation of all the profit which may ariſe from the arable land.

Whenever the upland paſtures are mended by manure, there ſhould be a regard had to the nature of the ſoil, and a proper ſort of manure applied: as for inſtance, all hot ſandy land ſhould have a cold manure; neats dung and ſwines dung are very proper for ſuch lands; but for cold lands, horſe dung, aſhes, and other warm manures, are proper. And when theſe are applied, it ſhould be done in autumn, before the rains have ſoaked the ground, and rendered it too ſoft to cart on; and it ſhould be carefully ſpread, breaking all the clods as ſmall as poſſible, and then harrowed with buſhes, to let it down to the roots of the graſs. When the manure is laid on at this ſeaſon, the rains in winter will waſh it down, ſo that the following ſpring the graſs will receive the advantage of it.

There ſhould alſo be great care taken to deſtroy the weeds in the paſture every ſpring and autumn: for, where this is not practiſed, the weeds will ripen their ſeeds, which will ſpread over the ground, and thereby fill it with ſuch a crop of weeds as will ſoon overbear the graſs, and deſtroy it; and it will be very difficult to root them out after they have gotten ſuch poſſeſſion, eſpecially ragwort, and ſuch other weeds as have down adhering to their ſeeds.

The graſs which is ſown in theſe upland paſtures ſeldom degenerates, if the land is tolerably good: whereas the low meadows, on which water ſtagnates in winter, in a few years turn to a harſh ruſhy graſs, though the upland will continue a fine ſweet graſs for many years without renewing.

There is no part of huſbandry of which the farmers are in general more ignorant than that of the paſture: moſt of them ſuppoſe, that when old paſture is ploughed up, it can never be brought to have a good ſward again; ſo their common method of managing their land after ploughing, is to ſow with their crop of barley ſome graſs ſeeds as they call them; that is, either the red clover, which they intend to ſtand two years after the corn is taken off the ground, or rye-graſs mixed with trefoil; but as all theſe are at moſt but biennial plants, whoſe roots decay ſoon after their ſeeds are perfected, ſo the ground, having no crop upon it, is again ploughed for corn; and this is the conſtant round which the lands are employed in by the better ſort of farmers.

But whatever may have been the practice of theſe people, it is certainly poſſible to lay down lands which have been in tillage with graſs, in ſuch a manner as that the ſward ſhall be as good, if not better, than any natural graſs, and of as long duration. But this is never to be expected in the common method of ſowing a crop of corn with the graſs ſeeds; for, whenever this has been practiſed, if the corn has ſucceeded well, the graſs has been very poor and weak; ſo that if the land has not been very good, the graſs has ſcarcely been worth ſaving; for the following year it has produced but little hay, and the year after the crop is worth little, either to mow or feed. Nor can it be expected to be otherwiſe, for the ground cannot nouriſh two crops; and if there were no deficiency in the land, yet the corn, being the firſt and moſt vigorous of growth, will keep the graſs from making any conſiderable progreſs; ſo that the plants will be extremely weak, and but very thin, many of them which come up in the ſpring being deſtroyed by the corn; for wherever there are roots of corn, it cannot be expected there ſhould be any graſs. Therefore the graſs muſt be thin; and if the land is not in good heart to ſupply the graſs with nouriſhment, that the roots may branch out after the corn is gone, there cannot be any conſiderable crop of clover; and as their roots are biennial, many of the ſtrongeſt plants will periſh ſoon after they are cut; and the weak plants, which had made but little progreſs before, will be the principal part of the crop for the ſucceeding year; which is frequently not worth ſtanding.

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381 How to ſow upland paſtures.

Therefore, when ground is laid down for graſs, there ſhould be no crop of any kind ſown with the ſeeds; or at leaſt the crop ſhould be ſown very thin, and the land ſhould be well ploughed and cleaned from weeds, otherwiſe the weeds will come up the firſt, and grow ſo ſtrong as to overbear the graſs, and if they are not pulled up, will entirely ſpoil it. The beſt ſeaſon to ſow the graſs ſeeds upon dry land, when no other crop is ſown with them, is about the middle of September or ſooner, if there is an appearance of rain: for the ground being then warm, if there happen ſome good ſhowers of rain after the ſeed is ſown, the graſs will ſoon make its appearance, and get ſufficient rooting in the ground before winter: ſo will not be in danger of having the roots turned out of the ground by froſt, eſpecially if the ground is well rolled before the froſt comes on, which will preſs it down, and fix the earth cloſe to the roots. Where this hath not been practiſed, the froſt has often looſened the ground ſo much, as to let in the air to the roots of the graſs, and done it great damage; and this has been brought as an objection to the autumnal ſowing of graſs; but it will be found to have no weight if the above direction is practiſed: nor is there any hazard of ſowing the graſs at this ſeaſon, but that of dry weather after the ſeeds are ſown; for if the graſs comes up well, and the ground is well rolled in the end of October, or the beginning of November, and repeated again the beginning of March, the ſward will be cloſely joined at bottom, and a good crop of hay may be expected the ſame ſummer. But where the ground cannot be prepared for ſowing at that ſeaſon, it may be performed the middle or latter end of March, according to the ſeaſon's being early or late; for, in backward ſprings, and in cold land, we have often ſowed the graſs in the middle of April with ſucceſs; but there is danger, in ſowing late, of dry weather, and eſpecially if the land is light and dry; for we have ſeen many

times

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times the whole furface of the ground removed by ftrong winds at that feafon; fo that the feeds have been driven in heaps to one fide of the field. Therefore, whenever the feeds are fown late in the fpring, it will be proper to roll the ground well foon after the feeds are fown, to fettle the furface, and prevent its being removed.

The forts of feeds which are the beft for this purpofe, are, the beft fort of upland hay feeds, taken from the cleaneft paftures, where there are no bad weeds; if this feed is fifted to clean it from rubbifh, three bufhels will be fufficient to fow an acre of land. The other fort is the *trifolium pratenfe album*, which is commonly known by the names *white Dutch clover*, or *white honeyfuckle grafs*. Eight pounds of this feed will be enough for one acre of land. The grafs feed fhould be fown firft, and then the Dutch clover feed may be afterwards fown; but they fhould not be mixed together, becaufe the clover feeds being the heavieft will fall to the bottom, and conſequently the ground will be unequally fown.

When the feeds are come up, if the land fhould produce many weeds, thefe fhould be drawn out before they grow fo tall as to overbear the grafs; for where this has been neglected, the weeds have taken fuch poffeffion of the ground as to keep down the grafs, and ftarve it; and when thefe weeds have been fuffered to remain until they have fhed their feeds, the land has been fo plentifully ſtocked with them as entirely to deſtroy the grafs; therefore it is one of the principal parts of huſbandry never to ſuffer weeds to grow on the land.

382 Ivantages of rolling grafs.

If the ground is rolled two or three times at proper diſtances after the grafs is up, it will preſs down the grafs, and cauſe it to make a thicker bottom; for, as the Dutch clover will put out roots from every joint of the branches which are near the ground, ſo, by preſſing down of the ſtalks, the roots will mat ſo cloſely together, as to form a ſward ſo thick as to cover the whole ſurface of the ground, and form a green carpet, and will better reſiſt the drought. For if we do but examine the common paſtures in ſummer, in moſt of which there are patches of this white honeyſuckle graſs growing naturally, we ſhall find theſe patches to be the only verdure remaining in the fields. And this, the farmers in general acknowledge, is the ſweeteſt feed for all ſorts of cattle; yet never had any notion of propagating it by ſeeds, nor has this been long practiſed in England.

As the white clover is an abiding plant, ſo it is certainly the very beſt ſort to ſow, where paſtures are laid down to remain; for as the hay-ſeeds, which are taken from the beſt paſtures will be compoſed of various ſorts of graſs, ſome of which may be but annual, and others biennial; ſo, when thoſe go off, there will be many and large patches of ground left bare and naked, if there is not a ſufficient quantity of the white clover to ſpread over and cover the land. Therefore a good ſward can never be expected where this is not ſown; for in moſt of the natural paſtures, we find this plant makes no ſmall ſhare of the ſward; and it is equally good for wet and dry land, growing naturally upon gravel and clay in moſt parts of England: which is a plain indication how eaſily this plant may be cultivated to great advantage in moſt ſorts of land throughout this kingdom. Culture of Grafs.

Therefore the true cauſe why the land which has been in tillage is not brought to a good turf again, in the uſual method of huſbandry, is, from the farmers not diſtinguiſhing which graſſes are annual from thoſe which are perennial: for if annual or biennial graſſes are ſown, theſe will of courſe ſoon decay; ſo that, unleſs where ſome of their ſeeds may have ripened and fallen, nothing can be expected on the land but what will naturally come up. Therefore this, with the covetous method of laying down the ground with a crop of corn, has occaſioned the general failure of increaſing the paſture in many parts of Britain, where it is now much more valuable than any arable land.

After the ground has been ſown in the manner before directed, and brought to a good ſward, the way to preſerve it good is, by conſtantly rolling the ground with a heavy roller, every ſpring and autumn, as hath been before directed. This piece of huſbandry is rarely practiſed by farmers; but thoſe who do, find their account in it, for it is of great benefit to the graſs. Another thing ſhould alſo be carefully performed, which is, to cut up docks, dandelion, knapweed, and all ſuch bad weeds, by their roots every ſpring and autumn; this will increaſe the quantity of good graſs, and preſerve the paſtures in beauty. Dreſſing of theſe paſtures every third year is alſo a good piece of huſbandry; for otherwiſe it cannot be expected the ground ſhould continue to produce good crops. Beſides this, it will be neceſſary to change the ſeaſons of mowing, and not to mow the ſame ground every year, but to mow one ſeaſon and feed the next; for where the ground is every year mown, it muſt be conſtantly dreſſed, as are moſt of the graſs grounds near London, otherwiſe the ground will be ſoon exhauſted.

383 Culmiferous graſſes.

Culmiferous graſſes might be divided into two general claſſes for the purpoſes of the farmer, that it might be of uſe for him to attend to; viz. 1ſt, Thoſe which, like the common annual kinds of corn, run chiefly to ſeed-ſtalks; the leaves gradually decaying as they advance towards perfection, and becoming totally withered, or falling off entirely, when the ſeeds are ripe. Rye-graſs belongs to this claſs in the ſtricteſt ſenſe. To it likewiſe may be aſſigned the vernal graſs, dogs-tail graſs, and fine bent graſs. 2dly, Thoſe whoſe leaves continue to advance even after the ſeed-ſtalks are formed, and retain their verdure and ſucculence during the whole ſeaſon, as is the caſe with the feſcue and poa tribes of graſſes, whoſe leaves are as green and ſucculent when the ſeeds are ripe and the flower-ſtalks fading, as at any other time.

† *Tranſ. relating to Nat. Hiſt. &c.*

384 Culpable negligence of farmers about the proper kinds of graſſes.

"It is wonderful, Mr Stillingfleet ‡ remarks, to ſee how long mankind have neglected to make a proper advantage of plants of ſuch importance, and which, in almoſt every country, are the chief food of cattle. The farmer, for want of diſtinguiſhing and ſelecting graſſes for ſeed, fills his paſtures either with weeds or bad or improper graſſes; when, by making a right choice, after ſome trials, he might be ſure of the beſt graſs, and in the greateſt abundance that his land admits of. At preſent, if a farmer wants to lay down his land to graſs, what does he do? he either takes

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his ſeeds indiſcriminately from his own foul hay rack, or ſends to his next neighbour for a ſupply. By this means, beſides a certain mixture of all ſorts of rubbiſh, which muſt neceſſarily happen, if he chances to have a large proportion of good ſeeds, it is not unlikely but that what he intends for dry land may come from moiſt, where it grew naturally, and the contrary. This is ſuch a ſlovenly method of proceeding, as one would think could not poſſibly prevail univerſally: yet this is the caſe as to all graſſes except the darnel-graſs, and what is known in ſome few counties by the name of the *Suffolk-graſs*; and this latter inſtance is owing, I believe, more to the ſoil than any care of the huſbandman. Now, would the farmer be at the pains of ſeparating once in his life half a pint or a pint of the different kinds of graſs ſeeds, and take care to ſow them ſeparately, in a very little time he would have wherewithal to ſtock his farm properly, according to the nature of each ſoil, and might at the ſame time ſpread theſe ſeeds ſeparately over the nation, by ſupplying the ſeed ſhops. The number of graſſes fit for the farmer is, I believe, ſmall; perhaps half a dozen or half a ſcore are all he need to cultivate; and how ſmall the trouble would be of ſuch a taſk, and how great the benefit, muſt be obvious to every one at firſt ſight. Would not any one be looked on as wild who ſhould ſow wheat, barley, oats, rye, peaſe, beans, vetches, buck-wheat, turnips, and weeds, of all ſorts together? yet how is it much leſs abſurd to do what is equivalent in relation to graſſes? Does it not import the farmer to have good hay and graſs in plenty? and will cattle thrive equally on all ſorts of food? We know the contrary. Horſes will ſcarcely eat hay that will do well enough for oxen and cows. Sheep are particularly fond of one ſort of graſs, and fatten upon it faſter than any other, in Sweden, if we may give credit to Linnæus. And may they not do the ſame in Britain? How ſhall we know till we have tried?"

385 Kinds of graſs commonly ſown.

The graſſes commonly ſown for paſture, for hay, or to cut green for cattle, are red clover, white clover, yellow clover, rye-graſs, narrow-leaved plantane, commonly called *ribwort*, ſainfoin, and lucerne.

Red clover is of all the moſt proper to be cut green for ſummer food. It is a biennial plant when ſuffered to perfect its ſeed; but when cut green, it will laſt three years, and in a dry ſoil longer. At the ſame time the ſafeſt courſe is to let it ſtand but a ſingle year: if the ſecond year's crop happen to be ſcanty, it proves, like a bad crop of peaſe, a great encourager of weeds, by the ſhelter it affords them.

Here, as in all other crops, the goodneſs of ſeed is of importance. Chooſe plump ſeed of a purple colour, becauſe it takes on that colour when ripe. It is red when hurt in the drying, and of a faint colour when unripe.

386 Of red clover.

Red clover is luxuriant upon a rich ſoil, whether clay, loam or gravel: it will grow even upon a moor, when properly cultivated. A wet ſoil is its only bane; for there it does not thrive.

To have red clover in perfection, weeds muſt be extirpated, and ſtones taken off. The mould ought to be made as fine as harrowing can make it; and the ſurface be ſmoothed with a light roller, if not ſufficiently ſmooth without it. This gives opportunity for diſtributing the ſeed evenly; which muſt be covered by a ſmall harrow with teeth no larger than thoſe of a garden rake, three inches long, and ſix inches aſunder *. In harrowing, the man ſhould walk behind with a rope in his hand fixed to the back part of the harrow, ready to diſentangle it from ſtones, clods, turnip or cabbage roots, which would trail the ſeed, and diſplace it.

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* Plate VIII. fig.

Nature has not determined any preciſe depth for the ſeed of red clover more than of other ſeed. It will grow vigorouſly from two inches deep, and it will grow when barely covered. Half an inch may be reckoned the moſt advantageous poſition in clay ſoil, a whole inch in what is light or looſe. It is a vulgar error, that ſmall ſeed ought to be ſparingly covered. Miſled by that error, farmers commonly cover their clover ſeed with a buſhy branch of thorn; which not only covers it unequally, but leaves part on the ſurface to wither in the air.

The proper ſeaſon for ſowing red clover, is from the middle of April to the middle of May. It will ſpring from the firſt of March to the end of Auguſt; but ſuch liberty ought not to be taken except from neceſſity.

There cannot be a greater blunder in huſbandry than to be ſparing of ſeed. Ideal writers talk of ſowing an acre with four pounds. That quantity of ſeed, ſay they, will fill an acre with plants as thick as they ought to ſtand. This rule may be admitted where grain is the object; but it will not anſwer with reſpect to graſs. Graſs ſeeds cannot be ſown too thick: the plants ſhelter one another; they retain all the dew; and they muſt puſh upward, having no room laterally. Obſerve the place where a ſack of peaſe, or of other grain, has been ſet down for ſowing: the ſeed dropt there accidentally grows more quickly than in the reſt of the field ſown thin out of hand. A young plant of clover, or of ſainfoin, according to Tull, may be raiſed to a great ſize where it has room; but the field will not produce half the quantity. When red clover is ſown for cutting green, there ought not to be leſs than 24 pounds to an acre. A field of clover is ſeldom too thick: the ſmaller a ſtem be, the more acceptable it is to cattle. It is often too thin; and when ſo, the ſtems tend to wood.

387 Of ſowing clover with grain.

Grain may be ſown more ſafely with red clover than with almoſt any other graſs; and the moſt proper grain has been found to be flax. The ſoil muſt be highly cultivated for flax as well as for red clover. The proper ſeaſon of ſowing is the ſame for both; the leaves of flax being very ſmall, admit of free circulation of air; and flax being an early crop, is removed ſo early as to give the clover time for growing. In a rich ſoil it has grown ſo faſt, as to afford a good cutting that very year. Next to flax, barley is the beſt companion to clover. The ſoil muſt be looſe and free for barley; and ſo it ought to be for clover: the ſeaſon of ſowing is the ſame; and the clover is well eſtabliſhed in the ground before it is overtopped by the barley. At the ſame time, barley commonly is ſooner cut than either oats or wheat. In a word, barley is rather a nurſe than a ſtepmother to clover during its infancy. When clover is ſown in ſpring upon wheat, the ſoil which has lain five or ſix months without being ſtirred, is an improper bed for it; and the wheat, being in the vigour of growth,

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overtops it from the beginning. It cannot be ſown along with oats, becauſe of the hazard of froſt; and when ſown as uſual among the oats three inches high, it is overtopped, and never enjoys free air till the oats be cut. Add, that where oats are ſown upon the winter furrow, the ſoil is rendered as hard as when under wheat.—Red clover is ſometimes ſown by itſelf without other grain: but this method, beſide loſing a crop, is not ſalutary; becauſe clover in its infant ſtate requires ſhelter.

As to the quantity of grain proper to be ſown with clover: In a rich ſoil well pulverized, a peck of barley on an Engliſh acre is all that ought to be ventured; but there is not much ſoil in Scotland ſo rich. Two Linlithgow firlots make the proper quantity for an acre that produces commonly ſix bolls of barley; half a firlot for what produces nine bolls. To thoſe who are governed by cuſtom, ſo ſmall a quantity will be thought ridiculous. Let them only conſider, that a rich ſoil in perfect good order, will from a ſingle ſeed of barley produce 20 or 30 vigorous ſtems. People may flatter themſelves with the remedy of cutting barley green for food, if it happen to oppreſs the clover. This is an excellent remedy in a field of an acre or two; but the cutting an extenſive field for food muſt be ſlow; and while one part is cutting, the clover is ſmothered in other parts.

388 White and yellow clover, ribwort, and rye-graſs.

The culture of white clover, of yellow clover, of ribwort, of rye-graſs, is the ſame in general with that of red clover. We proceed to their peculiarities. Yellow clover, ribwort, rye-graſs, are all of them early plants, blooming in the end of April or beginning of May. The two latter are evergreens, and therefore excellent for winter paſture. Rye-graſs is leſs hurt by froſt than any of the clovers, and will thrive in a moiſter ſoil: nor in that ſoil is it much affected by drought. In a rich ſoil, it grows four feet high: even in the dry ſummer 1775, it roſe to three feet eight inches; but it had gained that height before the drought come on. Theſe graſſes are generally ſown with red clover for producing a plentiful crop. The proportion of ſeed is arbitrary; and there is little danger of too much. When rye-graſs is ſown for procuring ſeed, five firlots wheat meaſure may be ſown on an acre; and for procuring ſeed of ribwort, 40 pounds may be ſown. The roots of rye-graſs ſpread horizontally: they bind the ſoil by their number; and though ſmall, are yet ſo vigorous as to thrive in hard ſoil. Red clover has a large tap-root, which cannot penetrate any ſoil but what is open and free; and the largeneſs of the root makes the ſoil ſtill more open and free. Rye-graſs, once a great favourite, appears to be diſcarded in many parts of Britain. The common practice has been, to ſow it with red clover, and to cut them promiſcuouſly the beginning of June for green food, and a little later for hay. This indeed is the proper ſeaſon for cutting red clover, becauſe at that time the ſeed of the rye-graſs is approaching to maturity, its growth is ſtopped for that year, as much as of oats or barley cut after the ſeed is ripe. Oats or barley cut green before the ſeed forms, will afford two other cuttings; which is the caſe of rye-graſs, of yellow clover, and of ribwort. By ſuch management, all the profit will be drawn that theſe plants can afford.

When red clover is intended for ſeed, the ground ought to be cleared of weeds, were it for no other purpoſe than that the ſeed cannot otherwiſe be preſerved pure; what weeds eſcape the plough ought to be taken out by the hand. In England, when a crop of ſeed is intended, the clover is always firſt cut for hay. This appears to be done, as in fruit trees, to check the growth of the wood, in order to encourage the fruit. This practice will not anſwer in Scotland, as the ſeed would often be too late for ripening. It would do better to eat the clover with ſheep till the middle of May, which would allow the ſeed to ripen. The ſeed is ripe when, upon rubbing it between the hands, it parts readily from the huſk. Then apply the ſcythe, ſpread the crop thin, and turn it carefully. When perfectly dry, take the firſt opportunity of a hot day for threſhing it on boards covered with a coarſe ſheet. Another way, leſs ſubject to riſk, is to ſtack the dry hay, and to threſh it in the end of April. After the firſt threſhing, expoſe the huſks to the ſun, and threſh them over and over till no ſeed remain. Nothing is more efficacious than a hot ſun to make the huſk part with its ſeed; in which view it may be expoſed to the ſun by parcels, an hour or two before the flail is applied.

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White clover, intended for ſeed, is managed in the ſame manner. No plant ought to be mixed with rye-graſs that is intended for ſeed. In Scotland, much rye-graſs ſeed is hurt by tranſgreſſing that rule. The ſeed is ripe when it parts eaſily with the huſk. The yellowneſs of the ſtem is another indication of its ripeneſs; in which particular it reſembles oats, barley, and other culmiferous plants. The beſt manner to manage a crop of rye-graſs for ſeed, is to bind it looſely in ſmall ſheaves, widening them at the bottom to make them ſtand erect; as is done with oats in moiſt weather. In that ſtate they may ſtand till ſufficiently dry for threſhing. By this method they dry more quickly, and are leſs hurt by rain, than by cloſe binding and putting the ſheaves in ſhocks like corn. The worſt way of all is to ſpread the rye-graſs on the moiſt ground, for it makes the ſeed malten. The ſheaves, when ſufficiently dry, are carried in cloſe carts to where they are to be threſhed on a board, as mentioned above for clover. Put the ſtraw in a rick when a hundred ſtone weight or ſo is threſhed. Carry the threſhing board to the place where another rick is intended; and ſo on till the whole ſeed be threſhed, and the ſtraw ricked. There is neceſſity for cloſe carts to ſave the ſeed, which is apt to drop out in a hot ſun; and, as obſerved above, a hot ſun ought always to be choſen for threſhing. Carry the ſeed in ſacks to the granary or barn, there to be ſeparated from the huſks by a fanner. Spread the ſeed thin upon a timber floor, and turn it once or twice a-day till perfectly dry. If ſuffered to take a heat, it is uſeleſs for ſeed.

339 Culture of ſainfoin.

The writers on agriculture reckon ſainfoin preferable to clover in many reſpects: They ſay, that it produces a larger crop; that it does not hurt cattle when eaten green; that it makes better hay; that it continues four times longer in the ground; and that it will grow on land that will bear no other crop.

Sainfoin has a very long tap-root, which is able to pierce very hard earth. The roots grow very large; and the larger they are, they penetrate to the greater depth; and hence it may be concluded, that this graſs, when

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when it thrives well, receives a great part of its nouriſhment from below the *ſtaple* of the ſoil: of courſe, a deep dry ſoil is beſt for the culture of ſainfoin. When plants draw their nouriſhment from that part of the ſoil that is near the ſurface, it is not of much conſequence whether ther number be great or ſmall. But the caſe is very different when the plants receive their food, not only near, but alſo deep below, the ſurface. Beſides, plants that ſhoot their roots deep are often ſupplied with moiſture, when thoſe near the ſurface are parched with drought.

To render the plants of ſainfoin vigorous, it is neceſſary that they be ſown thin. The beſt method of doing this is by a drill; becauſe, when ſown in this manner, not only the weeds, but alſo the ſupernumerary plants, can eaſily be removed. It is ſeveral years before ſainfoin comes to its full ſtrength; and the number of plants ſufficient to ſtock a field, while in this imperfect ſtate, will make but a poor crop for the firſt year or two. It is therefore neceſſary that it be ſown in ſuch a manner as to make it eaſy to take up plants in ſuch numbers, and in ſuch order, as always to leave in the field the proper number in their proper places. This can only be done, with propriety, by ſowing the plants in rows by a drill. Suppoſing a field to be drilled in rows at ten inches diſtance, the partitions may be hand-hoed, and the rows dreſſed in ſuch a manner as to leave a proper number of plants. In this ſituation the field may remain two years; then one-fourth of the rows may be taken out in pairs, in ſuch a manner as to make the beds of fifty inches, with ſix rows in each, and intervals of thirty inches, which may be ploughed. Next year, another fourth of the rows may be taken out in the ſame manner, ſo as to leave double rows with partitions of ten inches, and intervals of thirty: All of which may be hoed at once or alternately, as it may be found moſt convenient.

The great quantity of this graſs which the writers on this ſubject aſſure us may be raiſed upon an acre, and the excellency and great value of the hay made of it, ſhould induce farmers to make a complete trial of it, and even to uſe the ſpade in place of the hoe, or hoe-plough, if neceſſary.

The plants taken up from a field of ſainfoin may be ſet in another field; and if the tranſplanting of this graſs ſucceeds as well as the tranſplanting of lucerne has done with M. Lunin de Chateauvieux, the trouble and expence will be ſufficiently recompenſed by the largeneſs of the crops. In tranſplanting, it is neceſſary to cut off great part of the long tap-root: this will prevent it from ſtriking very deep into the ſoil, and make it puſh out large roots in a ſloping direction, from the cut end of the tap-root. Sainfoin managed in this manner, will thrive even on ſhallow land that has a wet bottom, provided it be not overſtocked with plants.

Whoever inclines to try the culture of this graſs in Scotland, ſhould take great pains in preparing the land, and making it as free from weeds as poſſible.

In England, as the roots ſtrike deep in that chalky ſoil, this plant is not liable to be ſo much injured by drought as other graſſes are, whoſe fibres ſtrike horizontally, and lie near the ſurface. The quantity of hay produced is greater and better in quality than any other. But there is one advantage attending this graſs, which renders it ſuperior to any other; and that ariſes from feeding with it milch cows. The prodigious increaſe of milk which it makes is aſtoniſhing, being nearly double that produced by any other green food. The milk is alſo better, and yields more cream than any other; and the butter procured from it is much better coloured and flavoured.

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The following remarks by an Engliſh farmer are made from much experience and obſervation.

390 Remarks on the culture of ſainfoin in England.

Sainfoin is much cultivated in thoſe parts where the ſoil is of a chalky kind. It will always ſucceed well where the roots run deep; the worſt ſoil of all for it is where there is a bed of cold wet clay, which the tender fibres cannot penetrate. This plant will make a greater increaſe of produce, by at leaſt 30 times, than common graſs or turf on poor land. Where it meets with chalk or ſtone, it will extend its roots through the cracks and chinks to a very great depth in ſearch of nouriſhment. The dryneſs is of more conſequence than the richneſs of land for ſainfoin; although land that is both dry and rich will always produce the largeſt crops.

It is very commonly ſown broad-caſt; but it is found to anſwer beſt in drills, eſpecially if the land be made fine by repeated ploughing, rolling, and harrowing. Much depends on the depth at which this ſeed is ſown. If it be buried more than an inch deep, it will ſeldom grow; and if left uncovered, it will puſh out its roots above ground, and theſe will be killed by the air. March and the beginning of April are the beſt ſeaſons for ſowing it, as the ſeverity of winter and the drought of ſummer are equally unfavourable to the young plants. A buſhel of ſeed ſown broad-caſt, or half that quantity in drills, if good, is ſufficient for an acre. The drills ſhould be 30 inches apart, to admit of horſe-hoeing between them. Much, however, depends on the goodneſs of the ſeed, which may be beſt judged of by the following marks:

The huſk being of a bright colour, the kernel plump, of a gray or bluiſh colour without, and if cut acroſs, greeniſh and freſh withinſide; if it be thin and furrowed, and of a yellowiſh caſt, it will ſeldom grow. When the plants ſtand ſingle, and have room to ſpread, they produce the greateſt quantity of herbage, and the ſeed ripens beſt. But farmers in general, from a miſtaken notion of all that appears to be waſte ground being unprofitable, plant them ſo cloſe, that they choke and impoveriſh each other, and often die in a few years. Single plants run deepeſt and draw moſt nouriſhment; they are alſo eaſieſt kept free from weeds. A ſingle plant will often produce half a pound of hay, when dry. On rich land this plant will yield two good crops in a year, with a moderate ſhare of culture. A good crop muſt not be expected the firſt year; but, if the plants ſtand not too thick, they will increaſe in ſize the ſecond year prodigiouſly.

No cattle ſhould be turned on the field the firſt winter after the corn is off with which it was ſown, as their feet would injure the young plants. Sheep ſhould not come on the following ſummer, becauſe they would bite off the crown of the plants, and prevent their ſhooting again. A ſmall quantity of ſoapers aſhes as a top-dreſſing will be of great ſervice, if laid on the firſt winter.

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If the fainfoin be cut juft before it comes into bloom, it is admirable food for horned cattle; and if cut thus early, it will yield a fecond crop the fame feafon. But if it proves a wet feafon, it is better to let it ftand till its bloom be perfected; for great care muft be taken, in making it into hay, that the flowers do not drop off, as cows are very fond of them; and it requires more time than any other hay in drying. Sainfoin is fo excellent a fodder for horfes, that they require no oats while they eat it, although they be worked hard all the time. Sheep will alfo be fattened with it fafter than with any other food.

If the whole feafon for cutting proves very rainy, it is better to let the crop ftand for feed, as that will amply repay the lofs of the hay; becaufe it will not only fetch a good price, but a peck of it will go as far as a peck and a half of oats for horfes.

The beft time of cutting the feeded fainfoin is, when the greateft part of the feed is well filled, the firft blown ripe, and the laft blown beginning to open. For want of this care fome people have loft moft of their feed by letting it ftand too ripe. Seeded fainfoin fhould always be cut in a morning or evening, when the dews render the ftalks tender. If cut when the fun fhines hot, much of the feed will fall out and be loft.

301 excellence as a fodder.

An acre of very ordinary land, when improved by this grafs, will maintain four cows very well from the firft of April to the end of November; and afford, befides, a fufficient ftore of hay to make the greater part of their food the four months following.

If the foil be tolerably good, a field of fainfoin will laft from 15 to 20 years in prime; but at the end of feven or eight years, it will be neceffary to lay on a moderate coat of well-rotted dung; or, if the foil be very light and fandy, of marl. By this means the future crops, and the duration of the plants in health and vigour, will be greatly increafed and prolonged. Hence it will appear, that for poor land there is nothing equal to this grafs in point of advantage to the farmer.

Clover will laft only two years in perfection; and often, if the foil be cold and moift, near half the plants will rot, and bald patches be found in every part of the field the fecond year. Befides, from our frequent rains during the month of September, many crops left for feeding are loft. But from the quantity and excellent quality of this grafs (fainfoin), and its ripening earlier, and continuing in vigour fo much longer, much rifk and certain expence are avoided, and a large annual profit accrues to the farmer.

302 Culture of lucerne.

The writers on agriculture, ancient as well as modern, bellow the higheft encomiums upon lucerne as affording excellent hay, and producing very large crops. Lucerne remains at leaft 10 or 12 years in the ground, and produces about eight tons of hay upon the Scots acre. There is but little of it cultivated in Scotland. However, it has been tried in feveral parts of that country; and it is found, that, when the feed is good, it comes up very well, and ftands the winter froft. But the chief thing which prevents this grafs from being more ufed in Scotland, is the difficulty of keeping the foil open and free from weeds. In a few years the furface becomes fo hard, and the turf fo ftrong, that it deftroys the lucerne before the plants have arrived at their greateft perfection: fo that lucerne can fcarce be cultivated with fuccefs there, unlefs fome method be fallen upon of deftroying the natural grafs, and preventing the furface from becoming hard and impenetrable. This cannot be done effectually by any other means than horfe-hoeing. This method was firft propofed by Mr Tull, and afterwards practifed fucceffully by M. de Chateauvieux near Geneva. It may be of ufe therefore to give a view of that gentleman's method of cultivating lucerne.

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He does not mention any thing particular as to the manner of preparing the land; but only obferves, in general, that no pains fhould be fpared in preparing it. He tried the fowing of lucerne both in rows upon the beds where it was intended to ftand, likewife the fowing it in a nurfery, and afterwards tranfplanting it into the beds prepared for it. He prefers tranfplanting; becaufe, when tranfplanted, part of the tap-root is cut off, and the plant fhoots out a number of lateral branches from the cut part of the root, which makes it fpread its roots nearer the furface, and confequently renders it more eafily cultivated: befides, this circumftance adapts it to a fhallow foil, in which, if left in its natural ftate, it would not grow.

The tranfplanting of lucerne is attended with many advantages. The land may be prepared in the fummer for receiving the plants from the nurfery in autumn; by which means the field muft be in a much better fituation than if the feed had been fown upon it in the fpring. By tranfplanting, the rows can be made more regular, and the intended diftances more exactly obferved; and confequently the hoeing can be performed more perfectly, and with lefs expence. M. Chateauvieux likewife tried the lucerne in fingle beds three feet wide, with fingle rows; in beds three feet nine inches wide, with double rows; and in beds four feet three inches wide, with triple rows. The plants in the fingle rows were fix inches afunder, and thofe in the double and triple rows were about eight or nine inches. In a courfe of three years he found, that a fingle row produced more than a triple row of the fame length. The plants of lucerne, when cultivated by tranfplantation, fhould be at leaft fix inches afunder, to allow them room for extending their crowns.

He further obferves, that the beds or ridges ought to be raifed in the middle; that a fmall trench, two or three inches deep, fhould be drawn in the middle; and that the plants ought to be fet in this trench, covered with earth up to the neck. He fays, that if the lucerne be fown in fpring, and in a warm foil, it will be ready for tranfplanting in September; that, if the weather be too hot and dry, the tranfplanting fhould be delayed till October; and that, if the weather be unfavourable during both thefe months, this operation muft be delayed till fpring. He further directs, that the plants fhould be carefully taken out of the nurfery, fo as not to damage the roots; that the roots be left only about fix or feven inches long; that the green crops be cut off within about two inches of the crown; that they be put into water as foon as taken up, there to remain till they are planted; and that they fhould be planted with a planting ftick, in the fame manner as cabbages.

He does not give particular directions as to the times of horfe-hoeing; but only fays, in general, that the

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the intervals ſhould be ſtirred once in the month during the whole time that the lucerne is in a growing ſtate. He likewiſe obſerves, that great care ought to be taken not to ſuffer any weeds to grow among the plants, at leaſt for the firſt two or three years; and for this purpoſe, that the rows, as well as the edges of the intervals where the plough cannot go, ſhould be weeded by the hand.

393 Culture of burnet.

Burnet is peculiarly adapted to poor land; beſides, it proves an excellent winter-paſture when hardly any thing elſe vegetates. Other advantages are, It makes good butter; it never blows or ſwells cattle; it is fine paſture for ſheep; and will flouriſh well on poor, light, ſandy, or ſtony ſoils, or even on dry chalk hills.

The cultivation of it is neither hazardous nor expenſive. If the land is prepared as is generally done for turnips, there is no danger of its failing. After the firſt year, it will be attended with very little expence, as the flat circular ſpread of its leaves will keep down, or prevent the growth of weeds.

On the failure of turnips, either from the fly or the black worm, ſome of our farmers have ſown the land with burnet, and in March following had a fine paſture for their ſheep and lambs. It will perfect its ſeed twice in a ſummer; and this ſeed is ſaid to be as good as oats for horſes; but it is too valuable to be applied to that uſe.

It is ſometimes ſown late in the ſpring with oats and barley, and ſucceeds very well; but it is beſt to ſow it ſingly in the beginning of July, when there is a proſpect of rain, on a ſmall piece of land, and in October following tranſplant it in rows two feet apart, and about a foot diſtant in the rows. This is a proper diſtance, and gives opportunity for hoeing the intervals in the ſucceeding ſpring and ſummer.

After it is ſed down with cattle, it ſhould be harrowed clean. Some horſes will not eat it freely at firſt, but in two or three days they are generally very fond of it. It affords rich pleaſant milk, and in great plenty.

A gentleman farmer near Maidſtone, ſome years ſince, ſowed four acres as ſoon as the crop of oats was got off, which was the latter end of Auguſt. He threw in 12 pounds of ſeed per acre, broaſt-caſt; and no rain falling until the middle of September, the plants did not appear before the latter end of that month. There was however a good crop; and in the ſpring he ſet the plants out with a turnip hoe, leaving them about a foot diſtant from each other. But the drill method is preferable, as it ſaves more than half the ſeed. The land was a poor dry gravel, not worth three ſhillings an acre for any thing elſe.

The ſevereſt froſt never injures this plant; and the oftener it is fed the thicker are its leaves, which ſpring conſtantly from its root.

We ſhall here enumerate a few more of the graſſes which have been accounted valuable, or are likely to become ſo.

394 Bulbous foxtail-graſs.

Alopecurus bulboſus, BULBOUS FOXTAIL GRASS, is recommended by Dr Anderſon *, as promiſing on ſome occaſions to afford a valuable paſture-graſs. It ſeems chiefly, he obſerves, to delight in a moiſt ſoil, and therefore promiſes to be only fit for a meadow paſture-graſs. The quality that firſt recommended it to his notice, was the unuſual firmneſs that its matted roots gave to the ſurface of the ground, naturally ſoft and moiſt, in which it grew; which ſeemed to promiſe that it might be of uſe upon ſuch ſoils, chiefly in preventing them from being much poached by the feet of cattle which might paſture upon them. Moſſy ſoils eſpecially are ſo much hurt by poaching, that any thing that promiſes to be of uſe in preventing it deſerves to be attended to.

* *Eſſays on Agriculture*, &c.

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395 Great Meadow-graſs.

Poa pratenſis, GREAT MEADOW-GRASS, ſeems to approach in many reſpects to the nature of the purple feſcue; only that its leaves are broader, and not near ſo long, being only about a foot or 16 inches at their greateſt length. Like it, it produces few ſeed ſtalks and many leaves, and is an abiding plant. It affects chiefly the dry parts of meadows, though it is to be found on moſt good paſtures. It is very retentive of its ſeeds, and may therefore be ſuffered to remain till the ſtalks are quite dry. It bloſſoms the beginning of June, and its ſeeds are ripe in July.

396 Creeping meadow graſs.

Poa compreſſa, CREEPING MEADOW-GRASS, according to Dr Anderſon, ſeems to be the moſt valuable graſs of any of this genus. Its leaves are firm and ſuculent, of a dark Saxon-green colour; and grow ſo cloſe upon one another, as to form the richeſt pile of paſture-graſs. The flower-ſtalks, if ſuffered to grow, appear in ſufficient quantities: but the growth of theſe does not prevent the growth of the leaves, both advancing together during the whole ſummer; and when the ſtalks fade, the leaves continue as green as before. Its leaves are much larger and more abundant than the common meadow-graſs, *poa trivialis*; and therefore it better deſerves to be cultivated.

397 Vernal graſs.

Anthoxanthum odoratum, VERNAL GRASS, grows very commonly on dry hills, and likewiſe on found rich meadow-land. It is one of the earlieſt graſſes we have; and from its being found on ſuch kinds of paſtures as ſheep are fond of, and from whence excellent mutton comes, it is moſt likely to be a good graſs for ſheep paſtures. It gives a grateful odour to hay. In one reſpect, it is very eaſy to gather, as it ſheds its ſeeds upon the leaſt rubbing. A correſpondent of the Bath Society, however, mentions a difficulty that occurs in collecting them, owing to its being ſurrounded with taller graſſes at the time of its ripening, and being almoſt hid among them. If it be not carefully watched when nearly ripe, he obſerves, and gathered within a few days after it comes to maturity, great part of the ſeed will be loſt. The twiſted elaſtic awns, which adhere to the ſeed, lift them out of their receptacles with the leaſt motion from the wind, even while the ſtraw and ear remain quite erect. It is found moſtly in the moiſt parts of meadows; very little of it on dry paſtures. It flowers about the beginning of May, and is ripe about the middle of June.

398 Creſted dog's-tail graſs.

Cynoſurus criſtatus, CRESTED DOG'S TAIL GRASS. Mr Stillingfleet imagines this graſs to be proper for parks, from his having known one, where it abounds, that is famous for excellent veniſon. He recommends it alſo, from experience, as good for ſheep; the beſt mutton he ever taſted, next to that which comes from hills where the purple and ſheep's feſcue, the fine bent, and the ſilver hair graſſes abound, having been from ſheep fed with it. He adds, that it makes a very fine turf upon dry ſandy or chalky ſoils: but unleſs ſwept over with the ſcythe, its flowering-ſtems will look brown;

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brown; which is the caſe of all graſſes which are not fed on by variety of animals. For that ſome animals will eat the flowering ſtems is evident from commons, where ſcarcely any parts of graſſes appear but the radical leaves. This graſs is ſaid to be the eaſieſt of the whole group to collect a quantity of ſeeds from. It flowers in June, and is ripe in July.

309 Cock's-tail, or feather graſs.

Stipa pennata, COCK'S-TAIL, or FEATHER GRASS.

400 Fine bent.

Agroſtis capillaris, FINE BENT, is recommended by Mr Stillingfleet, from his having always found it in great plenty on the beſt ſheep paſtures in the different counties of England that are remarkable for good mutton. This graſs flowers and ripens its ſeed the lateſt of them all. It ſeems to be loſt the former part of the year, but vegetates luxuriantly towards the autumn. It appears to be fond of moiſt grounds. It retains its ſeed till full ripe; flowers the latter end of July, and is ripe the latter end of Auguſt.

401 Mountain hair.

Aira flexuoſa, MOUNTAIN HAIR.

402 Silver hair.

—— *caryophillea*, SILVER HAIR.

The ſame may be ſaid of theſe two graſſes as of the preceding one.

403 Flote feſcue.

Feſtuca fluitans, FLOTE FESCUE. In a piece publiſhed in the Amœnitates Academicæ, vol. iii. entitled *Plantæ Eſculentæ*, we are informed, that "the ſeeds of this graſs are gathered yearly in Poland, and from thence carried into Germany, and ſometimes into Sweden, and ſold under the name of *manna ſeeds*.—Theſe are much uſed at the tables of the great, on account of their nouriſhing quality and agreeable taſte. It is wonderful (adds the author), that amongſt us theſe ſeeds have hitherto been neglected, ſince they are ſo eaſily collected and cleanſed." There is a clamminess on the ear of the flote feſcue, when the ſeeds are ripe, that taſtes like honey; and for this reaſon perhaps they are called *manna ſeeds*.

Linnæus (*Flor. Suec.* art. 95.) ſays that the bran of this graſs will cure horſes troubled with botts, if kept from drinking for ſome hours.

Concerning this graſs we have the following information by Mr Stillingfleet. "Mr Dean, a very ſenſible farmer at Ruſcomb, Berkſhire, aſſured me that a field, always lying under water, of about four acres, that was occupied by his father when he was a boy, was covered with a kind of graſs, that maintained five farm horſes in good heart from April to the end of harveſt, without giving them any other kind of food, and that it yielded more than they could eat. He, at my deſire, brought me ſome of the graſs, which proved to be the flote feſcue with a mixture of the marſh-bent; whether this laſt contributes much towards furniſhing ſo good paſture for horſes, I cannot ſay. They both throw out roots at the joints of the ſtalks, and therefore are likely to grow to a great length. In the index of dubious plants at the end of Ray's Synopſis, there is mention made of a graſs, under the name of *gramen caninum ſupinum longiſſimum*, growing not far from Saliſbury, 24 feet long. This muſt by its length be a graſs with a creeping ſtalk; and that there is a graſs in Wiltſhire growing in watery meadows, ſo valuable that an acre of it lets from 10 to 12 pounds, I have been informed by ſeveral perſons. Theſe circumſtances incline me to think it muſt be the flote feſcue; but whatever graſs it be, it certainly muſt deſerve to be inquired after.

Alopecurus pratenſis, MEADOW FOXTAIL. Linnæus ſays that this is a proper graſs to ſow on grounds that have been drained. Mr Stillingfleet was informed, that the beſt hay which comes to London is from the meadows where this graſs abounds. It is ſcarce in many parts of England, particularly Hereforddhire, Berkſhire, and Norfolk. It might be gathered at almoſt any time of the year from hay-ricks, as it does not ſhed its ſeeds without rubbing, which is the caſe of but few graſſes. It is among the moſt grateful of all graſſes to cattle. It is ripe about the latter end of June.

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404 Meadow foxtail.

405 Annual meadow graſs.

Poa annua, ANNUAL MEADOW GRASS. "This graſs (ſays Mr Stillingfleet) makes the fineſt of turfs. It grows everywhere by way ſides, and on rich ſound commons. It is called in ſome parts the *Suffolk graſs*. I have ſeen whole fields of it in High Suffolk without any mixture of other graſſes; and as ſome of the beſt ſalt butter we have in London comes from that county, it is moſt likely to be the beſt graſs for the dairy. I have ſeen a whole park in Suffolk covered with this graſs; but whether it afford good veniſon, I cannot tell, having never taſted of any from it. I ſhould rather think not, and that the beſt paſture for ſheep is alſo the beſt for deer. However, this wants trial. I remarked on Malvern-hill ſomething particular in relation to this graſs. A walk that was made there for the convenience of the water drinkers, in leſs than a year was covered in many places with it, though I could not find one ſingle plant of it beſides in any part of the hill. This was no doubt owing to the frequent treading, which above all things makes this graſs flouriſh; and therefore it is evident that rolling muſt be very ſerviceable to it. It has been objected, that this graſs is not free from *bents*, by which word is meant the flowering-ſtems. I anſwer, that this is moſt certainly true, and that there is no graſs without them. But the flowers and ſtems do not grow ſo ſoon brown as thoſe of other graſſes; and being much ſhorter, they do not cover the radical leaves ſo much; and therefore this graſs affords a more agreeable turf without mowing than any other whatever that I know of." The ſeeds of this ſpecies drop off before they are dry, and to appearance, before they are ripe. The utmoſt care is therefore neceſſary in gathering the blades, without which very few of the ſeeds will be ſaved. It ripens from the middle of April, to ſo late, it is believed, as the end of October; but moſtly diſappears in the middle of the ſummer. It grows in any ſoil and ſituation, but rather affects the ſhade.

406 Agroſtis cornucopiæ.

A new graſs from America (named *Agroſtis cornucopiæ*), was ſome time ago much advertiſed and extolled, as poſſeſſing the moſt wonderful qualities, and the ſeeds of it were ſold at the enormous rate of 68l. the buſhel. But we have not heard that it has at all anſwered expectation. On the contrary, we are informed by Dr Anderſon, in one of his publications*, that "it has upon trial been found to be good for nothing. Of the ſeeds ſown, few of them ever germinated: but enough of plants made their appearance, to aſcertain, that the graſs, in reſpect of quality, is among the pooreſt of the tribe; and that it is an *annual* plant, and altogether unprofitable to the farmer."

* *Bee*, vol. i. p. 38.

Chicorum Intybus, Chicory.

407 Chicory.

Mr Arthur Young has anxiouſly endeavoured to diffuſe a knowledge of this plant, and he appears to

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have been the firſt perſon that introduced it into the agriculture of England from France, where it grows naturally on the ſides of the roads and paths, and is ſometimes cultivated as a ſalad. When it has been ſown by itſelf, in ground prepared by good tillage, it has yielded two crops the ſame year. When ſown amongſt oats, no crop is expected till the following year. This plant defies the greateſt droughts, and reſiſts every ſtorm. Being of very early growth, its firſt leaves, which are large and tufted, ſpread ſidewiſe, and cover the ground ſo as to retain the moiſture and preſerve its roots from the heat which ſo often dries up every other vegetable production: it has not any thing to fear from ſtorms, for its thick and ſtiff ſtalks ſupport themſelves againſt the winds and heavieſt rains. The moſt ſevere cold and froſts cannot injure it. The quickneſs of its growth, above all, renders it moſt valuable, becauſe it furniſhes an abundance of ſalutary fodder in a ſeaſon, when the cattle, diſguſted with their dry winter food, greedily devour freſh plants.

This plant is greedily eaten by all ſorts of cattle, but it is difficult to make into hay. It is very voluminous, and drys ill, unleſs the weather be very favourable for it. The dry fodder, however, which it does yield, is eaten with pleaſure by the cattle. The following is the reſult of an experiment made with it by Mr Young upon an acre of ground

Annals of Agriculture, vol. xv.

ſown April 1788.

	Green produce. Tons	cwt.
Cut July 24,	9	10
October 17,	9	14
Produce of the year of ſowing,	19	4
1789. Cut May 21,	12	11
July 24,	16	4
December 3,	9	14
Produce of the ſecond year,	38	9
1790. Cut June 8,	18	15
Auguſt 15,	19	9
Produce of the third year,	38	4

The following Engliſh graſſes are recommended to attention by Mr Curtis, author of the *Flora Londinenſis*; and he has given directions for making experiments with graſs ſeeds in ſmall quantities.

408 Tall oat-graſs.

"*Avena elatior*, *tall oat graſs*; common in wet meadows, and by the ſides of hedges; early, and very productive, but coarſe.

409 Yellow oat-graſs.

"*Avena flaveſcens*, *yellow oat-graſs*; affects a dry ſoil, is early and productive, bids fair to make a good ſheep paſture.

410 Rough oat-graſs.

"*Avena pubeſcens*, *rough oat-graſs*; ſoil and ſituation nearly ſimilar to that of the meadow feſcue; hardy, early, and productive.

411 Upright broom-graſs.

"*Bromus erectus*, *upright broom-graſs*; peculiar to chalky ſoils; early and productive; promiſes to be a good graſs for chalky lands, and thrives indeed very well on others.

412 Blue dogs-tail

"*Cynoſurus cæruleus*, *blue dogs-tail graſs*; earlieſt of all the graſſes; grows naturally on the tops of the higheſt limeſtone rocks in the northern part of Great Britain: not very productive, yet may perhaps anſwer in certain ſituations, eſpecially as a graſs for ſheep; bears the drought of ſummer remarkably well: at all events ſeems more likely to anſwer than the *ſheeps feſcue graſs*, on which ſuch encomiums have, moſt unjuſtly, been laviſhed.

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413 Rough cock's-foot graſs.

"*Dactylis glomeratus*, *rough cock's-foot graſs*; a rough coarſe graſs, but extremely hard and productive: ſoil and ſituation the ſame as the *meadow feſcue*.

414 Tall feſcue graſs.

"*Feſtuca elatior*, *tall feſcue graſs*; tall and coarſe, but very productive; affects wet ſituations.

415 Hard feſcue graſs.

"*Feſtuca duriuſcula*, *hard feſcue graſs*; affects ſuch ſituations as the *ſmooth-ſtalked meadow graſs*; is early and tolerably productive: its foliage is fine, and of a beautiful green; hence we have ſometimes thought it was of all others the fitteſt for a graſs-plat or bowling-green; but we have found, that though it thrives very much when firſt ſown or planted, it is apt to become thin, and die away after a while.

416 Meadow cat's-tail graſs.

"*Phleum pratenſe*, *meadow cats-tail graſs*; affects wet ſituations; is very productive, but coarſe and late."

To ſow graſs ſeeds in ſmall quantities, this author gives the following directions:—

417 Rules for making experiments with graſs ſeeds.

"If a piece of ground can be had, that is neither very moiſt nor very dry, it will anſwer for ſeveral ſorts of ſeed: they may then be ſown on one ſpot; but if ſuch a piece cannot be obtained, they muſt be ſown on ſeparate ſpots according to their reſpective qualities, no matter whether in a garden, a nurſery, or in a field, provided it be well ſecured and clean. Dig up the ground, level and rake it, then ſow each kind of ſeed thinly in a ſeparate row, each row about a foot apart, and cover them over lightly with the earth; the latter end of Auguſt or beginning of September will be the moſt proper time for this buſineſs. If the weather be not uncommonly dry the ſeeds will quickly vegetate, and the only attention they will require will be to be carefully weeded. In about a fortnight from their coming up, ſuch of the plants as grow thickly together may be thinned, and thoſe which are taken up tranſplanted ſo as to make more rows of the ſame graſs.

"If the winter ſhould be very ſevere, though natives, as ſeedlings, they may receive injury; therefore it will not be amiſs to protect them with mats, fern, or by ſome other contrivance.

"Advantage ſhould be taken of the firſt dry weather in the ſpring, to roll or tread them down, in order to faſten their roots in the earth, which the froſt generally looſens: care muſt ſtill be taken to keep them perfectly clear from weeds. As the ſpring advances, many of them will throw up their flowering ſtems, and ſome of them will continue to do ſo all the ſummer. As the ſeed in each ſpike or pannicle ripens, it muſt be very carefully gathered and ſown in the autumn, at which time the roots of the original plants, which will now bear ſeparating, ſhould be divided, and tranſplanted, ſo as to form more rows; the roots of the ſmooth-ſtalked meadow-graſs, in particular, creeping like couch-graſs, may readily be increaſed in this way; and thus by degrees a large plantation of theſe graſſes may be formed and much ſeed collected.

"While the ſeeds are thus increaſing, the piece or pieces

Culture of Grafs. pieces of ground, which are intended to be laid down, ſhould be got in order. If very foul, perhaps the beſt practice (if paſture land) will be to pare off the ſward and burn it on the ground: or if this ſhould not be thought adviſable, it will be proper to plough up the ground and harrow it repeatedly, burning the roots of couch-graſs and other noxious plants till the ground is become tolerably clean; to render it perfectly ſo, ſome cleanſing crop, as potatoes or turnips, ſhould be planted or ſown.

"By this means, the ground we propoſe laying down will be got into excellent order without much loſs; and being now ready to form into a meadow or paſture, ſhould be ſown broad-caſt with the following compoſitions:

Meadow fox-tail, one pint;
Meadow feſcue, ditto;
Smooth-ſtalked meadow, half a pint;
Rough-ſtalked meadow, ditto;
Creſted dog's-tail, a quarter of a pint;
Sweet ſcented vernal, ditto;
Dutch clover (trifolium repens), half a pint;
Wild red clover (trifolium pratenſe), or in its ſtead,
Broad clover of the ſhops, ditto;
For wet land, the *creſted dog's-tail* and *ſmooth-ſtalked meadow* may be omitted, eſpecially the former.

"Such a compoſition as this, ſown in the proportion of about three buſhels to an acre on a ſuitable ſoil, in a favourable ſituation, will, I am bold to aſſert, form in two years a moſt excellent meadow; and, as all the plants ſown are ſtrong, hardy perennials, they will not eaſily ſuffer their places to be uſurped by any noxious plants, which by manure or other means, in ſpite of all our endeavours, will be apt to inſinuate themſelves; if they ſhould, they muſt be carefully extirpated; for ſuch a meadow is deſerving of the greateſt attention: but if that attention cannot be beſtowed on it, and in proceſs of time weeds ſhould predominate over the crop originally ſown, the whole ſhould be ploughed up, and freſh ſown with the ſame ſeeds, or with a better compoſition, if ſuch ſhall be diſcovered; for I have no doubt but at ſome future time, it will be as common to ſow a meadow with a compoſition ſomewhat like this as it now is to ſow a field with wheat or barley.

"One of the moſt important improvements in agriculture that has occurred of late years, is the practice of overflowing or flooding graſs lands, which is now coming greatly into uſe, not only on level grounds, but in all ſituations in which a command of water can be obtained. In the Monthly Review for October 1788, the editors acknowledge the favour of a correſpondent, who informed them, that watering of meadows was practiſed during the reigns of Queen Elizabeth and James I. A book was written upon the ſubject by one Rowland Vaughan, who ſeems to have been the inventor of this art, and who practiſed it on a very extenſive plan in the Golden Valley in Herefordſhire. Till this note to the Reviewers appeared, the inhabitants of a village called South Cerney in Glouceſterſhire had aſſumed the honour of the invention to themſelves, as we are informed in a treatiſe upon the ſubject by the Rev. Mr Wright curate of the place. According to a received tradition in that village, watering of meadows has been practiſed there for about a century, and was introduced by one *Welladviſe*, a wealthy farmer in South Cerney. His firſt experiment was by cutting a large ditch in the middle of his ground, from which he threw the water over ſome parts, and allowed it to ſtagnate in others: but finding this not to anſwer his expectations, he improved his method by cutting drains and filling up the hollows; and thus he ſucceeded ſo well, that his neighbours, who at firſt called him a madman, ſoon changed their opinion, and began to imitate his example.

418 Then the watering of meadows as firſt practiſed in England.

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419 Advantages of watering.

"The advantages which attend the watering of meadows are many and great; not only as excellent crops of graſs are thus raiſed, but as they appear ſo early, that they are of infinite ſervice to the farmers for food to their cattle in the ſpring before the natural graſs riſes. By watering we have plenty of graſs in the beginning of March, and even earlier when the ſeaſon is mild. The good effects of this kind of graſs upon all ſorts of cattle are likewiſe aſtoniſhing, eſpecially upon ſuch as have been hardly wintered; and Mr Wright informs us, that the farmers in his neighbourhood, by means of watering their lands, are enabled to begin the making of cheeſe at leaſt a month ſooner than their neighbours who have not the ſame advantage. Graſs raiſed by watering is found to be admirable for the nurture of lambs; not only thoſe deſigned for fattening, but ſuch as are to be kept for ſtore: For if lambs when very young are ſtopped and ſtinted in their growth, they not only become contracted for life themſelves, but in ſome meaſure communicate the ſame diminutive ſize to their young. The beſt remedy for preventing this evil is the ſpring feed from watered meadows; and Mr Wright is of opinion, that if the young of all kinds of farmer's ſtock were immediately encouraged by plenty of food, and kept continually in a growing ſtate, there would in a few years be a notable change both in the ſize and ſhape of cattle in general. Such indeed is the forwardneſs of graſs from watered meadows, that the feed between March and May is worth a guinea per acre; and in June an acre will yield two tons of hay, and the after-math is always worth twenty ſhillings; and nearly the ſame quantity is conſtantly obtained whether the ſummer be dry or wet. In dry ſummers alſo, ſuch farmers as water their meadows have an opportunity of ſelling their hay almoſt at any price to their neighbours.

420 Land conſtantly improves by watering.

"Land treated in this manner is continually improving in quality, even though it be mown every year: the herbage, if coarſe at firſt, becomes finer; the ſoil, if ſwampy, becomes ſound; the depth of its mould is augmented, and its quality meliorated every year.

"To theſe advantages (ſays Mr Boſwell in his treatiſe upon this ſubject) another may be addreſſed to the gentleman who wiſhes to improve his eſtate, and whoſe benevolent heart prompts him to extend a charitable hand to the relief of the induſtrious poor, and not to idleneſs and vice: almoſt the whole of the expence in this mode of cultivation is the actual manual labour of a claſs of people who have no genius to employ their bodily ſtrength otherwiſe for their own ſupport and that of their families; conſequently when viewed in this light, the expence can be but comparatively ſmall, the improvement great and valuable."

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421 Example of the produce of a watered meadow.

As a proof of the above doctrine, Mr Wright adduces an inſtance of one year's produce of a meadow in his neighbourhood. It had been watered longer than the eldeſt perſon in the neighbourhood could remember; but was by no means the beſt meadow upon the ſtream, nor was the preceding winter favourable for watering. It contains ſix acres and a half. The ſpring feed was let for ſeven guineas, and ſupported near 200 ſheep from the 1ſt of March till the beginning of May: the hay being ſold for 30 guineas, and the after-math for ſix. Another and ſtill more remarkable proof of the efficacy of watering, is, that two of the moſt ſkilful watermen of that place were ſent to lay out a meadow of ſeven acres, the whole crop of which was that year ſold for two pounds. Though it was thought by many impoſſible to throw the water over it, yet the ſkill of the workmen ſoon overcame all difficulties; and ever ſince that time the meadow has been let at the rent of three pounds per acre. From manifold experience, our author informs us, that the people in that part of the country are ſo much attached to the practice of watering, that they never ſuffer the ſmalleſt ſpring or rivulet to be unemployed. Even thoſe temporary floods occaſioned by ſudden ſhowers are received into proper ditches, and ſpread equally over the lands until their fertilizing property be totally exhauſted. "Neceſſity (ſays he) indeed compels us to make the moſt of every drop: for we have near 300 acres in this pariſh, that muſt all, if poſſible, be watered; and the ſtream that affords the water ſeldom exceeds five yards in breadth and one in depth: therefore we may ſay, that a ſcarcity of water is almoſt as much dreaded by us as by the celebrated inhabitants of the banks of the Nile."

422 The practice of watering ought to be more generally extended.

Conſidering the great advantages to be derived from the practice of watering meadows, and the many undoubted teſtimonies in its favour, Mr Wright expreſſes his ſurpriſe, that it has not come into more general uſe, as there is not a ſtream of water upon which a mill can be erected but what may be made ſubſervient to the enriching of ſome land, perhaps to a great quantity. "I am confident (ſays he), that there are in each county of England and Wales 2000 acres upon an average which might be thus treated, and every acre increaſed at leaſt one pound in annual value. The general adoption therefore of watering is capable of being made a national advantage of more than 100,000l. per annum, beſides the great improvement of other land ariſing from the produce of the meadows and the employment of the induſtrious poor. Such an improvement, one would think, is not unworthy of public notice; but if I had doubled the ſum, I believe I ſhould not have exceeded the truth, though I might have gone beyond the bounds of general credibility. In this one pariſh where I reſide there are about 300 acres now watered: and it may be eaſily proved that the proprietors of the land reap from thence 1000l. yearly profit."

In Mr Boſwell's treatiſe upon this ſubject, publiſhed in 1790, the author complains of the neglect of the practice of improving the wet, boggy, and ruſhy lands, which lie at the banks of rivers, and might be meliorated at a very ſmall expence, when much larger ſums are expended in the improvement of barren uplands and large tracts of heath in various parts of the kingdom: and he complains likewiſe of the little information that is to be had in books concerning the method of performing this operation. The only author from whom he acknowledges to have received any information is Blyth; and even his method of watering is very different from that practiſed in modern times; for which reaſon he propoſes to furniſh an original treatiſe upon the ſubject; and of this we ſhall now give the ſubſtance.

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423 Land capable of being watered.

The firſt thing to be conſidered is, what lands are capable of being watered. Theſe, according to Mr Boſwell, are all ſuch as lie low, near the banks of rivulets and ſprings, eſpecially where the water courſe is higher than the lands, and kept within its bounds by banks. If the rivulet has a quick deſcent, the improvement by watering will be very great, and the expences moderate. On level lands the water runs but ſlowly, which is alſo the caſe with the large rivers; and therefore only a ſmall quantity of ground can be overflowed by them in compariſon of what can be done in other caſes: but the water of large rivers is generally poſſeſſed of more fertilizing properties than that of rivulets. In many caſes, however, the rivers are navigable, or have mills upon them; both of which are ſtrong objections to the perfect improvement of lands adjacent to them. From theſe conſiderations, our author concludes, that the watering of lands may be performed in the beſt and leaſt expenſive manner by ſmall rivulets and ſprings.

There are three kinds of ſoils commonly found near the banks of rivers and rivulets, the melioration of which may be attempted by watering. 1. A gravelly or ſound warm firm ſoil, or a mixture of the two together. This receives an almoſt inſtantaneous improvement; and the faſter the water runs over it the better. 2. Boggy, miry, and ruſhy ſoils, which are always found by the banks of rivers where the land is nearly level. Theſe alſo are greatly improved by watering; perhaps equally ſo with thoſe already deſcribed, if we compare the value of both in their unimproved ſtate, this kind of ground being ſcarce worth any thing in its unimproved ſtate. By proper watering, however, it may be made to produce large crops of hay, by which horned cattle may be kept through the winter and greatly forwarded; though, in its uncultivated ſtate, it would ſcarce produce any thing to maintain ſtock in the winter, and very little even in ſummer. Much more ſkill, as well as expence, however, is requiſite to bring this kind of land into culture than the former. 3. The ſoils moſt difficult to be improved are ſtrong, wet, and clay ſoils; and this difficulty is occaſioned both by their being commonly on a dead level, which will not admit of the water running over them; and by their tenacity, which will not admit of draining. Even when the utmoſt care is taken, unleſs a ſtrong body of water is thrown over them, and that from a river the water of which has a very fertilizing property, little advantage will be gained; but wherever ſuch advantages can be had in the winter, and a warm ſpring ſucceeds, theſe lands will produce very large crops of graſs.

424 Springs rivulets preferable to large rivers.

The advantage of uſing ſprings and rivulets for watering inſtead of large rivers is, that the expence of raiſing wares acroſs them will not be great; nor are they liable to the other objections which attend the

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uſe of large rivers. When they run through a cultivated country alſo, the land floods occaſioned by violent rains frequently bring with them ſuch quantities of manure as contribute greatly to fertilize the lands, and which are totally loſt where the practice of watering is not in uſe.

Springs may be uſeful to the coarſe lands that lie near them, provided the water can be had in ſufficient quantity to overflow the lands. "By ſprings (ſays our author), are not here meant ſuch as riſe out of poor heath or boggy lands (for the water iſſuing from them is generally ſo ſmall in quantity, and always ſo very lean and hungry in quality, that little if any advantage can be derived from it); but rather the head of rivulets and brooks riſing out of a chalky and gravelly ſound firm ſoil, in a cultivated country. Theſe are invaluable; and every poſſible advantage ſhould be taken to improve the ground near them. The author knows a conſiderable tract of meadow-land under this predicament; and one meadow in particular that is watered by ſprings iſſuing immediately out of ſuch a ſoil, without any advantage from great towns, &c. being ſituated but a ſmall diſtance below the head of the rivulet, and the rivulet itſelf is fed all the way by ſprings riſing out of its bed as clear as cryſtal. The ſoil of the meadow is a good loam ſome inches deep, upon a fine ſpringy gravel. Whether it is from the heat of the ſprings, or whether the friction by the water running over the ſoil raiſes a certain degree of warmth favourable to vegetation, or from whatever cauſe it ariſes, the fecundity of this water is beyond conception; for when the meadow has been properly watered and well drained, in a warm ſpring, the graſs has been frequently cut for hay within five weeks from the time the ſtock was taken out of it, having eat it bare to the earth: almoſt every year it is cut in ſix weeks, and the produce from one to three waggon loads to an acre. In land thus ſituated, in the mornings and evenings in the months of April, May, and June, the whole meadow will appear like a large furnace: ſo conſiderable is the ſteam or vapour which ariſes from the warmth of the ſprings acted upon by the ſun-beams: and although the water is ſo exceeding clear, yet upon its being thrown over the land only a few days in warm weather, by dribbling through the graſs, ſo thick a ſcum will ariſe and adhere to the blades of the graſs, as will be equal to a conſiderable quantity of manure ſpread over the land, and (it may be preſumed from the good effects) ſtill more enriching.

"It is inconceivable what 24 hours water properly conveyed over the lands will do in ſuch a ſeaſon: a beautiful verdure will ariſe in a few days where a parched ruſty ſoil could only be ſeen; and one acre will then be found to maintain more ſtock than ten could do before."

425 Explanation of the terms uſed in watering.

Mr Boſwell next proceeds to an explanation of the terms uſed in this art; of the inſtruments neceſſary to perform it; and of the principles on which it is founded. The terms uſed are:

1. A WARE. This is an erection acroſs a brook, rivulet, or river, frequently conſtructed of timber, but more commonly of bricks or ſtones and timber, with openings to let the water paſs, from two to ten in number according to the breadth of the ſtream: the height being always equal to the depth of the ſtream compared with the adjacent land. The uſe of this is occaſionally to ſtop the current, and to turn it aſide into the adjacent lands.

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2. A SLUICE is conſtructed in the ſame manner as a ware; only that it has but a ſingle paſſage for the water, and is put acroſs ſmall ſtreams for the ſame purpoſe as a ware.

3. A TRUNK is deſigned to anſwer the ſame purpoſes as a ſluice; but being placed acroſs ſuch ſtreams as either cattle or teams are to paſs over, or where it is neceſſary to carry a ſmall ſtream at right angles to a large one to water ſome lands lower down, is for theſe reaſons made of timber, and is of a ſquare figure. The length and breadth are various, as circumſtances determine.

4. A CARRIAGE is made of timber or of brick. If of timber, oak is the beſt; if of brick, an arch ought to be thrown over the ſtream that runs under it, and the ſides bricked up: But when made of timber, which is the moſt common material, it is conſtructed with a bottom and ſides as wide and high as the main in which it lies. It muſt be made very ſtrong, cloſe, and well jointed. Its uſe is to convey the water in one main over another, which runs at right angles to it; the depth and breadth are the ſame with thoſe of the main to which it belongs: and the length is determined by that which it croſſes. The carriage is the moſt expenſive inſtrument belonging to watering.

5. A DRAIN-SLUICE, or *Drain-Trunk*, is always placed in the lower part of ſome main, as near to the head as a drain can be found; that is, ſituated low enough to draw the main, &c. It is made of timber, of a ſquare figure like a trunk, only much ſmaller. It is placed with its mouth at the bottom of the main, and let down into the bank; and from its other end a drain is cut to communicate with ſome trench-drain that is neareſt. The dimenſions are various, and determined by circumſtances. The uſe of it is, when the water is turned ſome other way, to convey the leaking water that oozes through the hatches, &c. into the drain, that otherwiſe would run down into the tails of thoſe trenches which lie loweſt, and there poach and rot the ground, and probably contribute not a little to the making it more unſound for ſheep. This operation is of the utmoſt conſequence in watering; for if the water be not thoroughly drained off the land, the ſoil is rotted; and when the hay comes to be removed, the wheels of the carriages ſink, the horſes are mired, and the whole load ſometimes ſticks faſt for hours together. On the other hand, when the drain trunks are properly placed, the ground becomes firm and dry, and the hay is ſpeedily and eaſily removed.

7. HATCHES are beſt made of oak, elm, or deal; the uſe of them is to fit the openings of wares, trunks, or ſluices; and to keep back the water when neceſſary, from paſſing one way, to turn it another. They ought to be made to fit as cloſe as poſſible. When hatches belong to wares that are erected acroſs large ſtreams, or where the ſtreams fall quickly with heavy rains, when the hatches are in their places to water the meadows, they are ſometimes made ſo, that a foot or more of the upper part can be taken off, ſo that vent may be given to the ſuperfluous water, and yet enough retained for the purpoſe of watering the meadows. In

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this caſe, they are called *flood-hatches*: but Mr Boſwell entirely diſapproves of this conſtruction, and recommends them to be made entire, though they ſhould be ever ſo heavy, and require the aſſiſtance of a lever to raiſe them up. For when the water is very high, and the hatches are ſuddenly drawn up, the water falls with great force upon the bed of the ware, and in time greatly injures it: but when the whole hatch is drawn up a little way, the water runs off at the bottom, and does no injury.

8. A HEAD MAIN, is a ditch drawn from the river, rivulet, &c. to convey the water out of its uſual current, to water the lands laid out for that purpoſe, by means of leſſer mains and trenches. The head-main is made of various dimenſions, according to the quantity of land to be watered, the length or deſcent of it, &c. Smaller mains are frequently taken out of the head one; and the only difference is in point of ſize, the ſecondary mains being much ſmaller than the other. They are generally cut at right angles, or nearly ſo with the other, though not invariably. The uſe of the mains, whether great or ſmall, is to feed the trenches with water, which branch out into all parts of the meadow, and convey the water to float the land. By ſome, theſe ſmaller mains are improperly called *carriages*.

9. A TRENCH is a ſmall ditch made to convey the water out of the mains for the immediate purpoſe of watering the land. It ought always to be drawn in a ſtraight line from angle to angle, with as few turnings as poſſible. It is never deep, but the width is in proportion to the length it runs, and the breadth of the plane between that and the trench-drain. The breadth tapers gradually to the lower end.

10. A TRENCH-DRAIN is always cut parallel to the trench, and as deep as the tail-drain water will admit, when neceſſary. It ought always, if poſſible, to be cut down to a ſtratum of ſand, gravel, or clay. If into the latter, a ſpade's depth into it will be of great advantage. The uſe of it is to carry away the water immediately after it has run over the panes from the trench. It need not be drawn up to the head of the land by five, ſix, or more yards, according to the nature of the ſoil. Its form is directly the reverſe of the trench; being narrower at the head, and growing gradually wider and wider until it empties itſelf into the tail drain.

11. The TAIL-DRAIN is deſigned as a receptacle for all the water that flows out of the other drains, which are ſo ſituated that they cannot empty themſelves into the river. It ſhould run, therefore, nearly at right angles with the trenches, though generally it is thought moſt eligible to draw it in the loweſt part of the ground, and to uſe it to convey the water out of the meadows at the place where there is the greateſt deſcent; which is uſually in one of the fence-ditches: and hence a fence-ditch is uſually made uſe of inſtead of a tail drain, and anſwers the double purpoſe of fencing a meadow, and draining it at the ſame time.

12. A PANE of ground is that part of the meadow which lies between the trench and the trench-drain; and in which the graſs grows for hay. It is watered by the trenches, and drained by the trench-drains; whence there is a pane on each ſide of every trench.

13. A WAY-PANE is that part of the ground which lies in a properly watered meadow, on the ſide of the main where no trenches are taken out, but is watered the whole length of the main over its banks. A drain for carrying off the water from this pane runs parallel to the main. The uſe is to convey the hay out of the meadows, inſtead of the teams having to croſs all the trenches. Culture Graſs

14. A BEND is made in various parts of thoſe trenches which have a quick deſcent, to obſtruct the water. It is made, by leaving a narrow ſtrip of green ſward acroſs the trench where the bend is intended to be left; cutting occaſionally a piece of the ſhape of a wedge out of the middle of it. The uſe is to check the water, and force it over the trench into the panes; which, were it not for theſe bends, would run rapidly on in the trench, and not flow over the land as it paſſes along. The great art in watering conſiſts in giving to each part of the panes an equal proportion of water.

15. A GUTTER is a ſmall groove cut out from the tails of theſe trenches where the panes run longer at one corner than the other. The uſe is to carry the water to the extreme point of the pane. Thoſe panes which are interſected by the trench and tail-drains, meeting in an obtuſe angle, require the aſſiſtance of gutters to convey the water to the longeſt ſide. They are likewiſe uſeful, when the land has not been ſo well levelled, but ſome part of the panes lie higher than they ought: in which caſe, a gutter is drawn from the trench over that high ground, which otherwiſe would not be overflowed. Without this precaution, unleſs the flats be filled up (which ought always to be done when materials can be had to do it) the water will not riſe upon it; and after the watering ſeaſon is paſt, thoſe places would appear ruſty and brown, while the reſt is covered with beautiful verdure. Our author, however, is of opinion, that this method of treating water meadows ought never to be followed; but that every inequality in water meadows ſhould either be levelled or filled up. Hence the waterman's ſkill is ſhown in bringing the water over thoſe places to which it could not naturally riſe, and in carrying it off from thoſe where it would naturally ſtagnate.

16. A CATCH-DRAIN is ſometimes made uſe of when water is ſcarce. When a meadow is pretty long, and has a quick deſcent, and the water runs quickly down the drains, it is cuſtomary to ſtop one or more of them at a proper place, till the water flowing thither riſes ſo high as to ſtrike back either into the tail drains ſo as to ſtagnate upon the ſides of the panes, or till it flows over the banks of the drains, and waters the grounds below, or upon each ſide. It is then to be conveyed over the land in ſuch quantity as is thought proper, either by a ſmall main, out of which trenches are to be cut with their proper drains, or by trenches taken properly out of it. In caſe of a ſtagnation, the deſign will not ſucceed; and it will then be neceſſary to cut a paſſage to let the ſtagnating water runs off. Even when the method ſucceeds beſt, Mr Boſwell is of opinion, that it is not by any means eligible; the water having been ſo lately ſtrained over the ground, that it is ſuppoſed by the watermen not to be endowed with ſuch fertilizing qualities as at firſt; whence nothing but abſolute neceſſity can juſtify the practice.

17. A POND is any quantity of water ſtagnating upon

upon the ground, or in the tail-drain, trench-drains, &c. ſo as to annoy the ground near them. It is occaſioned ſometimes by the flats not having been properly filled up; at others, when the ware not being cloſe ſhut, in order to water ſome grounds higher up, the water is thereby thrown back upon the ground adjacent.

18. A TURN of water ſignifies as much ground as can be watered at once. It is done by ſhutting down the hatches in all thoſe wares where the water is intended to be kept out, and opening thoſe that are to let the water through them. The quantity of land to be watered at once muſt vary according to circumſtances; but Mr Boſwell lays down one general rule in this caſe, viz. that no more land ought to be kept under water at one time than the ſtream can ſupply regularly with a ſufficient quantity of water; and if this can be procured, water as much ground as poſſible.

19. The HEAD of the meadow, is that part of it into which the river, main, &c. firſt enter.

20. The TAIL is that part out of which the river, &c. laſt paſſes.

21. The UPPER SIDE of a main or trench, is that ſide which (when the main or trench is drawn at right angles, or nearly ſo, with the river) fronts the part where the river entered. The lower ſide is the oppoſite.

22. The UPPER PANE in a meadow, is that which lies on the upper ſide of the main or trench that is drawn at right angles with the river: where the river runs north and ſouth, it enters in the former direction, and runs out in the ſouthern, the main and trenches running eaſt and weſt. Then all thoſe panes which lie on the north ſide of the mains are called *upper* panes; and thoſe on the ſouth ſide the *lower* panes. But when the mains, trenches, &c. run parallel to the river, there is no diſtinction of panes into upper and lower.

The inſtruments uſed in watering meadows are:

1. A *Water level*. The uſe of this is to take the level of the land at a diſtance, and compare it with that of the river, in order to know whether the ground can be overflowed by it or not. This inſtrument, however, is uſed only in large undertakings; for ſuch as are on a ſmaller ſcale, the workmen diſpenſe with it in the following manner: In drawing a main, they begin at the head, and work deep enough to have the water follow them. In drawing a tail drain, they begin at the lower end of it and work upwards, to let the tail water come after them. By this method we obtain the moſt exact level.

2. The *Line*, *Reel*, and *Breaſt-Plough*, are abſolutely neceſſary. The line ought to be larger and ſtronger than that uſed by gardeners.

3. *Spades*. Thoſe uſed in watering meadows are made of a particular form, on purpoſe for the work: having a ſtem conſiderably more crooked than thoſe of any other kind. The bit is iron, about a foot wide in the middle, and terminating in a point: a thick ridge runs perpendicularly down the middle, from the ſtem almoſt to the point. The edges on both ſides are drawn very thin, and being frequently ground and whetted, the whole ſoon becomes narrow; after which the ſpades are uſed for trenches and drains; new ones being procured for other purpoſes. The ſtems being made crooked, the workmen ſtanding in the trench or drains are enabled to make the bottoms quite ſmooth and even.

4. *Wheel* and *Hand-barrows*. The former are uſed for removing the clods to the flat places, and are quite open, without any ſides or hinder part. The latter are of ſervice where the ground is too ſoft to admit the uſe of wheel-barrows, and when clods are to be removed during the time that the meadow is under water.

5. *Three-wheeled Carts* are neceſſary when large quantities of earth are to be removed; particularly when they are to be carried to ſome diſtance.

6. Short and narrow *Scythes* are made uſe of to mow the weeds and graſs, when the water is running in the trenches, drains, and mains.

7. *Forks*, and long *Crooks* with four or five tines, are uſed for pulling out the roots of ſedges, ruſhes, reeds, &c. which grow in the large mains and drains. The crooks ſhould be made light, and have long ſtems to reach wherever the water is ſo deep that the workmen cannot work in it.

8. Strong *Water-boots*, the tops of which will draw up half the length of the thigh, are indiſpenſably neceſſary. They muſt alſo be large enough to admit a quantity of hay to be ſtuffed down all round the legs, and be kept well tallowed to reſiſt the running water for many hours together.

426 Principles on which the practice of watering depends.

The principles on which the practice of watering meadows depend are few and eaſy.

1. Water will always riſe to the level of the receptacle out of which it is originally brought.

2. There is in all ſtreams a deſcent greater or ſmaller; the quantity of which is in ſome meaſure ſhown by the running of the ſtream itſelf. If it run ſmooth and ſlow, the deſcent is ſmall; but if rapidly and with noiſe, the deſcent is conſiderable.

3. Hence if a main be taken out of the river high enough up the ſtream, water may be brought from that river to flow over the land by the ſide of the river, to a certain diſtance below the head of the main, although the river from whence it is taken ſhould, oppoſite to that very place, be greatly under it.

4. Water, ſunk under a carriage which conveys another ſtream at right angles over it, one, two, or more feet below its own bed, will, when it has paſſed the carriage, riſe again to the level it had before.

5. Water conveyed upon any land, and there left ſtagnant for any length of time, does it an injury; deſtroying the good herbage, and filling the place with ruſhes, flags, and other weeds.

6. Hence it is abſolutely neceſſary, before the work is undertaken, to be certain that the water can be thoroughly drained off.

427 Wright's method

In Mr Wright's treatiſe upon this ſubject, the author conſiders a ſolution of the three following queſtions as a neceſſary preliminary to the operation of watering. 1. Whether the ſtream of water will admit of a temporary dam or ware acroſs it? 2. Can the farmer raiſe the water by this means a few inches above its level, without injuring his neighbour's land? 3. Can the water be drawn off from the meadow as quick as it is brought on? If a ſatisfactory anſwer can be given

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to all theſe queſtions, he directs to proceed in the following manner.

Having taken the level of the ground, and compared it with the river, as directed by Mr Boſwell, cut a deep wide nich as near the dam as poſſible, and by it convey the water directly to the higheſt part of the meadow; keeping the ſides or banks of the ditch of an equal height, and about three inches higher than the general ſurface of the meadow. Where the meadow is large, and has an uneven ſurface, it will ſometimes be neceſſary to have three works in different directions, each five feet wide, if the meadow contains 15 acres, and if the higheſt part be fartheſt from the ſtream. A ditch of 10 feet wide and three deep will commonly water 10 acres of land. When there are three works in a meadow, and flood hatches at the mouth of each, when the water is not ſufficient to cover the whole completely at once, it may be watered at three different times, by taking out one of the hatches, and keeping the other two in. In this caſe, when the water has run over one diviſion of the land for 10 days, it may then be taken off that and tumbled over to another, by taking up another hatch and letting down the former; by which means the three diviſions will have a proper ſhare of the water alternately, and each reap equal benefit. The bottom of the firſt work ought to be as deep as the bottom of the river, when the fall of the meadow will admit of it; for the deeper the water is drawn, the more mud it carries along with it. From the works, cut at right angles, ſmaller ditches or troughs, having a breadth proportioned to the diſtance to which ſome part of the water is to be carried, their diſtance from each other being about 12 yards. A trough two feet wide and one foot deep, will water a ſurface 12 yards wide and 40 feet long. In each trough as well as ditch place frequent ſtops and obſtructions, eſpecially when the water is rapid, to keep it high enough to flow through the notches or over the ſides. Each ditch and trough is gradually contracted in width, as the quantity of water conſtantly decreaſes the farther they proceed. Between every two troughs, and at an equal diſtance from both, cut a drain as deep as you pleaſe parallel to them, and wide enough to receive all the water that runs over the adjacent lands, and to carry it off into the maſter-drain with ſuch rapidity as to keep the whole ſheet of water in conſtant motion; and if poſſible, not to ſuffer a drop to ſtagnate upon the whole meadow. "For a ſtagnation, ſays he, (though it is recommended by a Mr D. Young for the improvement of arable land), is what we never admit in our ſyſtem of watering; for we find that it rots the turf, ſoaks and ſtarves the land, and produces nothing but coarſe graſs and aquatic weeds.

"When a meadow lies cold, flat, and ſwampy, the width of the bed, or the diſtance between the trough and drain, ought to be very ſmall, never exceeding ſix yards: indeed, in this caſe, you can ſcarcely cut your land too much, provided the water be plentiful; for the more you cut, the more water you require. The fall of the bed in every meadow ſhould be half an inch in a foot: leſs will do, but more is deſirable; for when the draught is quick, the herbage is always fine and ſweet. The water ought never to flow more than two inches deep, nor leſs than one inch, except in the warm months."

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Mr Wright proceeds now to anſwer ſome objections made by the Reviewers in their account of the firſt edition of his work. 1. That the Glouceſterſhire farmers uſe more works for their lands than is neceſſary. To this it is anſwered, That where water is plentiful, they find it advantageous to uſe even more water than he recommends; and when water is ſcarce, they chooſe rather to water only one half, or even a ſmaller portion of a meadow at a time, and to give that a plentiful covering, than to give a ſcanty one to the whole. 2. The Reviewers likewiſe recommend a repeated uſe of the ſame water upon different and lower parts of the ſame meadow, or to make each drain ſerve as a trough to the bed which is below it. But though this method is in ſome degree recommended by the celebrated Mr Bakewell, and taught by a ſyſtematic waterer in Staffordſhire, he entirely diſapproves of it; excepting where the great declivity of the land will not admit of any other plan. "This cannot (ſays he) be a proper mode of watering graſs-land in the winter time; for it can be of no ſervice to the loweſt parts of the meadow, unleſs as a wetting in ſpring or ſummer. The firſt or higheſt part of a meadow laid out according to this plan will indeed be much improved; the ſecond may reap ſome benefit; but the third, which receives the exhauſted thin cold water, will produce a very unprofitable crop. Our farmers never chooſe more than a ſecond uſe in the ſame meadow, and that very ſeldom; they call even the ſecond running by the ſignificant name of *ſmall beer*; which, they ſay, may poſſibly ſatisfy thirſt, but can give very little life or ſtrength to land. It is a much better method to have a meadow laid out ſo as to be watered at ſeveral times, and to be at the expence of ſeveral ſmall flood-hatches, than to water the whole of it at once by means of catch-drains.

428 Objection to his method anſwered.

429 A repeated uſe of the ſame water is not eligible.

"Sometimes it is neceſſary, in a large meadow, to convey the water that has been uſed under the works and troughs; and then the water above is ſupported by means of boards and planks, which we call a *carry-bridge*. Sometimes, the better to regulate the courſe of the water on the ſurface, eſpecially in the ſpring, narrow trenches are dug, and the mould laid by the ſide of them, in order to be reſtored to its former place when the watering is finiſhed. The earth and mud thrown out in cleanſing and paring the ditches ſhould be carried to fill up the low hollow parts of the meadow, and be trodden down with an even ſurface; which will eaſily be done when the water is on, the waterman being always provided with a ſtrong pair of water-proof boots. If the mould thus uſed has upon it a turf that is tolerably fine, place it uppermoſt; but if it is ſedgy and coarſe, turn it under, and the water if it runs quick will ſoon produce a fine herbage upon it.

"The grounds that are watered in the eaſieſt and moſt effectual manner, are ſuch as have been ploughed and ridged up in lands about twelve yards wide. Here the water is eaſily carried along the ridge by means of a ſmall ditch or trough cut along its ſummit, and then, by means of the ſtops in it, is made to run down the ſides or beds into the furrows, by which it is carried into

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into the maſter-drain, which empties itſelf into the river. Every meadow, before it is well watered, muſt be brought into a form ſomething like a field that has been thus left by the plough in a ridged ſtate. Each ſide of the ridge ſhould be as nearly as poſſible an exact inclined plane, that the water may flow over it as equally as may be." Mr Wright does not, like Mr Boſwell, diſapprove of the uſe of flood-hatches; he only gives the following hint, viz. that their baſis ſhould be deep and firmly fixed, well ſecured with ſtone and clay, that it be not blown up. The following directions are given for each month of watering.

430 Of cleaning and repairing the works.

In the beginning of November, all the ditches, troughs, and drains, are to be thoroughly cleanſed by the ſpade and breaſt-plough, from weeds, graſs, and mud; and well repaired, if they have received any injury from cattle.

431 Thick and muddy water to be uſed when it can be done.

After a ſhower, when the water is thick and muddy, turn over the meadow as much water as you can without injuring the banks of the works, eſpecially if the land be poor; as in this month, according to our author, the water contains many more fertilizing particles, which he calls *ſalts* and *richneſs*, than later in the winter. In defence of this poſition, of which it ſeems the Monthly Reviewers have doubted, our author urges, that though he is not able to prove it by any chemical analyſis, yet it ſeems evident, that "after the firſt waſhing of farm yards, various ſinks, ditches, and the ſurface of all the adjoining fields, which have lain dry for ſome time, the common ſtream ſhould then contain much more fatneſs than when the ſame premiſes have been repeatedly waſhed." This is confirmed by the experience of the Glouceſterſhire farmers; who, if they can at this ſeaſon of the year procure plenty of muddy water to overflow their grounds for one week, look upon it to be equally valuable with what is procured during all the reſt of the winter. In ſupport of this, he quotes the followings words of Mr Forbes, in a treatiſe on watering: "The water ſhould be let in upon the meadow in November, when the firſt great rains make it muddy, for then it is full of a rich ſediment, brought down from the lands of the country through which it runs, and is waſhed into it by the rain; and as the ſediment brought by the firſt floods is the richeſt, the carriages and drains of the meadow ſhould all be ſcoured clean and in order, before theſe floods come."

"In oppoſition (adds Mr Wright) to the opinion of practical waterers, that the muddineſs of the water is of little conſequence, I heſitate not to affirm, that the mud is of as much conſequence in winter-watering, as dung is in the improvement of a poor upland field. For each meadow in this neighbourhood is fruitful in proportion to the quantity of mud that it collects from the water. And, indeed, what can be conceived more enriching than the abundant particles of putrid matter which float in the water, and are diſtributed over the ſurface of the land, and applied home to the roots of the graſs. It is true, that any the moſt ſimple water thrown over a meadow in proper quantity, and not ſuffered to ſtagnate, will ſhelter it in winter, and in the warmth of ſpring will force a crop; but this unuſual force muſt exhauſt the ſtrength of the land, which will require an annual ſupply of manure in ſubſtance, or, in a courſe of years, the ſoil will be impaired rather than improved. The meadows in this county, which lie next below a market town or village, are invariably the beſt; and thoſe which receive the water after it has been two or three times uſed, reap proportionably leſs benefit from it: For every meadow that is well laid out, and has any quantity of graſs upon its ſurface, will act as a fine ſieve upon the water, which, though it flow in ever ſo muddy, will be returned back to the ſtream as clear as it came from the fountain. This circumſtance, when there is a range of meadows to be watered, the property of different perſons, when water is ſcarce, creates vehement contentions and ſtruggles for the firſt uſe of it. The proprietors are therefore compelled to agree among themſelves, either to have the firſt uſe alternately, or for the higher meadows to dam up, and uſe only one half or a leſs portion of the river. Our farmers know the mud to be of ſo much conſequence in watering, that whenever they find it collected at the bottom of the river, or the ditches, they hire men whole days to diſturb and raiſe it with rakes made for the purpoſe, that it may be carried down by the water, and ſpread upon their meadows. One meadow in South Cerney, I think, is an inconteſtible proof of the conſequence of muddy water. It is watered by a branch of the common ſtream that runs for about half a mile down a public road. This water, by the mud on the road being continually diſturbed by carriages and the feet of cattle, becomes very thick, and when it enters the meadow is almoſt as white as milk. This field, which conſiſts of ſeven acres, was a few years ago let for 10s. an acre, but is already become the richeſt land in the pariſh, and has produced at one crop eighteen loads of hay, and each load more than 25 hundred weight."

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432 Inſtance of the good effects of muddy water.

In further confirmation of what our author aſſerts, he quotes, from the Annals of Agriculture, the following words of Mr Wimpey: "As to the ſorts of water, little is to be found, I believe, which does not encourage and promote vegetation, even the moſt ſimple, elementary, and uncompounded fluid: heat and moiſture, as well as air, are the *ſine qua non* of vegetation as well as animal life. Different plants require different proportions of each to live and flouriſh; but ſome of each is abſolutely neceſſary to all. However, experience as well as reaſon univerſally ſhows, that the more turbid, feculent, and replete with putreſcent matter the water is, the more rich and fertilizing it proves. Haſty and impetuous rains, of continuance ſufficient to produce a flood, not only diſſolve the ſalts, but waſh the manure in ſubſtance off the circumjacent land into the rapid current. Such turbid water is both meat and drink to the land; and, by the unctuous ſediment and mud it depoſits, the ſoil is amazingly improved and enriched. The virtue of water from a ſpring, if at all ſuperior to pure elementary water, is derived from the ſeveral ſtrata or beds of earth it paſſes through, which, according to the nature of ſuch ſtrata, may be friendly or otherwiſe to vegetation. If it paſſes through chalk, marl, foſſil ſhells, or any thing of a calcareous nature, it would in moſt ſoils promote the growth of plants; but if through metallic ores, or earth impregnated with the vitriolic acid, it would render the land unfertile, if not wholly barren. In general the water that has run far is ſuperior to that which immediately flows from the ſpring, and more eſpecially that which is feculent and muddy, con-

433 Mr Wimpey's opinion upon the ſubject.

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434 Confirmed by Mr Forbes.

435 Mr Boſwell's opinion.

436 Advantag of land-floods.

437 Of conver ing arable land into paſture.

ſifting chiefly of putrid animal ſubſtances waſhed down the ſtream."

To the ſame purpoſe alſo ſays Mr Forbes: "There is great difference in the quality of water, ariſing from the particles of different kinds of matter mixed with them. Thoſe rivers that have a long courſe through good land, are full of fine particles, that are highly fertilizing to ſuch meadows as are uſually overflowed by them; and this chiefly in floods, when the water is fulleſt of a rich ſediment: for when the water is clear, though it may be raiſed by art high enough to overflow the adjoining lands, and be of ſome ſervice to them, the improvement thus made is far ſhort of what is obtained from the ſame water when it is thick and muddy."

Mr Boſwell, though quoted by Mr Wright as an advocate for the doctrine juſt now laid down, ſeems, in one part of his work at leaſt, to be of a contrary opinion. This is in the 14th chapter of his book, where he remarks upon another publication on the ſame ſubject, the name of which he does not mention: "In page 4. of that pamphlet (ſays Mr Boſwell), the writer informs us, 'if the water uſed be always pure and ſimple, the effect will by no means be equal to the above; that is, of a ſtream that is ſometimes thick and muddy. We have a ſtriking inſtance of this in two of our meadows, which are watered immediately from ſprings that ariſe in the grounds themſelves. Their crops are early and plentiful, but not of a good quality, and the land remains unimproved after many years watering.'

"The writer of this treatiſe (Mr Boſwell), in a former edition, had aſſerted, and in this repeated, the contrary effects from a ſtream very near the ſpring-head, as clear as cryſtal.

"The gentleman (Mr Beverly of Keld) whom that writer mentions in his preface, made a ſhort viſit laſt ſpring into Dorſetſhire, to ſatisfy himſelf of the fact. The editor had the pleaſure to ſhow him the ſtream alluded to, which he traced almoſt to the fountain-head. It was perfectly clear, and the water was then immediately conveyed out of the ſtream upon the lands adjoining, ſome of which it was then running over; others it had been upon, and the verdure was then appearing. The gentleman expreſſed himſelf perfectly ſatisfied with the fact. To him the editor wiſhes to refer, &c. Mr George Culley of Fenton near Wooler in Northumberland, with a truly noble and public ſpirit that does him great honour as a friend to his country, ſent a very ſenſible young man from thence into Dorſetſhire, to learn the art of watering meadows, and to work the whole ſeaſon in thoſe meadows under different watermen. This man was often over thoſe meadows, and worked in ſome juſt below that were watered by the ſame ſtream. Might the editor preſume to offer his opinion upon this ſeeming contradiction, it is very probable that the ſoils, both the upper and under ſtrata, are very diffrent, as well as thoſe through which the different ſprings run."

From this paſſage, the latter part of which is not very intelligible, we might conclude that Mr Boſwell prefers clear to muddy water for overflowing meadows. In his chapter on land-floods, however, he expreſſes himſelf as follows: "They will (ſays he) always be found of great uſe where the ſweepings of towns, farm-yards, &c. are carried down by them; feldom any other erection is wanting beſides a ſluice or ſmall ware to divert and convey them over the lands. If the ſituation of the land happen to be on the ſide of a hill, catch-drains are abſolutely neceſſary for watering the lower part of the hill, after the water has been uſed upon the upper. In many parts of the kingdom, where there are large hills or extenſive riſing lands, great quantities of water run from them into the valleys after heavy rains: Theſe might with proper attention be collected together before they get to the bottom or flat ground, and from thence be diverted to the purpoſe of watering thoſe lands that lie below, with great advantage to the occupier, and at a ſmall expence. And ſhould the land thus ſituated be arable, yet it would be found a beneficial exchange to convert it into paſture; particularly if paſture-ground ſhould be a deſirable object to the occupier. The method of performing it is thus recommended. Obſerve the piece of land or field beſt adapted to the purpoſe, both for ſituation and ſoil. If it ſhould be arable, make it firſt very level; and with the crop of corn ſow all ſorts of hay ſeeds; and as ſoon as it has got a green ſward it may be laid out. In the loweſt part of the ground draw a deep ditch for the current to run in through it; and continue it into ſome ditch or low part in the lands below, that the water may be freely carried off, after it has been and while it is in uſe. Draw ditches above the field intended to be watered aſlant the ſides of the hill, in ſuch a manner that they may all empty themſelves into the head of the ditch above mentioned, juſt where it enters the field to be watered; then erecting a ware acroſs this ditch, the field will be capable of being watered, according to the ſituation of the ditch in the middle or on the ſide of the field. It muſt then be conveyed by ſmall mains or trenches, and ſubdivided again by branch-trenches, according to the ſite of the field and quantity of water that can be collected; trench-drains muſt be drawn, and the water conveyed into the ditch by means of tail-drains. A perſon unacquainted with water-meadows cannot conceive the advantage ariſing from water thus collected, and conveyed over this ſpecies of water-meadow (if it may be ſo called), being generally a firm good ſoil; but the water running down from rich cultivated hills, eminences, &c. ſweeps away with it, when the rain falls very heavy, vaſt quantities of dung dropped by ſheep and other cattle, and the manure carried upon arable lands; all which being now diverted, and carried over the meadow with an eaſy deſcent, gives time for the particles of manure to ſubſide upon the ground at one ſeaſon, or of being filtered from it as it dribbles through the graſs at another; after which the warm weather puſhes on vegetation amazingly. Meadows thus ſituated would be vaſtly ſuperior to any other, if they had the advantage of a conſtant ſtream; but even as they are, taking the opportunity of watering them by every heavy rain or flood that happens, they will be found to be very valuable. The occupier of ſuch lands is ſtrenuouſly adviſed to let no time be loſt in appropriating them to this uſe; becauſe theſe lands are healthy for all kinds of cattle at almoſt all ſeaſons; and the expence of converting

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verting them into this kind of water-meadow is exceeding ſmall, the annual charges afterwards quite trifling, and the produce very conſiderable."

438 Mr Wright's directions for watering through the different months of the year.

Mr Wright, having diſcuſſed the ſubject of the quality of the water, proceeds to give directions for watering through the different months of the year;—"In December and January, the chief care conſiſts in keeping the land ſheltered by the water from the ſeverity of froſty nights. It is neceſſary, however, through the whole winter, every ten days or fortnight, to give the land air, by taking the water off entirely, otherwiſe it would rot and deſtroy the roots of the graſs. It is neceſſary, likewiſe, that a proper perſon ſhould go over every meadow at leaſt twice every week, to ſee that the water is equally diſtributed, and to remove all obſtructions ariſing from the continual influx of weeds, leaves, ſticks, and the like. In February, a great deal depends upon care and caution. If you now ſuffer the water to remain on the meadow for many days without intermiſſion, a white ſcum is raiſed, very deſtructive to the graſs; and if you take off the water, and expoſe the land to a ſevere froſty night, without its being previouſly dried for a whole day, the greateſt part of the tender graſs will be cut off. The only ways to avoid both theſe injuries are, either to take the water off by day to prevent the ſcum, and to turn it over again at night to guard againſt the froſt; or, if this practice be too troubleſome, both may be prevented by taking the water entirely off for a few days and nights, provided the firſt day of taking off be a dry one; for if the graſs experience one fine drying day, the froſt at night can do little or no injury. The ſcum is generated chiefly by the warmth of the ſun, when the water is thin and uſed too plentifully. Towards the middle of this month we vary our practice in watering, by uſing only about half the quantity of water which is made uſe of earlier in the winter, all that is now required being to keep the ground in a warm moiſt ſtate, and to force vegetation.

"At the beginning of March, the crop of graſs in the meadows is generally ſufficient to afford an abundant paſture for all kinds of ſtock, and the water is taken off for near a week, that the land may become dry and firm before the heavy cattle are turned in.—It is proper, the firſt week of eating off the ſpring-feed, if the ſeaſon be cold, to give the cattle a little hay each night."

439 f eating f the ring graſs ith ewes id lambs.

"It is a cuſtom (ſays Mr Wright) with ſome farmers in Hampſhire, to eat off the ſpring graſs of their meadows with ewes and lambs, in the ſame manner that we do a field of turnips, by incloſing a certain portion each day with hurdles or ſtakes, and giving them hay at the ſame time. This is certainly making the moſt of the graſs, and an excellent method to fine and ſweeten the future herbage. In this month and April, you may eat the graſs as ſhort and cloſe as you pleaſe, but never later; for if you treſpaſs only one week on the month of May, the hay-crop will be very much impaired, the graſs will become ſoft and woolly, and have more the appearance and quality of an after-math than a crop. At the beginning of May, or when the ſpring-feeding is finiſhed, the water is again uſed for a few days by way of wetting.

"It is rather remarkable, that watering in autumn, winter, or ſpring, will not produce that kind of herbage which is the cauſe of the rot in ſheep; but has been known to remove the cauſe from meadows, which before had that baneful effect. If, however, you uſe the water only a few days in any of the ſummer months, all the lands thus watered will be rendered unſafe for the paſturage of ſheep. Of this I was lately convinced from an experiment made by a friend. At the beginning of July, when the hay was carried off, and the water rendered extremely muddy and abundant by ſeveral days rain, he thought proper to throw it over his meadows for ten days, in which time a large collection of extremely rich manure was made upon the land. In about a month the meadow was covered with uncommon luxuriancy and blackneſs of herbage. Into this graſs were turned eight ſound ewes and two lambs. In ſix weeks time the lambs were killed, and diſcovered ſtrong ſymptoms of rottenneſs; and in about a month afterwards one of the ewes was killed, and though it proved very fat, the liver was putrid and replete with the inſect called the *fluke* or *weevil*: the other ewes were ſold to a butcher, and all proved unſound. This experiment, however, convinces me, by the very extraordinary improvement made thereby in the meadow, that muddy water in the ſummer is much more enriching than it is in autumn or winter; and ought, therefore, to be uſed for a week at leaſt every wet ſummer, notwithſtanding its inconveniences to ſheep, the moſt profitable ſpecies of ſtock."

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440 How watering may occaſion the rot in ſheep.

Mr Boſwell, beſides his general directions for watering, gives many plans of the ditches, drains, &c. for particular meadows, ſome of them done from an actual ſurvey. But theſe being confined to particular ſituations, we ſhall here only ſpeak of his method in general. In his third chapter, entitled *A general Deſcription of Water-meadows*, he obſerves, that "lands capable of being watered, lie ſometimes only on one ſide, and ſometimes on both ſides of the ſtream deſigned to ſupply them with water. In the former caſe, when they have a pretty quick deſcent, the land may be often watered by a main drawn out of the ſtream itſelf, without any ware;" though he acknowledges that it is by far the beſt way to erect a ware, and to draw mains on each ſide, to diſpoſe of the water to the beſt advantage.

441 Mr Boſwell's general directions for watering.

Boggy lands require more and longer continued watering than ſuch as are ſandy or gravelly; and the larger the body of water than can be brought upon them, the better. The weight and ſtrength of the water will greatly aſſiſt in compreſſing the ſoil, and deſtroying the roots of the weeds that grow upon it; nor can the water be kept too long upon it, particularly in the winter ſeaſon; and the cloſer it is ſed, the better.

To improve ſtrong clay ſoils, we muſt endeavour to the utmoſt to procure the greateſt poſſible deſcent from the trench to the trench drain; which is beſt done by making the trench-drains as deep as poſſible, and applying the materials drawn out of them to raiſe the trenches. Then, with a ſtrong body of water, taking the advantage of the autumnal floods, and keeping the water ſome time upon them at that ſeaſon, and as often as convenient during the winter, the greateſt improvement on this ſort of ſoils may be made. Warm ſand or gravelly ſoil, are the moſt profitable under the watering ſyſtem, provided the water can be brought over

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them at pleasure. In soils of this kind, the water must not be kept long at a time, but often shifted, thoroughly drained, and the land frequently refreshed with it: under which circumstances the profit is immense. A spring-feeding, a crop of hay, and two after-maths, may be obtained in a year; and this, probably, where in a dry summer scarce grass enough could be found to keep a sheep alive. If the stream be large, almost any quantity of land may be watered from it; and though the expence of a ware over it is great, it will soon be repaid by the additional crop. If the stream is small, the expence will be so in proportion.

442 Method of improving a springy water meadow.

The following method of improving a water meadow that was springy has been tried by Mr Boswell with success. The meadow had been many years watered by a spring rising just above it from a barren sandy heath; the soil near the surface was in some places a gravelly land, in others a spongy cork, both upon a strong clay and sand mixture, which retained the draining of the lands above it. Whenever it had been watered, and left to drain itself dry, a yellowish red water stood in many parts, and oozed out of others; the herbage being no other than a poor, miserable, hairy grass and small sedge. Chalk and ashes had been thrown over it to very little purpose. It was then drained underground athwart all the different descents, and all these drains carried into one large drain, which had been already cut for the purpose of carrying off the water when the meadow was overflowed. These drains were cut quite through the mixture of clay and sand, and as much deeper as the fall of the ground below would admit of; then, with chalk cut for the purpose, small hollow drains were formed at the bottom of these; the drains were then filled up with the materials that came out.

This was done in the beginning of summer, and the work frequently examined through the season; the soil was found firmer than before, and none of that nasty red water to be met with upon the surface, though it continually oozed into the drains. In autumn the meadow was again prepared for waterings, by repairing those trenches and drains that were properly situated; and by cutting others where wanted, for the purpose of watering the meadow. The water being then brought over it from the same spring as before, the event answered the most sanguine wishes of the proprietor; the effects were visible the first year, and the ground has been constantly improving ever since.

443 Of watering lands on the sides of hills.

Mr Boswell also informs us, that a gentleman in Scotland had applied to him for directions to water some lands lying on the sides of hills, where the descent is quick; and of which there are many in this country, as well as in the north of England. It would be difficult to water such lands by means of drains and trenches according to the directions already given; because the bends in the trenches must be very near together and large, as the water must flow out of the trench *above* the bend to flow over the pane below it; the number and size would likewise be inconvenient, and greatly offend the eye.

Lands of this sort are generally capable of being ploughed; in which case our author directs them to be once ploughed in the spring, and sown with oats or any other kind of grain that will rot the sward. When the grain is harvested, plough the land across; the last ploughing with the Kentish plough, which has a moveable mouldboard, and is called a *turn-wrist* plough. This turns the furrows down the side of the hill, the horses going forwards and backwards in the same furrows. By this means the land is laid flat without any open furrows in it: dress it down in the spring very fine, and sow it with oats, and mix with some kinds of grass seeds very thick. Thus the ground will have but few irregularities; and as soon as the corn is carried off, or the following spring at farthest, the mains and drains may be cut out.

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For watering coarse lands that are firm enough to bear the plough, and situated near a stream, our author gives the following directions.

444 Of watering coarse lands.

"Let the land thus situated be ploughed once in the spring, and sown with any grain that will rot sward. As soon as the crop is off, plough it again, and leave it rough through the winter. Work it down early in the spring, and plough it in the direction the trenches are to lie, making the ridges of a proper size for watering, ten or twelve yards wide for instance; work it fine; then gather the ridges up again in the same manner, making the last furrows of each ridge as deep as possible. If the land be not fine, dress it down again, and gather it up a second time if necessary; and with a shovel throw the earth from the edges of the furrows to the tops of the ridges, to give the greatest possible descent from the trench to the drain. Sow it with oats and grass seeds very thick; and after the corn is carried off, the trenches may be formed upon the top of each ridge, dispersing the furrows with a spade as much as the fall of the land will admit of for the drains; taking care to procure sufficient fall at all events, to drain the lands after they have been watered. By this method the crop of corn will nearly pay all the expence, and the land will be in excellent order."

445 Of the management of meadows after watering.

After the work of watering a meadow is totally finished, and the hay carried off, cattle may be let in to eat the after-math. When this is done, it will then be necessary to examine whether or not the mains have suffered any injury from their feet; whether there be quantities of mud or sand collected at the angles, &c. all of which must be thrown out and the breaches repaired; by which means the drenches, drains, &c. will last three years, but otherwise not more than two. The roots, mud, &c. may be used in repairing the breaches, but never left upon the sides of the trenches out of which they are taken. The tail-drains require to be cleansed oftener than any of the other works, for this obvious reason, that the mud, &c. is carried down from all the others into them; where, if it be allowed to accumulate, it occasions a stagnation of water upon the meadow itself. In repairing the trenches, particular care ought to be taken that the workmen do not make them any wider than before, which they are very apt to do; neither are they to be allowed to throw the materials which they dig out in a ridge behind the edge of the trench, which both widens it and promotes weeds.

446 Of the times the water should continue upon the meadows.

During the time of watering, it will be necessary to examine the meadow every two or three days in order to remove obstructions, &c. If the drains should be filled with water and run over, they ought to be made deeper; or if this cannot be done, they should be widened

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widened. In the winter time a regular ſtrong water ſhould be kept, avoiding very ſtrong great floods. In this ſeaſon the water may be kept on the ground with ſafety for a month or even ſix weeks, if the ſoil be corky or boggy, or a ſtrong clay; but not quite ſo long if it be gravel or ſand. At the ſecond watering a fortnight or three weeks will be ſufficient; and after Candlemas a fortnight will be rather too long. At the third watering a week will be ſufficient, which will bring it to about the middle of March; by which time, if the weather be tolerably mild, the graſs will be long enough for the ewes and lambs, or fatting lambs; which may then be turned into the meadow with great advantage. Even in the end of February, if the winter has been very mild, the graſs will be long enough for them. Here they may be permitted to feed till the beginning of May, changing them into different meadows. As ſoon as they are taken out, the water muſt be turned in for a week, carefully examining every trench and drain for the reaſons already given. The water is then to be thifted into others, alternately watering and draining, leſſening the time the water remains upon it as the weather grows warmer; and in five, ſix, or ſeven weeks, the graſs will be fit to be mown for hay, and produce from one to two tons, or even more, an acre upon good ground.

Mr Boſwell directs, that about a week before the graſs is to be mown, the water ſhould be let into the meadow for 24 hours; which, he ſays, will make the ground moiſt at the bottom, the ſcythe will go through it the more eaſily, and the graſs will be mown cloſer to the ground. This practice, however, is entirely diſapproved of by Mr Wright. "Though it may prevail in Dorſetſhire (ſays he), it is very ſeldom adviſable, for the following reaſons: Water made to run through a thick crop of graſs, though it may appear ever ſo pure, will leave a certain quantity of adherent ſcum or ſediment, which can never be ſeparated from the hay, but will render it unpalatable, if not prejudicial, to the cattle that eat it. And this wetting of the land and graſs will impede the drying or making of the hay perhaps ſome days, which in difficult ſeaſons is of very great conſequence, and it will likewiſe make the turf too ſoft and tender to ſupport the wheels of a loaded waggon in carrying off the hay. Beſides, there is reaſon to believe that one day's wetting in the ſummer, will, upon moſt meadows, endanger the ſoundneſs of every ſheep that feeds upon the aftermath."

447 f ſpring. eding.

The ſpring-feeding ought never to be done by heavier cattle than ſheep or calves; for large cattle do much hurt by poaching the ground with their feet, deſtroying the trenches, and ſpoiling the graſs. Mr Boſwell likewiſe greatly recommends a proper uſe of ſpring floods, from which he ſays much benefit may be derived; but, if there is any quantity of graſs in the meadows not eaten, theſe floods muſt be kept out, otherwiſe the graſs will be ſpoiled; for they bring with them ſuch quantities of ſand and mud, which ſtick to the graſs, that the cattle will rather ſtarve than taſte it. Great quantities of graſs or after-math are frequently ſpoiled in flat countries by the floods which take place in the fall. In the winter time, however, when the ground is bare, the ſand and mud brought down by the floods is ſoon incorporated with the ſoil, and becomes an excellent manure. The certain rule with regard to this matter is, "Make uſe of the floods when the graſs cannot be uſed; avoid them when the graſs is long or ſoon to be cut."

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448 Of watering from the end of autumn to Candlemas.

"It has often been a ſubject of diſpute (ſays Mr Boſwell), whether, from the latter end of autumn to Candlemas, the throwing a very ſtrong body of water, where it can be done, over the meadows, is of any eſſential ſervice or not? Thoſe who conſider it as advantageous, aſſert, that when the waters run rude and ſtrong over the ground, they beat down and rot the tufts of foggy or rough graſs, ſedges, &c. that are always to be found in many parts of coarſe meadow-ground; and therefore are of peculiar ſervice to them. On the other ſide it is alleged, that by coming in ſo large a body, it beats the ground (in the weak places particularly) ſo bare, that the ſward is deſtroyed; and alſo brings with it ſuch quantities of ſeeds of weeds, that at the next hay ſeaſon the land in all thoſe bare places bears a large burden of weeds, but little graſs.

"The general opinion of the watermen upon this point is, that in water meadows which are upon a warm, ſandy, or gravelly ſoil, with no great depth of loam upon them, rude ſtrong watering, even in winter, always does harm without any poſſible eſſential ſervice. On the contrary, cold ſtrong clay land will bear a great deal of water a long time without injury; and boggy, corky, or ſpongy ſoil, will alſo admit of a very large and ſtrong body of water upon it with great advantage for almoſt any length of time at that ſeaſon, provided the drains are made wide and deep enough to carry it off, without forcing back upon the end of the panes. The weight and force of the water vaſtly aſſiſts in compreſſing thoſe ſoils, which only want ſolidity and tenacity to make them produce great burdens of hay: nothing, in their opinion, corrects and improves thoſe ſoils ſo much as a very ſtrong body of water, kept a conſiderable time upon them at that ſeaſon."

Notwithſtanding the above reaſons, however, Mr Boſwell informs us, that he has doubts upon the ſubject; nor can he by any means acquieſce in this opinion, unleſs, by rude ſtrong waters he is permitted to underſtand only rather a larger quantity of water conveyed over the land at this early ſeaſon than ought to be uſed in the ſpring or ſummer: unmanageable waters he believes always hurtful.

"It may be proper juſt to add (continues he), that as ſoon as the hay is carried off the meadows, cattle of any ſort except ſheep may be put to eat the graſs out of the trenches, and what may be left by the mowers. This perhaps will laſt them a week; when the water may be put into the meadows in the manner already deſcribed, taking care to mow the long graſs which obſtructs the water in the trenches; and this mowing is beſt done when the water is in them. Let the weeds, leaves, &c. be taken out and put in heaps, to be carried away into the farm yards; examine the trenches, make up the breaches, &c. take particular care that the water only dribbles over every part of the panes as thin as poſſible, this being the warmeſt ſeaſon of the year. The firſt watering ſhould not be ſuffered to laſt longer than two or three days before it is ſhifted off (and if the ſeaſon be wet, perhaps not ſo long, as warmth

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warmth ſeems to be the greateſt requiſite after the land is once wet to aſſiſt vegetation) to another part or meadow beat out by the cattle, by this time fit to take it. Do by this meadow exactly the ſame, and ſo by a third and fourth, if as many meadows belong to the occupier. Obſerve at all times, when the water is taken out of a meadow, to draw up the drain-ſluice hatches; as, without doing that, watering is an injury. By the time that three or four parts are thus regularly watered, the firſt will have an after-math, with ſuch rich and beautiful verdure as will be aſtoniſhing; and both quantity and quality will be beyond conception better than if the lands had not been watered.

"Hence we ſee why every perſon ſhould, if poſſible, have three or four meadows that can be watered; for here, while the cattle are eating the firſt, the ſecond is growing, the third draining, &c. and the fourth under water. In this manner the after-math will in a mild ſeaſon laſt till Chriſtmas. A reaſon was given why the ſpring-graſs ſhould be fed only by ſheep or calves; a reaſon equally cogent may be given, why the after-graſs ought not to be fed by them, becauſe it will infallibly rot them. No ſheep (ſays our author), except thoſe which are juſt fat, muſt ever be ſuffered even for an hour in water-meadows except in the ſpring of the year; and even then care muſt be taken that every part of the meadows have been well watered, and that they are not longer kept in them than the beginning of May. Although at preſent it is unknown what is the occaſion of the rot, yet certain it is, that even half an hour's feeding in unhealthy ground has often proved fatal. After a ſhort time they begin to loſe their fleſh, grow weaker and weaker; the beſt feeding in the kingdom cannot improve them after they once fall away; and when they die, animalcula like plaice are found in the livers. Scarcely any ever recover from a ſlight attack; but when farther advanced, it is always fatal. Guard by all means againſt keeping the water too long upon the meadow in warm weather; it will very ſoon produce a white ſubſtance like cream, which is prejudicial to the graſs, and ſhows that it has been too long upon the ground already. If it be permitted to remain a little longer, a thick ſcum will ſettle upon the graſs of the conſiſtence of glue, and as tough as leather, which will quite deſtroy it wherever it is ſuffered to be produced. The ſame bad effects ſeem to ariſe from rude waters; neither can the ſcum eaſily be got off.

449 Water ought not to be kept too long upon meadows.

450 Advantages of rolling meadows.

"Rolling meadows in the ſpring of the year is an excellent method. It ſhould be done after Candlemas, when the meadow has been laid dry a week. It ſhould be always rolled lengthwiſe of the panes, up one ſide of the trench and down the other. Rolling alſo contributes much to the graſs being cut cloſe to the ſurface when mown, which is no ſmall advantage; for the little hillocks, ſpewings of worms, ant-hills, &c. are by this means preſſed cloſe to the ground, which would otherwiſe obſtruct the ſcythe and take off its edge; and to avoid that inconvenience, the workmen always mow over them."

As a water-meadow has with ſo much juſtice been called a *hot-bed of graſs*, and as the practice of flooding tends ſo completely to ameliorate the pooreſt ſoils, and to extirpate heath and all coarſe and woody plants, we are ſatisfied that the knowledge of it cannot be too extenſively diffuſed, or too minutely enquired into. That it may be more clearly underſtood, therefore, we ſhall here give a ſtatement of the mode in which it is practiſed in Glouceſterſhire, as explained from Mr Wright's pamphlet, by the Rev. Mr Charles Findlater, in a letter to the conductors of the Farmer's Magazine.

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451 Watering explained by Mr Findlater.

"Fig. 6. repreſents a float-meadow under irrigation; the dark ſhading repreſenting the water.

Plate XI.

"When the hatch of the water dam-dike (marked H) is liſted up, the water runs in the natural channel of the river; when the hatch is ſhut, as repreſented in the figures, the natural channel is laid dry below it, and the water runs laterally along the main-feeder, in the direction of the arrows, and is from it diſtributed into the floating-gutters (*g*, *g*, *g*, *g*), which are formed along the crowns of the ridges, into which the meadow is arranged, overflowing on both ſides of ſaid gutters, and running down the ſides of the ridges into the furrows or drains betwixt the ridges (*d*, *d*, *d*, *d*,), which drains diſcharge it into the main-drain, whereby it is returned into its natural channel at the foot of the meadow.

"The marks (o o, or Δ Δ), and the tufts, in the main-feeder and the floating-gutters, denote—The firſt, obſtructions (made by ſmall ſtakes, or ſods, or ſtones) to raiſe the water, and make it flow over from the main-feeder into the floating-gutters, or from the latter over the ſides of the ridges; the ſecond, nicks, made in their ſides, with a ſimilar intention. If, however, the main-feeder and floating-gutters are properly conſtructed at their firſt formation, theſe ſupplementary aids will be, in a great meaſure, unneceſſary: For the main-feeder ought, at its entrance, to be of dimenſions juſt ſufficient to admit the quantity of water which is to be conveyed to the meadow; and gradually to contract its ſize as it goes along, in order that the water, for want of room, may be forced over its ſide, and into the floating-gutters: theſe laſt ought to be formed after the ſame model, that the water may, by their primary conſtruction, overflow their ſides, through their whole courſe. That as little as poſſible of the ſurface may be unproductive, a ſimilar conſtruction ſhould be adopted for the drains; they ought to be narrow neareſt to the main-feeder, where they receive little water, and to diverge as they approach the main-drain; which laſt is, for the ſame reaſon, ſimilarly conſtructed. In the plan, this mode of conſtruction is made obvious to the eye.

"The meadow, in this plate, muſt be conceived to lie in a regular and very gentle ſlope from the main-feeder to the main-drain.

"Fig. 4. and 5. preſent a view of the ridges cut acroſs, with the feeding-gutter (*g*) upon their crown, and the furrows, or diſcharging drains (*d*, *d*) along their ſides. Fig. 5. ſhows the ſhape (of gradual ſlope) into which they ought to be formed at firſt, were it not for the expence, *i. e.* when they are to be formed out of graſs fields, preſerving the graſs ſward. Fig. 4. repreſents the mode in which they may, more cheaply, though more roughly, be formed at firſt; when, the depoſitions of ſediment from the floating water, will gradually fill the ſhoulders of the floating-gutters, up to the dotted line, forming the ridge into the ſhape of fig. 5.

"In the formation of the meadow, (particularly if the declivity is very ſmall), care ſhould be taken to loſe as little as poſſible of the level in the main-feeder, and in the

Culture of Grass. the floating gutters; in order that the greater descent may be given to the water down the sides of the ridges, from the floating-gutters to their discharging drains, that the water may float over the ridges sides with the more rapidity, and in the more quick succession.

"The distance from the floating-gutter to the discharging-drain, ought not to be less than four yards, i. e. the breadth of the ridge eight yards; nor more than five yards and a half, i. e. the breadth of the ridge eleven yards.

"It is evident from the plan, that, when the hatch (H) is lifted up, the water resumes its natural channel, and the meadow becomes at once dry. Its figure frees it instantly of all surface water. If any of it is wet from springs, these must be carried off by under-draining; for it must be thoroughly drained before you can drown it to good effect.

3. 7. "This figure represents a float-meadow, where the declivity is unequal, and which, also, is too large, for the command of water, to admit of being floated all at once.

"In this meadow, it is supposed that the ground rises, from the natural channel of the river, up to (F 1.), which is a feeder, with its floating-gutters (*g, g, g, g*); and thence descends to the hollow (D 1.), which is a drain communicating with the main-drain, and receiving the water from the lesser drains or receiving furrows (*d, d, d*). It is supposed that the ground rises again from the hollow (D 1.), up to the second feeder (F 2.); and thence descends again into the hollow, along which is conducted the receiving-drain (D 2.). The remainder of the meadow is supposed to lie in a regular slope, from the main-feeder to the drain last mentioned, and the main-drain. The letter (*r*) marks a very small rut, made with a spade, or triangular hoe, for conducting water to places upon which it appears not to scatter regularly.

"The hatch upon the river's natural channel, and that upon the feeder (F 2.) are represented as shut; and, consequently the natural channel, together with that part of the meadow which is floated from the feeder (F 2.), as dry. The hatches upon the feeder (F 1.), and upon the main-feeder, are represented as drawn up; and, consequently the two parts of the meadow, floated from them, are represented as under water.

1. 8. "This represents catch-meadow, for a steep declivity, or side of a hill. It is called *catch*, because, when the whole is watered at once, the water floating over the uppermost pitches is catched in the floating-gutters, which distribute the water over the inferior pitches.

"The lateral horizontal feeding-gutters, which scatter the water over the first and second pitches, are represented as shut by sods or stones, &c. (8); and consequently these first and second pitches appear dry: The whole water is represented as passing down the main-feeder into the lowest floating-gutter, whence it floats the lowest or third pitch; and is received into the drain at the foot of the meadow, to be returned by it into the natural channel.

"When the whole is to be floated at once, the obstructions (8) are taken from the lateral floating-gutters: obstructions, mean time, are placed in the main-feeder, immediately under the floating-gutters, to force the water into said gutters.

"N. B. In obstructing the main-feeder, care must be taken not to obstruct it entirely, but to allow always a part of the water it contains to escape in it to the lower pitches; for, supposing the main-feeder to be entirely shut under the feeding-gutter (*g* 1.), so that the whole water was made to run over the first pitch, from said gutter and the horizontal part of the main-drain, the water filtrated through the grass of the first pitch, would be so very much deprived of its fertilizing qualities, as to be incapable of communicating almost any perceptible benefit to the pitches lying below. Water so filtrated, is called technically *used water;* and is esteemed next to useless; and for this reason, the grass nearest the floating-gutters is most abundant, and of best quality, in all kinds of meadow. Rotation of Crops.

"The proper breadth of the pitches of catch-meadow, from gutter to gutter, does not seem well determined; they ought, probably, not to be much broader than the distance from the floating-gutter to the receiving-drain in float-meadow, i. e. from four to five or six yards.—Catch-meadow is not so much prized as float-meadow.

"In the construction of the float-meadows, the floating-gutters die away to nothing before they meet the main-drain; the water from the end of the gutter finding its way over the intervening space, or being assisted in scattering by small ruts marked (*r*). The receiving-drains should, for like reason, not be commenced till within half a ridge breadth of the main-feeder."

It is to be observed with regard to the last of these modes of flooding, called *catch-meadow*, that although lands thus watered do not become equal to more level grounds subjected to the same process, or float-meadow, yet that the improvement of them is perhaps greater in proportion to the value of the lands in their original state; for, in this way, lands upon the declivity of hills, which once produced next to nothing, are enabled to bear a considerable crop of valuable grass. As streams of water are in high countries frequently found descending from very lofty situations, and as in these cases the expence of forming *catch-meadow* is very trifling, it may be regarded as of the most extensive utility.

Sect. V. *Rotation of Crops.*

452 Rotation of crops. No branch of husbandry requires more skill and sagacity than a proper rotation of crops, so as to keep the ground always in heart, and yet to draw out of it the greatest profit possible. Some plants rob the soil, others are gentle to it: some bind, others loosen. The nice point is, to intermix crops, so as to make the greatest profit consistently with keeping the ground in trim. In that view, the nature of the plants employed in husbandry must be accurately examined.

453 Culmiferous and leguminous plants. The difference between culmiferous and leguminous plants, is occasionally mentioned above. With respect to the present subject, a closer inspection is necessary. Culmiferous plants, having small leaves and few in number, depend mostly on the soil for nourishment and little on the air. During the ripening of the seed, they draw probably their whole nourishment from the soil; as the leaves by this time, being dry and withered, must have lost their power of drawing nourishment from the air. Now, as culmiferous plants are chiefly cultivated for their seed, and are not cut down till the seed

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ſeed be fully ripe, they may be pronounced all of them to be robbers, ſome more, ſome leſs. But ſuch plants, while young, are all leaves; and in that ſtate draw moſt of their nouriſhment from the air. Hence it is, that where cut green for food to cattle, a culmiferous crop is far from being a robber. A hay-crop accordingly, even where it conſiſts moſtly of rye-graſs, is not a robber, provided it be cut before the ſeed is formed; which at any rate it ought to be, if one would have hay in perfection. And the foggage, excluding the froſt by covering the ground, keeps the roots warm. A leguminous plant, by its broad leaves, draws much of its nouriſhment from the air. A cabbage which has very broad leaves, and a multitude of them, owes its growth more to the air than to the ſoil. One fact is certain, that a cabbage cut and hung up in a damp place, preſerves its verdure longer than other plants. At the ſame time, a ſeed is that part of a plant which requires the moſt nouriſhment; and for that nouriſhment a culmiferous plant muſt be indebted entirely to the ſoil. A leguminous crop, on the contrary, when cut green for food, muſt be very gentle to the ground. Peaſe and beans are leguminous plants; but being cultivated for ſeed, they ſeem to occupy a middle ſtation: their ſeed makes them more ſevere than other leguminous crops cut green; their leaves, which grow till reaping, make them leſs ſevere than a culmiferous plant left to ripen.

Theſe plants are diſtinguiſhed no leſs remarkably by the following circumſtance. All the ſeeds of a culmiferous plant ripen at the ſame time. As ſoon as they begin to form, the plant becomes ſtationary, the leaves wither, the roots ceaſe to puſh, and the plant, when cut down, is blanched and ſapleſs. The ſeeds of a leguminous plant are formed ſucceſſively: flowers and fruit appear at the ſame time in different parts of the plant. This plant accordingly is continually growing, and puſhing its roots. Hence the value of bean or peaſe ſtraw above that of wheat or oats: the latter is withered and dry when the crop is cut; the former, green and ſucculent. The difference therefore, with reſpect to the ſoil, between a culmiferous and leguminous crop, is great. The latter, growing till cut down, keeps the ground in conſtant motion, and leaves it to the plough looſe and mellow. The former gives over growing long before reaping; and the ground, by want of motion, turns compact and hard. Nor is this all. Dew falling on a culmiferous crop after the ground begins to harden, reſts on the ſurface, and is ſucked up by the next ſun. Dew that falls on a leguminous crop, is ſhaded from the ſun by the broad leaves, and ſinks at leiſure into the ground. The ground accordingly, after a culmiferous crop, is not only hard, but dry: after a leguminous crop, it is not only looſe, but ſoft and unctuous.

Of all culmiferous plants, wheat is the moſt ſevere, by the long time it occupies the ground without admitting a plough. And as the grain is heavier than that of barley or oats, it probably requires more nouriſhment than either. It is obſerved above, that as peaſe and beans draw part of their nouriſhment from the air by their green leaves while allowed to ſtand, they draw the leſs from the ground; and by their conſtant growing they leave it in good condition for ſubſequent crops. In both reſpects they are preferable to any culmiferous crop. Rotation of Crops.

Culmiferous crops, as obſerved above, are not robbers when cut green: the ſoil, far from hardening, is kept in conſtant motion by the puſhing of the roots, and is left more tender than if it had been left at reſt without any bearing crop.

Bulbous-rooted plants are above all ſucceſsful in dividing and pulverizing the ſoil. Potato-roots grow ſix, eight, or ten inches under the ſurface; and, by their ſize and number, they divide and pulverize the ſoil better than can be done by the plough; conſequently, whatever be the natural colour of the ſoil, it is black when a potato-crop is taken up. The potato, however, with reſpect to its quality of dividing the ſoil, muſt yield to a carrot or parſnip; which are large roots, and pierce often to the depth of 18 inches. The turnip, by its tap-root, divides the ſoil more than can be done by a fibrous-rooted plant; but as its bulbous-root grows moſtly above ground, it divides the ſoil leſs than the potato, the carrot, or the parſnip. Red clover, in that reſpect, may be put in the ſame claſs with turnip.

Whether potatoes or turnip be the more gentle crop, appears a puzzling queſtion. The former bears ſeed, and probably draws more nouriſhment from the ſoil than the latter, when cut green. On the other hand, potatoes divide the ſoil more than turnip, and leave it more looſe and friable. It appears no leſs puzzling, to determine between cabbage and turnip: the former draws more of its nouriſhment from the air, the latter leaves the ſoil more free and open.

The reſult of the whole is what follows: Culmiferous plants are robbers; ſome more, ſome leſs: they at the ſame time bind the ſoil; ſome more, ſome leſs. Leguminous plants in both reſpects are oppoſite: if any of them rob the ſoil, it is in a very ſlight degree; and all of them without exception looſen the ſoil. A culmiferous crop, however, is generally the more profitable: but few ſoils can long bear the burden of ſuch crops, unleſs relieved by interjected leguminous crops. Theſe, on the other hand, without a mixture of culmiferous crops, would ſoon render the ſoil too looſe.

Theſe preliminaries will carry the farmer ſome length in directing a proper rotation of crops. Where dung, lime, or other manure, can be procured in plenty to recruit the ſoil after ſevere cropping, no rotation is more proper or profitable in a ſtrong ſoil, than wheat, peaſe or beans, barley, oats, fallow. The whole farm may be brought under this rotation, except ſo far as hay is wanted. But as ſuch command of manure is rare, it is of more importance to determine what ſhould be the rotation when no manure can be procured but the dung collected in the farm. Conſidering that culmiferous crops are the more profitable in rich land, it would be proper to make them more frequent than the other kind. But as there are few ſoils in Scotland that will admit ſuch frequent culmiferous crops without ſuffering, it may be laid down as a general rule, that alternate crops, culmiferous and leguminous, ought to form the rotation. Nor are there many ſoils that will ſtand good, even with this favourable rotation, unleſs relieved from time to time by paſturing a few years. If ſuch extended rotation be artfully carried on,

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454 The nature of ſoil conſidered, with regard to the rotation of crops.

on, crops without end may be obtained in a tolerable good ſoil, without any manure but what is produced in the farm.

It is ſcarce neceſſary to be mentioned, being known to every farmer, that clay anſwers beſt for wheat, moiſt clay for beans, loam for barley and peaſe, light ſoil for turnip, ſandy ſoil for rye and buck-wheat; and that oats thrive better in coarſe ſoil than any other grain. Now, in directing a rotation, it is not ſufficient that a culmiferous crop be always ſucceeded by leguminous: attention muſt alſo be given, that no crop be introduced that is unfit for the ſoil. Wheat, being a great binder, requires more than any other crop a leguminous crop to follow. But every ſuch crop is not proper: potatoes are the greateſt openers of ſoil; but they are improper in a wheat ſoil. Neither will turnip anſwer, becauſe it requires a light ſoil. A very looſe ſoil, after a crop of rye, requires rye-graſs to bind it, or the treading of cattle in paſturing: but to bind the ſoil, wheat muſt not be ventured; for it ſucceeds ill in looſe ſoil.

Another conſideration of moment in directing the rotation is, to avoid crops that encourage weeds. Peaſe is the fitteſt of all crops for ſucceeding to wheat, becauſe it renders the grounds looſe and mellow, and the ſame ſoil agrees with both. But beware of peaſe, unleſs the ſoil be left by the wheat perfectly free of weeds; becauſe peaſe, if not an extraordinary crop, foſter weeds. Barley may be ventured after wheat, if the farmer be unwilling to loſe a crop. It is indeed a robber; better, however, any crop, than run the hazard of poiſoning the ſoil with weeds. But to prevent the neceſſity of barley after wheat, the land ought to be fallowed before the wheat: it cleans the ground thoroughly, and makes peaſe a ſecure crop after wheat. And after a good crop of peaſe, barley never fails. A horſehoed crop of turnip is equal to a fallow for rooting out weeds; but turnip does not ſuit land that is proper for wheat. Cabbage does well in wheat ſoil; and a horſehoed crop of cabbage, which eradicates weeds, is a good preparation for wheat to be ſucceeded by peaſe; and a crop of beans diligently hand-hoed, is in that view little inferior. As red clover requires the ground to be perfectly clean, a good crop of it inſures wheat, and next peaſe. In loam, a drilled crop of turnip or potatoes prepares the ground, equal to a fallow, for the ſame ſucceſſion.

Another rule is, to avoid a frequent repetition of the ſame ſpecies; for to produce good crops, change of ſpecies is no leſs neceſſary than change of ſeed. The ſame ſpecies returning every ſecond or third year, will infallibly degenerate, and be a ſcanty crop. This is remarkably the caſe of red clover. Nor will our fields bear pleaſantly perpetual crops of wheat after fallow, which is the practice of ſome Engliſh farmers.

Hitherto of rotation in the ſame field. We add one rule concerning rotation in different fields; which is, to avoid crowding crops one after another in point of time; but to chooſe ſuch as admit intervals ſufficient for leiſurely dreſſing, which gives opportunity to manage all with the ſame hands, and with the ſame cattle; for example, beans in January or February, peaſe and oats in March, barley and potatoes in April, turnip in June or July, wheat and rye in October.

For illuſtrating the foregoing rules, a few inſtances of exceptionable rotations will not be thought amiſs. The following is an uſual rotation in Norfolk. Firſt, wheat after red clover. Second, barley. Third, turnip. Fourth, barley with red clover. Fifth, clover cut for hay. Sixth, a ſecond year's crop of clover commonly paſtured. Dung is given to the wheat and turnip.—Againſt this rotation ſeveral objections lie. Barley after wheat is improper. The two crops of barley are too near together. The ſecond crop of clover muſt be very bad, if paſturing be the beſt way of conſuming it; and if bad, it is a great encourager of weeds. But the ſtrongeſt objection is, that red clover repeated ſo frequently in the ſame field cannot fail to degenerate; and of this the Norfolk farmers begin to be ſenſible. Salton in Eaſt Lothian is a clay ſoil; and the rotation there uſually has been wheat after fallow and dung. Second, barley after two ploughings; the one before winter, the other immediately before the ſeed is ſown. Third oats. Fourth, peaſe. Fifth, barley. Sixth, oats; and then fallow. This rotation conſiſts chiefly of robbing crops. Peaſe are the only leguminous crop, which, even with the fallow, is not ſufficient to looſen a ſtiff ſoil. But the ſoil is good, which in ſome meaſure hides the badneſs of the rotation. About Seaton, and all the way from Preſton to Goſford, the ground is ſtill more ſeverely handled: wheat after fallow and dung, barley, oats, peaſe, wheat, barley, oats, and then another fallow. The ſoil is excellent; and it ought indeed to be ſo, to ſupport many rounds of ſuch cropping.

Rotation of Corps. 455 Exceptionable rotations.

In the pariſhes of Tranent, Aberlady, Dirleton, North-Berwick, and Athelſtoneford, the following rotations were formerly univerſal, and to this day are much more frequent than any other mode.

1. After fallow and dung, wheat, barley, oats, peaſe and beans, barley, oats, wheat.

2. After fallow and dung, barley, oats, peaſe and beans, wheat, barley, oats, peaſe, wheat.

3. After fallow and dung, wheat, oats, peaſe, barley, oats, wheat.

4. After fallow and dung, barley, oats, beans, wheat, peaſe, barley, oats.

In the ſeveral Tours that are publiſhed by Young, are found, in the beſt counties of England, examples without end, of rotations no leſs exceptionable than many of thoſe mentioned.

456 Fields not to be kept too long in paſture.

Where a field is laid down for paſture in order to be recruited, it is commonly left in that ſtate many years; for it is the univerſal opinion, that the longer it lies, the richer it becomes for bearing corn. This may be true; but in order to determine the mode of cropping, the important point is, what upon the whole is the moſt profitable rotation; not what may produce luxuriant crops at a diſtant period. Upon that point it may be affirmed, that the farmer who keeps a field in paſture beyond a certain time, loſes every year conſiderably; and that a few luxuriant crops of corn, after 20 years of paſture, and ſtill more after 30, will not make up the loſs.

Paſture-graſs, while young, maintains many animals; and the field is greatly recruited by what they drop; it is even recruited by hay crops, provided the graſs be cut before ſeeding. But as old graſs yields little profit, the field ought to be taken up for corn when the paſture begins to fail; and after a few crops, it ought

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to be laid down again with grafs feeds. Seduced by a chimerical notion, that a field, by frequent corn crops, is fatigued, and requires reft like a labouring man or animal, careful farmers give long reft to their fields by paſture, never adverting that it affords little profit. It ought to be their ſtudy, to improve their ſoil, by making it free, and alſo retentive of moiſture. If they accompliſh theſe ends, they need not be afraid of exhauſting the ſoil by cropping.

457 Examples of rotations.

Where a farmer has acceſs to no manure but what is his own production, the caſe under conſideration, there are various rotations of crops, all of them good, though perhaps not equally ſo. We ſhall begin with two examples, one in clay and one in free ſoil, each of the farms 90 acres. Six acres are to be incloſed for a kitchen garden, in which there muſt be annually a crop of red clover, for ſummer food to the working cattle. As there are annually 12 acres in hay, and 12 in paſture, a ſingle plough with good cattle will be ſufficient to command the remaining 60 acres.

Rotation in a clay ſoil.

Inclof.	1795.	1796.	1797.	1798.	1799.	1800.
1.	Fallow.	Wheat.	Peaſe.	Barley.	Hay.	Oats.
2.	Wheat.	Peaſe.	Barley.	Hay.	Oats.	Fallow.
3.	Peaſe.	Barley.	Hay.	Oats.	Fallow.	Wheat.
4.	Barley.	Hay.	Oats.	Fallow.	Wheat.	Peaſe.
5.	Hay.	Oats.	Fallow.	Wheat.	Peaſe.	Barley.
6.	Oats.	Fallow.	Wheat.	Peaſe.	Barley.	Hay.
7.	Paſture.	Paſture.	Paſture.	Paſture.	Paſture.	Paſture.

When the rotation is completed, the ſeventh incloſure, having been ſix years in paſture, is ready to be taken up for a rotation of crops, which begins with oats in the year 1801, and proceeds as in the ſixth incloſure. In the ſame year 1801 the fifth incloſure is made paſture, for which it is prepared by ſowing paſture-graſs ſeeds with the barley of the year 1800. And in this manner may the rotation be carried on without end. Here the labour is equally diſtributed; and there is no hurry nor confuſion. But the chief property of this rotation is, that two culmiferous or white-corn crops are never found together; by a due mixture of crops, the ſoil is preſerved in good heart without any adventitious manure. At the ſame time, the land is always producing plentiful crops: neither hay nor paſture get time to degenerate. The whole dung is laid upon the fallow.

Every farm that takes a graſs crop into the rotation muſt be incloſed, which is peculiarly neceſſary in a clay ſoil, as nothing is more hurtful to clay than poaching.

Rotation in a free ſoil.

Inclof.	1795.	1796.	1797.	1798.	1799.	1800.
1.	Turnip.	Barley.	Hay.	Oats.	Fallow.	Wheat.
2.	Barley.	Hay.	Oats.	Fallow.	Wheat.	Turnip.
3.	Hay.	Oats.	Fallow.	Wheat.	Turnip.	Barley.
4.	Oats.	Fallow.	Wheat.	Turnip.	Barley.	Hay.
5.	Fallow.	Wheat.	Turnip.	Barley.	Hay.	Oats.
6.	Wheat.	Turnip.	Barley.	Hay.	Oats.	Fallow.
7.	Paſture.	Paſture.	Paſture.	Paſture.	Paſture.	Paſture.

For the next rotation, the ſeventh incloſure is taken up for corn, beginning with an oat crop, and proceeding in the order of the fourth incloſure; in place of which, the third incloſure is laid down for paſture by ſowing paſture-graſſes with the laſt crop in that incloſure, being barley. This rotation has all the advantages of the former. Here the dung is employed on the turnip crop. Rotation of Crops.

We proceed to conſider what rotation is proper for carſe clay. The farm we propoſe conſiſts of 73 acres. Nine are to be incloſed for a kitchen garden, affording plenty of red clover to be cut green for the farm cattle. The remaining 64 acres are divided into four incloſures, 16 acres each, to be cropped as in the following table.

Inclof.	1795.	1796.	1797.	1798.
1.	Beans.	Barley.	Hay.	Oats.
2.	Barley.	Hay.	Oats.	Beans.
3.	Hay.	Oats.	Beans.	Barley.
4.	Oats.	Beans.	Barley.	Hay.

Here the dung ought to be applied to the barley.

Many other rotations may be contrived, keeping to the rules above laid down. Fallow, for example, wheat, peaſe and beans, barley, cabbage, oats, for clay. Here dung muſt be given both to the wheat and cabbage. For free ſoil, drilled turnip, barley, red clover, wheat upon a ſingle furrow, drilled potatoes, oats. Both the turnip and potatoes muſt have dung. Another for free ſoil: turnip drilled and dunged, red clover, wheat on a ſingle furrow with dung, peaſe, barley, potatoes, oats. The following rotation has proved ſucceſsful in a ſoil proper for wheat. 1. Oats with red clover, after fallow without dung. 2. Hay. The clover ſtubble dunged, and wheat ſown the end of October with a ſingle furrow. 3. Wheat. 4. Peaſe. 5. Barley. Fallow again. Oats are taken the firſt crop, to ſave the dung for the wheat. Oats always thrive on a fallow, though without dung, which is not the caſe of barley. But barley ſeldom fails after peaſe. In ſtrong clay ſoil, the following rotation anſwers. 1. Wheat after fallow and dung. 2. Beans ſown under furrow as early as poſſible. Above the beans, ſow peaſe end of March, half a boll per acre, and harrow them in. The two grains will ripen at the ſame time. 3. Oats or barley on a winter furrow with graſs-ſeeds. 4. Hay for one year or two; the ſecond growth paſtured. Lay what dung can be ſpared on the hay-ſtubble, and ſow wheat with a ſingle furrow. 5. Wheat. 6. Beans or peaſe. 7. Oats. Fallow again.

In addition to theſe, we ſhall here ſtate from the Agricultural Survey of Yorkſhire, an example of a rotation uſed in that county upon a marſh-land farm conſiſting of 432 acres of arable land, in which a very great number of hands and horſes appear to have been employed, but in which very valuable products are reared. "The ſoil, where the principal part of the potatoes are grown, is a good warp; the other part on which potatoes are alſo cultivated, a mixture of warp and ſand: the remainder of the land, clay, with a ſmall portion of warp, but too ſtrong to grow potatoes, except about 70 acres, which is tolerably good potato-

land,

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land, but at too great a diſtance from the river. Graſs land only ſufficient to keep two milch cows, and horſes neceſſary for working the farm: 69 acres of the beſt warp land divided into three equal parts; 1. fallow, with from 16 to 20 loads of manure per acre; ſet it with potatoes; after, ſow wheat; and then fallow again: three acres of the ſame kind of land that is liable to be damaged by ſparrows when ſown with corn, is ſet with potatoes every year with about 10 loads of manure per acre each year: 84 acres of the lighter land is divided in the ſame manner, one-third fallow, with 10 loads of manure per acre; ſet potatoes and then ſow wheat, and fallow again: 42 acres of land, lately an old paſture divided into three parts: one-third flax, then ſown with rape, and after they come off, plough and harrow the land three or four times, and lay upon it about 20 loads of manure per acre, which will make it in great condition; after which ſet potatoes, then ſow flax again, and rape after: 150 acres divided into three parts; 1. fallow; 2. wheat; 3. beans, drilled at 9 inches diſtance, hand-hoed twice at 6s. per acre; fallow again, &c.: 80 acres of land that was lately in old graſs divided into four parts; fallow, wheat, beans drilled, and oats; then fallow again, &c. The remaining four acres thrown to any of the crops that are likely to fail. Rent 25s. per acre; aſſeſſments 5s. acre.

"*Diſtribution of crops for* 1795.

	Acres.	Average Produce of an Acre.
Wheat, - -	121	from 3 to 5 quarters.
Beans, - -	70	from 3 to 6 quarters.
Oats, - -	20	from 6 to 10 quarters.
Flax, - -	14	from 45 to 55 ſtones.
Rape, - -	14	from 5 to 5 quarters.
Potatoes, -	68	from 60 to 100 ſacks.
Fallow, - -	121	
To be thrown where a crop is likely to fail,	4	
	432	

"*Servants, Horſes, and Cows, kept upon the Farm.*

4 Houſe ſervants,
16 Labourers,
26 Horſes,
2 Milch cows.

"The above is an account of a farm belonging to one of the beſt managers of marſh-land. We muſt obſerve he fallows his land very often; yet he is well paid by his ſuperior crops. The laſt year (1795) he had 100 ſacks per acre off moſt of his potato-land; and ſold them from 8s. to 12s. per ſack of 14 pecks. All their corn is ſold by the quarter of eight Wincheſter buſhels, though I believe their meaſure rather overruns."

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458 ripeneſs. Culmiferous plants are ripe when the ſtem is totally white: they are not fully ripe if any green ſtreaks remain. Some farmers are of opinion, that wheat ought to be cut before it is fully ripe. Their reaſons are, firſt, that ripe wheat is apt to ſhake; and next, that the flour is not ſo good. With reſpect to the laſt, it is contrary to nature, that any ſeed can be better in an unripe ſtate than when brought to perfection; nor will it be found ſo upon trial. With reſpect to the firſt, wheat, at the point of perfection is not more apt to ſhake than for ſome days before: the huſk begins not to open till after the ſeed is fully ripe; and then the ſuffering the crop to ſtand becomes tickliſh; after the minute of ripening, it ſhould be cut down in an inſtant, if poſſible.

Reaping and Storing up Corn and Hay.

459 Of reapers. This leads to the hands that are commonly engaged to cut down corn. In Scotland, the univerſal practice was, to provide a number of hands, in proportion to the extent of the crop, without regard to the time of ripening. By this method, the reapers were often idle for want of work; and what is much worſe, they had often more work than they could overtake, and ripe fields were laid open to ſhaking winds. The Lothians have long enjoyed weekly markets for reapers, where a farmer can provide himſelf with the number he wants; and this practice is creeping into neighbouring ſhires. Where there is no opportunity of ſuch markets, neighbouring farmers ought to agree in borrowing and lending their reapers.

One ſhould imagine, that a caution againſt cutting corn when wet is unneceſſary; yet from the impatience of farmers to prevent ſhaking, no caveat is more ſo. Why do they not conſider, that corn ſtanding dries in half a day; when, in a cloſe ſheaf, the weather muſt be favourable if it dry in a month? in moiſt weather it will never dry.

460 Manner of cutting. With reſpect to the manner of cutting, we muſt premiſe, that barley is of all the moſt difficult grain to be dried for keeping. Having no huſk, rain has an eaſy acceſs; and it has a tendency to malten when wet. Where the ground is properly ſmoothed by rolling, it ſeems beſt to cut it down with the ſcythe. This manner being more expeditious than the ſickle, removes it ſooner from danger of wind; and gives a third more ſtraw, which is a capital article for dung, where a farm is at a diſtance from other manure. We except only corn that has lodged; for there the ſickle is more convenient than the ſcythe. As it ought to be dry when cut, bind it up directly: if allowed to lie any time in the ſwath, it is apt to be diſcoloured.—Barley ſown with graſs-ſeeds, red clover eſpecially, requires a different management. Where the graſs is cut along with it, the difficulty is great of getting it ſo dry as to be ventured in a ſtack. The beſt way is, to cut the barley with a ſickle above the clover, ſo as that nothing but clean barley is bound up. Cut with a ſcythe the ſtubble and graſs: they make excellent winter food. The ſame method is applicable to oats; with this only difference, that when the field is expoſed to the ſouth-weſt wind, it is leſs neceſſary to bind immediately after mowing. As wheat commonly grows higher than any other grain, it is difficult to manage it with the ſcythe; for which reaſon the ſickle is preferred in England. Peaſe and beans grow ſo irregularly, as to make the ſickle neceſſary.

461 Drying of peaſe. The beſt way for drying peaſe, is to keep ſeparate the handfuls that are cut; though in this way they wet eaſily, they dry as ſoon. In the common way of heap-

Reaping and Storing up Corn and Hay.

ing peaſe together for compoſing a ſheaf, they wet as eaſily, and dry not near ſo ſoon. With reſpect to beans, the top of the handful laſt cut ought to be laid on the bottom of the former; which gives ready acceſs to the wind. By this method peaſe and beans are ready for the ſtack in half the ordinary time.

462 Size of ſheaves.

A ſheaf commonly is made as large as can be contained in two lengths of the corn made into a rope. To ſave frequent tying, the binder preſſes it down with his knee, and binds it ſo hard as totally to exclude the air. If there be any moiſture in the crop, which ſeldom fails, a proceſs of fermentation and putrefaction commences in the ſheaf; which is perfected in the ſtack, to the deſtruction both of corn and ſtraw. How ſtupid is it, to make the ſize of a ſheaf depend on the height of the plants! By that rule, a wheat ſheaf is commonly ſo weighty, as to be unmanageable by ordinary arms: it requires an effort to move it that frequently burſts the knot, and occaſions loſs of grain, beſide the trouble of a ſecond tying. Sheaves ought never to be larger than can be contained in one length of the plant, cut cloſe to the ground; without admitting any exception, if the plants be above 18 inches high. The binder's arm can then compreſs the ſheaf ſufficiently without need of his knee. The additional hands that this way of binding may require, are not to be regarded compared with the advantage of drying ſoon. Corn thus managed may be ready for the ſtack in a week; it ſeldom in the ordinary way requires leſs than a fortnight, and frequently longer. Of a ſmall ſheaf compreſſed by the arm only, the air pervades every part; nor is it ſo apt to be unlooſed as a large ſheaf, however firmly bound. We omit the gathering of ſheaves into ſhocks, becauſe the common method is good, which is to place the ſhocks directed to the ſouth-weſt, in order to reſiſt the force of the wind. Five ſheaves on each ſide make a ſufficient ſtay; and a greater number cannot be covered with two head-ſheaves.

463 Carrying off the victual.

Every article is of importance that haſtens the operation in a country, like Scotland, ſubjected to unequal harveſt weather; for which reaſon, the moſt expeditious method ſhould be choſen for carrying corn from the field to the ſtack-yard. Our carriages are generally too ſmall or too large. A ſledge is a very awkward machine: many hands are required, and little progreſs made. Waggons and large carts are little leſs dilatory, as they muſt ſtand in the yard till unloaded ſheaf by ſheaf. The beſt way is, to uſe long carts moveable upon the axle, ſo as at once to throw the whole load on the ground; which is forked up to the ſtack by a hand appointed for that purpoſe. By this method, two carts will do the work of four or five.

464 Of ſtacking.

Building round ſtacks in the yard is undoubtedly preferable to houſing corn. There it is ſhut up from the air; and it muſt be exceeding dry, if it contract not a muſtineſs, which is the firſt ſtep to putrefaction. Add to this, that in the yard, a ſtack is preſerved from rats and mice, by being ſet on a pedeſtal: whereas no method has hitherto been invented for preſerving corn in a houſe from ſuch deſtructive vermine. The proper manner of building, is to make every ſheaf incline downward from its top to its bottom. Where the ſheaves are laid horizontally, the ſtack will take in rain both above and below. The beſt form of a ſtack is that of a cone placed on a cylinder; and the top of the cone ſhould be formed with three ſheaves drawn to a point. If the upper part of the cylinder be a little wider than the under, ſo much the better.

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The delaying to cover a ſtack for two or three weeks, though common, is, however, exceeding abſurd; for if much rain fall in the interim, it is beyond the power of wind to dry the ſtack. Vegetation begun in the external parts, ſhuts out the air from the internal; and to prevent a total putrefaction, the ſtack muſt be thrown down and expoſed to the air every ſheaf. In order to have a ſtack covered the moment it is finiſhed, ſtraw and ropes ought to be ready; and the covering ought to be ſo thick as to be proof againſt rain.

465 Covering the ſtacks.

Scotland is ſubject not only to floods of rain, but to high winds. Good covering guards againſt the former, and ropes artfully applied guard againſt the latter. The following is a good mode. Take a hay-rope well twiſted, and ſurround the ſtack with it, two feet or ſo below the top. Surround the ſtack with another ſuch rope immediately below the eaſing. Connect theſe two with ropes in an up-and-down poſition, diſtant from each other at the eaſing about five or ſix feet. Then ſurround the ſtack with other circular ropes parallel to the two firſt mentioned, giving them a twiſt round every one of thoſe that lie up and down, by which the whole will be connected together in a ſort of net-work. What remains is, to finiſh the two feet at the top of the ſtack. Let it be covered with bunches of ſtraw laid regularly up and down; the under part to be put under the circular rope firſt mentioned, which will keep it faſt, and the upper part be bound by a ſmall rope artfully twiſted, commonly called *the crown of the ſtack*. This method is preferable to the common way of laying long ropes over the top of the ſtack, and tying them to the belting ropes; which flattens the top, and makes it take in rain. A ſtack covered in the way here deſcribed, will ſtand two years ſecured both againſt wind and rain; a notable advantage in this variable climate.

466 Hay-making.

The great aim in making hay is, to preſerve as much of the ſap as poſſible. All agree in this; and yet differ widely in the means of making that aim effectual. To deſcribe all the different means would be equally tedious and unprofitable. We ſhall confine ourſelves to two, which appear preferable to all others. A crop of rye-graſs and yellow clover ought to be ſpread as cut. A day or two after, when the dew is evaporated, rake it into a number of parallel rows along the field, termed *wind-rows*, for the convenience of putting it up into ſmall cocks. After turning the rows once and again, make ſmall cocks weighing a ſtone or two. At the diſtance of two days or ſo, put two cocks into one, obſerving always to mix the tops and bottoms together, and to take a new place for each cock, that the leaſt damage poſſible may be done to the graſs. Proceed in putting two cocks into one, till ſufficiently dry for tramp-ricks of 100 ſtone each. The eaſieſt way of erecting tramp-ricks, is to found a rick in the middle of the row of cocks that are to compoſe it. The cocks may be carried to the rick by two perſons joining arms together. When all the cocks are thus carried to the rick within the diſtance of 40 yards or ſo, the reſt of the cocks will be more expeditiouſly carried to the rick, by a rope wound about them and dragged by a horſe.

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horſe. Two ropes are ſufficient to ſecure the ricks from wind the ſhort time they are to ſtand in the field. In the year 1775, 10,000 ſtone were put into tramp-ricks the fourth day after cutting. In a country ſo wet as many parts of Scotland are, expedition is of mighty conſequence in the drying both of hay and corn. With reſpect to hay intended for horned cattle, it is by the generality held an improvement, that it be heated a little in the ſtack. But we violently ſuſpect this doctrine to have been invented for excuſing indolent management. An ox, it is true, will eat ſuch hay; but it will always be found that he prefers ſweet hay; and it cannot well be doubted, but that ſuch hay is the moſt ſalutary and the moſt nouriſhing.

467 Hay of red clover.

The making hay conſiſting chiefly of red clover, requires more care. The ſeaſon of cutting is the laſt week of June, when it is in full bloom; earlier it may be cut, but never later. To cut it later would indeed produce a weightier crop; but a late firſt cutting makes the ſecond alſo late, perhaps too late for drying. At the ſame time, the want of weight in an early firſt cutting, is amply compenſated by the weight of the ſecond.

When the ſeaſon is too variable for making hay of the ſecond growth, mix ſtraw with that growth, which will be a ſubſtantial food for cattle during winter. This is commonly done by laying ſtrata of the ſtraw and clover alternately in the ſtack. But by this method, the ſtrata of clover, if they do not heat, turn mouldy at leaſt, and unpalatable. The better way is, to mix them carefully with the hand before they be put into the ſtack. The dry ſtraw imbibes the moiſture from the clover and prevents heating.

468 Other method.

But the beſt method of hay-making ſeems to be that recommended by Mr Anderſon*. "Inſtead (ſays he), of allowing the hay to lie, as uſual in moſt places, for ſome days in the ſwathe after it is cut, and afterwards alternately putting it up into cocks and ſpreading it out, and tedding it in the ſun, which tends greatly to bleach the hay, exhales its natural juices, and ſubjects it very much to the danger of getting rain, and thus runs a great riſk of being good for little, I make it a general rule, if poſſible, never to cut hay but when the graſs is quite dry; and then make the gatherers follow cloſe upon the cutters, putting it up immediately into ſmall cocks about three feet high each when new put up, and of as ſmall a diameter as they can be made to ſtand with; always giving each of them a ſlight kind of thatching, by drawing a few handfuls of the hay from the bottom of the cock all around, and laying it lightly upon the top with one of the ends hanging downwards. This is done with the utmoſt eaſe and expedition; and when it is once in that ſtate, I conſider my hay as in a great meaſure out of danger: for unleſs a violent wind ſhould ariſe immediately after the cocks are put up, ſo as to overturn them, nothing elſe can hurt the hay; as I have often experienced, that no rain, however violent, ever penetrates into theſe cocks but for a very little way. And, if they are dry put up, they never ſit together ſo cloſely as to heat; although they acquire, in a day or two, ſuch a degree of firmneſs, as to be in no danger of being overturned by wind after that time, unleſs it blows a hurricane.

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"In theſe cocks I allow the hay to remain, until, upon inſpection, I judge that it will keep in pretty large tramp-cocks (which is uſually in one or two weeks, according as the weather is more or leſs favourable), when two men, each with a long pronged pitchfork, lift up one of theſe ſmall cocks between them with the greateſt eaſe, and carry them one after another to the place where the tramp-cock is to be built (1): and in this manner they proceed over the field till the whole is finiſhed.

469 Advantages of this method.

"The advantages that attend this method of making hay, are, that it greatly abridges the labour; as it does not require above the one-half of the work that is neceſſary in the old method of turning and tedding it: That it allows the hay to continue almoſt as green as when it is cut, and preſerves its natural juices in the greateſt perfection; for, unleſs it be the little that is expoſed to the ſun and air upon the ſurface of the cocks, which is no more bleached than every ſtraw of hay ſaved in the ordinary way, the whole is dried in the moſt ſlow and equal manner that could be deſired; and, laſtly, That it is thus in a great meaſure ſecured from almoſt the poſſibility of being damaged by rain. This laſt circumſtance deſerves to be much more attended to by the farmer than it uſually is at preſent; as I have ſeen few who are ſufficiently aware of the loſs that the quality of their hay ſuſtains by receiving a ſlight ſhower after it is cut, and before it is gathered; the generality of farmers ſeeming to be very well ſatisfied if they get in their hay without being abſolutely rotted, never paying the leaſt attention to its having been ſeveral times wetted while the hay was making. But, if theſe gentlemen will take the trouble at any time to compare any parcel of hay that has been made perfectly dry, with another parcel from the ſame field that has received a ſhower while in the ſwathe, or even a copious dew, they will ſoon be ſenſible of a very manifeſt difference between them; nor will their horſes or cattle ever commit a miſtake in chooſing between the two.

470 Particular caution requiſite in this method.

"Let it be particularly remarked, that in this manner of making hay, great care muſt be taken that it be dry when firſt put into the cocks; for if it is in the leaſt degree wet at that time, it will turn inſtantly mouldy, and ſit together ſo as to become totally impervious to the air, and will never afterwards become dry till it is ſpread out to the ſun. For this reaſon, if at any time during a courſe of good ſettled weather you ſhould begin to cut in the morning before the dew is off the graſs, keep back the gatherers till the dew is evaporated; allowing that which was firſt cut to lie till it is dry before it is cocked. In this caſe, you will almoſt

* *Eſſays on Agriculture*, vol. i. p. 186.

(1) If the hay is to be carried to any conſiderable diſtance, this part of the labour may be greatly abridged, by cauſing the carriers take two long ſticks of a ſufficient ſtrength, and having laid them down by the ſmall cocks parallel to one another, at the diſtance of one and a half or two feet aſunder, let them lift three or four cocks, one after another, and place them carefully above the ſticks, and then carry them altogether, as if upon a handbarrow, to the place where the large rick is to be built.

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moſt always find that the uncut graſs will dry ſooner than that which has been cut when wet; and therefore, the gatherers may always begin to put up that which is freſh cut before the other; which will uſually require two or three hours to dry after the new-cut hay may be cocked. And if, at any time, in caſe of neceſſity, you ſhould be obliged to cut your hay before it is dry, the ſame rule muſt be obſerved always to allow it to remain in the ſwathe till it is quite dry: but, as there is always a great riſk of being long in getting it up, and as it never in this caſe *wins* (K) ſo kindly as if it had been dry cut, the farmer ought to endeavour, if poſſible, in all caſes to cut his hay only when dry; even if it ſhould coſt him ſome additional expence to the cutters, by keeping them employed at any other works, or even allowing them to remain idle, if the weather ſhould be variable or rainy.

"But if there is a great proportion of clover, and the weather ſhould chance to be cloſe and calm at the time, it may, on ſome occaſions, be neceſſary to open up the cocks a little, to admit ſome freſh air into them; in which caſe, if they have ſtood a day or two, it may be of great uſe to turn theſe cocks and open them up a little, which ought to be done in the drieſt time of the day; the operator taking that part of each cock which was the top, and with it forming the baſe of a new one; ſo that the part which was moſt expoſed to the air becomes excluded from it, and that which was undermoſt comes to be placed upon the top, ſo as to make it all dry as equally as poſſible.

"If the hay has not been damp when it was firſt put up, the cock may be immediately finiſhed out at once; but if it is at all wet, it will be of great uſe to turn over only a little of the top of the cock at firſt, and leaving it in that ſtate to dry a little, proceed to another, and a third, and fourth, &c. treating each in the ſame way; going in that manner till you find that the inſide of the firſt opened cock is ſufficiently dried, when it will be proper to return to it, turning over a little more of it till you come to what is ſtill damp, when you leave it, and proceed to another, and ſo on round the whole; always returning afreſh till the cocks are entirely finiſhed. This is the beſt way of ſaving your hay, if you have been under the neceſſity of cutting it while damp; but it is always beſt to guard againſt this inconvenience, if poſſible."

471 Hay-ſtacks.

In the yard, a ſtack of hay ought to be an oblong ſquare, if the quantity be greater than to be eaſily ſlowed in a round ſtack; becauſe a ſmaller ſurface is expoſed to the air than in a number of round ſtacks. For the ſame reaſon, a ſtack of peaſe ought to have the ſame form, the ſtraw being more valuable than that of oats, wheat, or barley. The moment a ſtack is finiſhed it ought to be covered; becauſe the ſurface hay is much damaged by withering in dry weather, and moiſtening in wet weather. Let it have a pavilion roof; for more of it can be covered with ſtraw in that ſhape, than when built perpendicular at the ends. Let it be roped as directed above for corn-ſtacks; with this difference only, that in an oblong ſquare the ropes muſt be thrown over the top, and tied to the belt-rope below. This belt-rope ought to be fixed with pins to the ſtack: the reaſon is, that the ropes thrown over the ſtack will bag by the ſinking of the ſtack, and may be drawn tight by lowering the belt-rope, and fixing it in its new poſition with the ſame pins. Manures.

The ſtems of hops, being long and tough, make excellent ropes; and it will be a ſaving article, to propagate a few plants of that kind for that very end.

A ſtack of rye-graſs hay, a year old, and of a moderate ſize, will weigh, each cubic yard, 11 Dutch ſtone. A ſtack of clover-hay in the ſame circumſtances weighs ſomewhat leſs.

Sect. VII. *Manures.*

472 M. Parmentier's opinions concerning manure.

"The uſe of manures (ſays M. Parmentier *), has been known in all ages; but we are yet far from having any clear and preciſe ideas of the nature of the juices which are deſtined for the nouriſhment of vegetables, and of the manner in which they are tranſmitted to their organs. The writers on agriculture, who have endeavoured to explain theſe matters, perceiving ſalts in moſt plants, were perſuaded that theſe ſalts, by the help of water and heat, paſſed, in a ſaline form, through the vegetable filter. Theſe firſt philoſophers did not heſitate to conſider every thing that has been done by the induſtry of man, to improve the nature of land, and its productions, as merely forming reſervoirs of theſe ſalts, which they conſider as the principle of fertility. This opinion was ſo well eſtabliſhed among the improvers of land, that, to this day, many of them have no object in view, in their operations, but to diſengage ſalts; and, when they attempt to explain certain phenomena which take place in their fields or orchards, they talk confidently about the *nitre of the air, of rain, of ſnow, of dew, and fogs*; of the *ſalts of the earth, of dung, of marl, of lime, of chalk*, &c. and make uſe of thoſe vague terms, *oil, ſulphur, ſpirit*, &c. which ought henceforward to be baniſhed from our elementary books on agriculture.

* *Memoirs of the Royal Society of Agriculture of Paris.*

"Among the authors who have attacked, and combated with moſt ſucceſs the opinion that the fruitfulneſs of ſoils, and the aliment of vegetables, reſide in ſaline ſubſtances, muſt be reckoned Eller and Wallerius. Theſe philoſophers examined, by every means which chemiſtry at that time could furniſh, the various kinds of earth proper for cultivation, and alſo thoſe ſubſtances which have always been conſidered as the moſt powerful manures, without being able to obtain, from any of them, any thing more than mere atoms of ſalt.

"Animated with the ſame zeal, and taking advantage of the inſtructions found in their writings, I thought it neceſſary to determine, by experience, whether, as has been aſſerted, there really exiſt neutral ſalts in earths; and alſo, whether thoſe earths are more fertile in proportion to the quantity of ſuch ſalts they contain. With this view, I lixiviated, by means of diſtilled water, many ſpecies of cultivated earths, taken in various ſtates, from freſh earth to that which had

(K) By *winning* hay, is meant the operation by which it is brought from the ſucculent ſtate of graſs to that of a dry fodder.

Manures. had been impoverished by the growth of several crops: I also tried dung, reduced more or less into the state of mould; and likewise the most active manures, such as the offal of animal substances rotted by putrefaction; but in none of these, however carefully analyzed, were found any salts in a free state. They contain indeed the materials proper for forming salts, but if they contain any ready formed, it is merely by accident.

"The researches of Kraft, and those of Alston, were not attended with different results. Having sown some oats in ashes, not lixiviated, and in sand strongly impregnated with potash and with saltpetre, and having found that the oats did not grow, they concluded that neutral salts, and alkalies, not only retarded the growth of vegetables, but that they absolutely prevented it. It is well known that in Egypt there are districts where the earth is entirely covered with sea-salt, and these districts are quite barren. It is probably owing to this property of sea-salt, that the Romans were accustomed to scatter large quantities of it over fields where any great crime had been committed, and of which they wished to perpetuate the remembrance, by rendering the part barren for a certain time.

"The idea that salts had great influence in vegetation ought to have been greatly weakened by the following simple reflection. Supposing that salts existed in garden-mould, they would be very soon dissolved by the rain, and carried away, towards the lower strata of the earth, to a depth to which the longest roots would not reach. Indeed the famous experiment of Van Helmont would have been sufficient to have destroyed the above opinion, if it did not generally happen that we are no sooner set free from one error than we fall into another not less extraordinary. The surprising effects of vegetation brought about by the overflowing of water, and in the neighbourhood of salt marshes, and the infinite number of inhaling capillary tubes observed upon the surface of vegetables, led to an opinion that the air and water, absorbed by the roots and leaves of plants, were only vehicles loaded with saline matter, analogous to the vegetables nourished by them.

"To the experiment of Van Helmont, which was repeated by many accurate observers, succeeded those of modern philosophers; from which it clearly appeared, that plants could grow, and produce fruit, in the air of the atmosphere, and in distilled water, also in pure sand, in powdered glass, in wet moss or sponge, in the cavity of fleshy roots, &c. and that plants which had nothing but the above-mentioned fluids for their nourishment, gave, when submitted to chemical analysis, the same products as those which had undergone their process of vegetation in a soil perfectly well manured. It was also observed, that the most barren soils were rendered fertile when they were properly supplied with water by canals; and the efficacy of irrigation was repeatedly evinced in different ways: from these observations was formed the following system, that water rises in plants in the form of vapour, as in distillation; that air introduces itself into their pores; and that, if salts contribute to the fruitfulness of soils, it is only in consequence of their containing the two fluids above mentioned in great abundance."

Our author, after making many experiments upon various soils and salts, maintains "that saline substances have no sensible effects in promoting vegetation, except inasmuch as they are of a deliquescent nature, Manures. have an earthy basis easily decomposed, and are used only in small quantity. In those circumstances they have the power of attracting, from the immense reservoir of the atmosphere, the vapours which circulate in it; these vapours they retain, along with the moisture that is produced from rain, snow, dew, fog, &c. which moisture they prevent from running together in a mass, or from being lost, either by exhaling into the air of the atmosphere, or by filtering itself through the inferior strata of the earth, and thereby leaving the roots of vegetables dry; they distribute that moisture uniformly, and transmit it, in a state of great division, to the orifices of the tubes destined to carry it into the texture of the plant, where it is afterwards to undergo the laws of assimilation. As every kind of vegetable manure possesses a viscous kind of moisture, it thereby partakes of the property of deliquescent salts. In short, the preparation of land for vegetation has no other object in view but to divide the earthy particles, to soften them, and to give them a form capable of producing the above-mentioned effects. It is sufficient, therefore, that water, by its mixture with the earth and the manure, be divided, and spread out so as to be applied only by its surface, and that it keep the root of the plant always wet, without drowning it, in order to become the essential principle of vegetation. But as plants which grow in the shade, even in the best soil, are weakly, and as the greater part of those which are made to grow in a place that is perfectly dark neither give fruit nor flowers, it cannot be denied, that the influence of the sun is of great importance in vegetable economy."

Such was the opinion of M. Parmentier while the old theory of chemistry prevailed; but when it appeared, by more recent discoveries, that air and water are not simple but compound bodies, made up of oxygen, hydrogen, and azote, and that they are resolved into these principles by many operations of nature and of art, he so far altered his theory of vegetation as to admit, that air and water act their part in that process, not in a compound state, but by means of the principles of which they consist. He now concluded, that the value of manured earth consists of its tendency to resolve water into gasses which give out heat while they are absorbed by the plants. As he thus supposes that the gasses constitute the food of plants, it follows, that the most aerated waters will be the most favourable to vegetation; and hence arises the value of those in which putrid animal matters are dissolved. Salts and dung act as leavens in bringing on a state of fermentation in the substances with which they are mingled, and operating the decomposition of water, which along with the carbon existing in the atmosphere, he imagines contains the whole materials of the more simple vegetables. Too great a quantity of salts prevents fermentation, or the decomposition of water, and hence is prejudicial to vegetation, while a small quantity is more advantageous, as more favourable to that process of putrefaction. Different manures also give forth gasses which are absorbed by plants, and give them a peculiarity of character: hence, in a soil composed of mud and dung, cabbages acquire a bad taste, from the hepatic gas, or sulphurated hydrogen gas, which is there evolved. In addition to these chemical

proportion-

Manures. properties of manure, it alſo, by its mechanical qualities, renders the ſoil more permeable to water and to the roots of the plants, and is thus favourable to the proceſs of vegetation. At the ſame time, as the earths themſelves have a chemical action upon water, and are capable of affording a proper baſis for plants, he conſiders them as in many caſes ſufficient to promote vegetation. Upon theſe principles, M. Parmentier takes a view of different ſubſtances uſed as manures. Manures.

Marl, in his opinion, is capable of acting in the ſame manner as the moſt fertile ſoil, when the principles of which it is compoſed, namely, clay, ſand, calcareous earth, and magneſian earth, are juſtly proportioned to each other. But it is ſometimes compact and tenacious, becauſe it contains a ſuperabundant portion of clay, and at other times porous and friable, becauſe it contains too much ſand, and therefore is not in general fit for vegetation by itſelf. Theſe conſiderations ought always to be our guide when we mean to employ marl as a manure.

It has been ſuppoſed that *to marl* is a ſort of technical expreſſion, intended to denote the bringing together or dividing the earthy particles by means of clay or ſand. It appears to our author, that neither of the above operations can properly be called *marling;* becauſe, in either caſe, all we do is, to put the ſoil into a ſituation to receive and to profit by the influence of the atmoſphere, and that of the manures made uſe of. The peculiar principle of marl is, that part of it which, like lime, acts very powerfully upon the different aeriform fluids, is eaſily reduced to powder, effervеſces with acids, and ſends forth a quantity of air-bubbles when water is poured upon it. Now this matter, which in a particular manner does the office of manure, reſides neither in clay nor in ſand. Upon the proportion of it depends the duration of the fertility it produces; conſequently it is of importance, when we make uſe of marl, to know which of its conſtituent parts it contains in the greateſt proportion, otherwiſe in ſome caſes we ſhould only add one common kind of earth to another. Hence our author infers, that for a chalky ſoil clay is the proper manure, and that in ſuch a ſoil a clay bottom is of more value than a gold mine.

"Wood-aſhes, as a manure, may be, in ſome reſpects, compared to marl; at leaſt they contain the ſame earth, as thoſe which generally enter into the compoſition of marl, but they contain a greater quantity of ſaline ſubſtances, proceeding from the vegetables of which they are the reſidue, and from the proceſs made uſe of in their combuſtion; a proceſs which increaſes their activity, and ſhould render us careful in what manner and for what purpoſes we employ them. Wood-aſhes, when ſcattered over fields, at proper times and in proper quantities, deſtroy weeds, and encourage the vegetation of good plants. But do the aſhes produce this effect by a ſort of corroſive power? I cannot (ſays our author) think it; for in that caſe all kinds of plants would indiſcriminately be acted upon by them, and to a certain degree deſtroyed.

"Beſides, the aſhes of freſh wood are ſeldom employed until they have been lixiviated; in which ſtate they are deprived of their cauſtic principle; thoſe aſhes which are moſt commonly made uſe of for manure are produced either from wood that has been floated in water, or from turf, or from pit-coal, and contain little or no alkaline ſalt.

"It appears much more probable that aſhes, when laid upon ground, deſtroy the weeds by a well known effect, namely, by ſeizing with eagerneſs that moiſture which ſerved to produce thoſe weeds, and which in a ſuperabundant quantity is neceſſary to their exiſtence and ſupport. Whereas thoſe plants which have a firmer texture and a longer root, which are rendered ſtrong by age and by having withſtood the rigour of winter, and which are in fact the plants of which the fields are compoſed, do not ſuffer any damage from the application of the aſhes; but, on the contrary, by being freed from the ſuperfluous weeds which ſtifled them, and robbed them of a part of their ſuſtenance, they receive a quantity of nouriſhment proportioned to their wants. The ſtate of relaxation and languor to which they were reduced by a ſuperabundance of water, leaves them, the ſoil gets its proper conſiſtence, and the graſs, corn, &c. acquiring the ſtrength and vigour which are natural to them, ſoon overcome the moſs, ruſhes, and other weeds; thus a good crop, of whatever the field conſiſts of, is produced. It is in the above manner that wood aſhes act, whenever in the ſpring it is neceſſary to apply them to meadows, corn fields, &c. the plants of which are ſtifled and weakened by a luxuriant vegetation of weeds, the uſual conſequence of mild and wet winters.

"When wood-aſhes produce an effect different from what is above deſcribed, it is either becauſe they happen to contain too much alkaline ſalt, or that they are laid on the ground in too great quantity, or that the fields to which they are applied were not ſufficiently wet to reſtrain their action; for when they are ſcattered upon cold ſoils, and buried by the plough before the time of ſowing, they are, like lime, of great ſervice. The laſt-mentioned ſubſtance is very efficacious in other circumſtances; and there is a well known method of uſing it practiſed by the Germans, as follows: A heap of lime is formed by the ſide of a heap of poor earth, and water is poured upon the lime; the earth is then thrown over it, and becomes impregnated with the vapours which eſcape from the lime while it is ſlaked. The earth, after being thus aerated, may be ſeparated; and although no lime remains mixed with it, is, by the operation juſt deſcribed, rendered capable of giving a luxuriant vegetation to whatever plants may be put into it.

"It is poſſible, therefore, to aerate earth as well as fluids; for this purpoſe, by mixing it with certain ſubſtances during their decompoſition, we muſt attach to it the principles of which thoſe ſubſtances are compoſed; from which there reſults a matter ſo loaded with gas, as to form a more compound ſubſtance, and one which has acquired new properties. The Arabians, for example, who take great pains to improve their land, are accuſtomed to make large pits, which they fill with animals which happen to die: theſe pits they afterwards cover with calcareous or clayey earth; and after ſome time theſe earths, which of themſelves are ſterile, acquire the properties of the richeſt manures.

"The foregoing obſervations may at leaſt be conſidered as proving, that thoſe ſubſtances which, when employed freſh and in too great quantity, are moſt prejudicial to vegetation, have, on the contrary, an advantageous

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tageous effect, when they are previouſly made to undergo a fermentation; or when they are mixed with earth or water, in a proportion adapted to the end propoſed. The graſs of fields in which cattle or poultry go to feed, after the firſt or ſecond crop of hay, appears to be dried by the urine and dung of thoſe animals, as if fire had been applied to it; whereas theſe ſame excrementitious ſubſtances, when combined with earth, or diluted with water, are capable, without any other preparation, of performing the office of good manure.

"But if animal ſecretions, when applied in ſubſtance to plants, were capable of acting upon them, as is affirmed, in ſuch a way as to corrode or burn them, how could ſeed which has been ſwallowed, and eſcaped the action of the digeſtive powers, be prolific when thrown out by the animal, after having remained ſo long in its dung? yet we often ſee oats, ſo circumſtanced, grow and produce ſeed. Is it not more conſiſtent with experience and obſervation to ſuppoſe, that theſe excrementitious ſubſtances, being ſtill endowed with animal heat, and with an organic motion, diffuſe round plants in vegetation a deleterious principle or inflammable gas, which deſtroys them? for ſoon after their application, the foliage of the plant grows yellow, dries up, and the plant withers, unleſs there happens a ſhower of rain, which revives it. When theſe ſubſtances are diluted, by being mixed with water and earth, they loſe that principle which is ſo deſtructive to vegetable life, and an incipient fermentation augments their power as a manure, ſo that they may be immediately made uſe of without any apprehenſion of injury from their effects.

"It appears, therefore, that any operation upon excrementitious ſubſtances, by which they are dried and reduced to powder, cannot be practiſed without depriving thoſe ſubſtances of a great part of ſuch of their principles as are eaſily evaporated, and upon which their fluidity depends; theſe principles, when diluted with water, and confined by being mixed with earth, are capable of increaſing the produce of the ſoil. Such is the way in which the huſbandmen in Flanders make uſe of this kind of manure, in the cultivation of a kind of rape or cole ſeed, which is to them a very important branch of agricultural induſtry and commerce; and they never obſerve that the ſap carries up any of thoſe principles which give ſuch manure its offenſive ſmell; nor do they obſerve, that the fodder produced from fields ſo manured, whether eaten freſh or dry, is diſagreeable to their cattle. The excrements of all animals would be injurious to plants, if applied too freſh, or in too great quantity; and a gardener could not commit a greater fault, than to put more than a certain quantity of them into the water he means to make uſe of to water his young plants; in ſhort, this kind of manure is to be uſed in a very ſparing manner; and he that is too prodigal of it will find, to his coſt, that exceſs, even of that which is otherwiſe beneficial, becomes an evil."

"It muſt certainly be allowed, that excrementitious ſubſtances are a very advantageous manure for cold ſoils, and ſuited to moſt vegetable productions; a long experience of their effects over a large tract of country, and the acknowledged intelligence of the Flemiſh farmers, ought to be conſidered as ſufficient to overcome the prejudice that has been raiſed againſt this ſort of manure. Suppoſing that the bad effects which have been attributed to it, when uſed in the ſtate in which it is taken out of privies, &c. are not the offspring of a prejudiced imagination, they may have ariſen from its having been made uſe of at an improper time, or in too great a quantity; or from its having been applied to a ſoil and for the cultivation of plants to which it was not adapted; for we know that the exceſs of any kind of manure changes the ſmell and taſte of plants, and the ſame effect is produced by watering them too frequently. Striking examples of this change are ſeen in the ſtrawberry and in the violet, when ſuch as have grown in the woods are compared to thoſe produced from ſome of our over-manured gardens; alſo in the lettuce, and ſome other plants, when thoſe raiſed for ſale by the gardeners about Paris are compared to thoſe of ſome particular kitchen gardens. In the markets of ſome cities, the carrots, turnips, and potatoes of the fields, are preferred to the ſame kind of roots cultivated by the gardeners; for though the laſt are of a larger ſize, they have not ſo good a flavour. Some vegetables, therefore, are like certain wild ſpecies of the animal kingdom; they reſiſt every kind of culture, as thoſe animals reſiſt every effort to tame them.

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"Although experience has taught the Flemiſh farmers, that excrementitious ſubſtances are more active in their natural ſtate than when dried, yet it cannot be denied that drying them, and reducing them into powder, is ſometimes very advantageous, becauſe in that ſtate they are much leſs offenſive, are eaſily tranſported to any diſtance, and may be uſed when moſt convenient or moſt proper. In many cities the inhabitants pay to have their privies emptied: in other places, thoſe who empty them pay for their contents; and it would aſtoniſh any one to be told how great a revenue is produced in the city of Liſle in Flanders by the ſale of this kind of manure. I am, however (ſays our author), far from thinking that it is right, in all caſes, to employ it in the above-mentioned ſtate of concentration; it would be better, in my opinion, to follow the example of the Flemiſh farmers, who uſe it the firſt year for the cultivation of plants for oil, or for hemp or flax; and the ſecond year for the beſt kinds of grain: thus obtaining two crops, inſtead of one, without any farther preparation of the land. What is ſaid above may be applied alſo to the manures produced from the dung of cattle, poultry, &c. (particularly to pigeons dung, the moſt powerful manure of its kind), all which, by being dried and powdered before they are uſed, loſe a great portion of their activity. From theſe obſervations another fact may be deduced, namely, that manure ſhould not be taken from the place where it has been thrown together until the ſeaſon of the year and the ſtate of the land are ſuch that it may be put into the ground as ſoon as it is brought to it. In ſome diſtricts a very injurious cuſtom prevails of carrying the manure into the fields, and leaving it there formed into ſmall heaps, expoſed for ſome days to the elements; during which time, either the ſun and wind dry up its natural moiſture, leaving a maſs which is much leſs active; or the rain diſſolves and carries away the extractive parts impregnated with the ſalt. This kind of brine, which is the moſt powerful part of the manure, penetrates the earth to a conſiderable depth, and ſhews (by the thick tufts which ariſe in thoſe places, and which produce more ſtraw than grain) that manure

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"We have always at hand the means of compoſing, from a great variety of vegetable and animal ſubſtances, ſuch manures as, when brought into a proper ſtate, and mixed with land, contribute to its fertility. Chemiſtry alſo offers to us a number of ſubſtances, which, although when uſed ſeparately they tend to diminiſh the fertilizing quality of the earth, are yet capable, by being combined, of forming excellent manures; ſuch, for inſtance, is that ſaponaceous combination which is produced from a mixture of potaſh, oil, and earth. What an advantage it would be, if, inſtead of being ſparing of manure, the inhabitants of the country would endeavour to increaſe the number of theſe reſources, and to render them more beneficial, by employing them in a more effectual manner! How many years had paſſed before it was known that the refuſe of apples and pears, after they are preſſed (and which uſed to be thrown away as uſeleſs), is capable of forming as valuable a manure, in cyder and perry countries, as the refuſe of grapes does in wine countries!"

From what has been obſerved, our author concludes, that manures act, in many circumſtances, like medicines, and conſequently that the ſame ſort of manure cannot be adapted to every ſituation, and every kind of ſoil; we muſt therefore take care to make proper diſtinctions between them. Whoever ſhall pretend that any particular kind of manure may be uſed, with equal benefit, in graſs land, corn fields, vineyards, orchards, kitchen gardens, &c. ought to be claſſed amongſt thoſe quacks who undertake to cure all perſons with the ſame remedy, without any regard to their age, conſtitution, &c. It is probably from not having paid ſufficient attention to the forementioned diſtinctions, that ſome authors have found fault with particular manures, while others have ſpoken too highly in their favour.

473 Practical rule for forming manures.

Having thus far ſtated the obſervations of this ingenious author, we think it neceſſary to remark, that the practical farmer, who wiſhes to advance ſafely and proſperouſly in his occupation, will probably find, that the beſt principle upon which he can proceed in forming his plans for the preparation of manure, will conſiſt of keeping ſtrictly in view the ideas which we formerly ſtated *, when conſidering the theory of agriculture. When we wiſh to fertilize land by art, we ought to follow nature, or to imitate the proceſs by which ſhe fertilizes it. Vegetable ſubſtances, fermented by the putrefaction of animal matters, rapidly fall down into earth, and aſſume the form of that rich black mould which is the moſt productive of all ſoils. The great object of the huſbandman, therefore, ought to be to procure large quantities of vegetable ſubſtances of every kind, ſuch as ſtraw, ſtubble, ruſhes, weeds, &c. and to lay theſe up to ferment along with the freſh dung of animals, particularly thoſe animals which chew the cud, for by digeſting their food in a very perfect manner, their dung contains a large portion of animal matter. As horſes, on the contrary, digeſt their food very weakly, their dung is often only ſufficiently animalized to bring on its own fermentation, which, however, is very ſtrong, on account of the large quantity of bits of ſtraw, hay, and other undecompoſed parts of their food which it contains. In the neighbourhood of cities, other animal ſubſtances, beſides dung, may frequently be obtained; ſuch as bullocks blood, and the refuſe of works in which train oil is prepared, none of which ought to be neglected by the huſbandman. Manures

* N° 75, 76, 77, 78.

The art of fermenting vegetable by animal matters, or the true art of making dung, has not yet been brought to perfection, nor is it in almoſt any ſituation ſufficiently attended to. In many places, we ſee large quantities of ferns, ruſhes, and the coarſe graſs of bogs, which no cattle will conſume, allowed to run to waſte; whereas, though theſe plants do not readily of themſelves run into fermentation, they might eaſily, by proper care, be made to undergo this proceſs, and conſequently be converted into a ſource of riches, that is, into fertile mould. On this ſubject, we ſhall here ſtate a mode of preparing dung upon the above principles, that has lately been diſcovered, and ſucceſsfully adopted in Mid Lothian by the Hon. Lord Meadowbank, one of the ſenators of the College of Juſtice in Scotland. It conſiſts of ſubjecting common peat-moſs to the proceſs of fermentation, now mentioned, and has been explained by his lordſhip in a ſmall printed pamphlet, of which, though not ſold to the public, a conſiderable number of copies have been diſtributed among his lordſhip's friends. It is in the following terms: "It is proper to ſtate in the outſet," ſays his lordſhip, "ſome general facts concerning the preparation of manure, which every practical farmer ſhould be acquainted with.

474 Lord Meadowbank's mode of converting moſs into manure.

"1. All recently dead animal or vegetable matter, if ſufficiently divided, moiſt, and not chilled nearly to freezing, tends ſpontaneouſly to undergo changes, that bring it at length to be a fat greaſy earth, which when mixed with ſands, clays, and a little chalk, or pounded limeſtone, forms what is called rich loam, or garden-mould.

"2. In vegetable matter, when amaſſed in quantities, theſe changes are at firſt attended with very conſiderable heat, (ſometimes proceeding the length of inflammation), which, when not exceeding blood-heat, greatly favours and quickens the changes, both in animal matter, and the further changes in vegetable matter, that are not ſenſibly attended with the production of heat. The changes attended with heat, are ſaid to happen by a fermentation, named from what is obſerved in making of ale, wine, or vinegar. The latter are aſcribed to what is called *putrefactive fermentation*.

"3. Beſides moderate moiſture and heat, and that diviſion of parts which admits the air in a certain degree, circumſtances which ſeem to be neceſſary to the production of theſe changes, ſtirring, or mechanical mixture, favours them; and a ſimilar effect ariſes from the addition of chalk, pounded limeſtone, lime, rubbiſh of old buildings, or burnt lime brought back to its natural ſtate; and alſo of aſhes of burnt coal, peat, or wood, ſoap-leys, ſoot, ſea ſhells, and ſea-ware. And, on the other hand, the changes are ſtopped or retarded by preſſure or conſolidation, excluding air; by much water, eſpecially when below the heat of a pool in ſummer; by aſtringents; and by cauſtic ſubſtances, as quicklime, acids, and pure alkalies, at leaſt till their cauſticity is mollified, at the expence of the deſtruction of part of the animal and vegetable matter to which they are added.

"4. Theſe

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" 4. Theſe changes are accompliſhed by the ſeparation or decompoſition of the parts or ingredients of which the dead vegetables and animals are compoſed; by the eſcape of ſomewhat of their ſubſtance in the form of vapours or gaſſes; by the imbibing alſo ſomewhat from water and from the atmoſphere; and by the formation of compound matters, from the reunion of parts or ingredients, which had been ſeparated by the powers of the living vegetables and animals. The earlier changes, and in general thoſe which take place previous to the deſtruction of the adheſion and texture of the dead vegetables and animals, appear to be rather pernicious than favourable to the growth of living vegetables, expoſed to the direct effect of them; whereas the changes ſubſequent to the deſtruction of the animal and vegetable texture promote powerfully the growth of plants, and, partly by their immediate efficacy on the plants expoſed to their influence, partly by the alterations they produce in the ſoil, conſtitute what is to be conſidered as enriching manure (1).

" 5. It ſhould be the object of the farmer to give his ſoil the full benefit of theſe latter changes, decompoſitions and recompoſitions, which proceed ſlowly, and continue to go on for years after the manure is lodged in the ſoil. Even loam or garden-mould is ſtill undergoing ſome remaining changes of the ſame ſort; and, by frequently ſtirring it, or removing it, and uſing it as a top-dreſſing, its ſpontaneous changes are ſo favoured, that it will yield heavy crops for a time, without freſh manure; or, in other words, it is rendered in ſo far a manure itſelf, as it decompoſes faſter than in its ordinary and more ſtationary ſtate, and, in ſo doing, nouriſhes vegetables more abundantly, or forms new combinations in the adjoining ſoil, that enable it to do ſo.

" It ſhould alſo be the object of the farmer, to employ the more early changes, not only to bring forward the ſubſtances undergoing them into a proper ſtate to be committed to the ſoil, but to accelerate or retard them, ſo as to have his manure ready for uſe at the proper ſeaſons, with as little loſs as poſſible, from part being too much and part too little decompoſed; and alſo to avail himſelf of the activity of thoſe changes, to reſtore to a ſtate of ſufficiently rapid ſpontaneous decompoſition, ſuch ſubſtances in his farm, as, though in a ſtate of decay, had become ſo ſtationary, as to be unfit for manure, without the aid of heat and mixture.

" By attention to the two firſt particulars, and the proper uſe of compreſſion, ſtirring and mixture, the farm dunghill, though formed ſlowly and of materials in very various ſtates of decay, is brought forward in nearly the ſame condition. By attention to the latter, manure may, in moſt ſituations in Scotland, be tripled or quadrupled; *et ſimum eſt aurum.* On the other hand, by inattention to them, part of the manure is put into the ſoil unprepared, that is, in a ſituation where the texture of the vegetable is ſtill entire; and, its decompoſition never having been carried far by the heat and mixture of a fermenting maſs, proceeds in the ſoil ſo ſlowly, that, like ploughed down ſtubble, it does not merit the name of manure. Part, again, is apt to be too much rotted, that is, much of it is too nearly approaching to the ſtate of garden-mould, whereby much benefit is loſt, by the eſcape of what had been ſeparated during the proceſs it has undergone, and the good effects on the ſoil of what remains are leſs durable; for, between ſolution in water and rapid decompoſition from its advanced ſtate of rottenneſs, it is ſoon reduced to that of garden-mould; and, in fine, the powers of fermenting vegetable with animal matter, which, when properly employed, are certainly moſt efficacious in converting into manure many ſubſtances that are otherwiſe very ſtationary and ſlow in their decompoſition, are loſt to the farmer, ſo that he is often reduced to adopt an imperfect and little profitable mode of cultivation, from the want of the manure requiſite for a better, though ſuch manure may be lying in abundance within his reach, but uſeleſs from his ignorance how to prepare it.

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" *Peat-moſs* is to be found in conſiderable quantities within reach of moſt farms in Scotland, particularly in thoſe diſtricts where outfield land (i. e. land not brought into a regular courſe of cropping and manuring) forms the larger part of the arable land. It conſiſts of the remains of ſhrubs, trees, heath, and other vegetables, which, under the influence of a cold and moiſt climate, and in wet ſituations, have got into a condition almoſt ſtationary, but much removed from that of the recently dead vegetable, and certainly conſiderably diſtant from that of garden-mould. It is no longer ſuſceptible of going of itſelf, though placed in the moſt favourable circumſtances, into that rapid fermentation, accompanied with heat, which maſſes of freſh vegetables experience: But it is ſtill a powerful fuel when dried; and, on the other hand, it requires long expoſure to the ſeaſons, in a dry ſituation, before, without mixture, it is fit for the nouriſhing of living vegetables.

" In general, however, there is nothing in the ſituation of peat-moſs, or in the changes it has undergone, that leads to think that it has ſuffered any thing that unfits it to be prepared for manure. It is no doubt found ſometimes mixed with particular mineral ſubſtances, that may be, for a time, pernicious to vegetation; but, in general, there is no ſuch admixture, and, when it does take place, a little patience and attention will be ſufficient to cure the evil. In the ordinary caſe, the only ſubſtances found in peat that may be unfavourable to vegetation, in ſo far at leaſt as tending to keep it ſtationary and prevent its rotting, are two, and both abounding in freſh vegetables of the ſorts of which moſs is chiefly compoſed: Theſe are, gallic acid, and the aſtringent principle, or tan; and, as theſe are got the better of in freſh vegetables by the hot fermentation to which they are ſubject, ſo as to leave the general maſs of the ſubſtances to which they belonged properly prepared manure, there is no reaſon to ſuppoſe, that the ſame may not be accompliſhed with the acid and tan of peat. Again, the powers of peat as a fuel, and of aſhes of peat as a manure, ought to convince every perſon, that the material and more eſſential parts of the dead vegetable, for the formation

(1) Hot fermenting dung partakes of both ſorts of fermentation.

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of manure, remain entire in peat. Here the inflammable oils and carbonaceous matter which abound in the fresh vegetable, and the latter of which also abounds in garden-mould, remain entire; the soot and ashes, too, which are the results of the inflammation of each, seem to be nearly equally fertilizing; and, in short, little seems to be lost in peat but the effects of the first fermentation in preparing the matter to undergo its future changes with the rapidity requisite to constitute manure. Besides, the soil produced from peat-earth, by exposure for a course of years, seems not to be sensibly different from that obtained from dung in the same way. Both are deficient in firmness of texture; but are very prolific when mixed with clays, sands, and calcareous earths, in due proportion.

"From considering the preceding circumstances, and from trying what substances operated on tan, and on the acid found in peat-moss, it was determined to subject it to the influence of different sorts of fermenting dung, with due attention to the proportions used, and to the effects of the different preparations; and the following is the direction, which an experience of six crops recommends to practice.

"Let the peat-moss, of which compost is to be formed, be thrown out of the pit for some weeks or months, in order to lose its redundant moisture. By this means, it is rendered the lighter to carry, and less compact and weighty, when made up with fresh dung, for fermentation; and accordingly less dung is required for the purpose, than if the preparation is made with peat taken recently from the pit.

"Take the peat-moss to a dry spot, convenient for constructing a dunghill, to serve the field to be manured. Lay it in two rows, and dung in a row betwixt them. The dung thus lies on the area of the compost-dunghill, and the rows of peat should be near enough each other, that workmen, in making up the compost, may be able to throw them together by the spade, without wheeling. In making up, let the workmen begin at one end. Lay a bottom of peat, 6 inches deep, and 15 feet wide, if the ground admit of it (M). Then lay about 10 inches of dung above the peat; then about 6 inches of peat; then four or five of dung, and then six more of peat; then another thin layer of dung; and then cover it over with peats at the end where it was begun, at the two sides, and above. It should not be raised above 4 feet, or 4½ feet high, otherwise it is apt to press too heavily on the under part, and check the fermentation. When a beginning is thus made, the workmen will proceed working backwards, and adding to the column of compost, as they are furnished with the three rows of materials, directed to be laid down for them. They must take care not to tread on the compost, or render it too compact; and of consequence, in proportion as the peat is wet, it should be made up in lumps, and not much broken.

"In mild weather, seven cart-load of common farm-dung, tolerably fresh made, is sufficient for 21 cart-loads of peat-moss: but in cold weather, a larger proportion of dung is desirable. To every 28 carts of the compost, when made up, it is of use to throw on above it a cart-load of ashes, either made from coal, peat, or wood; or if these cannot be had, half the quantity of slaked lime may be used, the more finely powdered the better. But these additions are nowise essential to the general success of the compost. Manure

"The dung to be used should either have been recently made, or kept fresh by compression; as, by the treading of cattle or swine, or by carts passing over it. And if there is little or no litter in it, a smaller quantity will serve, provided any spongy vegetable matter is added at making up the compost, as fresh weeds, the rubbish of a stack-yard, potato-shaws, sawings of timber, &c. And as some sorts of dung, even when fresh, are much more advanced in decomposition than others, it is material to attend to this; for a much less proportion of such dung, as is less advanced, will serve for the compost, provided care is taken to keep the mass sufficiently open, either by a mixture of the above-mentioned substances, or, if these are wanting, by adding the moss piece-meal, that is, first mixing it up in the usual proportion of three to one of dung, and then, after a time, adding an equal quantity, more or less, of moss. The dung of this character, of greatest quantity, is shamble-dung, with which, under the above precautions, six times the quantity of moss, or more, may be prepared. The same holds as to pigeon-dung, and other fowl-dung; and to a certain extent, also, as to that which is collected from towns, and made by animals that feed on grains, refuse of distilleries, &c.

"The compost, after it is made up, gets into a general heat, sooner or later, according to the weather, and the condition of the dung: in summer, in ten days or sooner; in winter, not perhaps for many weeks, if the cold is severe. It always, however, has been found to come on at last; and in summer, it sometimes rises so high, as to be mischievous, by consuming the materials, (fire-fanging). In that season, a stick should be kept in it in different parts, to pull out and feel now and then: for if it approaches to blood-heat, it should either be watered, or turned over; and on such an occasion, advantage may be taken to mix it with a little fresh moss. The heat subsides after a time, and with great variety, according to the weather, the dung, and the perfection of the making up of the compost; which then should be allowed to remain untouched, till within three weeks of using, when it should be turned over, upside down, and outside in, and all lumps broken: then it comes into a second heat; but soon cools, and should be taken out for use. In this state, the whole, except bits of the old decayed wood, appears a black free mass, and spreads like garden-mould. Use it, weight for weight, as farm-yard dung; and it will be found, in a course of cropping, fully to stand the comparison.

"The addition recommended of ashes or lime, is thought to favour the general perfection of the preparation, and to hasten the second heat. The lime laid on above the dunghill, as directed, is rendered mild by the vapours that escape during the first heat.

"Compost, made up before January, has hitherto been

(M) This alludes to the propriety, in clay lands, of suiting the dunghill to the breadth of a single *ridge*, free of each furrow.

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been in good order for the ſpring-crops; but this may not happen in a long froſt. In ſummer, it is ready in eight or ten weeks; and if there is an anxiety to have it ſoon prepared, the addition of aſhes, or of a little lime-rubbiſh of old buildings, or of lime ſlaked with foul water, applied to the dung uſed in making up, will quicken the proceſs conſiderably.

" Lime has been mixed previouſly with the peat; but the compoſt prepared with that mixture, or with the ſimple peat, ſeemed to produce equally good crops. All the land, however, that it has been tried on, has been limed more or leſs within theſe 25 years.

" Peat prepared with lime alone, has not been found to anſwer as a good manure. In one inſtance, viz. on a bit of fallow ſown with wheat, it was manifeſtly pernicious. Neither with cow-water alone is it prepared, unleſs by lying immerſed in a pool of it for a long time, when it turns into a ſort of ſleetch, which makes an excellent top-dreſſing. Something of the ſame ſort happens with ſoap-ſuds, and water of common ſewers, &c. Lime-water was not found to unite with the tan in peat, nor was urine (x). Peat made up with ſea-weed gets into heat, and the peat ſeems to undergo the ſame change as when prepared with dung. But the effect of this preparation on crops has not yet been experienced. Peat has alſo been expoſed to the fumes of a putrefying carcaſe. In one inſtance the peat proved a manure; but much weaker than when prepared with dung. There, however, the proportion uſed was very large to the carcaſe. Other trials are making, where the proportion is leſs, and with, or without, the addition of aſhes, lime, &c. In all theſe caſes, there can be no ſenſible heat. Peat, heated and rendered friable by the action of the living principle of turnips in growing, was not found entitled, when uſed as a top-dreſſing, to the character of manure. It had been made up in the view of preſerving the turnips during froſt. But the turnips ſprung, and the maſs heated. The turnips were taken out and the peat afterwards uſed as a top-dreſſing. Peat is now under trial, as preparing with turnips and freſh weeds, in fermentation, without the admixture of any animalized matters.

" It is ſaid that dry peat-earth is uſed as a manure in ſome parts of England. But unleſs in chalky ſoils, or others where there may be a great want of carbonaceous matter, it is much doubted whether it could be uſed with any ſenſible advantage. Peat-aſhes were found to raiſe turnips, but to have no ſenſible effect on the next crop.

" The quantity of the compoſt uſed per acre, has varied conſiderably, according to the richneſs of the ſoil manured, and the condition in which it is at manuring, and the ſeaſon in which the manure is applied. From 23 to 35 cart-load, by two horſes each, is about what has been given; the leſſer to fallows and ground in good tilth, and the larger when to be ploughed in with the ſward of poor land; and the intermediate quantities, with tares, peaſe, potatoes, &c.; and it has in moſt caſes undergone comparative trials with different ſorts of common dung. Manures.

" It may be proper to add, that too much attention cannot be paid to the proper preparation of the ground for the reception of manure. It ſhould be clean, pretty dry at the application, and well mixed and friable. Much of the manure applied is otherwiſe loſt, whether lime, dung, or compoſt. The additional quantities recommended when the land is coarſe, is juſt ſo much that would have been ſaved by better cultivation. Common farmers are little aware of this. They might ſave at leaſt half their lime, did they lay it on in powder (o), and on fallows, only harrowing it, and letting it wait for a ſhower before it is ploughed in; and perhaps not much leſs of their dung. It is aſtoniſhing what a viſible effect is produced on land properly mixed by a fallow, from the addition of only a very ſmall quantity of properly prepared dung or compoſt. Both its texture and colour undergo a very ſenſible change, which cannot be accounted for, except from the extrication of ſubſtances from the decompoſing manure, (probably from its ſpontaneous tendency to decompoſe being aided by the chemical action of various matters in a ſoil ſo prepared): And from theſe ſubſtances operating in the ſoil, numberleſs compoſitions and decompoſitions, or tendencies to them, take place, from the various elective attractions of the different parts of which it is compoſed. It is obvious, that an immenſely greater proportion of manure muſt be required to produce even a little of this, where the ſoil is coarſe or lumpy, or conſolidated by wetneſs, than when put into a ſituation favourable to the reciprocal action of the various ſubſtances contained in it, a variety and an admixture formed by nature in perfection in the more favoured ſoils, (as in the bottom of drained lakes, haughs, Delta ground), and which it is the buſineſs of the ſkilful and induſtrious farmer to form or make compenſation for the want of, by judicious manuring, where nature has been leſs bountiful of her gifts.

" It was meant to have given a detailed account of many of the experiments that have been made, whether in Agriculture or Chemiſtry. But as theſe are ſtill going on, and the practical reſults have attracted ſome attention, and prompted imitation by neighbours and acquaintance, ſo that manuſcript directions have been often applied for and obtained, it has been preferred to print, in the mean time, this ſhort account of the buſineſs, diveſted of ſcientific language, and ſuited to the peruſal of any practical huſbandman. It was indeed felt as a degree of wrong, not to take ſome ſteps to make it public, as ſoon as the certainty of ſucceſs warranted. And both the power and the duration

(x) Tan combines with animal gelly, and loſes its aſtringency. The animalized matter, extricated in fermenting dung, has probably this effect on the tan in peat, as well as to render the acid innocent. As vegetable matters ſeem in general to contain the ingredients of, and often ſomewhat ſimilar to, animal gluten, it is poſſible that the fermentation of freſh vegetables alone may prove ſufficient to prepare the peat to rot in the ſoil expeditiouſly; but it is certainly deſirable to uſe alſo animalized matter for this purpoſe.

(o) This they may, though driven in winter, and drowned in the heaps by rains. They have only to turn it over with a very ſmall additional quantity of new burnt ſhells when they come to uſe it.

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tion of the manure have now ſtood the teſt of a great variety of trials, on a conſiderable extent of ground, and of much diverſity of ſoil, continued without intermiſſion during the laſt ſix years. Hitherto it has been found equal, and indeed preferable, to common farm-yard dung, for the firſt three years, and decidedly to ſurpaſs it afterwards. It has been conjectured, from the appearance and effects of the compoſt, that its parts are leſs volatile and ſoluble than thoſe of dung; but that it yields to the crop what is requiſite, by the action of the living fibres of vegetables; and in this way waſtes ſlower, and laſts longer. Whatever be in this, nothing has appeared more remarkable, than its ſuperiority in maintaining (for four and five years) freſh and nouriſhing the paſture of thin clays, that had been laid down with it, and in making them yield well when again ploughed, and that without any top-dreſſing, or new manure of any ſort. Employed in this way, the effect of common dung is ſoon over, the ſoil becoming conſolidated, and the paſture ſtunted; and hence ſuch ſoils have not uſually been cultivated with advantage, except by tillage, and by the aid of quantities of manure, got by purchaſe, and much beyond the produce of the farm-yard. It is believed that the foregoing directions will, if practiſed, prove beneficial to every farmer who has acceſs to peat-moſs within a moderate diſtance; but it is to the farmers of the ſoils now mentioned, and of hungry gravels, to whom they would be found particularly valuable.

"Let it be obſerved, that the object in making up the compoſt is to form as large a hot-bed as the quantity of dung employed admits of, and then to ſurround it on all ſides, ſo as to have the whole benefit of the heat and effluvia. Peat, as dry as garden-mould, in ſeed-time, may be mixed with the dung, ſo as to double the volume and more, and nearly triple the weight, and inſtead of hurting the heat prolong it. Workmen muſt begin with uſing layers; but, when accuſtomed to the juſt proportions, if they are furniſhed with peat moderately dry, and dung not loſt in litter, they throw it up together as a mixed maſs; and they improve in the art, ſo as to make a leſs proportion of dung ſerve for the preparation."

475 Of the more common kinds of manure.

With regard to the other kinds of manure commonly in uſe in this country, their efficacy is well known; the only difficulty is to procure them in ſufficient quantity.—In ſuch lands as lie near the ſea, ſea-weeds offer an unlimited quantity of excellent manure. In the neighbourhood of rivers, the weeds with which they abound offer likewiſe an excellent manure in plenty. Oil-cake, malt-coombs, the refuſe of ſlaughter-houſes, &c. all are excellent where they can be got: but the ſituations which afford theſe are comparatively few; ſo that in moſt caſes the farmer muſt depend much on his own ingenuity and induſtry for raiſing a ſufficient quantity of dung to anſwer his purpoſes: and the methods taken for this purpoſe vary according to the ſituation of different places, or according to the fancy of the huſbandman.

476 Manures uſed in Norfolk.

In all countries where chalk, marl, or lime are to be had, they are certainly to be employed in their proper departments; but beſides theſe, *dung*, properly ſo called, mixed with earth or putrid animal and vegetable ſubſtances, everywhere conſtitutes a principal part of the manure. In Norfolk, Mr Marſhall tells us, that the *quality* of dung is attended to with greater preciſion than in moſt other diſtricts. *Town-muck*, as it is called, is held in moſt eſtimation; and the large towns Norwich and Yarmouth ſupply the neighbouring country. As Yarmouth, however, is a maritime place, and otherwiſe in a manner ſurrounded by marſhes, ſtraw is of courſe a ſcarce and dear article; whence, inſtead of littering their horſes with it, they uſe ſand. As the bed becomes ſoiled or wet, freſh ſand is put on, until the whole is in a manner ſaturated with urine and dung, when it is cleared away, and reckoned muck of ſuch excellent quality, that it is ſent for from a very great diſtance. With regard to other kinds of dung, that from horſes fed upon hay and corn is looked upon to be the beſt; that of fatting cattle the next; while the dung of lean cattle, particularly of cows, is ſuppoſed to be greatly inferior, even though turnips make part of their food. The dung of cattle kept on ſtraw alone is looked upon to be of little or no value; while the muck from trodden ſtraw is by ſome thought to be better than that from the ſtraw which is eaten by the lean ſtock.—Compoſts of dung with marl or earth are very generally uſed.

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477 In the midland diſtrict.

In the midland counties of England, Mr Marſhall informs us, the cores of horns cruſhed in a mill have been uſed as manure; though he knows not with what ſucceſs. His only objection is the difficulty of reducing them to powder. Dung is extremely dear in Norfolk; half a guinea being commonly given for a waggon-load driven by five horſes. Great quantities of lime and marle are found in this diſtrict. With regard to the method of raiſing dung in general, perhaps the obſervations of Mr Marſhall upon the management of the Yorkſhire farmers may be equally ſatisfactory with any thing that has yet been publiſhed on the ſubject.

478 Mr Marſhall's directions for raiſing dung.

"The general practice (ſays he) is to pile the dung on the higheſt part of the yard; or, which is ſtill leſs judicious, to let it lie ſcattered about on the ſide of a ſlope, as it were for the purpoſe of diſſipating its virtues. The urine which does not mix with the dung is almoſt invariably led off the neareſt way to the common ſewer, as if it were thought a nuiſance to the premiſes. That which mixes with the dung is of courſe carried to the *midden*, and aſſiſts in the general diſſipation. A yard of *dung*, nine-tenths of which are ſtraw, will diſcharge, even in dry weather, ſome of its more fluid particles; and in rainy weather, is, notwithſtanding the ſtraw, liable to be waſhed away if expoſed on a riſing ground. But how much more liable to waſte is a mixture of dung and urine, with barely a ſufficiency of ſtraw to keep them together! In dry weather the natural oozing is conſiderable; and in a wet ſeaſon every ſhower of rain waſhes it away in quantities. The Norfolk method of bottoming the dung-yard with mould is here indiſpenſably neceſſary to common good management. There is no better manure for graſs-lands than mould ſaturated with the oozing of a dunghill: it gets down quickly among the graſs, and has generally a more viſible effect than the dung itſelf. Under this management the arable land would have the ſelf-ſame dung it now has; while the graſs-land would have an annual ſupply of riches, which now run to waſte in the ſewers and rivulets. But before a dung-yard can with propriety be bottomed with mould, the bot-

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tom of the yard itſelf ought to be properly formed. A part of it ſituated conveniently for carriages to come at, and low enough to receive the entire drainings of the ſtable, cattle-ſtalls, and hog-ſties, ſhould be hollowed out in the manner of an artificial drinking-pool, with a rim ſomewhat riſing, and with covered drains laid into it from the various ſources of liquid manure. During the ſummer months, at leiſure times, and embracing opportunities of back-carriage, fill the hollow nearly full with mould, ſuch as the ſcourings of ditches, the ſhovellings of roads, the maiden earth of lanes and waſte corners, the coping of ſtone-quarries, &c. &c. leaving the ſurface ſomewhat diſhed; and within this diſh ſet the dung-pile, carefully keeping up a rim of mould round the baſe of the pile higher than the adjoining ſurface of the yard; equally to prevent extraneous matter from finding its way into the reſervoirs, and to prevent the eſcape of that which falls within its circuit."

479 Of lime as a manure. *N° 79, 80, 81.

The uſe of lime, as a manure, was formerly mentioned*, and alſo the principle upon which its value depends. It ought to be uſed not for the purpoſe of giving food to the plants, but as a ſtimulant, tending to bring the ſoil into activity, by reducing to mould all the dead roots of vegetables with which it may abound. Hence it ought never to be uſed without dung upon ſoils that have been exhauſted by repeated cropping, and that are in a clean ſtate.

480 Its operation.

However people may differ in other particulars, all agree, that the operation of lime depends on its intimate mixture with the ſoil; and therefore that the proper time of applying it, is when it is perfectly powdered, and the ſoil at the ſame time in the higheſt degree of pulverization. Lime of itſelf is abſolutely barren; and yet it enriches a barren ſoil. Neither of the two produces any good effect without the other; and conſequently, the more intimately they are mixed, the effect muſt be the greater.

Hence it follows, that lime ought always to be ſlaked with a proper quantity of water, becauſe by that means it is reduced the moſt effectually into powder. Lime left to be ſlaked by a moiſt air, or accidental rain, is ſeldom or never thoroughly reduced into powder, and therefore can never be intimately mixed with the ſoil. Sometimes an opportunity offers to bring home ſhell-lime before the ground is ready for it; and it is commonly thrown into a heap without cover, truſting to rain for ſlaking. The proper way is, to lay the ſhell-lime in different heaps on the ground where it is to be ſpread, to reduce theſe heaps into powder by ſlaking with water, and to cover the ſlaked lime with ſod, ſo as to defend it from rain. One, however, ſhould avoid as much as poſſible the bringing home lime before the ground be ready for it. Where allowed to lie long in a heap, there are two bad conſequences: firſt, lime attracts moiſture, even though well covered, and runs into clots, which prevents an intimate mixture; and, next, we know that burnt limeſtone, whether in ſhells or in powder, returns gradually into its original ſtate of limeſtone; and upon that account alſo, is leſs capable of being mixed with the ſoil. And this is verified by a fact, that, after lying long, it is ſo hard bound together as to require a pick to ſeparate the parts.

For the ſame reaſon, it is a bad practice, though common, to let ſpread lime lie on the ſurface all winter. The bad effects above mentioned take place here in part: and there is another, that rain waſhes the lime down to the furrows, and in a hanging field carries the whole away. Manures.

481 Time of liming.

As the particles of powdered lime are both ſmall and heavy, they quickly ſink to the bottom of the furrow, if care be not taken to prevent it. In that view, it is a rule, that lime be ſpread and mixed with the ſoil immediately before ſowing, or along with the ſeed. In this manner of application, there being no occaſion to move it till the ground be ſtirred for a new crop, it has time to incorporate with the ſoil, and does not readily ſeparate from it. Thus, if turnip-ſeed is to be ſown broad-caſt, the lime ought to be laid on immediately before ſowing, and harrowed in with the ſeed. If a crop of drilled turnip or cabbage be intended, the lime ought to be ſpread immediately before forming in drills. With reſpect to wheat, the lime ought to be ſpread immediately before ſeed-furrowing. If ſpread more early, before the ground be ſufficiently broken, it ſinks to the bottom. If a light ſoil be prepared for barley, the lime ought to be ſpread after ſeed-furrowing, and harrowed in with the ſeed. In a ſtrong ſoil, it ſinks not ſo readily to the bottom, and therefore, before ſowing the barley, the lime ought to be mixed with the ſoil by a brake. Where moor is ſummer-fallowed for a crop of oats next year, the lime ought to be laid on immediately before the laſt ploughing, and braked in as before. It has ſufficient time to incorporate with the ſoil before the land be ſtirred again.

482 Quantity.

The quantity to be laid on depends on the nature of the ſoil. Upon a ſtrong ſoil, 70 or 80 bolls of ſhells are not more than ſufficient, reckoning four ſmall firlots to the boll, termed *wheat meaſure;* nor will it be an overdoſe to lay on 100 bolls. Between 50 and 60 may ſuffice upon medium ſoils; and upon the thin or gravelly, between 39 and 40. It is not ſafe to lay a much greater quantity on ſuch ſoils.

483 Limurg paſture-fields.

It is common to lime a paſture-field immediately before ploughing. This is an unſafe practice; it is thrown to the bottom of the furrow, from which it is never fully gathered up. The proper time for liming a paſture-field, intended to be taken up for corn, is a year at leaſt, or two, before ploughing. It is waſhed in by rain among the roots of the plants, and has time to incorporate with the ſoil.

484 Beat limeſtone.

Limeſtone beat ſmall makes an excellent manure; and ſupplies the want of powdered lime where there is no fuel to burn the limeſtone. Limeſtone beat ſmall has not hitherto been much uſed as a manure; and the proportion between it and powdered lime has not been aſcertained. What follows may give ſome light. Three pounds of raw lime is by burning reduced to two pounds of ſhell-lime. Yet nothing is expelled by the fire but the air that was in the limeſtone: the calcareous earth remains entire. *Ergo*, two pounds of ſhell-lime contain as much calcareous earth as three pounds of raw limeſtone. Shell lime of the beſt quality, when ſlaked with water, will meaſure out to thrice the quantity. But as limeſtone loſes none of its bulk by being burnt into ſhells, it follows, that three buſhels of raw limeſtone contain as much calcareous earth as ſix buſhels of powdered lime; and conſequently, if powdered lime

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485 Of ſhell-marl. Shell-marl, as a manure, is managed in every reſpect like powdered lime; with this only difference, that a fifth or a fourth part more in meaſure ought to be given. The reaſon is, that ſhell-marl is leſs weighty than lime; and that a boll of it contains leſs calcareous earth, which is the fructifying part of both.

486 Of clay and ſtone marls. Clay and ſtone marls, with reſpect to huſbandry, are the ſame, though in appearance different.

The goodneſs of marl depends on the quantity of calcareous earth in it: which has been known to amount to a half or more. It is too expenſive if the quantity be leſs than a third or a fourth part. Good marl is the moſt ſubſtantial of all manures; becauſe it improves the weakeſt ground to equal the beſt borough-acres. The low part of Berwickſhire, termed *the Merſe*, abounds everywhere with this marl; and is the only county in Scotland where it is plenty.

Land ought to be cleared of weeds before marling; and it ought to be ſmoothed with the brake and harrow, in order that the marl may be equally ſpread. Marl is a foſſil on which no vegetable will grow; its efficacy depends, like that of lime, on its pulverization, and intimate mixture with the ſoil. Toward the former, alternate drought and moiſture contribute greatly, as alſo froſt. Therefore, after being evenly ſpread, it ought to lie on the ſurface all winter. In the month of October it may be rouſed with a brake; which will bring to the ſurface, and expoſe to the air and froſt, all the hard parts, and mix with the ſoil all that is powdered. In that reſpect it differs widely from dung and lime, which ought uſually to be ploughed into the ground without delay. Oats is a hardy grain, which will anſwer for height the firſt crop after marling better than any other; and it will ſucceed though the marl be not thoroughly mixed with the ſoil. In that caſe, the marl ought to be ploughed in with an ebb furrow immediately before ſowing, and braked thoroughly. It is tickliſh to make wheat the firſt crop: if ſown before winter, froſt ſwells the marl, and is apt to throw the ſeed out of the ground; if ſown in ſpring, it will ſuffer more than oats by want of due mixture.

Summer is the proper ſeaſon for marling; becauſe in that ſeaſon the marl, being dry, is not only lighter, but is eaſily reduced to powder. Froſt, however, is not improper for marling, eſpecially as in froſt there is little opportunity for any other work.

Marl is a heavy body, and ſinks to the bottom of the furrow, if indiſcreetly ploughed. Therefore the firſt crop ſhould always have an ebb furrow. During the growing of that crop, the marl has time to incorporate with the ſoil, and to become a part of it; after which it does not readily ſeparate.

487 Of gypſum as a manure. Of late a new manure has been introduced into ſome countries. This is gypſum, which is lime united with ſulphuric acid. In the eighth volume of the Annals of Agriculture we are informed, that it is commonly uſed as a manure in Switzerland. In the 10th volume of the ſame work, Sir Richard Sutton gives ſome account of an experiment made with it on his eſtate; but in ſuch an inaccurate manner, that nothing could be determined. "The appearance in general (ſays he), I think, was rather againſt the benefit of the plaſter, though not decidedly ſo." He tells us, that its virtues were a ſubject of debate in Germany. In America this ſubſtance ſeems to have met with more ſucceſs than in any other country. In the fifth volume of Bath Papers, Mr Kirkpatrick of the iſle of Wight, who had himſelf viſited North America, informs us, that it is much uſed in the United States, on account of its cheapneſs and efficacy; though, from what is there ſtated, we muſt undoubtedly be led to ſuppoſe, that its *efficacy* muſt be very great before it can be entitled to the praiſe of *cheapneſs*. In the firſt place, it is brought from the hills in the neighbourhood of Paris to Havre de Grace, and from thence exported to America; which of itſelf muſt occaſion a conſiderable expence, though the plaſter were originally given *gratis*. In the next place it muſt be powdered in a ſtamping mill, and the finer it is powdered ſo much the better. In the third place, it muſt be *ſown* over the ground to be manured with it. The quantity for graſs is ſix buſhels to an acre. It ought to be ſown on dry ground in a wet day; and its efficacy is ſaid to laſt from ſeven to twelve years. It operates entirely as a top-dreſſing.

In the 10th volume of the Annals of Agriculture, we have ſome extracts from a treatiſe by Mr Powel, preſident of the Philadelphia Society for encouraging Agriculture, upon the ſubject of gypſum as a manure; of the efficacy of which he gives the following inſtances. 1. In October 1786, plaſter of Paris was ſown in a rainy day upon wheat-ſtubble without any previous culture. The crop of wheat had ſcarce been worth reaping, and no kind of graſs ſeed had been ſown upon the ground; nevertheleſs, in the month of June it was covered with a thick mat of white clover, clean and even, from ſix to eight inches in height. A piece of ground adjoining to this white clover was alſo ſown with gypſum, and exhibited a fine appearance of white and red clover mixed with ſpear-graſs. Some wet ground ſown at the ſame time was not in the leaſt improved.—This anecdote reſts entirely on the veracity of an anonymous farmer. 2. Eight buſhels of plaſter of Paris ſpread upon two acres and a half of wheat-ſtubble ground, which the ſpring before had been ſowed with about two pounds of red clover-ſeed to the acre for paſture, yielded five tons of hay by the middle of June. A ſmall piece of ground of ſimilar quality, but without any plaſter, produced only one ton and a half in the ſame proportion.—Mr Powel concludes in favour of the effects of the plaſter upon arable as well as graſs land.

Other accounts to the ſame purpoſe have been publiſhed, though it muſt alſo be remarked, that various perſons who have made trial of this manure, declare themſelves diſſatisfied with it; but it does not appear that it has hitherto been at all tried in this part of the iſland.

When a ſoil abounds too much in particles of a particular kind, it has been found expedient to mix it with earth of a different character. Hence we are informed in the 12th volume of the Annals of Agriculture, that in Cornwall, large quantities of ſea-ſand are annually conveyed to the land, and laid upon the ſoil; a practice which will no doubt have a tendency to ameliorate ſtiff clays, and to render them more pervious to the roots of plants. With the ſame view, and alſo to ſave fuel, a practice is ſaid to exiſt in the Netherlands, of baking

488 Of ſea-ſ as a ma nure.

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baking up the droſs or culm of coal, and alſo peat-earth, with clay, into lumps or bricks, which when dried in the air, make excellent fuel, and alſo afford an immenſe quantity of valuable aſhes to be laid upon the land.

Sect. VIII. *Principles and Operations of the Drill or Horſe-hoeing Huſbandry.*

The general properties attributed to the new or drill huſbandry may be reduced to two, viz. the promoting the growth of plants by hoeing, and the ſaving of ſeed; both of which are equally profitable to the farmer.

489 Advantages aſcribed to horſe-hoeing.

The advantages of tillage before ſowing have already been pointed out. In this place we muſt confine ourſelves to the utility of tillage after ſowing. This kind of tillage is moſt generally known by the name of *horſe-hoeing*.

Land ſowed with wheat, however well it may be cultivated in autumn, ſinks in the winter; the particles get nearer together, and the weeds riſe; ſo that in ſpring, the land is nearly in the ſame ſituation as if it never had been ploughed. This, however, is the ſeaſon when it ſhould branch and grow with moſt vigour; and conſequently ſtands moſt in need of ploughing or hoeing, to deſtroy the weeds, to ſupply the roots with freſh earth, and, by dividing anew the particles of the ſoil, to allow the roots to extend and collect nouriſhment.

It is well known, that, in gardens, plants grow with double vigour after being hoed or tranſplanted. If plants growing in arable land could be managed with eaſe and ſafety in this manner, it is natural to expect, that their growth would be promoted accordingly. Experience ſhows, that this is not only practicable, but attended with many advantages.

In the operation of hoeing wheat, though ſome of the roots be moved or broken, the plants receive no injury; for this very circumſtance makes them ſend forth a greater number of roots than formerly, which enlarge their paſture, and conſequently augment their growth.

Sickly wheat has often recovered its vigour after a good hoeing, eſpecially when performed in weather not very hot or dry.

Wheat, and ſuch grain as is ſown before winter, requires hoeing more than oats, barley, or other grain ſown in the ſpring; for, if the land has been well ploughed before the ſowing of ſpring corn, it neither has time to harden, nor to produce many weeds, not having been expoſed to the winter's ſnow and rain.

Of Sowing.

490 Method of ſowing in the drill huſbandry.

As in the practice of the new huſbandry, plants grow with greater vigour than by the old method, the land ſhould be ſowed thinner. It is this principle of the new huſbandry that has been chiefly objected to; for, upon obſerving the land occupied by a ſmall number of plants, people are apt to look upon all the vacant ſpace as loſt. But this prejudice will ſoon be removed, when it is conſidered, that in the beſt land cultivated in the common method, and ſown very thick, each ſeed produces but one or two ears; that, in the ſame land ſown thinner, every ſeed produces two or three ears; and that a ſingle ſeed ſometimes produces 18 or 21 ears.

In the common method, as there are many more plants than can find ſufficient nouriſhment, and as it is impoſſible to aſſiſt them by hoeing, numbers die before they attain maturity; the greateſt part remain ſickly and drooping; and thus part of the ſeed is loſt. On the contrary, in the new method, all the plants have as much food as they require; and as they are, from time to time, aſſiſted by hoeing, they become ſo vigorous as to equal in their production the numerous but ſickly plants cultivated in the common method.

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Of Hoeing.

The new huſbandry is abſolutely impracticable in lands that are not eaſily ploughed. Attempting to cultivate land according to this huſbandry, without attending to this circumſtance, that it is practicable in no land excepting ſuch as has already been brought into good tilth by the old method, has gone far to make it contemptible in many places.

When a field is in good tilth, it ſhould be ſown ſo thin as to leave ſufficient room for the plants to extend their roots. After being well ploughed and harrowed, it muſt be divided into rows, at the diſtance of 30 inches from one another. On the ſides of each of theſe rows, two rows of wheat muſt be ſowed ſix inches diſtant from each other. By this means there will be an interval of two feet wide betwixt the rows, and every plant will have room enough to extend its roots, and to ſupply it with food. The intervals will likewiſe be ſufficient for allowing the earth to be hoed or tilled without injuring the plants in the rows.

491 The different hoeings.

The firſt hoeing, which ſhould be given before the winter, is intended to drain away the wet, and to diſpoſe the earth to be mellowed by the froſts. Theſe two ends will be anſwered by drawing two ſmall furrows at a little diſtance from the rows, and throwing the earth taken from the furrows into the middle of the intervals. This firſt hoeing ſhould be given when the wheat is in leaf.

The ſecond hoeing, which is intended to make the plants branch, ſhould be given after the hard froſts are over. To do this with advantage, after ſtirring the earth a little near the rows, the earth which was thrown into the middle of the intervals ſhould be turned back into the furrows. This earth, having been mellowed by the winter, ſupplies the plants with excellent food, and makes the roots extend.

The third hoeing, which is intended to invigorate the ſtalk, ſhould be given when the ears of the corn begin to ſhow themſelves. This hoeing may, however, be very ſlight.

But the laſt hoeing is of the greateſt importance, as it enlarges the grain, and makes the ears fill at their extremities. This hoeing ſhould be given when the wheat is in bloom; a furrow muſt be drawn in the middle of the interval, and the earth thrown to the right and left on the foot of the plants. This ſupports the plants, prevents them from being laid, and prepares the ground for the next ſowing, as the ſeed is then to be put in the middle of the ground that formed the intervals.

The beſt ſeaſon for hoeing is two or three days after rain, or ſo ſoon after rain as the ſoil will quit the inſtrument in hoeing. Light dry ſoils may be hoed almoſt at any time, but this is far from being the caſe with ſtrong

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ſtrong clay ſoils; the ſeaſon for hoeing ſuch is frequently ſhort and precarious; every opportunity therefore ſhould be carefully watched, and eagerly embraced. The two extremes of wet and dry, are great enemies to vegetation in ſtrong clay ſoils. There is a period between the time of clay ſoils running together, ſo as to puddle by ſuperfluous wet, and the time of their caking by drought, in which they are perfectly manageable. This is the juncture for hoeing; and ſo much land as ſhall be thus ſeaſonably hoed, will not cake or cruſt upon the ſurface, as it otherwiſe would have done, till it has been ſoaked or drenched again with rain; in which caſe the hoeing is to be repeated as ſoon as the ſoil will quit the inſtrument, and as often as neceſſary; by which time the growing crop will begin to cover the ground, ſo as to act as a ſcreen to the ſurface of the land againſt the intenſe heat of the ſun, and thereby prevent, in a great meaſure, the bad effects of the ſoil's caking in dry weather.

By this ſucceſſive tillage, or hoeing, good crops will be obtained, provided the weather is not very unfavourable.

But as ſtrong vigorous plants are long before they arrive at maturity, corn raiſed in the new way is later in ripening than any other, and muſt therefore be ſown earlier.

In order to prepare the intervals for ſowing again, ſome well-rotted dung may be laid in the deep furrows made in the middle of the intervals; and this dung muſt be covered with the earth that was before thrown towards the rows of wheat. But, if the land does not require mending, the deep furrow is filled without any dung. This operation ſhould be performed immediately after harveſt, that there may be time to give the land a ſlight ſtirring before the rows are ſowed; which ſhould occupy the middle of the ſpace which formed the intervals during the laſt crop. The intervals of the ſecond year take up the ſpace occupied by the ſtubble of the firſt.

Suppoſing dung to be neceſſary, which is denied by many, a very ſmall quantity is ſufficient; a ſingle layer, put in the bottom of each furrow, will be enough.

Description of the Instruments commonly uſed in the New Husbandry.

492 Inſtruments deſcribed, Plate X.

Fig. 1. is a marking plough. The principal uſe of this plough is to ſtraight and regulate the ridges. The firſt line is traced by the eye, by means of three poles, placed in a ſtraight line. The plough draws the firſt furrow in the direction of this line; and at the ſame time, with the tooth A, fixed in the block of wood near the end of the croſs-pole or ſlider BB, marks the breadth of the ridge at the diſtance intended. The ploughman next traces the next line or rutt made by the tooth, and draws a ſmall furrow along it: and continues in this manner till the whole field is laid out in ſtraight and equidiſtant ridges.

Fig. 2. is a plough for breaking up ley, or turning up the bottom of land when greatly exhauſted. By its conſtruction, the width and depth of the furrows can be regulated to a greater certainty than by any other hitherto known in this country. Its appearance is heavy: but two horſes are ſufficient to plough with it in ordinary free land; and only four are neceſſary in the ſtiffeſt clay-ſoils. This plough is likewiſe eaſily held and tempered. A, is the ſword fixed in the ſizers B, which runs through a mortoiſe E, at the end of the beam C, and regulates the depth of the furrow by raiſing or depreſſing the beam; it is fixed by putting the pin D through the beam and ſword, and is moveable at E.

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Fig. 3. is a jointed brake-harrow with 24 teeth, ſhaped like coulters, and ſtanding at about an angle of 80 degrees. By this inſtrument the land is finely pulverized, and prepared for receiving the ſeed from the drill. It requires four horſes in ſtiff, and two in open land. This harrow is likewiſe uſed for levelling the ridges; which is done by preſſing it down by the handles where the ridge is high, and raiſing it up when low. Plate X.

Fig. 4. is an angular weeding harrow, which may follow the brake when neceſſary. The ſeven hindmoſt teeth ſhould ſtand at a more acute angle than the reſt, in order to collect the weeds, which the holder can drop at pleaſure, by raiſing the hinder part, which is fixed to the body of the harrow by two joints.

Fig. 5. is a pair of harrows with ſhafts. This harrow is uſed for covering the ſeed in the drills, the horſe going in the furrow.

Fig. 6. is a drill-plough, conſtructed in ſuch a manner as to ſow at once two rows of beans, peaſe, or wheat. This machine is eaſily wrought by two horſes. A, is the happer for containing the ſeed; B, circular boxes for receiving the ſeed from the happer; CC, two ſquare boxes which receive the ſeed from ſmall holes in the circular boxes, as they turn round; and laſt of all, the ſeed is dropped into the drills through holes in the ſquare boxes, behind the coulters D. The cylinder E follows, which, together with the wheel F, regulates the depth of the coulters, and covers the ſeed; the harrow G comes behind all, and covers the ſeed more completely. HH, two ſliders, which, when drawn out, prevent the ſeed from falling into the boxes; and, I, is a ketch which holds the rungs, and prevents the boxes from turning, and loſing ſeed at the ends of the ridges.

Fig. 7. is a ſingle hoe-plough of a very ſimple conſtruction, by which the earth in the intervals is ſtirred and laid up on both ſides to the roots of the plants, and at the ſame time the weeds are deſtroyed. AA the mouldboards, which may be raiſed or depreſſed at pleaſure, according as the farmer wants to throw the earth higher or lower upon the roots.

Fig. 2. is a drill-rake for peaſe. This inſtrument, which is chiefly calculated for ſmall incloſures of light grounds, is a ſort of ſtrong plough rake, with four large teeth at *a*, *a*, *b*, *b*, a little incurvated. The diſtance from *a* to *a*, and from *b* to *b*, is nine inches. The interval between the two inner teeth, *a* and *b*, is three feet ſix inches, which allows ſufficient room for the hole-plough to move in. To the piece of timber *c c*, forming the head of the rake, are fixed the handles *d*, and the beam *e* to which the horſe is faſtened. When this inſtrument is drawn over a piece of land made thoroughly fine, and the man who holds it bears upon the handles, four furrows, *f*, *g*, *h*, *i*, will be formed, at the diſtances determined by the conſtruction of the inſtrument. Theſe diſtances may be accurately preſerved, provided that the teeth *a a* return when the ploughman Plate IX

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man comes back, after having ploughed one turn, in two of the channels formed before, marked *b b*: thus all the furrows in the field will be traced with the ſame regularity. When the ground is thus formed into drills, the peaſe may be ſcattered by a ſingle motion of the hand at a certain diſtance from one another into the channels, and then covered with the flat part of a hand-rake, and preſſed down gently. This inſtrument is ſo ſimple, that any workman may eaſily make or repair it.

Plate XI. On Plate XI. is delineated a patent drill machine, lately invented by the Reverend James Cooke of Heaton-Norris near Manchester. A, the upper part of the ſeed-box. B, the lower part of the ſame box. C, a moveable partition, with a lever, by which the grain or ſeed is let fall at pleaſure from the upper to the lower part of the ſeed-box, from whence it is taken up by cups or ladles applied to the cylinder D, and dropped into the funnel E, and conveyed thereby into the furrow or drill made in the land by the coulter F, and covered by the rake or harrow G. H, a lever, by which the wheel I is lifted out of generation with the wheel K, to prevent the grain or ſeed being ſcattered upon the ground, while the machine is turning round at the end of the land, by which the harrow G is alſo lifted from the ground at the ſame time, and by the ſame motion, by means of the crank, and the horizontal lever *h h*. L, a ſliding lever, with a weight upon it, by means of which the depth of the furrows or drills, and conſequently the depth that the grain or ſeed will be depoſited in the land, may be eaſily aſcertained. M, a ſcrew in the coulter beam, by turning of which the ſeed-box B is elevated or depreſſed, in order to prevent the grain or ſeed being cruſhed or bruiſed by the revolution of the cups or ladles. Fig. 13. a rake with iron teeth, to be applied to the under ſide of the rails of the machine, with ſtapples and ſcrew nuts at *n n*, by which many uſeful purpoſes are anſwered, viz. in accumulating cuitch or hay into rows, and as a ſcarificator for young crops of wheat in the ſpring, or to be uſed upon a fallow; in which caſe, the ſeed-box, the ladle cylinder, the coulters, the funnels, and harrows, are all taken away.

The ſide view of the machine is repreſented, for the ſake of perſpicuity, with one ſeed-box only, one coulter, one funnel, one harrow, &c. whereas a complete machine is furniſhed with five coulters, five harrows, ſeven funnels, a ſeed-box in eight partitions, &c. with ladles of different ſizes, for different ſorts of grain and ſeeds.

Theſe machines (with five coulters ſixteen guineas, with four coulters fifteen guineas), equally excel in ſetting or planting all ſorts of grain and ſeeds, even carrot-ſeed, to exactneſs, after the rate of from eight to ten chain acres per day, with one man, a boy, and two horſes. They depoſite the grain or ſeed in any given quantity from one peck to three buſhels per acre, regularly and uniformly, and that without grinding or bruiſing the ſeed, and at any given depth, from half an inch to half a dozen inches, in rows at the diſtance of twelve, ſixteen and twenty-four inches, or any other diſtance. They are equally uſeful on all lands, are durable, eaſy to manage, and by no means ſubject to be put out of repair.

The ladle cylinder D is furniſhed with cups or ladles of four different ſizes for different ſorts of grain or ſeeds, which may be diſtinguiſhed by the numbers 1, 2, 3, 4.—N° 1. (the ſmalleſt ſize) is calculated for turnip-ſeed, clover-ſeed, cole-ſeed, rape, &c. and will ſow ſomething more than one pound per ſtatute acre. N° 2. for wheat, rye, hemp, flax, &c. and will ſow ſomething more than one buſhel per acre. N° 3. for barley; and will ſow one buſhel and a half per acre. N° 4. for beans, oats, peaſe, vetches, &c. and will ſow two buſhels per acre.

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Notwithſtanding the above ſpecified quantities of grain or ſeeds, a greater or leſs quantity of each may be ſown at pleaſure, by ſtopping up with a little clay or by adding a few ladles to each reſpective box. The grain or ſeeds intended to be ſown, muſt be put in thoſe boxes, to which the cups or ladles as above deſcribed reſpectively belong, an equal quantity into each box, and all the other boxes empty. The ladle cylinder may be reverſed, or turned end for end at pleaſure, for different ſorts of grain, &c.

For ſowing beans, oats, peaſe, &c. with a five-coulter machine, four large ladles muſt occaſionally be applied at equal diſtances round thoſe parts of the cylinder which ſubtend the two end boxes. And for ſowing barley, eight large ones muſt be applied as above; or four ladles, N° 2. to each of the wheat boxes. Theſe additional ladles are fixed on the cylinder with nails, or taken off in a few minutes; but for ſowing with a four-coulter machine, the above alterations are not neceſſary.

The funnels are applied to their reſpective places by correſponding numbers. Care ſhould be taken, that the points of the funnels ſtand directly behind the backs of the coulters, which is done by wedges being applied to one ſide or other of the coulters, at the time they are fixed in their reſpective places.

The machine being thus put together, which is readily and expeditiouſly done, as no ſeparate part will coincide with any other but that to which it reſpectively belongs, and an equal quantity of grain or ſeed in each of the reſpective boxes, the land alſo being previouſly ploughed and harrowed once or ſo in a place to level the ſurface; but if the land be very rough, a roller will beſt anſwer that purpoſe, whenever the land is dry enough to admit of it; and upon ſtrong clays, a ſpiked roller is ſometimes neceſſary to reduce the ſize of the large dry clods; which being done, the driver ſhould walk down the furrow or edge of the land, and having hold of the laſt horſe's head with his hand, he will readily keep him in ſuch a direction, as will bring the outſide coulter of the machine within three or four inches of the edges of the land or ridge, at which uniform extent, he ſhould keep his arm till he comes to the end of the land; where having turned round, he muſt come to the other ſide of his horſes, and walking upon the laſt outſide drill, having hold of the horſe's head with his hand as before, he will readily keep the machine in ſuch a direction, as will ſtrike the ſucceeding drill at ſuch a diſtance from the laſt outſide one, or that he walks upon, as the coulters are diſtant from each other.

The perſon who attends the machine ſhould put down the lever H ſoon enough at the end of the land, that the cups or ladles may have time to fill, before he begins to ſow; and at the end of the land, he muſt ap-

Drill or Horſe-hoeing Huſbandry.

ply his right hand to the middle of the rail between the handles, by which he will keep the coulters in the ground, while he is lifting up the lever H with his left hand, to prevent the grain being ſcattered upon the headland, while the machine is turning round: this he will do with great eaſe, by continuing his right hand upon the rail between the handles, and applying his left arm under the left handle, in order to lift the coulters out of the ground while the machine is turning round.

If there be any difficulty in uſing the machine, it conſiſts in driving it ſtraight. As to the perſon who attends the machine, he cannot poſſibly commit any errors, except ſuch as are wilful, particularly as he ſees at one view the whole proceſs of the buſineſs, viz. that the coulters make the drills of a proper depth; that the funnels continue open to convey the grain or ſeed into the drills; that the rakes or harrows cover the grain ſufficiently; and when ſeed is wanting in the lower boxes B, which he cannot avoid ſeeing, he readily ſupplies them from the upper boxes A, by applying his hand, as the machine goes along, to the lever C. The lower boxes B ſhould not be ſuffered to become empty before they are ſupplied with ſeed, but ſhould be kept nearly full, or within an inch or ſo of the edge of the box.

If chalk lines are made acroſs the backs of the coulters, at ſuch a diſtance from the ends as the ſeed ſhould be depoſited in the ground (viz. about two inches for wheat, and from two to three for ſpring corn), the perſon that attends the machine will be better able to aſcertain the depth the ſeed ſhould be depoſited in the drills, by obſerving, as the machine goes along, whether the chalk lines are above or below the ſurface of the land; if above, a proper weight muſt be applied to the lever L, which will force the coulters into the ground; if below, the lever L and weight muſt be reverſed, which will prevent their ſinking too deep.

In different parts of the kingdom, lands or ridges are of different ſizes; where the machine is too wide for the land, one or more funnels may occaſionally be ſtopped with a little looſe paper, and the ſeed received into ſuch funnel returned at the end of the land, or ſooner if required, into the upper ſeed-box. But for regularity and expedition, lands conſiſting of ſo many feet wide from outſide to outſide, as the machine contains coulters, when fixed at twelve inches diſtance, or twice or three times the number, &c. are beſt calculated for the machine. In wet ſoils or ſtrong clays, lands or ridges of the width of the machine, and in dry ſoils, of twice the width, are recommended. For ſowing of narrow high-ridged lands, the outſide coulters ſhould be let down, and the middle ones raiſed, ſo that the points of the coulters may form the ſame curve that the land or ridge forms. And the looſe ſoil harrowed down into the furrows ſhould be returned to the edges of the lands or ridges from whence it came, by a double mouldboard or other plough, whether the land be wet or dry.

Clover or other leys, intended to be ſown by the machine, ſhould be ploughed a deep ſtrong furrow and well harrowed, in order to level the ſurface, and to get as much looſe ſoil as poſſible for the coulters to work in; and when ſown, if any of the ſeed appears in the drills uncovered by reaſon of the ſtiff texture of the ſoil, or toughneſs of the roots, a light harrow may be taken over the land, once in a place, which will effectually cover the ſeed, without diſplacing it all in the drills. For ſowing leys, a conſiderable weight muſt be applied to the lever L, to force the coulters into the ground; and a ſet of wrought-iron coulters, well ſteeled, and made ſharp at the front edge and bottom, are recommended; they will pervade the ſoil more readily, conſequently require leſs draught, and expedite buſineſs more than adequate to the additional expence.

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For every half acre of land intended to be ſown by the machine with the ſeed of that very valuable root (carrot), one buſhel of ſaw-duſt, and one pound of carrot-ſeed, ſhould be provided; the ſaw duſt ſhould be made dry, and ſifted to take out all the lumps and chips, and divided into eight equal parts or heaps; the carrot-ſeed, ſhould likewiſe be dried, and well rubbed between the hands, to take off the beards, ſo that it may ſeparate readily; aed being divided into eight equal parts or heaps, one part of the carrot-ſeed muſt be well mixed with one part of the ſaw-duſt, and ſo on, till all the parts of carrot-ſeed and ſaw-duſt are well mixed and incorporated together; in which ſtate it may be ſown very regularly in drills at twelve inches diſtance, by the cups or ladles N° 2. Carrot-ſeed reſembling ſaw-duſt very much in its ſize, roughneſs, weight, adheſion &c. will remain mixed as above during the ſowing; a ladleful of ſaw-duſt will, upon an average, contain three or four carrot-ſeeds, by which means the carrot-ſeed cannot be otherwiſe than regular in the drills. In attempting to depoſite ſmall ſeeds near the ſurface, it may ſo happen that ſome of the ſeeds may not be covered with ſoil; in which caſe, a light roller may be drawn over the land after the ſeed is ſown, which will not only cover the ſeeds, but will alſo, by levelling the ſurface, prepare the land for an earlier hoeing than could otherwiſe have taken place.

It has always been found troubleſome, ſometimes impracticable, to ſow any kind of grain or ſeeds (even broad-caſt) in a high wind. This inconvenience is entirely obviated by placing a ſcreen of any kind of cloth, or a ſack, ſupported by two uprights nailed to the ſides of the machine, behind the funnels, which will prevent the grain or ſeed being blown out of its direction in falling from the ladles into the funnels. Small pipes of tin may alſo be put on to the ends of the funnels, to convey the grain or ſeed ſo near the ſurface of the land, that the higheſt wind ſhall not be able to interrupt its deſcent into the drills.

Reſpecting the uſe of the machine, it is frequently remarked by ſome people not converſant with the properties of matter and motion, that the ſoil will cloſe after the coulters, before the ſeed is admitted into the drills. Whereas the very contrary is the caſe; for the velocity of the coulters in paſſing through the ſoil, is ſo much greater than the velocity with which the ſoil cloſes up the drills by its own ſpontaneous gravity, that the inciſions or drills will be conſtantly open for three or four inches behind the coulters; by which means, it is morally impoſſible (if the points of the funnels ſtand directly behind the coulters) that the ſeed, with the velocity it acquires in falling through the funnels, ſhall not be admitted into the drills.

Fig.

Drill or Horſe-hoeing Huſbandry.

Plate XI.

Fig. 12. is a new conſtructed ſimple hand-hoe, by which one man will effectually hoe two chain acres *per* day, earthing up the ſoil at the ſame time to the rows of corn or pulſe, ſo as to cauſe roots to iſſue from the firſt joint of the ſtem, above the ſurface of the land, which otherwiſe would never have exiſted.

This hoe is worked much in the ſame manner as a common Dutch hoe, or ſcuffle, is worked in gardens. The handle is elevated or depreſſed, to ſuit the ſize of the perſon that works it, by means of an iron wedge being reſpectively applied to the upper or under ſide of the handle that goes into the ſocket of the hoe.

The wings or moulding plates of the hoe, which are calculated to earth up the ſoil to the rows of corn, ſo as to cauſe roots to iſſue from the firſt joint of the ſtem above the ſurface, which otherwiſe would not have exiſted, ſhould never be uſed for the firſt hoeing, but ſhould always be uſed for the laſt hoeing, and uſed or not uſed, at the option of the farmer, when any intermediate hoeing is performed.

Summary of the Operations neceſſary in executing the New Husbandry with the Plough.

493 Summary of the operations.

1. It is indiſpenſably neceſſary that the farmer be provided with a drill and hoe-plough.

2. The new huſbandry may be begun either with the winter or ſpring corn.

3. The land muſt be prepared by four good ploughings, given at different times, from the beginning of April to the middle of September.

4. Theſe ploughings muſt be done in dry weather, to prevent the earth from kneading.

5. The land muſt be harrowed in the ſame manner as if it were ſowed in the common way.

6. The rows of wheat ſhould be ſowed very ſtraight.

7. When the field is not very large, a line muſt be ſtrained acroſs it, by which a rill may be traced with a hoe for the horſe that draws the drill to go in; and when the rows are ſown, 50 inches muſt be left betwixt each rill. But, when the field is large, ſtakes at five feet diſtance from each other muſt be placed at the two ends. The workman muſt then trace a ſmall furrow with a plough that has no mouldboard, for the horſe to go in that draws the drill, directing himſelf with his eye by the ſtakes.

8. The ſowing ſhould be finiſhed at the end of September, or beginning of October.

9. The furrows muſt be traced the long way of the land, that as little ground as poſſible may be loſt in headlands.

10. The rows, if it can be done, ſhould run down the ſlope of the land, that the water may get the eaſier off.

11. The ſeed-wheat muſt be plunged into a tub of lime-water, and ſtirred, that the light corn may come to the ſurface and be ſkimmed off.

12. The ſeed muſt be next ſpread on a floor, and frequently ſtirred, till it is dry enough to run through the valves of the happer of the drill.

13. To prevent ſmut, the ſeed may be put into a ley of aſhes and lime.

14. Good old ſeed-wheat ſhould be choſen in preference to new, as it is found by experience not to be ſo ſubject to ſmut.

15. After the happers of the drill are filled, the horſe muſt go ſlowly along the furrow that was traced. That a proper quantity of ſeed may be ſown, the aperture of the happer muſt be ſuited to the ſize of the grain.

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16. As the drill is ſeldom well managed at firſt, the field ſhould be examined after the corn has come up, and the deficiencies be ſupplied.

17. Upon wet ſoils or ſtrong clays, wheat ſhould not be depoſited more than two inches deep, on any account whatever; nor leſs than two inches deep on dry ſoils. From two to three inches is a medium depth for all ſpring corn. But the exact depth at which grain ſhould be depoſited in different ſoils, from the lighteſt ſand to the ſtrongeſt clay, is readily aſcertained only by obſerving at what diſtance under the ſurface of the land, the ſecondary or coronal roots are formed in the ſpring.

18. Stiff lands, that retain the wet, muſt be ſtirred or hoed in October. This ſhould be done by opening a furrow in the middle of the intervals, and afterwards filling it up by a furrow drawn on each ſide, which will raiſe the earth in the middle of the intervals, and leave two ſmall furrows next the rows, for draining off the water, which is very hurtful to wheat in winter.

19. The next ſtirring muſt be given about the end of March, with a light plough. In this ſtirring the furrows made to drain the rows muſt be filled up by earth from the middle of the interval.

20. Some time in May, the rows muſt be evened; which, though troubleſome at firſt, ſoon becomes eaſy, as the weeds are ſoon kept under by tillage.

21. In June, juſt before the wheat is in bloom, another ſtirring muſt be given with the plough. A deep furrow muſt be made in the middle of the intervals, and the earth thrown upon the ſides of the rows.

22. When the wheat is ripe, particular care muſt be taken, in reaping it, to trample as little as poſſible on the ploughed land.

23. Soon after the wheat is carried off the field, the intervals muſt be turned up with the plough, to prepare them for the ſeed. The great furrow in the middle muſt not only be filled, but the earth raiſed as much as poſſible in the middle of the intervals.

24. In September, the land muſt be again ſowed with a drill, as above directed.

25. In October, the ſtubble muſt be turned in for forming the new intervals; and the ſame management muſt be obſerved as directed in the firſt year.

We pretend not to determine whether the old or new huſbandry be preferable in every country. With regard to this point, the climate, the ſituation of particular land, ſkill and dexterity in managing the machinery, the comparative expence in raiſing crops, and many other circumſtances, muſt be accurately attended to, before a determination can be given.

To give an idea of the arguments by which the drill huſbandry was originally ſupported, we ſhall here take notice of a comparative view of the old and new methods of culture which was furniſhed for the editors of Mr Tull's Horſe-Hoeing Huſbandry, by a gentleman who for ſome years practiſed both in a country where the ſoil was light and chalky, like that from which he drew his obſervations. It is neceſſary to remark, that in the new huſbandry every article is ſtated at its full value, and the crop of each year is four buſhels ſhort of the other; though,

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though, in several years experience, it has equalled and generally exceeded those in the neighbourhood in the old way.

"An estimate of the expence and profit of 10 acres of land in 20 years.

I. In the old way.

494 Comparative view of the expence and profits of the old and new husbandry.

	L.	s.	d.	L.	s.	d.
First year, for wheat, costs viz.	33l.	5s.				
First ploughing, at 6s. per acre	3	0	0			
Second and third ditto, at 8s. per acre	4	0	0			
Manure, 30s. per acre	15	0	0			
				22	0	0
Two harrowings, and sowing, at 2s. 6d. per acre	1	5	0			
Seed, three bushels per acre, at 4s. per bushel	6	0	0			
Weeding at 2s. per acre,	1	0	0			
Reaping, binding, and carrying, at 6s. per acre	3	0	0			
				11	5	0
Second year, for barley, costs 11l. 6s. 8d. viz.						
Once ploughing at 6s. per acre	3	0	0			
Harrowing and sowing, at 1s. 6d. per acre	0	15	0			
Weeding, at 1s. per acre	0	10	0			
Seed, four bushels per acre, at 2s. per bushel	4	0	0			
Cutting, raking, and carrying at 3s. 2d. per acre	1	11	8			
Grass-seeds, at 3s. per acre	1	10	0			
				11	6	8
				44	11	8
Third and fourth years, lying in grass, cost nothing: so that the expence of ten acres in four years comes to 44l. 11s. 8d. and in twenty years to -				222	18	4
First year's produce is half a load of wheat per acre, at 7l.	35	0	0			
Second year's produce is two quarters of barley per acre, at 1l. - -	20	0	0			
Third and fourth years grass is valued at 1l. 10s. per acre	15	0	0			
So that the produce of ten acres in four years is	70	0	0			
And in twenty years it will be				350	0	0
Deduct the expence, and there remains clear profit on ten acres in twenty years by the old way -				127	1	8

II. In the new way.

	L.	s.	d.	L.	s.	d.
First year's extraordinary expence is, for ploughing and manuring the land, the same as in the old way, L.	22	0	0			
Ploughing once more, at 4s. per acre - -	2	0	0			
Seed, nine gallons per acre, at 4s. per bushel	2	5	0			
Drilling, at 7d. per acre -	0	5	10			
Hand-hoeing and weeding, at 2s. 6d. per acre -	1	5	0			
Horse-hoeing six times, at 10s. per acre -	5	0	0			
Reaping, binding, and carrying, at 6s. per acre -	3	0	0			
The standing annual charge on ten acres, is -	13	15	10			
Therefore the expence on ten acres in twenty years is - -				275	16	8
Add the extraordinaries of the first year, and the sum is - -				297	16	8
The yearly produce is at least two quarters of wheat per acre, at 1l. 8s. per quarter; which on ten acres in twenty years, amounts to - -				560	0	0
Therefore, all things paid, there remains clear profit on ten acres in twenty years by the new way - -				262	3	4

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395 Arguments in favour of the drill husbandry.

"So that the profit on ten acres of land in twenty years, in the new way, exceeds that in the old by 135l. 1s. 8d. and consequently is considerably more than double thereof; and ample encouragement to practise a scheme, whereby so great advantage will arise from so small a quantity of land, in the compass of a twenty-one years lease; one year being allowed, both in the old and new way, for preparing the ground.

"It ought withal to be observed, that Mr Tull's husbandry requires no manure at all, though we have here, to prevent objections, allowed the charge thereof for the first year; and moreover, that though the crop of wheat from the drill-plough is here put only at two quarters on an acre, yet Mr Tull himself, by actual experiment and measure, found the produce of his drilled wheat crop amounted to almost four quarters on an acre."

It appears also from a comparative calculation of expence and profit between the drill and common husbandry, taken from Mr Baker's report to the Dublin Society of his experiments in agriculture for the year 1765, that there is a clear profit arising upon an Irish acre of land in 15 years in the drill husbandry of 52l. 3s. 11d. and in the common husbandry of 27l. 19s. 2d.; and therefore a greater profit in the drilled acre in this time of 24l. 4s. 9d. which amounts to 1l. 12s. 3¾d. per annum. From hence he infers, that in every 15 years the fee-simple of all the tillage-lands of the kingdom is lost to the community by the common course of tillage. In stating the accounts, from which their result is obtained, no notice is taken of fences, watercutting the land, weeding and reaping, because these articles depend on a variety of circumstances, and will, in general, exceed in the common husbandry those incurred by the other.

Besides, the certainty of a crop is greater in this new

Drill or Horſe-hoeing Husbandry.

way than in the old way of ſowing; for moſt of the accidents attending wheat crops are owing to their being late ſown, which is neceſſary to the farmer in the old way; but in the horſe-hoeing method the farmer may plough two furrows whereon the next crop is to ſtand immediately after the firſt crop is off. In this manner of huſbandry, the land may be ploughed dry and drilled wet, without any inconvenience; and the ſeed is never planted under the furrow, but placed juſt at the depth which is moſt proper, that is, at about two inches; in which caſe it is eaſy to preſerve it, and there is no danger of burying it. Thus the ſeed has all the advantage of early ſowing, and none of the diſadvantages that may attend it in the other way, and the crop is much more certain than by any other means that can be uſed.

The condition in which the land is left after the crop, is no leſs in favour of the horſe-hoeing huſbandry than all the other articles. The number of plants is the great principle of the exhauſting of land. In the common huſbandry, the number is vaſtly greater than in the drilling way, and three plants in four often come to nothing, after having exhauſted the ground as much as profitable plants; and the weeds which live to the time of harveſt in the common way, exhauſt the land no leſs than ſo many plants of corn, often much more. The horſe-hoeing method deſtroys all the weeds in the far greater part of the land, and leaves that part unexhauſted and perfectly freſh for another crop. The wheat plants being alſo but a third part of the number at the utmoſt of thoſe in the ſowing way, the land is ſo much the leſs exhauſted by them; and it is very evident from the whole, that it muſt be, as experience proves that it is, left in a much better condition after this than after the common huſbandry.

496 Objections and anſwers.

The farmers who are againſt this method object, that it makes the plants too ſtrong, and that they are more liable to the blacks or blights of inſects for that reaſon; but as this allows that the hoeing can, without the uſe of dung, give too much nouriſhment, it is very plain that it can give enough; and it is the farmer's fault if he do not proportion his pains ſo as to have the advantage of the nouriſhment without the diſadvantages. It is alſo objected, that as hoeing can make poor land rich enough to bear good crops of wheat, it may make good land too rich for it. But if this ſhould happen, the ſowing of wheat on it may be let alone a while, and in the place of it the farmer may have a crop of turnips, carrots, cabbages, and the like, which are excellent food for cattle, and cannot be over-nouriſhed: or, if this is not choſen, the land, when thus made too rich, may ſoon be ſufficiently impoveriſhed by ſowing corn upon it in the common old way.

The method of horſe-hoeing huſbandry, ſo ſtrongly recommended by Mr Tull, is objected to by many on account of the largeneſs of the intervals which are to be left between the rows of corn. Theſe are required to be about five feet wide; and it is thought that ſuch wide ſpaces are ſo much loſt earth, and that the crop is to be ſo much the leſs for it. But it is to be obſerved, that the rows of corn ſeparated by theſe intervals need not be ſingle; they may be double, triple, or quadruple, at the pleaſure of the farmer; and four rows thus ſtanding as one will have the five feet interval but one-fourth of its bigneſs as to the whole quantity, and it will be but as fifteen inch intervals to plants in ſingle rows. Corn that is ſown irregularly in the common way, ſeems indeed to cover the ground better than that in rows; but this is a mere *deception viſus*; for the ſtalks of corn are never ſo thick as when they come out of one plant, or as when they ſtand in a row; and a horſe-hoed plant of corn will have 20 or 30 ſtalks in a piece of ground of the ſame quantity, where an unhoed plant will have only two or three ſtalks. If theſe ſtalks of the hoed plant were ſeparated and planted over the intervals, the whole land would be better covered than it is the common way; and the truth is, that though theſe hoed fields ſeem to contain a much leſs crop than the common ſown fields, yet they in reality do contain a much greater. It is only the different placing that makes the ſown crop ſeem the larger, and even this is only while both crops are young.

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The intervals are not loſt ground, as is uſually ſuppoſed, but when well horſe-hoed they are all employed in the nouriſhment of the crop: the roots of the plants in the adjoining rows ſpreading themſelves through the whole interval, and drawing ſuch nouriſhment from it, that they increaſe accordingly. When the plants ſtand in the ſcattered way, as in common ſowing, they are too cloſe to one another; each robs its neighbour of part of their nouriſhment, and conſequently the earth is ſoon exhauſted, and all the plants half ſtarved. The cloſe ſtanding of them alſo prevents the benefit of after-tilling, as the hoe cannot be brought in, nor the ground by any means ſtirred between them to give it a new breaking, and conſequently afford them new food.

Experiments have abundantly proved, that in large grounds of wheat where the different methods have been tried, thoſe parts where the intervals were largeſt have produced the greateſt crops, and thoſe where hoeing was uſed without dung have been much richer than thoſe where dung was uſed without hoeing. If it were poſſible that plants could ſtand as thick, and thrive as well over the whole ſurface of the ground as they do in the rows ſeparated by theſe large intervals, the crops of corn ſo produced would be vaſtly greater than any that have been heard of; but the truth is, that plants receive their growth not according to the ground they ſtand on, but to the ground they can extend their roots into; and therefore a ſingle row may contain more plants than a large interval can nouriſh, and therefore the ſame number that ſtand in that row, and no more than theſe, could be nouriſhed, if ſcattered over the whole interval: and they would be much worſe nouriſhed in that way; becauſe while the interval is void, the earth may be ſtirred about them, and new roots will be formed in great numbers from every one broken by the inſtruments, and new nouriſhment laid before theſe roots by the breaking the particles of earth, by which the plants will have ſupplies that they cannot have when ſcattered over the whole ſurface, becauſe the ground is then all occupied, and cannot be moved between the plants.

497 In what ſituation the new method is not proper.

All ſoils and all ſituations are not equally proper for this method of planting in rows, with large intervals and hoeing between. The lighteſt ſoils ſeem to be beſt for it, and the tough and wet clays the worſt. Such grounds as lie on the ſides of hills are alſo leſs proper than others for this work.

This

Drill or Horſe-hoeing Huſbandry.

This method is not ſo proper in common fields, but that not in reſpect of the ſoil, but of the huſbandry of the owners, who are uſually in the old way, and change the ſpecies of corn, and make it neceſſary to fallow every ſecond, third, or fourth year. Nevertheleſs it has been found by later experiments, that the intervals betwixt the rows of plants, as recommended by Mr Tull, were too great, perhaps double of what they ſhould be in the moſt profitable method of culture; by which means much leſs crops are obtained than might be produced at nearly the ſame expence. This has rendered the profits of the drill method much leſs than they would have been in a more judicious practice, and, conſequently, has proved a great diſadvantage to it in compariſon with the broadcaſt. Mr Tull was led into this, partly from the want of more perfect inſtruments for hoeing, and of ploughs proper for drilling.

To the preceding ſtatements, the following obſervations by Sir John Anſtruther, publiſhed among the Select Papers of the Bath Society, may not be improperly ſubjoined.

498 Obſervations by Sir John Anſtruther.

The ſlow progreſs which the drill huſbandry has made in many parts of Great Britain ſince Mr Tull's time, he obſerves, has been principally owing to the want of proper drill-ploughs. Before drilling can become general, thoſe ploughs muſt be ſimple, ſuch as a common ploughman accuſtomed to uſe ſtrong inſtruments can uſe without breaking, and ſuch alſo as common workmen can eaſily make or repair. Mathematical accuracy he conſiders as not required for delivering the ſeed: for it matters very little whether there be a quarter of a peck more or leſs ſown, if it be delivered with tolerable regularity. He therefore had a plough made, according to his own directions, by a common plough-wright, of ſufficient ſtrength for any land made fit for turnips or wheat. It was tried on very rough ground unfit for ſowing, in order to aſcertain its ſtrength; and it had been uſed for eight years without its needing any repair. It is a double drill-plough, which ſows two ridges at a time, the horſe going the furrow between them, and of courſe does not tread upon the ground intended to be ſown; which with a ſingle drill muſt be the caſe, and does much harm by the horſes feet ſinking and making holes in the fine ground, which retain the water, and hurt the wheat when young.

He proceeds to obſerve, "That having read Mr Forbes upon the extenſive practice of the new huſbandry, and ſome other authors, who gave a more clear and diſtinct account of the different operations in drilling than had heretofore been given, I wiſhed to try them, and to adapt my plough to ſow the quantities therein directed. It was, however, adjuſted to ſow a ſmaller quantity, and the ſeed was not ſteeped.

"Not having ground ſo proper as I wiſhed, it was drilled on the ſide of a field, the ſoil of which was light and ſandy, and in ſuch bad order, that the preceding crop was a very indifferent one. It was therefore manured with a compoſt dunghill.

"After croſs-ploughing and manuring, it was laid into four and a half feet ridges, then harrowed and drilled with one peck and a half of wheat on an acre and a quarter, which is nearly one peck and a fifth per Engliſh acre. It was drilled the 27th of October, and rolled after drilling. The crop was late in its appearance, and very backward in the ſpring. Drill or Horſe-hoeing Huſbandry.

"March 31ſt, it was horſe-hoed one furrow *from* the rows.

"April 8th, it was hand-hoed and weeded in the rows.

"25th, horſe-hoed again, laying a furrow back *to* the rows.

"May 15th, hand-hoed the ſecond time.

"June 2d, horſe-hoed *from* the rows.

"June 12th, hand-hoed the third time.

"July 14th, horſe-hoed *to* the rows.

"At this laſt hoeing, as many of the ears were beaten down into the intervals by wind and rain, a man went before the horſe-hoe, and turned the ears back into their proper place.

"The crop, when reaped and threſhed, yielded me 36 buſhels on one acre and a quarter, which is 28 buſhels and three pecks per acre; and the produce from one peck and half 96 for one.

"As the produce appeared ſo great, from land in ſuch bad order, it was carefully meaſured again, and found to be right. But this increaſe, though great, was not ſo large as Mr Crake of Glaſgow had without dung.

"Mr Randal ſays, 'It is an experimental fact, that on a fine loam exquiſitely prepared, 144 buſhels have been produced from one acre. And, I believe, it is not known what the increaſe may be brought to in rich lands by high cultivation.'

"Some years ſince, I had beans dropt alternately with potatoes, at two feet diſtance in the rows, which were three feet apart, and ploughed in the intervals. The land adjoining was ſown with beans and peaſe, which were a good crop; but thoſe ſown among the potatoes a better one. I pulled one ſtem of the beans planted with the potatoes, which had three branches riſing from the bottom, and it produced 225 beans. In all the trials of drilled beans, moſt of the ſtems had two branches, with many pods upon each.——From theſe and other inſtances, I believe it is not yet known to what increaſe grain may be brought by drilling, good cultivation, and manure.

"Horſe-hoeing is certainly preferable to cloſe drilling or hand-hoeing; but the latter is ſuperior to broadcaſt.

"Horſe-hoeing the full depth increaſes the crop, by making it tiller or branch more than it otherwiſe would do; and the advantage is diſtinctly obſervable every hoeing, by the colour of the grain. It prepares the ground for the next crop, at the ſame time that it increaſes the crop growing, which hand-hoeing does not, although it may deſtroy the weeds. Thus drilled ground is kept in a looſe open ſtate to receive the benefit of the influence of the air and weather, which broad-caſt has not; and it is evident, from certain experience, that crops may be drilled many years to good advantage without manure.

"Suppoſe the crops only 20 buſhels per acre, what courſe of broadcaſt-crops will give 5l. an acre for the courſe? But ſuppoſe they are dunged the ſame as any ground in the moſt approved courſe, there is the greateſt reaſon to expect as much as in the above experiment,

Drill or Horse-hoeing Husbandry.

ment, which is 28¼, and at 5s. per bushel, amounts to 7l. 3s. 9d.

"Calculations may be of service to those who wish to try drilling, and have few books to direct them.

"One acre is 10 chains long, of 660 feet, or 220 yards long, and one yard broad, containing 4840 square yards. Then if the ridge is four feet six inches, this makes 24 ridges, and three feet to spare. This length of 220 yards multiplied by 24 (the number of ridges), gives a length of yards 3080, to which add 146 for the spare three feet, and it will be 3226 yards. And as two rows are drilled on a ridge, the number of rows will be in length 6452 yards; but as a deduction of 172 yards must be made for the head ridges, suppose three yards each, &c. the whole length to be sown will be 6280 yards clear. Now a gallon (Winchester) holds about 80,000 grains. The quantity, recommended to be drilled by Mr Forbes and others, being six gallons, or two-thirds of a bushel, per acre, is nearly 78 grains to a yard, or 26 to a foot. But in my experiment, by this calculation, it was only about 11 grains to a foot: which is quite sufficient, if the seed be good, and it be not destroyed by vermin.

"Now with regard to the quantity of land this drill plough may sow; if a horse walks at the rate of two miles per hour, he goes 16 miles in eight hours, or 28,460 yards. As he sows two ridges at once, this is seven lengths and two thirds per acre, or 1686 yards to sow an acre, being nearly 17 acres in a day.

"Four horse-hoeings are calculated equal to two ploughings. In plain ploughing they suppose the ridge is ploughed with four furrows, or eight for twice ploughing. The four horse-hoeings are eight furrows, equal to two ploughings.

"Mr Tull directs four hoeings, and Mr Forbes five. 1st, In November, when the plant has four blades. 2dly, In March, deep, and nearer the rows than the former; both these hoeings should be *from* the rows. 3dly, Hand-hoed when it begins to spindle, if the earth be crumbly, *to* the rows. 4thly, When it begins to blossom, *from* the rows, but as near to them as in the second hoeing. 5thly, When done blossoming, to ripen and fill the grain, *to* the rows.

"The last hoeing Mr Toll does not direct, but Mr Forbes advises it, as being of essential service in filling the grain, and saving trouble in making the next seed-furrows. They advise the patent or sowing-plough for horse-hoeing; and the expence is calculated by Mr Craick at one guinea per acre, reaping included.

"But let us suppose the following, which are the prices in the county I live in (Fife).

	L.	s.	d.
Ploughing to form the ridges,	0	4	0
Harrowing,	0	0	4
Four hoeings, equal to two ploughings,	0	8	0
Sowing	0	0	4
Hand-hoeing twice,	0	8	0
Seed, one peck and a half at 5s. a bushel	0	1	10
Whole expence per acre,	L. 1	2	6"

499 e drill l the ad-cast thods re parti- arly pared.

Drill-husbandry is, as a good writer has justly defined it, "*the practice of a garden brought into the field.*" Every man of the least reflection must be sensible, that the practice of the garden is much *better* than that of the field, only a little more expensive; but if (as is the case) this extra expence be generally much more than repaid by the superior goodness and value of drilled crops, it ought to have no weight in comparing the two modes of husbandry.

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In the broad-cast method the land is often sown in bad tilth, and always scattered at random, sometimes by very unskilful hands. In drilling, the land must be in fine order; the seed is set in trenches drawn regularly; all of nearly an equal depth, and that depth suited to the nature of each kind of seed. These seeds are also distributed at proper distances, and by being equally and speedily covered, are protected from vermin and other injuries; so that the practice of the garden is here exactly introduced into the field.

In the broad-cast method the seed falls in some places too thick; in others too thin; and being imperfectly covered, a part of it is devoured by vermine which follow the sower; another part is left exposed to rain or frost, or to heats, which greatly injure it. When harrowed, a great part of it (small seeds especially) is buried so deep, that if the soil be wet, it perishes before it can vegetate.

Again: When thus sown, there is no meddling with the crop afterwards, because its growth is irregular. The soil cannot be broken to give it more nourishment, nor can even the weeds be destroyed without much inconvenience and injury.

But in the drill-husbandry the intervals between the rows, whether double or single, may be horse-hoed; and thereby nourishment may repeatedly be given to the plants, and the weeds almost totally destroyed.

The very same effects which digging has upon young shrubs and trees in a garden, will result from horse-hoeing in a field, whether the crop be corn or pulse: For the reason of the thing is the same in both cases, and being founded in nature and fact, cannot ever fail. In drilling, no more plants are raised on the soil than it can well support: and by dividing and breaking the ground, they have the full advantage of all its fertility.

The plough prepares the land for a crop, but goes no further; for in the broad-cast husbandry it cannot be used: but the crop receives greater benefit from the tillage of the land by the horse-hoe, while it is growing, than it could in the preparation. No care in tilling the land previous to sowing can prevent weeds rising with the crop; and if these weeds be not destroyed while the crop is growing, they will greatly injure it. In the broad-cast husbandry this cannot be done; but in drilling, the horse-hoe will effect it easily.

And what adds to the farmer's misfortune is, that the most pernicious weeds have seeds winged with down, which are carried by the wind to great distances; such as thistles, sow-thistles, colts-foot, and some others.

If the expence of horse-hoeing be objected, there are two answers which may very properly be made: The first is, that this expence is much less than that of hand-hoeing were it practicable, or of hand-weeding. The second is, that it is more than repaid by the quantity of seed saved by drilling; to say nothing of the extra quantity and goodness of the crops, which are generally self-evident.

Upon the whole, if the particular modes of cultivating land by the new husbandry should, after all, be

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considered as perhaps too limited to be univerſally adopted; yet it has been of great uſe in raiſing ſuſpicions concerning the old method, and in turning the views of philoſophers and farmers towards improving in general. Many real improvements in agriculture have been the conſequences of theſe ſuſpicions; and as this ſpirit of inquiry remains in full vigour, a ſolid foundation is laid for expecting ſtill further improvements in this uſeful art.

500 The drill-huſbandry is not a modern diſcovery.

It may be proper here to remark, however, that the drill-huſbandry is by no means a modern European invention. It is now uſed in the Carnatic, and in all probability has exiſted among the induſtrious nations of India from a very early period. It is uſed not only for all grains, but alſo for the culture of tobacco, cotton, and the caſtor-oil plant. Beſides the drill-plough, and the common plough, the Indians uſe a third, with a horizontal ſhare, which immediately follows the drill-plough at work. It is ſet in the earth, about the depth of 7 or 8 inches, and paſſes under three drills at once. It operates by agitating the earth, ſo as to make the ſides of the drills fall in and cover the ſeed, which it does ſo effectually as ſcarcely to leave any traces of a drill.

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PART II. CULTIVATION OF VEGETABLES MORE PROPERLY ARTICLES OF COMMERCE.

THESE in general are ſuch as cannot be uſed for food; and are principally flax, hemp, rape, hops, and timber of various kinds. Of each of theſe we ſhall treat particularly in the following ſections.

SECT. I. *Of Flax and Hemp.*

501 Flax and hemp.

FLAX is cultivated not only with a view to the common purpoſes of making linen, but for the ſake of its ſeed alſo; and thus forms a moſt extenſive article of commerce; all the oil uſed by painters, at leaſt for common purpoſes, being extracted from this ſeed. The cake which remains after the extraction of the oil is in ſome places uſed as a manure, and in others ſold for fattening of cattle. In the Vale of Glouceſter, Mr Marſhall informs us, that it is, next to hay, the main article of ſtall-fattening; though the price is now become ſo great, that it probably leaves little or no profit to the conſumer, having within a few years riſen from three guineas to ſix and ſix and a half, and the loweſt price being five guineas per ton; and even this is lower than it was lately. Hence ſome individuals have been induced to try the effect of linſeed itſelf boiled to a jelly, and mixed with flour, bran, or chaff, with good ſucceſs, as Mr Marſhall has been informed; and even the oil itſelf has been tried for the ſame purpoſe in Herefordſhire. Though this plant is in univerſal culture over the whole kingdom, yet it appears by the vaſt quantity imported, that by far too little ground is employed in that way. As Mr Marſhall takes notice of its culture only in the county of Yorkſhire, it probably does not make any great part of the huſbandry of the other counties of which he treats; and even in Yorkſhire he tells us, that its cultivation is confined to a few diſtricts. The kind cultivated there is that called *blealine*, or *the blue or lead-coloured flax*, and this requires a rich dry ſoil for its cultivation. A deep, fat, ſandy loam is perhaps the only ſoil on which it can be cultivated with advantage. If ſown upon old corn land, it ought to be well cleaned from weeds, and rendered perfectly friable by a ſummer-fallow. Manure is ſeldom or ever ſet on for a line crop: and the ſoil proceſs conſiſts generally of a ſingle ploughing. The ſeed-time is in the month of May, but much depends on the ſtate of the ſoil at the time of ſowing. "It ſhould neither be wet nor dry; and the ſurface ought to be made as fine as that of a garden bed. Not a clod of the ſize of an egg ſhould remain unbroken." Two buſhels of ſeed are uſually ſown upon an acre: the ſurface, after being harrowed, is ſometimes raked with garden or hay rakes; and the operation would be ſtill more complete if the clods and other obſtructions, which cannot be eaſily removed, were drawn into the interfurrows. A light hand-roller uſed between the final raking and harrowing would much aſſiſt this operation. The chief requiſite during the time of vegetation is weeding, which ought to be performed with the utmoſt care; and for this reaſon it is particularly requiſite that the ground ſhould be previouſly cleanſed as well as poſſible, otherwiſe the expence of weeding becomes too great to be borne, or the crop muſt be conſiderably injured. It is an irreparable injury, if, through a dry ſeaſon, the plants come up in two crops; or if by accident or miſmanagement they be too thin. The goodneſs of the crop depends on its running up with a ſingle ſtalk without branches: for wherever it ramifies, there the length of the line terminates; and this ramification is the conſequence of its having too much room at the root, or getting above the plants which ſurround it. The branches are never of any uſe, being unavoidably worked off in dreſſing; and the ſtem itſelf, unleſs it bear a due proportion to the length of the crop, is likewiſe worked off among the refuſe. This ramification of the flax will readily be occaſioned by clods on the ground when ſown. A ſecond crop is very ſeldom attended with any profit; for being overgrown with the ſpreading plants of the firſt crop, it remains weak and ſhort, and at pulling time is left to rot upon the land.

502 Linſeed-cake, linſeed itſelf, and linſeed oil, uſed for fattening cattle.

503 Culture of flax in Yorkſhire.

Flax is injured not only by drought but by froſt, and is ſometimes attacked even when got five or ſix inches high, by a ſmall white flug, which ſtrips off the leaves to the top, and the ſtalks bending with their weight are thus ſometimes drawn into the ground. Hence, if the crop does not promiſe fair at weeding time, our author adviſes not to beſtow farther labour and expence upon it. A crop of turnips or rape will generally pay much better than ſuch a crop of flax. The time of flax-harveſt in Yorkſhire is generally in the latter end of July or beginning of Auguſt.

504 Mr Marſhall's remarks on flax crop.

On the whole, our author remarks, that "the goodneſs of the crop depends in ſome meaſure upon its length; and this upon its evenneſs and cloſeneſs upon the ground. Three feet high is a good length, and the

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the thickneſs of a crow's quill a good thickneſs. A fine ſtalk affords more line and fewer ſhivers than a thick one. A tall thick ſet crop is therefore deſirable. But unleſs the land be good, a thick crop cannot attain a ſufficient length of ſtem. Hence the folly of ſowing flax on land which is unfit for it. Nevertheleſs, with a ſuitable ſoil, a ſufficiency of ſeed evenly diſtributed, and a favourable ſeaſon, flax may turn out a very profitable crop. The flax crop, however, has its diſadvantages: it interferes with harveſt, and is generally believed to be a great exhauſter of the ſoil, eſpecially when its ſeed is ſuffered to ripen. Its cultivation ought therefore to be confined to rich graſs-land diſtricts, where harveſt is a ſecondary object, and where its exhauſtion may be rather favourable than hurtful to ſucceeding arable crops, by checking the too great rankneſs of rich freſh broken ground.

505 Mr Bartley's experiments

In the 5th volume of Bath Papers, Mr Bartley, near Briſtol, gives an account of the expences and produce of five acres of graſs cultivated on a rich loamy ſand. The total expence was 42l. 13s. 4d.; the produce was ten packs of flax at 5l. 5s. value 52l. 10s. 35 buſhels of linſeed at 5s. value 8l. 15s.; the net profit therefore was 18l. 11s. 8d. or 4l. 13s. 4d. per acre. This gentleman is of opinion that flax-growers ought to make it their ſtaple article, and conſider the other parts of their farm as in ſubſerviency to it.

506 Remarks by a Dorſetſhire gentleman.

In the ſecond volume of Bath Papers, a Dorſetſhire gentleman, who writes on the culture of hemp and flax, gives an account ſomewhat different from that of Mr Marſhall. Inſtead of *exhauſting* crops, he maintains that they are both *ameliorating* crops, if cut without ſeeding; and as the beſt crops of both are raiſed from foreign ſeed, he is of opinion that there is little occaſion for raiſing it in this country. A crop of hemp, he informs us, prepares the land for flax, and is therefore clear gain to the farmer. "That theſe plants impoveriſh the ſoil," he repeats, "is a mere vulgar notion, devoid of all truth.—The beſt hiſtorical relations, and the verbal accounts of honeſt ingenious planters, concur in declaring it to be a vain prejudice, unſupported by any authority; and that theſe crops really meliorate and improve the ſoil." He is likewiſe of opinion, that the growth of flax and hemp is not neceſſarily confined to rich ſoils, but that they may be cultivated with profit alſo upon poor ſandy ground, if a little expence be laid out in manuring it. "Spalding-moor in Lincolnſhire is a barren ſand; and yet with proper care and culture it produces the beſt hemp in England, and in large quantities. In the iſle of Aſholme, in the ſame county, equal quantities are produced; for the culture and management of it is the principal employ of the inhabitants; and, according to Leland, it was ſo in the reign of Henry VIII. In Marſhland the ſoil is a clay or ſtrong warp, thrown up by the river Ouſe, and of ſuch quality, that it cracks with the heat of the ſun, till a hand may be put into the chinks; yet if it be once covered with the hemp or flax before the heats come on, the ground will not crack that ſummer. When the land is ſandy, they firſt ſow it with barley, and the following ſpring they manure the ſtubble with horſe or cow dung, and plough it under. Then they ſow their hemp or flax, and harrow it in with a light harrow, having ſhort teeth. A good crop deſtroys all the weeds, and makes it a fine fallow for flax in the ſpring. As ſoon as the flax is pulled, they prepare the ground for wheat. Lime, marl, and the mud of ponds, is an excellent compoſt for hemp-lands."

507 Flax and hemp may be cultivated upon poor as well as rich ſoils.

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508 Vaſt quantities of flax and hemp imported into Britain.

Our author takes notice of the vaſt quantity of flax and hemp, not leſs than 11,000 tons, imported in the year 1763 into Britain; and complains that it is not raiſed in the iſland, which he thinks might be done, though it would require 60,000 acres for the purpoſe. He obſerves, that the greater part of thoſe rich marſhy lands lying to the weſt of Mendip hills are very proper for the cultivation of hemp and flax; and if laid out in this manner could not fail of turning out highly advantageous both to the landholders and the public at large. The vaſt quantities of hemp and flax (ſays he) which have been raiſed on lands of the ſame kind in Lincolnſhire marſhes, and the fens of the iſle of Ely and Huntingdonſhire, are a full proof of the truth of my aſſertion. Many hundreds of acres in the above-mentioned places, which, for paſturage or grazing, were not worth more than twenty or twenty-five ſhillings per acre, have been readily let at 4l. the firſt year, 3l. the ſecond, and 2l. the 3d. The reaſon of this ſuppoſed declining value of land, in proportion to the number of years ſown with flax, is, that it is uſual with them to ſeed for the purpoſe of making oil, that being the principal cauſe of the land being thereby impoveriſhed.

It is certain, however, that the quantity of hemp exported from St Peterſburgh in Britiſh ſhips has continued to increaſe, ſo that in 1785 the quantity of hemp exported from Peterſburgh in Britiſh ſhips was as follows:

	Poods.
Of clean hemp, - -	1,038,791
Outſhot, - - - -	37,382
Half clean, - - -	18,374
Hemp codille, - - -	19,251
	1,113,798

There are 63 poods to a ton, conſequently the whole amounted to 17,695 tons; and it is ſaid that this quantity has ſince been tripled and quadrupled. It is therefore an object of great national importance to conſider, whether flax and hemp might not be profitably reared in our own country without producing any alarm concerning their tendency to exhauſt the ſoil. With this view we ſhall here ſtate the ſubſtance of a report made by Mr Durno, Britiſh conſul in Pruſſia in 1789, to the lords of the Committee of Council for Trade, concerning the method of cultivating flax and hemp in Pruſſia, Ruſſia, and Poland.

509 Mr Durno's report on the culture of flax and hemp in Pruſſia, &c.

A black, not moraſſy, open gravelly ſoil is preferred, as flax and hemp become exuberant and coarſe on too rich a ſoil. To aſcertain the proper middle degree of ſtrength of ſoil, previous crops of grain are taken. On a vigorous ſoil wheat is firſt ſown; then rye, barley, oats; and laſt of all flax or hemp. Two ſucceſſive crops of hemp are taken if the land is immediately dunged. For one crop of flax, it is not dunged at all. On a ſoil of leſs ſtrength, flax and hemp are ſown immediately after a winter crop of rye, the land being ploughed in autumn, if the weather allows, if not, in ſpring. It is then harrowed and manured, and again

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ploughed immediately before ſowing. Another winter crop of rye may immediately be ſown in the ſame field after drawing the flax or hemp, but after the flax; dung is in this caſe neceſſary. A field that has been laid down in fallow, if only ploughed up, yields a better crop of flax than if manured and cultivated in the above or any other way. Flax and hemp are ſown from the 25th of May to the 10th of June, and the flax is reaped in the end of Auguſt, and hemp in the end of September.

As to their effects on the ſoil, no kind of grain can be ſown immediately after a crop of flax without dunging, but after one of hemp, any grain, and even hemp itſelf, may be ſown without manure. Hemp cleans the ground by ſuffocating, by its broad leaves, all ſorts of weeds or undergrowth; but flax muſt be weeded once or twice before it blooms. Flax is plucked when the ſtalk becomes yelloviſh, the pods brown, and the ſeed hard and full bodied. For finer flax, the ſtalk is pulled while yet green; but the ſeed is then ſacrificed, and fit only for cruſhing for oil, of which it produces a ſmall quantity. Hemp is alſo plucked or drawn when the ſtalk and pods have changed colour. If the flax is very dry when plucked, the ſeed is ſtripped off immediately; if not, it is allowed to dry on the field. Seed-pods are ſpread thinly on a floor, where they are turned twice a-day, till ſo dry that they open of themſelves; when it is thraſhed and cleaned like other grain. To gain the hemp-ſeed, the hemp itſelf, when plucked, is ſet on end againſt any convenient place. The roots and top-ends are then cut off. The roots are thrown away, and the top-ends are threſhed out and cleaned. The ſeed is apt to be ſpoiled by remaining in a moiſt ſtate for any length of time.

As ſoon as the ſeed has been gained, the flax and hemp are ſteeped in water till the flax ſeparate from the rind, and the hemp till the harl ſprings from the ſtalk. In ſoft water, in warm weather, nine or ten days are ſufficient for this purpoſe. In hard water, with cold weather, from fourteen days to three weeks are requiſite. Stagnate is preferred to running water; but fiſh ponds and the drinking places of cattle muſt be avoided, as the fiſh would be deſtroyed, and the water would be rendered unwholeſome and unpalatable to the cattle; but a muddy or ſlimy bottom is preferred. In the ſouthern provinces of Poland, as Volhinia, Podolia, &c. ſteeping is not practiſed, on the ſuppoſition that it weakens the harl and darkens the colour, though this idea ſeems to have no foundation.

After being taken out of the ſteep, the flax is dried on a graſs field; after which it is gathered up into ſmall ſtacks; but the hemp, inſtead of being ſpread out on a field, is ſet up againſt the walls of buildings till it is alſo dried, after which they are both houſed.

It is generally underſtood in theſe countries, that the cultivation of flax and hemp is more profitable than that of any kind of grain.

510 Culture of flax in Ireland.

To this we ſhall add a conciſe ſtatement of the mode of cultivating flax in Ireland. A good crop of flax is there expected from any ſtrong clays that are fit for the growth of corn; but an open black loamy ſoil, enriched by having lain long in paſture, is preferable. The ground muſt be in fine tilth, and as free from weeds as poſſible. Potatoes uſually precede flax, though turnips, beans, or any manured crop, are a good preparation: but the firſt or ſecond crop after paſture is preferred to any of theſe. Stubble lands, that have been long in tillage, may, by proper preparation, bring a crop; but it is apt to fail in ſuch ſituations, the ſtalks turning to a reddiſh colour called *firing* before it ripens; upon which it muſt immediately be pulled. Two buſhels of ſeed are uſed to the Engliſh acre, unleſs for the purpoſe of a very fine manufacture; in which caſe a large quantity of ſeed is uſed, and the flax is pulled very green. The ſeaſon of ſowing is the firſt fine weather after the middle of March. The moſt approved mode of culture is in beds about ſix feet broad, covering the ſeed about an inch and a half deep, with earth ſhoveled out of the furrows: but the moſt ordinary mode is to ſow on common ridges, and to harrow in the ſeed. Before the flax is five inches high it ſhould be carefully hand-weeded; and if any part lodges, it ſhould be turned over. The produce is uſually worth 7l. ſterling the Engliſh acre. The crop ſhould ſtand till the lower part of the ſtalk becomes yelloviſh, and the under leaves begin to wither, unleſs the ſeed is to be preſerved, which is done by rippling it through an iron comb, and the flax may be ſteeped immediately after it is pulled. Turf-bog water, if clear, anſwers well, but foul ſtagnate water ſtains the flax. Too pure a ſpring is injurious. A reſervoir dug in clay is preferred. The time of lying in the ſteep depends upon the quality of the water and the ſtate of the weather. It is dried on graſs by being ſpread thin; artificial heat has been recommended for drying flax; but no good form of it has been ſuggeſted.

Rape o Cole-See

511 Sheep employed to weed flax.

In addition to what is here ſtated, the compiler of this article accounts it proper to take notice of a mode of weeding flax that has frequently been practiſed in Scotland. It conſiſts of turning a flock of ſheep at large into the field. They will not taſte the young flax plants, but they carefully ſearch for the weeds, which they devour. It may alſo be remarked, that for drying flax in wet ſeaſons, the ſteam kiln formerly propoſed (N° 34) would be a valuable inſtrument.

Sect. II. *Rape or Cole-Seed.*

This, as well as linſeed, is cultivated for the purpoſe of making oil, and will grow almoſt anywhere. Mr Hazard informs us, that in the north of England the farmers pare and burn their paſture lands, and then ſow them with rape after one ploughing; the crop commonly ſtanding for ſeed, which will bring from 25l. to 30l. per laſt (80 buſhels). Poor clay, or ſtone-braſh land, will frequently produce from 12 to 16 or 18 buſhels per acre, and almoſt any freſh or virgin earth will yield one plentiful crop; ſo that many in the northern counties have been raiſed, by cultivating this ſeed, from poverty to the greateſt affluence. The ſeed is ripe in July or the beginning of Auguſt; and the thraſhing of it out is conducted with the greateſt mirth and jollity.

Bath Papers, vol. iv

512 Advantage of cultivating rape-ſeed.

513 Of cutting and thraſhing the rape-ſeed.

The rape being fully ripe, is firſt cut with ſickles, and then laid thin upon the ground to dry; and when in proper condition for thraſhing, the neighbours are invited, who readily contribute their aſſiſtance. The thraſhing is performed on a large cloth in the middle of

Rape or Cole-Seed.

of the field, and the ſeed put into the ſacks and carried home. It does not admit of being carried from the field in the pod in order to be thraſhed at home, and therefore the operation is always performed in the field; and by the number of aſſiſtants procured on this occaſion, a field of 20 acres is frequently thraſhed out in one day. The ſtraw is burnt for the ſake of its alkali, the aſhes being ſaid to equal the beſt kind of thoſe imported from abroad.

514 Of ſowing it.

The proper time for ſowing rape is the month of June; and the land ſhould, previous to the ſowing, be twice well ploughed. About two pounds of ſeed are ſufficient for an acre; and, according to our author, it ſhould be caſt upon the ground with only the thumb and two fore fingers; for if it be caſt with all the fingers, it will come up in patches. If the plants come up too thick, a pair of light harrows ſhould be drawn along the field length-wiſe and croſs-wiſe; by which means the plants will be equally thinned; and when the plants which the harrows have pulled up are withered, the ground ſhould be rolled. A few days after the plants may be ſet out with a hoe, allowing 16 or 18 inches diſtance betwixt every two plants.

513 Tranſplanting recommended.

Mr Hazard ſtrongly recommends the tranſplanting of rape, having experienced the good effects of it himſelf. A rood of ground, ſown in June, will produce as many plants as are ſufficient for 10 acres; which may be planted out upon ground that has previouſly borne a crop of wheat, provided the wheat be harveſted by the middle of Auguſt. One ploughing will be ſufficient for theſe plants; the beſt of which ſhould be ſelected from the ſeed-plot, and planted in rows two feet aſunder and 16 inches apart in the rows. As rape is an excellent food for ſheep, they may be allowed to feed upon it in the ſpring; or the leaves might be gathered, and given to oxen or young cattle: freſh leaves would ſprout again from the ſame ſtalks, which in like manner might be fed off by ewes and lambs in time enough to plough the land for a crop of barley and oats. Planting rape in the beginning of July, however, would be moſt advantageous for the crop itſelf, as the leaves might then be fed off in the autumn, and new ones would appear in the ſpring. Our author diſcommends the practice of ſowing rape with turnips, as the crops injure one another. "Thoſe who look for an immediate profit (ſays he), will undoubtedly cultivate rape for ſeed; but perhaps it may anſwer better in the end to feed it with ſheep; the fat ones might cull it over firſt, and afterwards the lean or ſtore-ſheep might follow them, and be folded thereon; if this is done in the autumn ſeaſon, the land will be in good heart to carry a crop of wheat; or where the rape is fed off in the ſpring, a crop of barley might follow. In either caſe rape is profitable to the cultivator; and when it is planted, and well earthed round the ſtems, it will endure the ſevereſt winter; but the ſame cannot be advanced in favour of that which is ſown broadcaſt.

516 Sheep may be fed in the ſpring with rape.

517 Culture of rape-ſeed in Brabant.

Cole ſeed is cultivated in Brabant, in the following manner, according to the Abbé Mann. "It is ſown about the middle of July, and the young plants are tranſplanted about the end of September. This is done with a narrow ſpade ſunk into the ground, and moved with the hand forwards and backwards; which ſimple motion, makes a ſufficient opening to receive the plant; a boy or girl follows the labourer with plants, and putting one of them into each hole, treads againſt it to cloſe it up. If the plantation is done with the plough, the plants are placed at regular diſtances in the furrow, and are covered with the earth turned up with the ſucceeding furrow. Sometimes, after the cole ſeed is planted, the foot of the ſtalks is covered, by means of a common ſpade or hoe, with the earth near it, which furniſhes nouriſhment for the plants during winter, by the crumbling of theſe little clods of earth over the roots. The cole-ſeed is reaped about midſummer or later, according as the ſeaſon is more or leſs advanced; it is left on the field for ten or twelve days after it is cut, and then thraſhed on a kind of ſail-cloth, ſpread on the ground for that purpoſe, and the ſeed carried in ſacks to the farm. When the crop is good, a bunder produces about forty raziers of 80lbs. weight each. It is to be obſerved, that the ground whereon cole-ſeed is to be planted, muſt be dunged and twice ploughed the ſame year it is put in uſe."

Coriander-Seed, Canary-Seed, &c.

SECT. III. *Coriander-Seed.*

THIS is uſed in large quantities by diſtillers, druggiſts, and confectioners, and might be a conſiderable object to ſuch farmers as live in the neighbourhood of great towns; but the price is very variable, viz. from 16s. to 42s. per cwt. In the 4th volume of Bath Papers, Mr Bartley gives an account of an experiment made on this ſeed, which proved very ſucceſsful. Ten perches of good ſandy loam were ſown with coriander on the 23d of March 1783. Three pounds of ſeed were ſufficient for this ſpot; and the whole expence amounted only to 5s. 10d. The produce was 87 pounds of ſeed, which, valued at 3d. yielded a profit of 5s. 11d. or 1l. 18s. 4d. per acre. He afterwards made ſeveral other experiments on a larger ſcale; but none of the crops turned out ſo well, though all of them afforded a good profit.

518 Mr Bartley's experiment.

SECT. IV. *Canary-Seed.*

THIS is cultivated in large quantity in the Iſle of Thanet, where it is ſaid they have frequently 20 buſhels to an acre. Mr Bartley, in the month of March 1783, ſowed half an acre of ground, the ſoil a mixture of loam and clay, but had only eight buſhels and a half, or 17 buſhels per acre. With this produce, however, he had a profit of 4l. 2s. 3d. per acre.

519 Culture of canary-ſeed.

SECT. V. *Woad.*

THE uſe of this in dyeing is well known, and the conſumption is ſo great, that the raiſing of the plant might undoubtedly be a object to an huſbandman, provided he could get it properly manufactured for the dyers, and could overcome their prejudices. At preſent, the growing of this plant is in a manner monopolized by ſome people in particular places, particularly at Keynſham near Briſtol in England. Mr Bartley informs us, that in a converſation he had with theſe growers, the latter aſſerted, that the growth of woad was peculiar to their ſoil and ſituation. The ſoil about this place is a blackiſh heavy mould, with a conſiderable proportion of clay, but works freely: that of Briſlington,

520 Woad eaſily cultivated.

Hops. Brillington, where Mr Bartley reſides, a hazel ſandy loam; nevertheleſs, having ſowed half an acre of this ſoil with woad ſeed, it throve ſo well, that he never ſaw a better crop at Keynſham. Having no apparatus, however, or knowledge of the manufacture, he ſuffered it to run to ſeed, learning only from the experiment, that woad is very eaſily cultivated, and that the only difficulty is the preparing it for the market.

SECT. VI. *Hops.*

521 Hops forbid by act of parliament.

THE uſes of theſe as an ingredient in malt liquors, are well known. Formerly, however, they were ſuppoſed to poſſeſs ſuch deleterious qualities, that the uſe of them was forbid by act of parliament in the reign of James VI. But though this act was never repealed, it does not appear that much regard was ever paid to it, as the uſe of hops has ſtill continued, and is found not to be attended with any bad effects on the human conſtitution. The only queſtion, therefore, is, How far the raiſing a crop of them may be profitable to a huſbandman? and indeed this ſeems to be very doubtful.

Mr Arthur Young, in a Fortnight's Tour through Kent and Eſſex, informs us*, that at Caſtle Hedingham he was told by a Mr Rogers, who had a conſiderable hop-plantation, that four acres of hop-ground coſt him upwards of 120l. and that the uſual expences of laying out an acre of ground in this way amounted to 34l. 6s. By a calculation of the expences of an acre in Kent, it appeared that the money ſunk to plant an acre there amounted to 32l. 8s. 6d.; that the annual expence was 23l. and the profit no more than 1l. 8s. 1d. In another place, he was informed by a Mr Potter, who cultivated great quantities of hops, that if it were not for ſome extraordinary crops which occurred now and then, nobody would plant them. In Eſſex, the expences of a hop-plantation are ſtill greater than thoſe we have yet mentioned; an acre many years ago requiring 75l. to lay it out on hops, and now not leſs than 100l. the annual expence being eſtimated at 31l. 1s. while the produce commonly does not exceed 32l.

Annals of Agriculture, vol. ii.

522 Expence of cultivating them at Caſtle Hedingham.

523 In Eſſex.

In the neighbourhood of Stow-market in this county, Mr Young informs us, there are about 200 acres planted with hops, but "18 or 20 are grubbed up within two years, owing to the badneſs of the times." Here they are planted on a black looſe moor, very wet and boggy; and the more wet the better for the crop, eſpecially if the gravel, which conſtitutes the bottom, be not more than three feet from the ſurface. In preparing the ground for hops, it is formed into beds, 16 feet wide, ſeparated from each other by trenches. In theſe beds they make holes ſix feet aſunder, and about 12 inches diameter, three rows upon a bed. Into each hole they put about half a peck of very rotten dung or rich compoſt; ſcatter earth upon it, and plant ſeven ſets in each; drawing earth enough to them afterwards to form ſomething of a hillock. A hop garden, Mr Young informs us, "will laſt almoſt for ever, by renewing the hills that fail, to the amount of about a ſcore annually, but it is reckoned better to grub up and new-plant it every 20 or 25 years."

In this volume of the Annals, Mr Young informs us, that "one profit of hop-land is that of breaking it up. Mr Potter grubbed up one garden, which failing, he ploughed and ſowed barley, the crop great: then mazagan beans, two acres of which produced 16 quarters and five buſhels. He then ſowed it with wheat, which produced 13 quarters and four buſhels and a half: but ſince that time the crops have not been greater than common. The ſame gentleman has had 10 quarters of oats after wheat." In the ninth volume of the ſame work, however, we have an account of an experiment by Mr Le Bland of Sittingbourn in Kent, of grubbing up 12 acres of hop-ground, which was not attended with any remarkable ſucceſs. Part of the hops were grubbed up in the year 1781, and mazagan beans ſown in their ſtead: but by reaſon of the ſeed being bad, and the dry ſummer, the crop turned out very indifferent. Next year the remainder of the hops were grubbed up, and the whole 12 acres ſown with wheat; but ſtill the crop turned out very bad, owing to the *wet* ſummer of that year. It was next planted with potatoes, which turned out well: and ever ſince that time the crops have been good. This gentleman informs us, that the perſon who had the hop-ground above mentioned did not loſe leſs by it than 1500l.

Cultivation of Fruit.

524 Profit of breaking up hop-land precarious.

525 Culture of hops in Norfolk on the decline.

The culture of hops ſeems to be confined in a great meaſure to the ſouthern counties of England; for Mr Marſhall mentions it as a matter of ſurpriſe, that in Norfolk he ſaw a "tolerably large hop garden." The proprietor informed him, that three or four years before there had been 10 acres of hops in the pariſh (Blowfield) where he reſided; which was more than could be collected in all the reſt of the county; but at that time there were not above five: and the culture was daily declining, as the crops, owing to the low price of the commodity, did not defray the expence.

From all this it appears, that hops are perhaps the moſt uncertain and precarious crop on which the huſbandman can beſtow his labour. Mr Young is of opinion, that ſome improvement in the culture is neceſſary; but he does not mention any, excepting that of planting them in eſpaliers. This method was recommended both by Mr Rogers and Mr Potter above mentioned. The former took the hint from obſerving, that a plant which had been blown down, and afterwards ſhot out horizontally, always produced a greater quantity than thoſe which grew upright. He alſo remarks, that hops which are late picked carry more next year than ſuch as are picked early; for which reaſon he recommends the late picking. The only reaſon for picking early is, that the hops appear much more beautiful than the others.

SECT. VII. *Cultivation of Fruit.*

IN Herefordſhire and Glouceſterſhire the cultivation of fruit for the purpoſe of making a liquor from the juice, forms a principal part of their huſbandry. In Devonſhire alſo conſiderable quantities of this kind of liquor are made, though much leſs than in the two counties above mentioned.

526 Fruits cultivated in Herefordſhire and Glouceſterſhire.

The fruits cultivated in Herefordſhire and Glouceſterſhire are, the apple, the pear, and the cherry. From the two firſt are made the liquors named *cyder and perry*;

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ry; but though it is probable that a liquor of some value might be made from cherries also, it does not appear to have ever been attempted. Mr Marshall remarks, that nature has furnished only one species of pears and apples, *viz.* the common crab of the woods and hedges, and the wild pear, which is likewise pretty common. The varieties of these fruits are entirely artificial, being produced not by seed, but by a certain mode of culture; whence it is the business of those who wish to improve fruit therefore, to catch at superior accidental varieties; and having raised them by cultivation to the highest perfection of which they are capable, to keep them in that state by artificial propagation. Mr Marshall, however, observes, that it is impossible to make varieties of fruit altogether permanent, though their duration depends much upon management. "A time arrives (says he) when they can no longer be propagated with success. All the old fruits which raised the fame of the liquors of this country are now lost, or so far on the decline as to be deemed irrecoverable. The *red streak* is given up; the celebrated *stir-apple* is going off; and the *squash-pear*, which has probably furnished this country with more *champaign* than was ever imported into it, can no longer be got to flourish: the stocks canker, and are unproductive. In Yorkshire similar circumstances have taken place: several old fruits which were productive within my own recollection are lost; the stocks cankered, and the trees would no longer come to bear."

527 Varieties of fruits entirely artificial.

528 Varieties cannot be made permanent.

Our author controverts the common notion among orchard-men, that the decline of the old fruits is owing to a want of fresh grafts from abroad, particularly from Normandy, from whence it is supposed that apples were originally imported into this country. Mr Marshall, however, thinks, that these original kinds have been long since lost, and that the numerous varieties of which we are now possessed were raised from seed in this country. He also informs us, that at Ledbury he was shown a Normandy apple tree, which, with many others of the same kind, had been imported immediately from France. He found it, however, to be no other than the *bitter-sweet*, which he had seen growing as a neglected wilding in an English hedge.

529 Mr Marshall's directions for raising new varieties of fruit.

The process of raising new varieties of apples, according to Mr Marshall, is simple and easy. "Elect (says he) among the native species individuals of the highest flavour; sow the seeds in a highly enriched seed bed. When new varieties, or the improvement of old ones, are the objects, it may perhaps be eligible to use a frame or stove; but where the preservation of the ordinary varieties only is wanted, an ordinary loamy soil will be sufficient. At any rate, it ought to be perfectly clean at least from root weeds, and should be double dug from a foot to 18 inches deep. The surface being levelled and raked fine, the seeds ought to be scattered on about an inch asunder and covered about half an inch deep with some of the finest mould previously raked off the bed for that purpose. During summer the young plants should be kept perfectly free from weeds, and may be taken up for transplantation the ensuing winter; or if not very thick in the seed-bed, they may remain in it till the second winter.

530 The nursery ground.

The nursery ground ought also to be enriched, and double dug to the depth of 14 inches at least; though 18 or 20 are preferable. The seedling plants ought to be sorted agreeably to the strength of their roots, that they may rise evenly together. The top or downward roots should be taken off, and the longer side rootlets shortened. The young trees should then be planted in rows three feet asunder, and from 15 to 18 inches distant in the rows; taking care not to cramp the roots, but to lead them evenly and horizontally among the mould. If they be intended merely for stocks to be grafted, they may remain in this situation until they be large enough to be planted out; though, in strict management, they ought to be re-transplanted two years before their being transferred into the orchard, "in fresh but unmanured double-dug ground, a quincunx four feet apart every way." In this second transplantation, as well as in the first, the branches of the root ought not to be left too long, but to be shortened in such a manner as to induce them to form a globular root, sufficiently small to be removed with the plant; yet sufficiently large to give it firmness and vigour in the plantation.

531 Method of choosing the plants.

Having proceeded in this manner with the seed-bed, our author gives the following directions. "Select from among the seedlings the plants whose wood and leaves wear the most *apple-like* appearance. Transplant these into a rich deep soil in a genial situation, letting them remain in this nursery until they begin to bear. With the seeds of the fairest, richest, and best flavoured fruit repeat this process; and at the same time, or in due season, engraft the wood which produced this fruit on that of the richest, sweetest, best-flavoured apple: repeating this operation, and transferring the subject under improvement from one tree and sort to another, as richness, flavour, or firmness, may require; continuing this double mode of improvement until the desired fruit be obtained. There has, no doubt, been a period when the improvement of the apple and pear was attended to in this country; and should not the same spirit of improvement revive, it is probable that the country will, in a course of years, be left destitute of valuable kinds of these two species of fruit; which, though they may in some degree be deemed objects of luxury, long custom seems to have ranked among the necessaries of life."

532 Mr Grimwood's opinion of the degeneracy of apples.

In the fourth volume of Bath Papers, Mr Grimwood supposes the degeneracy of apples to be rather imaginary than real. He says, that the evil complained of "is not a real decline in the quality of the fruit, but in the tree; owing either to want of health, the season, soil, mode of planting, or the stock they are grafted on, being too often raised from the seed of apples in the same place or country. I have not a doubt in my own mind, but that the trees which are grafted on the stocks raised from the apple pips are more tender than those grafted on the real crab-stock; and the seasons in this country have, for many years past, been unfavourable for fruits, which add much to the supposed degeneracy of the apple. It is my opinion, that if planters of orchards would procure the trees grafted on real crab-stocks from a distant country, they would find their account in so doing much overbalance the extra expence of charge and carriage.

533 Mr Gillingwater's opinion.

In the same volume, Mr Edmund Gillingwater assigns as a reason for the degeneracy of apples the mixture of various farina, from the orchards being too near each other. In consequence of this notion, he

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he alſo thinks that the old and beſt kinds of apple trees are not loſt, but only corrupted from being planted too near bad neighbours: "Remove them (ſays he) to a ſituation where they are not expoſed to this inconvenience, and they will immediately recover their former excellency." This theory, however, is not ſupported by a ſingle experiment.

534 Mr Samuel's opinion of the method of recovering the beſt fruit.

In this volume alſo Mr Richard Samuel expreſſes his concern at the "preſent neglect of orchards, where the old trees are decaying, without proper proviſion being made for the ſucceeding age: for if a farmer plants freſh trees (which does not frequently happen), there is ſeldom any care taken to propagate the better ſorts, as his grafts are uſually taken promiſcuouſly from any ordinary kind, moſt eaſily procured in the neighbourhood." His remedy is to collect grafts from the beſt trees; by which means he ſuppoſes that the ſuperior kinds of fruit would ſoon be recovered. To a care of this kind he attributes the ſuperiority of the fruit in the neighbourhood of great towns to that in other places.

535 Cultivation, &c. of fruit trees.

With regard to the method of cultivating fruit trees, it is only neceſſary to add, that while they remain in the nurſery, the intervals between them may be occupied by ſuch kitchen-ſtuff as will not crowd or overſhadow the plants; keeping the rows in the mean time perfectly free from weeds. In pruning them, the leader ſhould be particularly attended to. If they ſhoot double, the weaker of the contending branches ſhould be taken off; but if the leader be loſt, and not eaſily recoverable, the plant ſhould be cut down to within a hand's breadth of the ſoil, and a freſh ſtem trained. The undermoſt boughs ſhould be taken off by degrees, going over the plants every winter; but taking care to preſerve heads of ſufficient magnitude not to draw the ſtems up too tall, which would make them feeble in the lower part. The ſtems in Herefordſhire are trained to ſix feet high; but our author prefers ſeven, or even half a rod in height. A tall-ſtemmed tree is much leſs injurious to what grows below it than a low-headed one, which is itſelf in danger of being hurt, at the ſame time that it hurts the crop under it. The thickneſs of the ſtem ought to be in proportion to its height; for which reaſon a tall ſtock ought to remain longer in the nurſery than a low one. The uſual ſize at which they are planted out in Herefordſhire is from four to ſix inches girt at three feet high; which ſize, with proper management, they will reach in ſeven or eight years. The price of theſe ſtocks in Herefordſhire is 1s. 6d. each. Our author met with one inſtance of crabſtocks being gathered in the woods with a good proſpect of ſucceſs.

536 Method of managing the ground of orchards in Herefordſhire and Glouceſterſhire.

In Herefordſhire it is common to have the ground of the orchards in tillage, and in Glouceſterſhire in graſs; which Mr Marſhall ſuppoſes to be owing to the difference betwixt the ſoil of the two counties; that of Herefordſhire being generally arable, and Glouceſter graſs land. Trees, however, are very deſtructive, not only to a crop of corn, but to clover and turnips; though tillage is favourable to fruit trees, in general, eſpecially when young. In graſs grounds their progreſs is comparatively ſlow, for want of the earth being ſtirred about them, and by being injured by the cattle, eſpecially when low-headed and drooping. After they begin to bear, cattle ought by all means to be kept away from them, as they not only deſtroy all the fruit within their reach, but the fruit itſelf is dangerous to the cattle, being apt to ſtick in their throats and choak them. Theſe inconveniences may be avoided, by eating the fruit grounds bare before the gathering ſeaſon, and keeping the boughs out of the way of the cattle: but Mr Marſhall is of opinion, that it is wrong to plant orchards in graſs land. "Let them (ſays he) lay their old orchards to graſs; and if they plant, break up their young orchards to arable. This will be changing the courſe of huſbandry, and be at once beneficial to the land and the trees.

Cultivation of Fruits.

537 Indolence of the farmers in theſe parts complained of.

Our author complains very much of the indolent and careleſs method in which the Herefordſhire and Glouceſterſhire farmers manage their orchards. The natural enemies of fruit trees (he ſays) are, 1. A redundancy of wood. 2. The miſſetoe. 3. Moſs. 4. Spring froſts. 5. Blights. 6. Inſects. 7. And exceſs of fruit. 8. Old age.

538 Exceſs of wood how remedied.

1. A redundancy of wood is prejudicial, by reaſon of the barren branches depriving thoſe which bear fruit of the nouriſhment which ought to belong to them. A multitude of branches alſo give the wind ſuch an additional power over the tree, that it is in perpetual danger of being overthrown by them: trees are likewiſe thus injured by the damps and want of circulation of air, ſo that only the outer branches are capable of bringing fruit to maturity. "It is no uncommon ſight (ſays he) to ſee trees in this diſtrict, with two or three tires of boughs preſſing down hard upon one another, with their twigs ſo intimately interwoven, that even when the leaves are off, a ſmall bird can ſcarcely creep in among them.

539 Miſſetoe how deſtroyed.

2. The miſſetoe in this country is a great enemy to the apple tree. It is eaſily pulled out with hooks in froſty weather, when, being brittle, it readily breaks off from the branches. It likewiſe may be applied to a profitable purpoſe, ſheep being as fond of it as of ivy.

540 Moſs of fruit trees.

3. Moſs can only be got the better of by induſtry in clearing the trees of it; and in Kent there are people who make it their profeſſion to do ſo.

541 Spring-froſts.

4. Spring-froſts, eſpecially when they ſuddenly ſucceed rain, are great enemies to fruit trees; dry froſts only keep back the bloſſoms for ſome time. Art can give no farther aſſiſtance in this caſe than to keep the tree in a healthy and vigorous ſtate, ſo as to enable them to throw out a ſtrength of bud and bloſſom; and by keeping them thin of wood, to give the man opportunity of drying quickly before the froſt ſet in.

542 Blights an uncertain term.

5. Blight is a term, as applied to fruit trees, which Mr Marſhall thinks is not underſtood. Two bearing years, he remarks, ſeldom come together; and he is of opinion, that it is the mere exhauſting of the trees by the quantity of fruit which they have carried one year, that prevents them from bearing any the next. The only thing, therefore, that can be done in this caſe is, to keep the trees in as healthy and vigorous a ſtate as poſſible.

543 Method propoſed of deſtroying waſps.

6. Inſects deſtroy not only the bloſſoms and leaves, but ſome of them alſo the fruit, eſpecially pears. In the year 1783 much fruit was deſtroyed by waſps. Mr Marſhall adviſes to ſet a price upon the female waſps in the ſpring; by which theſe miſchievous inſects would perhaps be exterminated, or at leaſt greatly leſſened.

Timber Trees.

544 Of an excess of fruit.

7. An excess of fruit stints the growth of young trees, and renders all in general barren for two or three years; while in many cases the branches are broken off by the weight of the fruit; and in one case Mr Marshall mentions, that an entire tree had sunk under its burden. To prevent as much as possible the bad effects of an excess of fruit, Mr Marshall recommends "to graft in the boughs," and when fully grown, to thin the bearing branches; thus endeavouring, like the gardener, to grow fruit every year."

545 Duration of fruit trees may be lengthened.

8. Though it is impossible to prevent the effects of old age, yet by proper management the natural life of fruit trees may be considerably protracted. The most eligible method is to graft stocks of the native crab in the boughs. The decline of the tree is preceded by a gradual decline of fruitfulness, which takes place long before the tree manifests any sign of decay. During this decline of fruitfulness, there is a certain period when the produce of a tree will no longer pay for the ground it occupies; and beyond this period it ought by no means to be allowed to stand. In the Vale of Gloucester, however, our author saw an instance of some healthy bearing apple trees, which then had the *second* tops to the same stems. The former tops having been worn out, were cut off, and the stumps sawgrafted. Our author observes, that the pear tree is much longer lived than the apple, and ought never to be planted in the same ground. He concludes with the following general observation: "Thus considering fruit trees as a crop in husbandry, the general management appears to be this: Plant upon a recently broken-up worn-out sward. Keep the soil under a state of arable management, until the trees be well grown: then lay it down to grass, and let it remain in sward until the trees be removed, and their roots be decayed; when it will again require a course of arable management."

546 Mr Marshall's observation on the culture of fruit trees.

Sect. VIII. *Of Timber Trees.*

The importance and value of these are so well known, that it is superfluous to say any thing on that subject at present: notwithstanding this acknowledged value, however, the growth of timber is so slow, and the returns for planting so distant, that it is generally supposed for a long time to be a positive loss, or at least to be attended with no profit. This matter, however, when properly considered, will appear in another light. There are four distinct species of woodlands; viz. woods, timber groves, coppices, and woody wastes. The woods are a collection of timber trees and underwood; the timber groves contain timber trees without any underwood; and the coppices are collections of underwood alone. All these turn out to advantage sooner or later, according to the quick or slow growth of the trees, and the situation of the place with respect to certain local advantages. Thus in some places underwood is of great consequence, as for rails, hoops, stakes, fuel, &c.; and by reason of the quickness of its growth it may be accounted the most profitable of all plantations. An osier-bed will yield a return of profit the second or third year, and a coppice in 15 or 20 years; while a plantation of oaks will not arrive at perfection in less than a century. This last period is so long, that it may not unreasonably be supposed likely to deter people from making plantations of this kind, as few are willing to take any trouble for what they are never to see in perfection. It must be remembered, however, that though the trees themselves do not come to perfection in a shorter time, the value of the ground will always increase in proportion to their age. Thus, says one author upon this subject, "we have some knowledge of a gentleman now living, who during his lifetime has made plantations, which in all probability will be worth to his son as much as his whole estate, handsome as it is. Supposing that those plantations have been made 50 or 60 years, and that in the course of 20 or 30 more they will be worth 50,000l.; may we not say, that at present they are worth some 20,000l. or 30,000l.? Mr Pavier, in the 4th volume of Bath Papers, computes the value of 50 acres of oak timber in 100 years to be 12,100l. which is nearly 50s. annually per acre; and if we consider that this is continually accumulating, without any of that expence or risk to which annual crops are subject, it is probable that timber planting may be accounted one of the most profitable articles in husbandry. Evelyn calculates the profit of 1000 acres of oak land, in 150 years, at no less than 670,000l.; but this is most probably an exaggeration. At any rate, however, it would be improper to occupy, especially with timber of such slow growth, the grounds which either in grass or corn can repay the trouble of cultivation with a good annual crop.

547 Different kinds of woodlands.

548 What plantation will soonest bring in a return of profit.

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549 Advantages of planting.

In the fourth volume of the Bath Papers, Mr Wagstaffe recommends planting as an auxiliary to cultivation. He brings an instance of the success of Sir William Jerningham, who made trial of "the most unpromising ground perhaps that any successful planter has hitherto attempted." His method was to plant beech trees at proper distances among Scotch firs, upon otherwise barren heaths. "These trees (says Mr Wagstaffe), in a soil perhaps without clay or loam, with the heathy sod trenched into its broken strata of sand or gravel, under the protection of the firs, have laid hold, though slowly, of the soil; and accelerated by the superior growth of the firs, have proportionally risen, until they wanted an enlargement of space for growth, when the firs were cut down." He next proceeds to observe, that when the firs are felled, their roots decay in the ground; and thus furnish by that decay a new support to the soil on which the beeches grow: by which means the latter receive an additional vigour, as well as an enlargement of space and freer air; the firs themselves, though cut down before they arrived at their full growth, being also applicable to many valuable purposes.

550 Planting meliorates the soil.

551 Culture of timber trees recommended by Mr Harries.

In the sixth volume of Annals of Agriculture, we find the culture of trees recommended by Mr Harries: and he informs us, that the larch is the quickest grower and the most valuable of all the resinous timber trees; but unless there be pretty good room allowed for the branches to stretch out on the lower part of the trunk, it will not arrive at any considerable size; and this observation, he says, holds good of all pyramidal trees. Scotch firs may be planted between them, and pulled out after they begin to obstruct the growth of the larch. Some of these larches he had seen planted about 30 years before, which, at 5 feet distance from the ground, measured from 4 feet to 5 feet 6 inches in circumfer-

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ence. The moſt barren grounds, he ſays, would anſwer for theſe trees, but better ſoil is required for the oaks. In this paper he takes notice of the leaves of one of his plantations of oaks having been almoſt entirely deſtroyed by inſects; in conſequence of which they did not increaſe in bulk as uſual: but another which had nearly eſcaped theſe ravages, increaſed at an average 1 inch in circumference. "A tree 4 feet round (ſays he), that has timber 20 feet in length, gains by this growth a ſolid foot of timber annually, worth one ſhilling at leaſt, and pays 5 per cent. for ſtanding. It increaſes more as the tree gets from 5 to 6 feet round. I have a reaſonable hope to infer from my inquiry, that I have in my groves 3000 oaks that pay me one ſhilling each per annum, or 150l. a-year. My poplars have gained in circumference near two inches, and a Worceſter and witch elm as much. I have lately been informed, that the ſmooth cut of a holly tree, that meaſures 20 inches and upwards round, is worth to the cabinet-makers 2s. 6d. per foot.

552 Increaſe of oak trees.

553 Increaſe of trees in the marquis of Lanſdowne's plantation.

The following table ſhows the increaſe of trees in 21 years from their firſt planting. It was taken from the marquis of Lanſdowne's plantation, begun in the year 1765, and the calculation made on the 15th of July 1786. It is about ſix acres in extent; the ſoil partly a ſwampy meadow upon a gravelly bottom. The meaſures were taken at 5 feet above the ſurface of the ground; the ſmall firs having been occaſionally drawn for poſts and rails, as well as rafters for cottages; and when peeled of the bark, will ſtand well for ſeven years.

	Height in Feet.	Circumference in Feet.	Inch.
Lombardy poplar -	60 to 80	4	8
Arbeal - -	50 to 70	4	6
Plane - -	50 to 60	3	6
Acacia - -	50 to 60	2	4
Elm - -	40 to 60	3	6
Cheſnut - -	30 to 50	2	9
Weymouth pines -	30 to 50	2	5
Cluſter ditto -	30 to 50	2	5
Scotch fir -	30 to 50	2	10
Spruce ditto -	30 to 50	2	2
Larch - -	50 to 60	3	10

From this table it appears, that planting of timber-trees, where the return can be waited for during the ſpace of 20 years, will undoubtedly repay the original profits of planting, as well as the intereſt of the money laid out; which is the better worth the attention of a proprietor of land, as the ground on which they grow may be ſuppoſed good for very little elſe. From a comparative table of the growth of oak, aſh, and elm timber, given in the 11th volume of the Annals of Agriculture, it appears that the oak is by much the ſloweſt grower of the three.

554 Of underwood, &c.

With reſpect to the growth of underwood, which in ſome caſes is very valuable, it is to be remarked, that in order to have an annual fall of it, the whole quantity of ground, whatever its extent may be, ought to be divided into annual ſowings. The exact number of ſowings muſt be regulated by the uſes to which it is intended to be put. Thus if, as in Surry, ſtakes, edders, and hoops are ſaleable, there ought to be eight or ten annual ſowings; or if, as in Kent, hop-poles are demanded, 14 or 15 will be required; and if, as in Yorkſhire, rails be wanted, or, as in Glouceſterſhire, cordwood be moſt marketable, 18 or 20 ſowings will be neceſſary to produce a ſucceſſion of annual falls. Thus the buſineſs, by being divided, will be rendered leſs burdenſome: a certain proportion being every year to be done, a regular ſet of hands will, in proper ſeaſon, be employed; and by beginning upon a ſmall ſcale, the errors of the firſt year will be corrected in the practice of the ſecond, and thoſe of the ſecond in that of the third. The produce of the intervals will fall into regular courſe; and when the whole is completed, the falls will follow each other in regular ſucceſſion. The greateſt objection to this method of ſowing woodlands is the extraordinary trouble in fencing: but this objection does not hold if the ſowings lie at a diſtance from one another; on the contrary, if they lie together, or in plots, the entire plot may be incloſed at once; and if it contain a number of ſowings, ſome ſubdiviſions will be neceſſary, and the annual ſowings of theſe ſubdiviſions may be fenced off with hurdles, or ſome other temporary contrivance; but if the adjoining land be kept under the plough, little temporary fencing will be neceſſary. It muſt be obſerved, however, that in raiſing a woodland from ſeeds, it is not only neceſſary to defend the young plants againſt cattle and ſheep, but againſt hares and rabbits alſo: ſo that a cloſe fence of ſome kind is abſolutely neceſſary.

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With regard to the preparation of the ground for raiſing timber, it may be obſerved, that if the ſoil be of a ſtiff clayey nature, it ſhould receive a whole year's fallow as for wheat; if light, a crop of turnips may be taken; but at all events it muſt be made perfectly clean before the tree ſeeds be ſown, particularly from perennial root weeds; as, after the ſeeds are ſown, the opportunity of performing this neceſſary buſineſs is in a great meaſure loſt. If the ſituation be moiſt, the ſoil ſhould be gathered into wide lands, ſufficiently round to let the water run off from the ſurface, but not high. The time of ſowing is either the month of October or March; and the method as follows: "The land being in fine order, and the ſeaſon favourable, the whole ſhould be ſown with corn or pulſe adapted to the ſeaſon of ſowing: if in autumn, wheat or rye may be the crop; but if in ſpring, beans or oats. Whichever of theſe three ſpecies be adopted, the quantity of ſeed ought to be leſs than uſual, in order to give a free admiſſion of air, and prevent the crop from loading. The ſowing of the grain being completed, that of the tree-ſeeds muſt be immediately ſet about. Theſe are to be put in drills acroſs the land: acorns and nuts ſhould be dibbled in, but keys and berries ſcattered in trenches or drills drawn with the corner of a hoe, in the manner that gardeners ſow their peaſe. The diſtance might be a quarter of a ſtatute rod, or four feet and one inch and a half. A land-chain ſhould be uſed in ſetting out the drills, as not being liable to be lengthened or ſhortened by the weather. It is readily divided into rods; and the quarters may be eaſily marked.

555 Method of ſowing.

The ſpecies of underwood to be ſown muſt be determined by the conſumpt of it in the neighbourhood of the plantation. Thus, if ſtakes, hoops, &c. be in requeſt, the oak, hazel, and aſh, are eſteemed

as

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as underwood. Where charcoal is wanted for iron forges, beech is the prevailing underwood. The oak, box, birch, &c. are all in requeſt in different countries, and the choice muſt be determined by the prevailing demand. As the keys of the aſh ſometimes lie two or even three years in the ground, it will be proper to have the places where they are ſown diſtinguiſhed by ſome particular marks, to prevent them from being diſturbed by the plough after harveſt: as a few beans ſcattered along with them, if the crop be oats; or oats, if the crop be beans. The crop ſhould be *reaped*, not *mown*, at harveſt time, and be carried off as faſt as poſſible. Between harveſt and winter, a pair of furrows ſhould be laid back to back in the middle of each interval, for meliorating the next year's crop, and laying the ſeedling plants dry; while the ſtubble of the unploughed ground on each ſide of the drills will keep them warm during the winter. The next year's crop may be potatoes, cabbages, turnips, or if the firſt was corn, this may be beans; if the firſt was beans, this may be wheat drilled. In the ſpring of the third year the drills which roſe the firſt year muſt be looked over, and the vacancies filled up from thoſe parts which are thickeſt; but the drills of the aſh ſhould be let alone till the fourth year. The whole ſhould afterwards be looked over from time to time; and this, with cultivating the intervals, and keeping the drills free from weeds, will be all that is neceſſary until the tops of the plants begin to interfere.

The crops may be continued for ſeveral years; and if they only pay for the expences, they will ſtill be of conſiderable advantage by keeping the ground ſtirred, and preſerving the plants from hares and rabbits. Even after the crops are diſcontinued, the ground ought ſtill to be ſtirred, alternately throwing the mould to the roots of the plants, and gathering it into a ridge in the middle of the interval. The beſt method of doing this is to ſplit the ground at the approach of winter in order to throw it up to the trees on both ſides; this will preſerve the roots from froſt: gather it again in the ſpring, which will check the weeds, and give a freſh ſupply of air: ſplit again at midſummer, to preſerve the plants from drought: gather, if neceſſary, in autumn, and ſplit as before at the approach of winter. The ſpring and midſummer ploughings ſhould be continued as long as a plough can paſs between the plants.

Whenever the oaks intended for timber are in danger of being drawn up too ſlender for their height, it will be neceſſary to cut off all the reſt at the height of about an handbreadth above the ground; and thoſe deſigned to ſtand muſt now be planted at about two rods diſtant from each other, and as nearly a quincunx as poſſible. The ſecond cutting muſt be determined by the demand there is for the underwood; with only this proviſo, that the timber ſtands be not too much crowded by it; for rather than this ſhould be the caſe, the coppice ſhould be cut, though the wood may not have reached its moſt profitable ſtate. What is here ſaid of the method of rearing oak trees in woods, is in a great meaſure applicable to that of raiſing other trees in timber groves. The ſpecies moſt uſually raiſed in theſe are the aſh, elm, beech, larch, ſpruce fir, Weymouth pine, poplar, willow, alder, cheſnut, walnut, and cherry. The three laſt are uſed as ſubſtitutes for the oak and beech, and theſe two for the mahogany.

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The following account of the mode of planting that was adopted by the earl of Fife, for no leſs than 550 acres of moorith lands, is worthy of attention. It is contained in a letter from his lordſhip to the publiſher of the Annals of Agriculture. "Where there are ſtones in the moor, I incloſe with a ſtone wall five feet high, coped with two turfs, which coſt about 15s. every Scots chain of 24 ells, and where there are no ſtones, which is moſtly the caſe in the moors in the county of Murray, I incloſe with a fence of turf, five feet high, four feet wide at the foundation, and 22 inches at top, at 4s. the Scots chain. I find thoſe fences anſwer as well as the ſtone, for there are many of them now above 20 years old, as good as at firſt. I plant in every acre about 1200 trees. I uſed to plant above 3000, but by experience I find it better not to plant them ſo thick, but make them up, if neceſſary, the third year (eſpecially in my plantations in the county of Murray), where ſcarcely a tree planted ever fails. The greateſt number of the trees are Scots firs raiſed by myſelf, or purchaſed at 10d. the thouſand, planted from the ſeed-bed at three years old. I only conſider them as nurſes to my other trees, for they are regularly cut out when they have done their duty as nurſes, and are profitable for fire, and uſeful in agriculture. I plant every other ſpecies of foreſt trees intermixed with the firs. I order different pieces of the moor to be trenched where the ſoil is beſt, and moſt ſheltered, and lay a little lime and dung on it, and in theſe places I ſow ſeeds of trees for nurſery. I alſo plant in beds, year-old trees of different kinds, taken from my other nurſeries. I nurſe them for three years, and then plant them all over the plantation: this I find very beneficial, as they are raiſed in the ſame ſoil. When I am filling up the plantations, the firs are, for the firſt time, cut down; or they are tranſplanted, being raiſed with balls of earth when the moor is wet with rain, which is very eaſily done, and they are carried to incloſures of ten or twelve acres, where, from a deſire of forward woods, I am planting trees more advanced. They are planted in pits about 40 feet diſtance, and ſeldom or never fail, and anſwer a ſecond time as nurſes.

Vol. ix. 556 Earl of Fife's plantations.

"My firſt care after the incloſure is properly filled up, is to guard againſt injury from cattle: a ſmall allowance given to a few labourers anſwers that purpoſe, and if the fences are properly executed they require very little repair. After the plantation is filled up, the moſt regular attention muſt be had to the weeding of it, and this is carried on over my plantations of all ages in the moſt exact manner; I make roads through all the plantations which are carried forward according to the ſituation, never in a ſtraight line ſo as to draw violent winds, and thoſe roads go to all parts of the plantation; they make agreeable rides through fine woods, formerly a bleak moor, and anſwer not only for filling up, but alſo for carrying away the neceſſary weedings. As I obſerved before, the value and proſperity of the wood depends upon the unremitted attention in weeding it.

"I begin to plant in October, and continue till April. If the weather is froſty and not fit for planting, all the people are employed in weeding the woods."

It is proper, however, upon this ſubject, to remark,

Cattle proper to be employed.

that the value of plantations of timber trees, as connected with other branches of agriculture, is not a little limited. In a mountainous country, and in bleak moorish situations, nothing tends more to increaſe the value of the ſoil, than plantations properly diſtributed. They give ſhelter both to the cattle and to the corn crops; and by preventing the warmth which is produced by proper manures, aid by the germination of vegetables, from being diſſipated, they give effect to all the efforts of induſtry. Accordingly, in ſuch ſituations, plantations are no ſooner reared, than the whole face of the country around them aſſumes an improving aſpect, and diſplays a richer verdure. When ſuddenly cut down, in conſequence of the neceſſities of an improvident proprietor, the reverſe of all this occurs. Vegetation is chilled by the piercing blaſts which now meet with no reſiſtance, and the cattle droop from want of ſhelter; ſo that in a few years the place can ſcarcely be known. But the caſe is very different with regard to a rich and level country that is meant to be cultivated for corn. There the effect of numerous plantations, of high trees and lofty hedge rows, is altogether diſtreſſing to the huſbandman. It is only in open fields that grain appears well ripened and completely filled. When ſurrounded with timber trees, on the contrary, it ripens ill, and is ill-coloured and unequal. In ſpring the high ſhelter prevents the grounds from drying, and keeps back the labour. In ſummer the crop is liable to diſeaſes from want of air, and is devoured by large flocks of ſmall birds. In autumn, from want of a free circulation of air the corn ripens late, and in a weeping climate it can never be gathered in good condition. In wet ſeaſons it is utterly ruined. In winter, when the ſnow is drifting about, the trees prepare a reſting place for large quantities of it; theſe frequently remain and ſtop the ſpring work. Add to this, that in a low country even the cattle are hurt by the ſwarms of vermin that are bred, and come forth, under the ſhelter of lofty trees and high fences.

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557 Where plantations are eligible or otherwiſe.

PART III. OF THE CATTLE PROPER TO BE EMPLOYED IN FARM WORK; REARING AND MANAGEMENT OF THEM. OF HOGS, POULTRY, &c. OF THE DAIRY, MAKING OF FRUIT LIQUORS. OF FENCES.

SECT. I. *Of the Cattle proper to be employed.*

AS great part of the ſtock of a huſbandman muſt always conſiſt of cattle, and as one of his principal expences muſt conſiſt of the maintenance of them, this part of his buſineſs is certainly to be looked upon as extremely important. The cattle belonging to a farm may be divided into two claſſes, viz. ſuch as are intended for work, and ſuch as are deſigned for ſale. The former are now principally horſes, the oxen formerly employed being fallen into diſuſe, though it does not yet certainly appear that the reaſons for the exchange are ſatisfactory. In the ſecond volume of Bath Papers, we have an account of a comparative experiment of the utility of horſes and oxen in huſbandry by Mr Keddington near Bury in Suffolk, in which the preference is deciſively given to oxen. He informs us, that at the time he began the experiment (in 1779), he was almoſt certain that there was not an ox worked in the whole county; finding, however, the expence of horſes very great, he purchaſed a ſingle pair of oxen, but found much difficulty in breaking them, as the workmen were ſo much prejudiced againſt them, that they would not take the proper pains. At laſt he met with a labourer who undertook the taſk; and the oxen "ſoon became as tractable and as handy, both at ploughing and carting, as any horſes." On this he determined to part with all his cart-horſes; and by the time he wrote his letter, which was in 1781, he had not a ſingle horſe, nor any more than ſix oxen; which inconſiderable number performed with eaſe all the work of his farm (conſiſting of upwards of 100 acres of arable land and 60 of paſture and wood), beſides the ſtatute duty on the highways, timber and corn carting, harrowing, rolling, and every part of rural buſineſs. They are conſtantly ſhoed; their harneſs is the ſame as that of horſes (excepting the neceſſary alterations for difference of ſize and ſhape); they are driven with bridles and bits in their mouths, anſwering to the ſame words of the ploughman and carter as horſes will do. A ſingle man holds the plough, and drives a pair of oxen with reins: and our author informs us, that they will plough an acre of ground in leſs than eight hours time; he is of opinion that they could do it in ſeven. The intervals of a ſmall plantation, in which the trees are ſet in rows ten feet aſunder, are ploughed by a ſingle ox with a light plough, and he is driven by the man who holds it. The oxen go in a cart either ſingle, or one, two, or three, according to the load. Four oxen will draw 80 buſhels of barley or oats in a waggon with eaſe; and if good of their kind, will travel as faſt as horſes with the ſame load. One ox will draw 40 buſhels in a light cart, which our author thinks is the beſt carriage of any. On the whole, he prefers oxen to horſes for the following reaſons.

558 Mr Keddington's experiment on the comparative utility of horſes and oxen.

559 Reaſons for preferring oxen to horſes.

1. They are kept at much leſs expence, never eating meal or corn of any kind. In winter they are fed with ſtraw, turnips, carrots, or cabbages; or inſtead of the three laſt, they have each a peck of bran per day while kept conſtantly at work. In the ſpring they eat hay; and if working harder than uſual at ſeed-time, they have bran beſides. When the vetches are fit for mowing, they get them only in the ſtable. After the day's work in ſummer they have a ſmall bundle of hay, and ſtand in the ſtable till they cool; after which they are turned into the paſture. Our author is of opinion, that an ox may be maintained in condition for the ſame conſtant work as a horſe, for at leaſt 4l. leſs annually.

2. After a horſe is ſeven years old, his value declines every year; and when lame, blind, or very old, he is ſcarce worth any thing; but an ox, in any of theſe ſituations, may be fatted, and ſold for even more than the firſt purchaſe; and will always be fat ſooner after work than before.

3. Oxen are leſs liable to diſeaſes than horſes.

4. Horſes are frequently liable to be ſpoiled by ſervants

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vants riding them without their master's knowledge, which is not the case with oxen.

5. A general use of oxen would make beef plentiful, and consequently all other meat; which would be a national benefit.

560 Difficulty in shoeing oxen.

Mr Kedington concludes his paper with acknowledging, that there is one inconvenience attending the use of oxen, viz. that it is difficult to shoe them; though even this, he thinks, is owing rather to the unskilfulness of the smiths who have not been accustomed to shoe these animals, than to any real difficulty. He confines them in a pound while the operation is performing.

561 Mr Marshall's calculations.

Mr Marshall, in his Rural Economy of the Midland Counties, shows the advantage of employing oxen in preference to horses from the mere article of expence, which, according to his calculation, is enormous on the part of the horses. He begins with estimating the number of square miles contained in the kingdom of England; and this he supposes to be 30,000 of cultivated ground. Supposing the work of husbandry to be done by horses only, and each square mile to employ 20 horses, which is about 3 to 100 acres, the whole number used throughout Britain would be 600,000; from which deducting one-sixth for the number of oxen employed at present, the number of horses just now employed will be 500,000. Admitting that each horse works ten years, the number of farm-horses which die annually are no fewer than 50,000; each of which requires full four years keep before he is fit for work. Horses indeed are broke in at three, some at two years old, but they are, or ought to be, indulged in keep and work till they are six; so that the cost of rearing and keeping may be laid at full four ordinary years. For all this consumption of vegetable produce he returns not the community a single article of food, clothing, or commerce; even his skin for economical purposes being barely worth the taking off. By working horses in the affairs of husbandry, therefore, "the community is losing annually the amount of 200,000 years keep of a growing horse;" which at the low estimate of five pounds a-year, amonnts to a million annually. On the contrary, supposing the business of husbandry to be done solely by cattle, and admitting that oxen may be fatted with the same expenditure of vegetable produce as that which old horses require to fit them for full work, and that instead of 50,000 horses dying, 50,000 oxen, of no more than 52 stone each, are annually slaughtered; it is evident, that a quantity of beef nearly equal to what the city of London consumes would be annually brought into the market; or, in other words, 100,000 additional inhabitants might be supplied with one pound of animal food a-day each; and this without consuming one additional blade of grass. "I am far from expecting (says Mr Marshall), that cattle will, in a short space of time, become the universal beasts of draught in husbandry; nor will I contend, that under the present circumstances of the island they ought in strict propriety to be used. But I know that cattle, under proper management, and kept to a proper age, are equal to every work of husbandry, in most, if not all situations: And I am certain, that a much greater proportion than there is at present might be worked with considerable advantage, not to the community

562 A million annually lost by keeping horses.

only, but to the owners and occupiers of lands. If only one of the 50,000 carcases now lost annually to the community could be reclaimed, the saving would be an object."

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563 No oxen used in Norfolk.

In Norfolk, our author informs us, that horses are the only beasts of labour; and that there is not perhaps one ox worked throughout the whole county. It is the same in the Vale of Gloucester, though oxen are used in the adjoining counties. Formerly some oxen were worked in it double; but they were found to poach the land too much, and were therefore given up. Even when worked single, the same objection is made: but, says Mr Marshall, "in this I suspect there is a spice of obstinacy in the old way; a want of a due portion of the spirit of improvement; a kind of indolence. It might not perhaps be too severe to say of the Vale farmers, that they would rather be eaten up by their horses than step out of the beaten track to avoid them." Shoeing oxen with whole shoes, in our author's opinion, might remedy the evil complained of; "but if not, let those (says he) who are advocates for oxen, calculate the comparative difference in *wear* and keep, and those who are their enemies estimate the comparative mischiefs of treading; and thus decide upon their value as beasts of labour in the Vale."

564 Objection to them in the Vale of Gloucester.

565 Used in the Cotswold.

In the Cotswold oxen are worked as well as horses; but the latter, our author fears, are still in the proportion of two to one: he has the satisfaction to find, however, that the former are coming into more general use. They are worked in harness; the collar and harness being used as for horses, not reversed, as in most cases they are for oxen. "They appear (says our author) to be perfectly handy; and work, either at plough or cart, in a manner which shows, that although horses may be in some cases *convenient*, and in most cases *pleasurable to the driver*, they are by no means *necessary* to husbandry. A convenience used in this country is a moveable *harness-house* with a sledge bottom, which is drawn from place to place as occasion may require. Thus no labour is lost either by the oxen or their drivers.

566 Moveable harness-houses.

In Yorkshire oxen are still used, though in much fewer numbers than formerly; but our author does not imagine this to be any decisive argument against their utility. The Yorkshire plough was formerly of such an unwieldy construction, that four or six oxen, in yokes, led by two horses, were absolutely requisite to draw it; but the improvements in the construction of the plough have of late been so great, that two horses are found to be sufficient for the purpose; so that as Yorkshire has all along been famous for its breed of horses, we are not to wonder at the present disuse of oxen. Even in carriages they are now much disused; but Mr Marshall assigns as a reason for this, that the roads were formerly deep in winter, and soft to the hoof in summer; but now they are universally a causeway of hard limestones, which hurt the feet of oxen even when shod. Thus it even appears matter of surprise to our author that so many oxen are employed in this county; and the employment of them at all is to him a convincing argument of their utility as beasts of draught. The timber carriers still continue to use them, even though their employment be solely upon the road. They find them not only able to stand working every day, provided their feet do not fail them,

567 Why the use of oxen is declining in Yorkshire.

but

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but to bear long hours better than horſes going in the ſame paſture. An ox in a good paſture ſoon fills his belly, and lies down to reſt; but a horſe can ſcarce ſatisfy his hunger in a ſhort ſummer's night. Oxen are alſo conſidered as much ſuperior at a difficult pull to horſes; but this he is willing to ſuppoſe ariſes from their uſing half-bred hunters in Yorkſhire, and not the true breed of cart horſes. "But what (ſays he) are thorough-bred cart horſes? Why, a ſpecies of ſtrong, heavy, ſluggiſh animals, adapted ſolely to the purpoſe of draught; and according to the preſent law of the country, cannot, without an annual expence, which nobody beſtows upon them, be uſed for any other purpoſe. This ſpecies of beaſts of draught coſt at four years old from 20l. to 30l. They will, with extravagant keep, extraordinary care and attendance, and much good luck, continue to labour eight or ten years; and may then generally be ſold for five ſhillings a-head. If we had no other ſpecies of animals adapted to the purpoſes of draught in the iſland, cart horſes would be very valuable, they being much ſuperior to the breed of ſaddle horſes for the purpoſe of draught. But it appears evident, that were only a ſmall ſhare of the attention paid to the breeding of draught oxen which is now beſtowed on the breeding of cart horſes, animals equally powerful, more active, leſs coſtly, equally adapted to the purpoſes of huſbandry if harneſſed with equal judgement, leſs expenſive in keep and attendance, much more durable, and infinitely more valuable after they have finiſhed their labours, might be produced. A ſteer, like a colt, ought to be familiarized to harneſs at two or three years old, but ſhould never be ſubjected to hard labour until he be five years old; from which age until he be 15 or perhaps 20, he may be conſidered as in his prime as a beaſt of draught. An ox which I worked ſeveral years in Surrey, might at 17 or 18 years of age have challenged for ſtrength, agility, and ſagacity, the beſt bred cart horſe in the kingdom.

568 Superiority of oxen to horſes.

569 Horſe are everywhere prevailing over oxen.

Notwithſtanding all that has been ſaid, however, and written about the ſuperiority of oxen to horſes, the latter are ſtill coming into more general uſe, eſpecially in proportion as the breed of horſes improves; and we may add, in proportion as the ſtate of cultivation in any part of the country improves. The reaſon is obvious. The horſe is a more active animal than the ox, and can be turned with greater readineſs from one kind of work to another. His hoof is leſs readily injured by the hardneſs of good roads; and for the uſe of the plough upon a well ordered farm, there is no compariſon between the two kinds of animals. Where land is once brought into a proper ſtate of tillage, it is eaſily turned over; and the value of the animal employed in doing ſo conſiſts not ſo much in the poſſeſſion of great ſtrength as in the activity which he exerts in going over a great extent of ground in a ſhort time. In this laſt reſpect, a good breed of horſes ſo far ſurpaſſes every kind of oxen yet known in this country, that we ſuſpect much the horſe will ſtill continue to be preferred by enterpriſing huſbandmen.

With regard to the loſs which the public is ſuppoſed to ſuſtain by preferring horſes to oxen, that point has of late been rendered, to ſay no more, extremely doubtful. In the Agricultural Survey of the county of Northumberland, we have the following comparative ſtatement between horſes and oxen, for the purpoſe of the draught:—"By way of preliminary, it will be neceſſary to admit as data, that a horſe which eats 70 buſhels of oats per year, will not conſume of other food ſo much as an ox that gets no corn; but in the following eſtimate we ſhall allow horſes to eat as much as oxen, as the difference is not yet ſufficiently aſcertained.

570 Calculations in favour of the uſe of horſes.

"That the oxen are yoked at three years old, and are worked till ſix, and for the firſt year require eight to do the work of two horſes; but after having been worked a year, and become tractable and ſtronger, ſix are equal to two horſes, either by being yoked three at a time, or two, and driven by the holder with cords; of courſe, the expence of a driver may be eſtimated to be ſaved for one half the year.

"That the expences of a ploughman, the plough, and other articles that are the ſame in both teams, need not be taken into the account.

"And that oxen to work regularly through the year, cannot work more than half a day at a time."

Expences of an Ox per annum.

Summering.—Graſs 2 acres at 20s. per acre				L.	2	0 0
Wintering.—On ſtraw and turnips	L.	2	0 0			
But if on hay		4	0 0			
The average is					3	0 0
				L.	5	0 0
Intereſt at 5 per cent. for price of the ox					0	10 0
Harneſs, ſhoeing, &c.					0	15 0
					6	5 0
Deduct for the increaſed value of an ox for 1 year					1	0 0
Gives the expence per annum of an ox for the team					5	5 0
And the expence of ſix oxen				L.	31	10 0
To which muſt be added the expence of a driver for half a year					3	10 0
Total expence of a team of 6 oxen				L.	35	0 0

An Eight-Ox team.

The expence of an ox per annum being	L.	5	5 0 8
That of eight will be		42	0 0
To which add the expence of a driver		8	0 0
Gives the expence per annum of an eight-ox team	L.	50	0 0
Therefore the expence of a team of oxen for the firſt year will be -	L.	50	0 0
Ditto the ſecond year - -		35	0 0
Ditto the third year - -		35	0 0
Divided by		3)120	0 0

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Brought over,			
Divided by - - -	3)120	0	0
Gives the average expence per annum of an ox team from 3 to 6 years old	L.40	0	0

Expence of a Horſe per annum.

Summering.—Graſs 2 acres at 20s. per acre - - -	L 2	0	0
Wintering.—Straw 13 weeks at 9d. per week - -	0	10	0
Hay 16 ditto 1½ tons at 2l.	3	0	0
Corn (for a year) 70 buſhels of oats at 2l.	7	0	0
Shoeing and harneſs - -	1	0	0
Annuity to pay off 25l. in 16 years, the purchaſe value of the horſe at four years old - - -	2	5	0
Expence of a horſe per annum	L.15	15	0
Expence of a two-horſe team	L.31	10	0

" If a three-horſe team be uſed, the account will ſtand thus:

The expence of a horſe per annum being	L.15	15	0
			3
That of three will be - - -	47	5	0
To which add the expence of a driver	8	0	0
Gives the expence of a three-horſe team	L.55	5	0

" If the compariſon be made with the horſe team of many of the midland counties, where they uſe *five horſes yoked one before another in one plough*, the account will ſtand thus:

The expence of one horſe per annum being - - - -	L.15	15	0
			5
That of five will be - - -	78	15	0
To which add the expence of a man to drive	18	0	0
The expence of a team of five horſes will be	L.96	15	0
ditto of 3 ditto	55	5	6
ditto of 2 ditto	31	10	0
ditto of 8 oxen	50	0	0
The average expence of an ox-team from three to ſix years old, that will do the ſame quantity of work as two horſes	40	0	0

" The concluſions to be drawn from the above ſtatement, are ſo obvious as to need little elucidation. But we cannot help remarking, how ſtrong the force of prejudice muſt be, to continue the uſe of five horſes, and heavy, clumſy, unwieldy *wheel ploughs*, where a ſingle *ſwing plough* and two horſes yoked double, and driven by the holder, would do the ſame quantity of work, equally well and at one half of the expence."

" But before any proper concluſion can be drawn, whether *ox teams* or *horſe* are the moſt eligible, it will be neceſſary to conſider, whether the quantity of land employed in ſupporting thoſe animals, be uſed in the moſt profitable mode to the community, as well as to the occupier. Different Kinds of Horſes.

" With the latter, the firſt queſtion for conſideration is, whether eight oxen uſed in the team or in grazing will pay him the moſt money?

" Suppoſe eight oxen, at *three years old*, were put to the plough, and plough ſix acres per week, which, at 3s. 4d. per acre, is 20s.; and if they work forty-eight weeks in a year, their whole earnings (after deducting 6l. for expences of harneſs, ſhoeing, &c.) will be 42l.; but if they plough only *five acres per week* (which is probably nearer the truth), then their whole earnings will be only 34l.

" The ſame oxen put to graze at the ſame money ſhould improve in value 5l. 5s. each in the firſt caſe, and 4l. 5s. in the latter; but we are inclined to believe there are few ſituations, if the cattle are of a good quick-feeding kind, where they would not pay conſiderably more.

" In reſpect to the community, the account will be nearly as follows:

" From the above ſtatements, we find that an ox for ſummering and wintering requires	3½ acres
Therefore a ſix-ox team will require	21 ditto
And two horſes for graſs and hay per annum require - - -	7 ditto
For corn and ſtraw - - - -	4 ditto
Land neceſſary for keeping two horſes per annum - - -	11 ditto
The difference in the quantity of land required for a team of oxen more than horſes	10 ditto.

" Hence it appears, that a team of ſix oxen requires ten acres more land to maintain them, than a team of two horſes, which will do the ſame work; and of courſe the produce which might be derived from theſe ten acres is loſt to the community. Suppoſe it be one half in graſs, the other half in tillage, then we ſhall have

" 5 Acres of clover or graſs,
1⅔ Ditto of oats,
1⅔ Ditto of turnips or fallow,
1⅔ Ditto of wheat.

" It would then ſend to market yearly, at the loweſt computation,

7½ cwt. of beef,
8 quarters of oats,
And 5 ditto of wheat.

" From this view of the ſubject, it appears that if oxen were univerſally uſed for the draught, in the room of horſes, there would be a conſiderable defalcation, in the ſupply of the markets, both in corn and animal food. And the loſs to the farmer would be the profit derived from the produce; which, by the uſual mode of allowing one-third for the farmer's profit, would in this caſe be about 10l."

Sect. II. *Of the different kinds of Horſes, and the Method of Breeding, Rearing, and Feeding them.*

572 Account of the black cart-horſe.

The midland counties of England have for ſome time been celebrated on account of their breed of the *black cart-horſe*; though Mr Marſhall is of opinion that this kind are unprofitable as beaſts of draught in huſbandry.

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bandry. The preſent improvement in the breed took its riſe from ſix Zealand mares ſent over by the late Lord Cheſterfield during his embaſſy at the Hague. Theſe mares being lodged at his lordſhip's ſeat at Bretby in Derbyſhire, the breed of horſes thus became improved in that county, and for ſome time it took the lead for the ſpecies of theſe animals. As the improved breed paſſed into Leiceſterſhire, however, through ſome unknown circumſtances, it became ſtill more improved, and Leiceſter has for ſome time taken the lead. It is now found, however, that the very large horſes formerly bred in this diſtrict are much leſs uſeful than ſuch as are of a ſmaller ſize. Mr Marſhall deſcribes in magnificent terms one of theſe large horſes, a ſtallion belonging to Mr Bakewell named K (q), which, he ſays, was the handſomeſt horſe he ever ſaw. "He was (ſays he) the fancied *war-horſe* of the German painters; who, in the luxuriance of imagination, never perhaps excelled the natural grandeur of this horſe. A man of moderate ſize ſeemed to ſhrink behind his fore end, which roſe ſo perfectly upright, his ears ſtood (as Mr Bakewell ſays every horſe's ears ought to ſtand) perpendicularly over his fore feet. It may be ſaid, with little latitude, that in grandeur and ſymmetry of form, viewed as a picturable object, he exceeded as far the horſe which this ſuperior breeder had the honour of ſhowing to his Majeſty, and which was afterwards ſhown publicly at London, as that horſe does the meaneſt of the breed." A more *uſeful* horſe, bred alſo by Mr Bakewell, however, is deſcribed as having a "thick carcaſe, his back ſhort and ſtraight, and his legs ſhort and clean; as ſtrong as an ox, yet active as a poney; equally ſuitable for a cart or a lighter carriage."

572 Horſes belonging to Mr Bakewell deſcribed.

The ſtallions in this county are bred either by farmers or by perſons whoſe buſineſs it is to *breed* them, and who therefore have the name of *breeders*. Theſe laſt either cover with themſelves, or let them out to others for the ſeaſon, or ſell them altogether to ſtallion-men who travel about with them to different places.—The prices given for them are from 50 to 200 guineas by purchaſe; from 40 to 80 or a hundred by the ſeaſon; or from half a guinea to two guineas by the mare. The mares are moſtly kept by the farmers, and are worked until near the times of foaling, and moderately afterwards while they ſuckle: the beſt time for foaling is ſuppoſed to be the month of March or April; and the time of weaning that of November.—"The price of foals (ſays Mr Marſhall), for the laſt ten years, has been from five to ten pounds or guineas; for yearlings, 10 to 15 or 20; for two-year-olds, 15 to 25 or 30; for ſix year-olds, from 25 to 40 guineas."—Our author acknowledges that this breed of horſes, conſidered abſtractedly in the light in which they appear here, are evidently a profitable ſpecies of live ſtock, and as far as there is a market for ſix-years-old horſes of this breed, it is profitable to agriculture. "But (ſays he) viewing the buſineſs of agriculture in general, not one occupier in ten can partake of the profit; and being kept in agriculture after they have reached that profitable age, they become indiſputably one of its heavieſt burdens. For beſides a ceſſation of improvement of four or five guineas a-year, a decline in value of as much yearly takes place. Even the brood-mares, after they have paſſed that age, may, unleſs they be of a very ſuperior quality, be deemed unprofitable to the farmer."

573 Prices of ſtallions.

574 Mr Marſhall's obſervations on breeding horſes.

Different Kinds of Horſes.

Our author complains that the ancient breed of Norfolk horſes is almoſt entirely worn out. They were ſmall, brown-muzzled, and light boned; but they could endure very heavy work with little food; two of them were found quite equal to the plough in the ſoil of that county, which is not deep. The preſent breed is produced by a croſs with the large one of Lincolnſhire and Leiceſterſhire already mentioned. He approves of the Suffolk breed, which (he ſays) are a "half-horſe half-hog race of animals, but better adapted to the Norfolk huſbandry than the Leiceſterſhire breed: their principal fault, in his opinion, is a flatneſs of the rib.—In the Vale of Glouceſter moſt farmers rear their own plough-horſes, breeding of horſes not being practiſed. They are of a very uſeful kind, the colour moſtly black, inclinable to tan colour, ſhort and thick in the barrel, and low on their legs. The price of a ſix-year old horſe from 25l. to 35l. Some cart-horſes are bred in Cotſwold hills; the mares are worked till the time of foaling, but not while they ſuckle; and the foals are weaned early, while there is plenty of graſs upon the ground.

575 Norfolk breed deſcribed.

576 Suffolk and Glouceſter breeds.

Yorkſhire, which has been long celebrated for its breed of horſes, ſtill ſtands foremoſt in that reſpect among the Engliſh counties. It is principally remarkable for the breed of ſaddle-horſes, which cannot be reared in Norfolk, though many attempts have been made for that purpoſe. Yorkſhire ſtallions are frequently ſent into Norfolk; but though the foals may be handſome when young, they loſe their beauty when old. In Yorkſhire, on the other hand, though the foal be ever ſo unpromiſing, it acquires beauty, ſtrength, and activity as it grows up. Mr Marſhall ſuppoſes that from five to ten thouſand horſes are annually bred up between the eaſtern Morelands and the Humber.

577 Yorkſhire horſes.

"Thirty years ago (ſays Mr Marſhall), ſtrong ſaddle-horſes, fit for the road only, were bred in the Vale; but now the prevailing breed is the faſhionable coach-horſe, or a tall, ſtrong, and over-ſized hunter; and the ſhows of ſtallions in 1787 were flat and ſpiritleſs in compariſon with thoſe of 1783." The black cart-horſe, an object of Mr Marſhall's peculiar averſion, is alſo coming into the Vale.

In the breeding of horſes he complains greatly of the negligence of the Yorkſhire people, the mares being almoſt totally neglected; though in the brute creation almoſt every thing depends upon the female.

578 Lanarkſh breed of horſes.

Of late years a very valuable breed of horſes has been reared in the upper part of Clydeſdale or Lanarkſhire. They are of a middle ſize, well ſhaped, and extremely active. They are not fit for a very heavy draught, but the very quick ſtep which they poſſeſs gives them a decided preference for the uſe of the plough upon well cultivated lands, as they are capable of going over an immenſe quantity of ground in a ſhort time.

(q) Mr Bakewell diſtinguiſhes all his horſes, bulls, and rams, by the letters of the alphabet.

Different Kinds of Horses.

time where the draught is not severe. The same qualities render them highly useful for the ordinary purposes of farm-work. They are rapidly spreading over all parts of the country, and have found their way into the north of England where they are greatly valued. In the same part of the country, a larger breed has also of late been encouraged, which adds very considerable strength or power to the activity of the former kind. They are in great request about Glasgow and other manufacturing towns. Their usual draught is a load of about 24 cwt. in addition to the cart on which the load is placed.

With regard to the general maintenance of horses, we have already mentioned several kinds of food upon which experiments have been made with a view to determine the most profitable mode of keeping them. Perhaps, however, the most certain method of ascertaining this matter is by observing the practice of those counties where horses are most in use. Mr Marshall recommends the Norfolk management of horses as the cheapest method of feeding them practised anywhere; which, however, he seems willing to ascribe in a great measure to the excellency of their breed. In the winter months, when little work is to be done, their only rack-meat is barley-straw; a reserve of clover-hay being usually made against the hurry of seed-time. A bushel of corn in the most busy season is computed to be an ample allowance for each horse, and in more leisure times a much less quantity suffices. Oats, and sometimes barley, when the latter is cheap and unsaleable are given; but in this case the barley is generally malted, i. e. steeped and afterwards spread abroad for a few days, until it begin to vegetate, at which time it is given to the horses, when it is supposed to be less heating than in its natural state. Chaff is universally mixed with horse-corn: the great quantities of corn grown in this county afford in general a sufficiency of *natural* chaff; so that *cut chaff* is not much in use: the chaff, or rather the awns of barley, which in some places are thrown as useless to the dunghill, are here in good esteem as provender. Oat-chaff is deservedly considered as being of much inferior quality.---It may here be remarked, that this method of keeping horses which Mr Marshall approves of in the Norfolk farmers, is practised, and probably has been so from time immemorial, in many places of the north of Scotland; and is found abundantly sufficient to enable them to go through the labour required. In summer they are in Norfolk kept out all night, generally in clover leys, and in summer their keep is generally clover only, a few tares excepted.

579 Norfolk management of horses recommended.

580 This method followed in many places in Scotland.

In the fourth volume of the Annals of Agriculture, Mr Young gives an account of the expence of keeping horses; which, notwithstanding the vast numbers kept in the island, seems still to be very indeterminate, as the informations he received varied no less than from 8l. to 25l. a-year. From accounts kept on his own farm of the expence of horses kept for no other purpose than that of agriculture, he stated them as follows:

	L.	s.	d.
1763 Six horses cost per horse	10	13	0
1764 Seven do.	8	10	11
1765 Eight do.	14	6	6
1766 Six do.	12	18	9

Average on the whole 11l. 12s. 3d.

581 Calculations of the expence of keeping horses.

By accounts received from *Northumins* in Herefordshire, the expences stood as follows:

	L.	s.	d.
1768 Expence per horse	20	7	0
1769	15	8	5
1770	14	14	2
1771	15	13	3
1772	18	4	0
1773	15	11	8
1774	14	4	5
1775	19	0	5
1776	10	14	5

Average 16l. 13s. 1d.

Different Kinds of Horses.

On these discordant accounts Mr Young observes, undoubtedly with justice, that many of the extra expences depend on the extravagance of the servants; while some of the apparent savings depend either on their carelessness, or *stealing* provender to their beasts privately, which will frequently be done. He concludes, however, as follows: "The more exactly the expence of horses is examined into, the more advantageous will the use of oxen be found. Every day's experience convinces me more and more of this. If horses kept for use alone, and not for show, have proved thus expensive to me, what must be the expence to those farmers who make their fat fleck teams an object of vanity? It is easier conceived than calculated.

582 Use of roots for feeding horses.

It must be observed, however, that the above trials or accounts are of an old date; and that during the late dearth a variety of experiments were made, which shew that horses may be successfully fed, even when engaged in hard labour, with other articles than grain. With this view, different roots have been given them as substitutes; and a great saving has been experienced, attended with no loss of labour or disadvantage to the animal: so that the continuance and extension of this system is a matter of much importance to the public. The articles that have been chiefly employed are turnips, roota baga, potatoes, carrots, &c.—Turnips have been given in a raw state, withholding about one half of the usual allowance of corn, and in most instances the animals have done their work well, and appeared in good condition. When the roota baga has been used, little or no grain has been necessary, and the other roots already mentioned have been successfully used even in a raw state; but when potatoes, yams, roota baga, &c. are boiled, which has sometimes been done, it does not appear that grain is at all necessary. It is to be observed, that young horses eat these roots readily and with great relish; and that during the winter, with them and a small portion of dry food, they are kept in as good condition and spirit as when fed upon grass during the summer. This is a matter of much importance to young animals, as it must contribute greatly to their growth and future strength. Whereas, in a great majority of cases, when reared without the aid of these roots, they are fed in winter, when substantial food is most necessary to support them against the severity of the weather, in such a manner as to be barely kept alive. During the winter months their growth is thus stopt; they lose the little flesh they had acquired during the preceding summer, become stinted and hide-bound, and, when the spring arrives, they are in so miserable a state, that a considerable part even of the summer elapses before they

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can resume their growth. In this way, four or five years are required to bring them to the size that others of the same species attain in half that time under different management.

Sect. III. *Of the Breeding and Rearing of Black Cattle.*

583 A hornless breed of black cattle desirable for work.

These are reared for two different purposes, viz. work, and fattening for slaughter. For the former purpose, Mr Marshall remarks, that it is obviously necessary to procure a breed without horns. This he thinks would be no disadvantage, as *horn*, though formerly an article of some request, is now of very little value. The horns are quite useless to cattle in their domestic state, though nature has bestowed them upon them as weapons of defence in their wild state; and our author is of opinion that it would be quite practicable to produce a hornless breed of black cattle as well as of sheep, which last has been done by attention and perseverance; and there are now many hornless breeds of these creatures in Britain. Nay, he insists, that there are already three or four breeds of hornless cattle in the island; or that there are many kinds of which numbers of individuals are hornless, and from these, by proper care and attention, a breed might be formed. The first step is to select females; and having observed their imperfections, to endeavour to correct them by a well chosen male.

584 Properties requisite in black cattle.

The other properties of a perfect breed of black cattle for the purposes of the dairy as well as others, ought, according to Mr Marshall, to be as follow: 1. The head small and clean, to lessen the quantity of offal. 2. The neck thin and clean, to lighten the fore-end, as well as to lessen the collar, and make it sit close and easy to the animal in work. 3. The carcase large, the chest deep, and the bosom broad, with the ribs standing out full from the spine; to give strength of frame and constitution, and to admit of the intestines being lodged within the ribs. 4. The shoulders should be light of bone, and rounded off at the lower point, that the collar may be easy, but broad to give strength, and well covered with flesh for the greater ease of draught, as well as to furnish a desired point in fatting cattle. 5. The back ought to be wide and level throughout; the quarters long; the thighs thin; and standing narrow at the round bone; the udder large when full, but thin and loose when empty, to hold the greater quantity of milk; with large dug-veins to fill it, and long elastic teats for drawing it off with greater ease. 6. The legs (below the knee and hock) straight, and of a middle length; their bone, in general, light and clean from fleshiness, but with the joints and sinews of a moderate size, for the purposes of strength and activity. 7. The flesh ought to be mellow in the state of fleshiness, and firm in the state of fatness. 8. The hide mellow, and of a middle thickness, though in our author's opinion this is a point not yet well determined.

585 Of rearing calves without milk.

As the milk of cows is always an article of great importance, it becomes an object to the husbandman, if possible, to prevent the waste of that useful fluid, which in the common way of rearing calves is unavoidable. A method of bringing up these young animals at less expence was at one time proposed by the Duke of Northumberland. His plan was to make skimmed milk answer the purpose of that which is newly drawn from the teat; and which, he supposed, might answer the purpose at one-third of the expence of new milk. The articles to be added to the skimmed milk are treacle and the common linseed oil-cake ground very fine, and almost to an impalpable powder, the quantities of each being so small, that to make 32 gallons would only cost 6d. besides the skimmed milk. It mixes very readily and almost intimately with the milk, making it more rich and mucilaginous, without giving it any disagreeable taste. The receipt for making it is as follows: Take one gallon of skimmed milk, and to about a pint of it add half an ounce of treacle, stirring it until it is well mixed; then take one ounce of linseed oil-cake finely pulverized, and with the hand let it fall gradually in very small quantities into the milk, stirring it in the mean time with a spoon or ladle until it be thoroughly incorporated; then let the mixture be put into the other part of the milk, and the whole be made nearly as warm as new milk when it is first taken from the cow, and in that state it is fit for use. The quantity of the oil-cake powder may be increased from time to time as occasion requires, and as the calf becomes inured to its flavour. On this subject Mr Young remarks, that in rearing calves, there are two objects of great importance. 1. To bring them up without any milk at all; and, 2. To make skimmed milk answer the purpose of such as is newly milked or sucked from the cow. In consequence of premiums offered by the London Society, many attempts have been made to accomplish these desirable purposes; and Mr Budel of Wanborough in Surrey was rewarded for an account of his method. This was no other than to give the creatures a gruel made of ground barley and oats. Mr Young, however, who tried this method with two calves, assures us that both of them died, though he afterwards put them upon milk when they were found not to thrive. When in Ireland he had an opportunity of purchasing calves at three days old from 20d. to 3s. each; by which he was induced to repeat the experiment many times over. This he did in different ways, having collected various receipts. In consequence of these he tried hay-tea, bean-meal mixed with wheat-flour, barley and oats ground nearly, but not exactly, in Mr Budd's method; but the principal one was flax-seed boiled into a jelly, and mixed with warm water; this being recommended more than all the rest. The result of all these trials was, that out of 30 calves only three or four were reared; these few were brought up with barley and oat-meal, and a very small quantity of flax-seed jelly; one only excepted, which at the desire of his coachman was brought up on a mixture of two-thirds of skimmed milk and one-third of water, with a small addition of flax-jelly well dissolved.

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Annals of Agriculture. vol p. 296.

586 Mr Young's experiments.

The second object, viz. that of improving skimmed milk, according to the plan of the duke of Northumberland, seems to be the more practicable of the two. Mr Young informs us, that it has answered well with him for two seasons; and two farmers to whom he communicated it gave likewise a favourable report.

In the third volume of the same work, we are informed that the Cornwall farmers use the following method in rearing their calves. "They are taken from

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from the cow from the fourth to the ſixth day; after which they have raw milk from ſix to ten or fourteen days. After this, they feed them with ſcalded ſkimmed milk and gruel made of ſhelled oats, from three quarts to four being given in the morning, and the ſame in the evening. The common family broth is thought to be as good, or better, than the gruel, the ſavour of the ſalt being ſuppoſed to ſtrengthen their bowels. The proportion of gruel or broth is about one-third of the milk given them. A little fine hay is ſet before them, which they ſoon begin to eat.

587 Method of rearing calves in Cornwall.

588 Mr Crook's method.

In the 5th volume of Bath Papers, we have an account by Mr Crook of a remarkably ſucceſsful experiment on rearing calves without any milk at all. This gentleman, in 1787, weaned 17 calves; in 1788, 23; and in 1789, '15. In 1787, he bought three ſacks of linſeed, value 2l. 5s. which laſted the whole three years. One quart of it was put to ſix quarts of water; which, by boiling 10 minutes, was reduced to a jelly: the calves were fed with this mixed with a ſmall quantity of tea, made by ſteeping the beſt hay in boiling water. By the uſe of this food three times a-day, he ſays that his calves throve better than thoſe of his neighbours, which were reared with milk. Theſe unnatural kinds of food, however, are in many caſes apt to produce a looſeneſs, which in the end proves fatal to the calves. In Cornwall, they remedy this ſometimes by giving acorns as an aſtringent; ſometimes by a cordial uſed for the human ſpecies, of which opium is the baſis.

589 Norfolk method, &c.

In Norfolk, the calves are reared with milk and turnips; ſometimes with oats and bran mixed among the latter. Winter calves are allowed more milk than ſummer ones; but they are univerſally allowed new milk, or even to ſuck. In the midland counties bull-calves are allowed to remain at the teat until they be ſix, nine, or twelve months old, letting them run either with their dams or with cows of leſs value bought on purpoſe. Each cow is generally allowed one male or two female calves. Thus they grow very faſt, and become ſurpriſingly vigorous. The method of the dairy-men is to let the calves ſuck for a week or a fortnight, according to their ſtrength; next they have new milk in pails for a few meals; after that, new and ſkimmed milk mixed; then ſkimmed milk alone, or porridge made with milk, water, ground oats, &c. ſometimes with oil-cake, &c. until cheeſe-making commences; after which they have whey-porridge, or ſweet whey in the field, being carefully houſed in the night until the warm weather come in.

590 Bradfute's mode.

A late intelligent Scottiſh clergyman, Mr John Bradfute of Dunſyre, once or twice ſucceſsfully made trial of treacle, as a food by means of which to rear calves without the aid of any kind of milk. He uſed it diluted with common water, and ſometimes with what is called *hay-tea*, that is to ſay, water in which hay had been boiled. The whole expence of the treacle neceſſary to bring a calf the length of uſing common food was at that time (15 years ago) about 4s. 6d. The animals came forward well, and enjoyed good health; but they grew much to the bone, and did not fatten for a conſiderable time.

591 Cattle are reared

For feeding cattle, two modes of practice have been propoſed, and in ſome ſituations adopted; the one mode, which is the moſt ancient, and the moſt extenſively practiſed in agricultural counties, conſiſts of turning out the cattle during the whole ſeaſon that any food for them can be found on the ground, and of taking them into the houſe during the ſeverity of winter, and of feeding them with ſuch articles as can be moſt conveniently procured in the climate and ſituation, ſuch as, ſtraw or hay of different kinds, and roots.

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592 Or ſtall fed.

The other mode, which has been adopted to ſome extent by huſbandmen in Germany, and at times alſo in our own great towns, by perſons called *cow-feeders*, who ſupply the inhabitants with milk, is called the ſyſtem of ſtall-feeding. It conſiſts of keeping the cattle continually in the houſe at every ſeaſon of the year, and of feeding them there. By many German writers upon rural economy this ſyſtem is highly approved of, as affording the means of drawing the higheſt poſſible produce from every portion of the land, and as employing a great number of hands in the uſeful occupations of huſbandry. In a communication to the Board of Agriculture from A. Thaer, M. D. phyſician of the electoral court of Hanover, the advantages of this ſyſtem are ſaid to be founded upon the following incontrovertible principles:

593 Stall-feeding in Germany.

"1. A ſpot of ground which, when paſtured upon, will yield ſufficient food for only one head, will abundantly maintain four head of cattle in the ſtable, if the vegetables be mowed at a proper time, and given to the cattle in a proper order.

"2. The ſtall-feeding yields at leaſt double the quantity of manure from the ſame number of cattle; for the beſt and moſt efficacious ſummer manure is produced in the ſtable, and carried to the fields at the moſt proper period of its fermentation, whereas, when ſpread on the meadow, and exhauſted by the air and ſun, its power is entirely waſted.

"3. The cattle uſed to ſtall-feeding will yield a much greater quantity of milk, and increaſe faſter in weight when fattening than when they go to the field.

"4. They are leſs ſubject to accidents, do not ſuffer by the heat, by flies, and inſects, are not affected by the baneful fogs which are frequent in Germany, and bring on inflammations: on the contrary, if every thing be properly managed, they remain in a conſtant ſtate of health and vigour."

It is added that a ſufficient, or rather plentiful ſupply of food for one feed of cattle daily, if kept in a ſtable, conſiſts upon an average of 130 pounds of green, or 30 pounds of dry clover, which anſwers the ſame purpoſe. Hence one head of cattle requires in 365 days, about 10,950 pounds of dry clover, or about 100 cwts. of 110 pounds each, the portion of food being according to this mode of feeding alike both in ſummer and winter. Each head of beſt fat cattle fed in the ſtable, if plenty of food be given, yields annually 16 full double cart loads of dung. The rotation of crops that is moſt frequently uſed in Germany upon farms occupied in ſtall-feeding, appears to be the following: "One year, manured for beans, peaſe, cabbages, potatoes, turnips, linſeed, &c.; 2. Rye; 3. Barley, mixed with clover; 4. Clover, to be mowed two or three times; 5. Clover, to be mowed once, then to be broken up, ploughed three or four times, and manured; 6. Wheat; 7. Oats."—In conſequence of the large quantity of ſtable dung pro-

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duced upon farms thus occupied, every acre of land receives every three years 10 double cart loads of that beſt of all kinds of manure.

It is undoubtedly to be wiſhed that a ſimilar mode of management could be profitably introduced into this country, from the tendency which it would have to augment the number of perſons occupied in rural affairs, from the importance which it would give to farms of a moderate extent, and from the benefit which muſt ariſe from making the moſt of every part of the ſoil. It has already been introduced into ſeveral places in England, and we have little doubt that the practice will gradually extend itſelf, in conſequence of the increaſing demand for butchers meat, and for all the productions of the dairy.

594 Two modes of ſtall-feeding.

Of ſtall-feeding, however, whether with a view to the maintenance or to the fattening of cattle, it muſt be obſerved, that there are two modes of proceeding. Of late years, it has been found advantageous to cultivate to a great extent turnips, potatoes, and other roots, and theſe now conſtitute a large portion of the winter food of cattle. Theſe roots are either given to the cattle in their natural raw ſtate, or they are given after being boiled. Of theſe two modes of feeding, that of giving them to the cattle raw has hitherto been the moſt common, but it is extremely improper, as being a thriftleſs plan of proceeding. The ſame quantity of theſe roots, if given in a raw ſtate, that will barely ſupport a horſe in idleneſs, will enable him, when boiled, to encounter the ſevereſt labour without injury to his health or ſpirit. There are many animals alſo, ſuch as hogs, which cannot be fattened by roots unleſs they undergo this proceſs. Theſe animals can be reared to the full ſize upon raw potatoes, yams, carrots, roota baga, &c. and may be kept in good health for any length of time without the aid of any other food. Under that management, however, they very ſeldom if ever fatten; but when the roots are boiled, they immediately begin to feed, and ſoon become fat upon a ſmaller allowance than what was neceſſary to keep them barely alive when given in a raw ſtate.

The ſame holds true in a great degree with regard to all cattle. With a view, therefore, to make the moſt of the various farculent roots which are now cultivated, and which will perhaps one day be accounted the moſt valuable productions of our ſoil, it is abſolutely neceſſary that they ſhould be given to cattle boiled.

595 Roots given to cattle ſhould be boiled

Many huſbandmen have long been ſenſible of this, but it has appeared a very formidable operation to boil the greateſt part of the food of perhaps 20 horſes, and 100 head of black cattle. There is nothing more true, however, than that this labour when undertaken upon ſkilful principles, may be rendered not only eaſy, but ſo trifling, that it may be performed by a ſingle old man, or by a woman. To accompliſh this object, however, it is neceſſary, that the roots be boiled not over the fire in a chaldron of metal, but at a diſtance from it in a large wooden vat or tub by the ſteam of boiling water.

596 Cheap mode of boiling roots by ſteam.

There are two ways of boiling roots by ſteam. They may either be boiled in ſuch a way as to retain their original figure, or they may be converted into ſoup; both modes are performed with equal caſe. All that is neceſſary, is to erect a boiler in any outhouſe: The boiler, which may be of caſt iron, ought to have a cloſe cover or lid, having a ſmall hole for filling it with water, which can be eaſily cloſed up, and another hole in the centre of about one-fourth of the diameter of the cover. To this laſt hole ought to be ſoldered a tube of tin-plate, commonly called *white iron*, by which the ſteam may aſcend. This tube ought to riſe perpendicularly to the height of ſix feet, narrowing gradually to about two inches diameter. It may then bend off at right angles, to the moſt convenient ſituation for the tub or vat in which the roots are to be boiled. When it comes perpendicularly over the centre of the vat, it muſt be made to deſcend to within two or three inches of the bottom of it, being properly ſupported and fixed all the way.

To boil roots with this apparatus, it is only neceſſary to tumble them into the tub or vat into which the end of the white-iron tube deſcends. The tub ought then to be covered negligently. The water in the boiler being heated to ebullition, its ſteam or vapour riſes and paſſes along the white iron tube, and at laſt deſcends to the bottom of the wooden veſſel containing the roots, and in a very trifling ſpace of time renders them completely ſoft. If it is wiſhed to convert theſe roots into ſoup, it is only neceſſary to throw among them a quantity of water, and to maſh them down with any large ladle or other inſtrument. The ſteam continuing to deſcend will ſpeedily boil the water, and agitate and mingle the whole ingredients of which the ſoup may be compoſed. In this way by various mixtures of roots, with little or no trouble, rich broths, which human beings would not diſlike, may be formed for feeding a multitude of cattle, and the ſoup may eaſily be drawn off from the bottom of the vat by means of a hole to be occaſionally opened or ſhut with a round piece of wood.

In performing the above operation, however, of forming broth or ſoup, before allowing the water in the veſſel over the fire to give over boiling, the hole ought to be opened by which it is uſually filled with water, as the liquor in the vat might otherwiſe, in conſequence of the preſſure of the atmoſphere, aſcend through the white-iron tube and come over into the boiler. To ſtrengthen the white-iron tube, it may be proper alſo to cover it all over with paper paſted to it with glue, or with a mixture of peaſe-meal and water.

597 Rules for fattening cattle.

To fatten cattle with ſucceſs, then, we apprehend that the following rules ought to be adhered to. As a man is kept thin and meagre by whatever agitates his mind, or renders him anxious, fretful, and uncomfortable, ſo we ought to conſider that cattle, though they want foreſight of the future, have nevertheleſs minds capable of being irritated and diſturbed, which muſt ſo far waſte their bodies. In attempting to fatten them, therefore, care ought to be taken to preſerve the tranquillity of their minds, and as much as poſſible to keep them in a ſtate of cleanneſs and of moderate warmth. The food they receive ought to be varied at times to increaſe their appetite; but above all things it ought to be made as far as poſſible of eaſy digeſtion, that they may receive it in larger portions, and that a greater quantity of it may incorporate with their conſtitution, and not be thrown off by dung, as happens when they receive coarſe nouriſhment. It is in vain to object to this artificial mode of proceeding, that the natural food of animals is graſs alone, and that their

natural

Rearing and Fattening Hogs.

natural dwelling is the open air. The ſame might be ſaid with regard to the human ſpecies. In his natural, that is, in his unimproved ſtate, a ſavage may be under the neceſſity of eating raw fleſh or herbs, or of climbing into a tree for ſhelter; but although it may be poſſible for him to ſubſiſt in this way, yet we know that this is by no means the beſt mode of his exiſtence, and that his life and health are better preſerved by the ſhelter of a ſettled dwelling, and by more delicate food prepared by induſtry. In the ſame manner it is no doubt true, that cattle can exiſt upon very coarſe food, and may be even fattened by means of it; but as a greater quantity of it becomes neceſſary, the huſbandman's profit in rearing them is ſo far diminiſhed, and the value of his lands to the community is leſſened.

Sect. IV. *Of the Rearing and Fattening of Hogs.*

The practice of keeping theſe animals is ſo general, eſpecially in England, that one ſhould think the profit attending it would be abſolutely indiſputable: and this the more eſpecially, when it is conſidered how little nicety they have in their choice of food. From ſuch experiments, however, as have been made, the matter appears to be at leaſt very doubtful, unleſs in particular circumſtances. In the firſt volume of Annals of Agriculture, we have an experiment by Mr Mure of feeding hogs with the cluſter potato and carrots; by which it appeared, that the profit on large hogs was much greater than on ſmall ones: the latter eating almoſt as much as the former, without yielding a proportionable increaſe of fleſh. The gain was counted by weighing the large and ſmall ones alive; and it was found, that from November 17th to January 5th, they had gained in the following proportion:

598 Mr Mure's experiments.

22 large hogs, - -	L. 1	3	6
20 ſmall, - -	0	7	8
2 ſtag hogs, - -	1	17	8

On being finiſhed with peaſe, however, it appeared, that there was not any real profit at laſt; for the accounts ſtood ultimately as follow:

Dr				Cr			
Value of hogs at putting up,	L. 44	2	0	42 hogs ſold fat at	L. 95	0	0
33 coomb peaſe, at 14s.	23	2	0				
2 ditto, 2 buſhels barley, at 14s.	1	15	0				
56 days attendance of one man, at 14d.	3	5	4				
950 buſhels of carrots, and 598 of potatoes, at 3½d. per buſhel, -	22	15	8				
	L. 95	0	0		L. 9	0	0

In ſome experiments by Mr Young, related in the ſame volume, he ſucceeded ſtill worſe, not being able to clear his expences. His firſt experiment was attended with a loſs of one guinea per hog; the ſecond with a loſs of 12s. 8d.; the third, of only 3s. In theſe three the hogs were fed with peaſe; given whole in the two firſt, but ground into meal in the laſt. The fourth experiment, in which the hog was fed with Jeruſalem artichokes, was attended with no loſs; but another, in which peaſe were again tried, was attended with a loſs of 4s. Other experiments were tried with peaſe, which turning out likewiſe unfavourable, barley was tried ground along with peaſe and beans. This was attended with a ſmall profit, counting nothing for the trouble of feeding the animals. The expences on two hogs were 14l. 13s. 10½d, the value 15l. 11s. 3½d. ſo that there was a balance in his favour of 17s. 4½d. In another experiment in which the hogs were fed with peaſe and barley ground, the beans being omitted as uſeleſs, there was a profit of 12s. 3d. upon an expence of 22l. 15s. 9d; which our author ſuppoſes would pay the attendance. In this experiment the peaſe and barley meal were mixed into a liquor like cream, and allowed to remain in that ſtate for three weeks, till it became ſour. This was attended in two other inſtances with profit, and in a third with loſs: however, Mr Young is of opinion, that the practice will ſtill be found advantageous on account of the quantity of dung raiſed; and that the farmer can thus uſe his peaſe and barley at home without carrying them to market.

It is to be obſerved, that the above experiments were not made upon the fattening of hogs in the proper manner in which that animal ought to be fed. Its food ought undoubtedly to conſiſt chiefly of roots, ſuch as yams, potatoes, &c.; but theſe roots, as already mentioned, ought always to be boiled, or made into ſoups. With this mode of proceeding, the hog, from its rapid multiplication, and quick growth, is a very profitable kind of ſtock. It ought to be remembered, however, that of this, as well as of moſt other kinds of animals, a large breed is always to be preferred; for the difference is very trifling, or rather, in general, amounts to nothing at all, between the quantity of food neceſſary to ſupport a ſmall animal, and the quantity neceſſary to ſupport a large animal of the ſame kind.

599 Deſcription of a proper hogſty.

Hogſties are of ſimple conſtruction; they require only a warm dry place for the ſwine to lie in, with a ſmall area before, and troughs to hold their food. They are generally made with ſhed roofs, and ſeldom above 6 or 7 feet wide.

Although ſwine are generally conſidered as the filthieſt of all animals, yet there is no animal delights more in a clean comfortable place to lie down in, and none that cleanlineſs has a better effect upon with reſpect to their thriving and feeding. In order to keep them dry, a ſufficient ſlope muſt be given, not only to the inſide where they lie, but to the outſide area, with proper drains to carry off all moiſture. The inſide ſhould alſo be a little elevated, and have a ſtep up from the area at leaſt 5 or 6 inches. Hogſties ſhould have ſeveral diviſions to keep the different ſorts of ſwine ſeparate, nor ſhou'd a great many ever be allowed to go together; for it is thought they feed better in ſmall numbers, and of equal ſize, than when many are put together of different ſizes. Proper diviſions muſt therefore be made, ſome for ſwine when with the boar, others for brood ſwine, and for them to farrow in, for weaning the pigs, for feeding, &c.

Swine are apt to ſpill and waſte a great deal of their meat by getting their feet among it, unleſs proper precautions

Sheep.

cautions are taken to prevent them. This may be done by making a rail or covering of thin deal ſlope from the back part of the trough towards the fore part, leaving juſt room enough to admit their heads. There ſhould alſo be diviſions acroſs the troughs, according to the number of ſwine, to prevent the ſtrongeſt driving away the weakeſt. Theſe diviſions need not extend to the bottom of the troughs, but ſhould riſe a little higher than the top, and may be made of pieces of board about 8 or 10 inches broad.

Sties ought to be conſtructed that the ſwine may be eaſily fed without going in among them. In ſome places it is ſo contrived that they may be fed through openings in the back kitchen wall, without even going out of doors. This is very convenient where only a few ſwine are kept for family uſe, and makes it eaſy to give them the refuſe of vegetables and other things from the kitchen, which perhaps, would otherwiſe be thrown away. Where pigs are to be reared on an extenſive ſcale, there ought to be what is called in England a *pigs kitchen*, that is, a proper apparatus ought to be erected adjoining to the hogſty, for boiling their food. To avoid expence, ſteam ought always to be uſed for this purpoſe, in the way already deſcribed.

Sect. V. *Sheep.*

600 Experiments on feeding ſheep with roots.

The rearing of ſheep properly belongs to the article paſturage. So far, however, as they are fed upon the products of human induſtry, they belong to the preſent ſubject. In the Memoirs of the Royal Society of Agriculture in Paris for the year 1788, the reſult is given of certain experiments upon the advantage and economy of feeding ſheep in the houſe with roots. The experiments were made by M. Cretté de Palluel. He ſtates that the cuſtom of feeding ſheep in a houſe is common in ſeveral of the French provinces, but in others is unknown: That the mode of fattening them in that ſituation conſiſted of giving them clean corn and choice hay: That in ſubſtituting roots for corn, hay was continued to be given to them, either of clover, lucern, after-math, or any other ſort. The corn commonly uſed for fattening ſheep is barley and oats. Sometimes gray peaſe, or the marſhed bean, and rye. "Although the ſheep fed upon roots (ſays M. Cretté) did not acquire quite ſo great a degree of fatneſs as thoſe fed upon corn, it is however true, that they all fattened, and that if their food had been varied, they would have made great progreſs: I can even aſſert the fact of four, which were put upon change of food towards the end of the experiment, and ate much more.

Sheep.

"The ſheep put to potatoes ate little at firſt, for ſome days, which prevented them for thriving ſo much as the others; but they recovered the ſecond month what they loſt the firſt. As for thoſe put to turnips and beets, they fed heartily from the firſt moment, and continued it. They all drank much leſs than thoſe fed upon corn.

"Corn might with advantage be added to the roots: When the ſheep are intended to be ſold, two feeds of corn given them for a fortnight, in the intervals of their meals of roots, would harden both their fleſh and their tallow.

"It was not ſufficient to prove the poſſibility of fattening ſheep with different kinds of roots; it was farther neceſſary to aſcertain the qualities which their fleſh might acquire, by the uſe of them. Four ſheep, fed upon the four regimens, were killed the ſame day; there was indeed ſome trifling difference in the texture of their fleſh, but upon the whole the flavour of all was the ſame. Let us then conclude, that the culture of roots opens to us infinite reſources, not only for fattening of ſheep, but alſo of beaſts; and we do not doubt of their being uſed to the greateſt advantage in bringing up cattle in the countries where they are bred.

"The knowledge of theſe experiments muſt induce farmers to adopt this culture, ſince it is ſo advantageous. Roots cannot be exported; corn, on the contrary, is exported; and the grower may ſell the roots inſtead of conſuming them. One acre of roots is equal to five acres of corn. By this means he multiplies his land, and may conſequently multiply his cattle and his dunghill: added to this, roots are not ſubject, like corn, to the inclemencies of the ſeaſons; the produce is always more certain; theſe plants being of different natures, it is not likely that they ſhould all fail; the earth is a more faithful depoſitory of our treaſures than the atmoſphere; the dreadful hurricane of the 15th of this month (July) deſtroyed every thing but roots; they are the only product which eſcaped its ravages; if the hail tore their leaves, others will ſoon ſhoot; and carrots, beets, turnips, and potatoes, will be ſafe."

The reſult of the experiments alluded to is given in the following terms:

Experiment

Experiment upon Fatting Sheep, and their Increaſe from Month to Month.

Sixteen ſheep, of the ſame age, of four different breeds, were picked out of my flock, viz. four the breed of the country, four of Beauce, four of Champagne, and four of Picardy: I weighed them alive, and marked each with a number; I divided them into four lots, and fed them on four different ſorts of food, as under.

Food.	N°	Breeds.	Weights at different Periods—1788.					Increaſe each Month.				Total incr. which each food has produced upon four Sheep.
			Jan. 20.	Feb. 20.	Mar. 20.	April 20	May 20.	1ſt M	2d M.	3d M.	4th M	
Potatoes,	1	Iſle de France,	69¼lb.	79¾lb.	—	—	—	10lb.	lb.	lb.	lb.	70 lb.
	2	Beauce,	70¾	82½	90½lb.	93lb.	95lb.	11¾	7¾	2¾	2	
	3	Champagne,	69¼	83	82½	84	—	13¾	loſs½	1½	—	
	4	Picardy,	88	95	101	—	—	15	6	—	—	
								50½	13½	4¼	2	
Turnips,	5	Iſle de France,	69	86	87	—	—	17	1	—	—	67½
	6	Beauce,	71	86	—	—	—	15	—	—	—	
	7	Champagne,	68½	78½	82½	84	84¼	10	4	1½	¼	
	8	Picardy,	79	95½	97½	97½	—	16½	2	—	—	
								58½	7	1½	¼	
Beets,	9	Iſle de France,	72	83¾	90½	94	—	11¾	7¼	3½	—	71
	10	Beauce,	70¾	80¾	86	—	—	10	5¼	—	—	
	11	Champagne,	77¼	90½	—	—	—	13¾	—	—	—	
	12	Picardy,	80	93½	98½	100½	101	13½	5	1½	½	
								48	17¾	5	½	
Oats, barley, and gray peas.	13	Iſle de France,	74	91	95½	102	106	17	4½	6½	4	92½
	14	Beauce,	73½	84¾	91½	96	—	10¾	7¾	4½	—	
	15	Champagne,	71	86¼	93	—	—	15¾	6¼	—	—	
	16	Picardy,	71	87	—	—	—	16	—	—	—	
								59	18½	11	4	

"Observation. The increaſe of theſe ſheep, during the firſt month, being ſo much more conſiderable than in the following months, muſt be attributed to this cauſe, that lean cattle put up to fatten, eat greedily until they are cloyed, which only fills them, without much increaſing their fleſh; but, on the contrary, the increaſe produced in the enſuing months, although apparently leſs, turns all to profit in fleſh and tallow."

Sect. VI. *Rabbits.*

In particular ſituations theſe animals may be kept to advantage, as they multiply exceedingly, and require no trouble in bringing up. A conſiderable number of them are kept in Norfolk, where many parts, conſiſting of barren hills or heaths, are proper for their reception. They delight in the ſides of ſandy hills, which are generally unproductive when tilled; but level ground is improper for them. Mr Marſhall is of opinion, that there are few ſandy or other looſe-ſoiled hills which would not pay better in rabbit warrens than any thing elſe. "The hide of a bullock (ſays he) is not worth more than $\frac{1}{10}$th of his carcaſe; the ſkin of a ſheep may, in full wool, be worth from a ſixth to a tenth of its carcaſe; but the fur of a rabbit is worth twice the whole value of the carcaſe; therefore ſuppoſing a rabbit to conſume a quantity of food in proportion to its carcaſe, it is, on the principle offered, a ſpecies of ſtock nearly three times as valuable as either cattle or ſheep. Rabbit warrens ought to be incloſed with a ſtone or ſod wall; and at their firſt ſtocking, it will be neceſſary to form burrows to them until they have time to make them to themſelves. Boring the ground horizontally with a large auger is perhaps the beſt method that can be practiſed. Eagles, kites, and other birds of preys, as well as cats, weaſels, and pole-cats, are great enemies of rabbits. The Norfolk warreners catch the birds by traps placed on the tops of ſtumps of trees or artificial hillocks of a conical form, on which they naturally alight.—Traps alſo ſeem to be the only method of getting rid of the other enemies; though thus the rabbits themſelves are in danger of being caught.

601 Rabbits more valuable than black cattle or ſheep.

602 Method of deſtroying birds of prey.

Rabbits may be fed during the ſummer with clover and

Poultry. and other green food, and during the winter with cabbages. Where they are kept in an inclosure as part of the stock of the farm, a practice which has not yet been used in this country, they ought to be fed with great regularity, and with as much as they are willing to take. When this is done, they thrive upon a very moderate quantity of food; but if they are once allowed to suffer hunger in any great degree, they become extremely ravenous, and for a long time can scarcely be satisfied with food. In a communication to the Board of Agriculture from M. Bertrand of Mechlin, in the Netherlands, we are informed that the rabbits of the Angora breed yield in Normandy an uncommonly valuable wool, which serves as a primary material in several considerable manufactures. The Normans assert, that each rabbit yields wool of the value of a crown or six livres. M. Bertrand having discovered that these rabbits are extremely fond of the leaves of the *robinia pseudo acacia*, (the false acacia), made the following trial of its effects. He fed some females with these leaves only, while to others he gave cabbage leaves and the common food furnished to these animals. He observed that the young ones proceeding from the females fed on the leaves of the *robinia*, grew larger and in less time, and that their coats and wool were finer than on the others fed in the common way. He caused the skins of the indigenous rabbits fed with the robinia leaves to be examined by hatters, and they valued them much more than the common ones, asserting that their wool approached in quality to that of hares. The robinia, he observes, thrives on barren heaths. Its branches and leaves are remarkably numerous. Its leaves may be converted into hay, which rabbits and other animals devour eagerly. One person is able to cut a sufficient quantity of branches for a great number of rabbits; and turnips, vetches, beans, and other vegetables, can be sown under the trees.

603 Angora breed of rabbits.

Sect. VII. *Poultry.*

604 Poultry ought to be confined.

Poultry, if rightly managed, might be a source of great profit to the farmer, but where many are kept, they ought not to be allowed to go at large, in which case little profit can be expected from them, for not only will many of their eggs be lost, and many of themselves perhaps destroyed by vermin, but at certain seasons they do a great deal of mischief both in the barn-yard and in the field. No doubt they pick up some grain at the barn-doors that might otherwise be lost; but if the straw is properly threshed and shaken, there would be very little of this. In the common careless way of threshing a great deal of corn is undoubtedly thrown out among the straw; but when we consider the dung of the fowls and their feathers that get among it, and the injury these must do to the cattle, this is no object. It is much better to allow the poultry a certain quantity of food, and to let the cattle have the benefit of what corn may remain among the straw.

Poultry ought therefore always to be confined, but not in a close, dark, diminutive hovel, as is often the case; they should have a spacious airy place properly constructed for them. Some people are of opinion that each sort of poultry should be kept by itself. This, however, is not absolutely necessary; for all sorts may be kept promiscuously together, provided they have a place sufficiently large to accommodate them conveniently, and proper divisions and nests for each kind to retire to separately, which they will naturally do of themselves. Poultry.

This method is practised with great success at Mr Wakefield's, near Liverpool, who keeps a large stock of turkeys, geese, hens, and ducks, all in the same place; and although young turkeys are in general considered so difficult to bring up, he rears great numbers of them in this manner every season with little or no trouble whatever. He has about three quarters or near a whole acre inclosed with a fence only six or seven feet high, formed of slabs set on end, or any thinnings of fir or other trees split and put close together. They are fastened by a nail near the top and another near the bottom, and are pointed sharp, which I suppose prevents the poultry flying over, for they never attempt it although so low. Within this fence are places done up slightly (but well secured from wet) for each sort of poultry; also a pond or stream of water running through it. These poultry are fed almost entirely with potatoes boiled in steam, and thrive astonishingly well. The quantity of dung that is made in this poultry-place is also an object worth attention; and when it is cleared out, a thin paring of the surface is at the same time taken off, which makes a valuable compost. *Communication to the Board of Agriculture, by Robert Beatson, Esq.* 605 Example of a proper mode of keeping poultry.

It is generally understood that a full-grown hen continues in her prime for three years, and that during that period, if properly fed, she will lay at a medium 200 eggs every year. The number, however, of eggs may be greatly increased by making the place to which this kind of poultry retire at night very warm and comfortable by its being placed contiguous to a wall on the other side of which a fire is kept, or by its being heated in any other manner. In the cottages of the poor in Scotland, where the poultry and the inhabitants sleep under the same roof, the hens continue with a moderate portion of food to produce eggs during the greatest part of the winter.

606 Great number of turkeys reared in Norfolk.

In Norfolk a great number of turkeys are bred, of a size and quality superior to those in other parts. Mr Marshall accounts for their number in the following manner: "It is understood in general, that to rear turkeys with success, it is necessary that a male bird should be kept upon the spot to impregnate the eggs singly; but the good housewives of this country know, that a daily intercourse is unnecessary; and that if the hen be sent to a neighbouring cock previous to the season of exclusion, one act of impregnation is sufficient for one brood. Thus relieved from the expence and disagreeableness of keeping a male bird, most little farmers, and many cottagers, rear turkeys. This accounts for their number; and the species and the food they are fatted with (which, I believe, is wholly buck) account for their superior size and quality."

The following account of the Lincolnshire management of geese is given by Mr John Foote of Brandon, in the Annals of Agriculture. "It is generally allowed, that three geese to one gander is sufficient; more geese would be too many, so as to render the eggs abortive. The quantity of eggs to every goose for sitting about 12 or 13. They must be fed with corn Vol. xiv. 607 Lincolnshire management of geese.

Manage m nt of the Dairy.

corn in their water whilſt ſitting, near them, ſo as to feed at pleaſure. The ganders ſhould be allowed to keep near them, ſo that they can ſee them, as they will naturally watch as a guard over their own geeſe.

" Their neſts ſhould be made for them of ſtraw, and confined ſo as the eggs cannot roll out when the geeſe turn them, which they do every day.

" When near hatching, the ſhell ſhould be broke a little againſt the beak or bill of the goſling, to give air, or to enable it to receive ſtrength to throw off the ſhell at a proper time. The method of plucking them about the beginning of April is this: Pluck gently and carefully the fine feathers off their breaſt and back; but be careful not to pull or interrupt their down or pen feathers.

" You alſo pull their quills, five out of a wing; but I think four would be better. The quills will bear pulling in 13 or 14 weeks again, twice in a year; the feathers three times a year, of the old geeſe and ganders, ſeven weeks from the firſt pulling; and then again ſeven weeks after, which is the laſt pulling of the year.

" The young geeſe may be pulled once at 13 or 14 weeks old, but not quilled, being hatched in March.

" If the geeſe are late in hatching, I expect the brood geeſe ſhould not be plucked ſo ſoon as April, but the month after.

" If they are fed with barley and oats, as they ought to be, they will thrive and do the better, and their feathers will grow the faſter, and better in quality; they muſt have plenty of graſs and water.

" Although perſons not acquainted with the management of geeſe, as above deſcribed, may think it inhuman; yet I am credibly informed, they will do better than where they do not pluck them, if they are properly done, as they loſe their feathers by moulting, and would not be ſo healthy.

" It is proved, that by annually plucking geeſe, as in Lincolnſhire, there is ſaved, by the increaſe of feathers, many hundred pounds value, which other countries waſte, though a miſtaken opinion, as not an object worth their attention. Gooſe feathers are now ſold at 18s. a ſtone, that uſed about 25 years ago to be bought at 10s. or 11s. in that county.

" A gooſe will produce by this method about 1s. 6d. annually of good feathers and quills."

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608 mportance f the airy.

In all but the richeſt corn countries, this is a moſt important branch of the buſineſs of a huſbandman. It includes not only the proper method of preſerving milk in a wholeſome and uncorrupted ſtate, but alſo the manufacturing from it the two valuable articles of butter and cheeſe. We ſhall firſt conſider the ſubject of the dairy in a general manner; after which we ſhall take notice of the mode of preparing butter and cheeſe.

609 'rinciples n which dairy ught to be anaged.

Dr James Anderſon remarks, that when a dairy is eſtabliſhed, the undertaker may ſometimes think it his intereſt to obtain the greateſt poſſible quantity of produce: ſometimes it may be more beneficial for him to have it of the fineſt quality; and at other times it may be neceſſary to have both theſe objects in view, the one or the other in a greater or leſs proportion; it is therefore of importance that he ſhould know how he may accompliſh the one or the other of theſe purpoſes in the eaſieſt and moſt direct manner.

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To be able to convert his milk to the higheſt poſſible profit in every caſe, he ought to be fully acquainted with every circumſtance reſpecting the manufacture both of butter and of cheeſe; as it may in ſome caſes happen, that a certain portion of that milk may be more advantageouſly converted into butter than into cheeſe, while another portion of it would return more profit if made into cheeſe.

The firſt thing to be adverted to, in an undertaking of this nature, is to chooſe cows of a proper ſort. Among this claſs of animals, it is found by experience, that ſome kinds give milk of a much thicker conſiſtence, and richer quality, than others; nor is this richneſs of quality neceſſarily connected with the ſmallneſs of the quantity yielded by cows of nearly an equal ſize; it therefore behoves the owner of a dairy to be peculiarly attentive to this circumſtance. In judging of the value of a cow, it ought rather to be the quantity and the quality of the cream produced from the milk of the cow, in a given time, than the quantity of the milk itſelf: this is a circumſtance that will be ſhewn hereafter to be of more importance than is generally imagined. The ſmall cows of the Alderney breed afford the richeſt milk hitherto known; but individual cows in every country may be found, by a careful ſelection, that afford much thicker milk than others; theſe therefore ought to be ſearched for with care, and their breed reared with attention, as being peculiarly valuable.

Few perſons, who have had any experience at all in the dairy, can be ignorant, however, that in comparing the milk of two cows, to judge of their reſpective qualities, particular attention muſt be paid to the time that has elapſed ſince their calving; for the milk of the ſame cow is always thinner ſoon after calving than it is afterwards; as it gradually becomes thicker, though generally leſs in quantity, in proportion to the time ſince the cow has calved. The colour of the milk, ſoon after calving, is richer than it is afterwards; but this, eſpecially for the firſt two weeks, is a faulty colour, that ought not to be coveted.

To make the cows give abundance of milk, and of a good quality, they muſt at all times have plenty of food. Graſs is the beſt food yet known for this purpoſe, and that kind of graſs which ſprings up ſpontaneouſly on rich dry ſoils is the beſt of all. If the temperature of the climate be ſuch as to permit the cows to graze at eaſe throughout the day, they ſhould be ſuffered to range on ſuch paſtures at freedom; but if the cows are ſo much incommoded by the heat as to be prevented from eating through the day, they ought in that caſe to be taken into cool ſheds for protection; where, after allowing them a proper time to ruminate, they ſhould be ſupplied with abundance of green food, freſh-cut for the purpoſe, and given to them by hand frequently, in ſmall quantities, freſh and freſh, ſo as to induce them to eat it with pleaſure. When the heat of the day is over, and they can remain abroad with eaſe, they may be again turned into the paſture, where they ſhould be allowed to range with freedom all night, during the mild weather of ſummer.

Cows, if abundantly fed, ſhould be milked three times a day during the whole of the ſummer ſeaſon; in the morning early, at noon, and in the evening, juſt before night-fall,

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night-fall. In the choice of perſons for milking the cows, great caution ſhould be employed; for if that operation be not carefully and properly performed, not only the quantity of the produce of the dairy will be greatly diminiſhed, but its quality alſo will be very much debaſed; for if all the milk be not thoroughly drawn from a cow when ſhe is milked, that portion of milk which is left in the udder ſeems to be gradually abſorbed into the ſyſtem, and nature generates no more than to ſupply the waſte of what has been taken away. If this leſſened quantity be not again thoroughly drawn off, it occaſions a yet farther diminution of the quantity of milk generated; and thus it may be made to proceed, in perpetual progreſſion from little to leſs, till none at all is produced. In ſhort, this is the practice in all caſes followed, when it is meant to allow a cow's milk to dry up entirely, without doing her hurt. In this manner, therefore, the profits of a dairy might be wonderfully diminiſhed; ſo that it much behoves the owner of it to be extremely attentive to this circumſtance, if he wiſhes to avoid ruin. It ought to be a rule without an exception, never to allow this important department to be entruſted, without controul, to the management of hired ſervants. Its importance will be ſtill more manifeſt from the following aphoriſms.

Aphoriſm 1. "Of the milk that is drawn from any cow at one time, that which comes off at the firſt is always thinner, and of a much worſe quality, than that which comes afterwards; and the richneſs goes on continually increaſing to the very laſt drop that can be drawn from the udder at that time."

Few perſons are ignorant that the milk which is laſt of all taken from the cow at milking (in this country called *ſtroakings*) is richer than the reſt of the milk; but fewer ſtill are aware of the greatneſs of the diſproportion between the quality of the firſt and the laſt drawn milk, from the ſame cow, at one milking. The following facts (ſays our author) reſpecting this circumſtance were aſcertained by me many years ago, and have been confirmed by many ſubſequent experiments and obſervations.

Having taken ſeveral large tea-cups, exactly of the ſame ſize and ſhape, one of theſe tea-cups was filled at the beginning of the milking, and the others at regular intervals, till the laſt, which was filled with the dregs of the ſtroakings. Theſe cups were then weighed, the weight of each having been ſettled, ſo as to aſcertain that the quantity of milk in each was preciſely the ſame; and from a great number of experiments, frequently repeated with many different cows, the reſult was in all caſes as follows:

Firſt, The quantity of cream obtained from the firſt-drawn cup was, in every caſe, much ſmaller than from that which was laſt drawn; and thoſe between afforded leſs or more as they were nearer the beginning or the end. It is unneceſſary here to ſpecify theſe intermediate proportions; but it is proper the reader ſhould be informed, that the quantity of cream obtained from the laſt-drawn cup, from ſome cows, exceeded that from the firſt in the proportion of ſixteen to one. In other cows, however, and in particular circumſtances, the diſproportion was not quite ſo great; but in no caſe did it fall ſhort of the rate of eight to one. Probably, upon an average of a great many cows, it might be found to run as ten or twelve to one.

Secondly, The difference in the quality of the cream, however, obtained from theſe two cups, was much greater than the difference in the quantity. In the firſt cup, the cream was a thin tough film, thinner, and perhaps whiter, than writing paper; in the laſt, the cream was of a thick *butyrous* conſiſtence, and of a glowing richneſs of colour that no other kind of cream is ever found to poſſeſs.

Thirdly, The difference in the quality of the milk that remained, after the cream was ſeparated, was perhaps ſtill greater than either in reſpect to the quantity or the quality of the cream. The milk in the firſt cup was a thin bluiſh liquid, as if a very large proportion of water had been mixed with ordinary milk; that in the laſt cup was of a thick conſiſtence, and yellow colour, more reſembling cream than milk both in taſte and appearance.

From this important experiment, it appears that the perſon who, by bad milking of his cows, loſes but half a pint of his milk, loſes in fact about as much cream as would be afforded by ſix or eight pints at the beginning, and loſes, beſides, that part of the cream which alone can give richneſs and high flavour to his butter.

Aphoriſm 2. "If milk be put into a diſh, and allowed to ſtand till it throws up cream, that portion of cream which riſes firſt to the ſurface is richer in quality, and greater in quantity, than what riſes in a ſecond equal ſpace of time; and the cream that riſes in the ſecond interval of time is greater in quantity, and richer in quality, than that which riſes in a third equal ſpace of time; that of the third than the fourth, and ſo on: the cream that riſes decreaſing in quantity, and declining in quality, continually, as long as any riſes to the ſurface."

Our ingenious author confeſſes, that his experiments not having been made with ſo much accuracy in this caſe as in the former, he was not enabled to aſcertain the difference in the proportion that takes place in equal portions of time; but they have been ſo often repeated as not to leave any room to doubt the fact, and it will be allowed to be a fact of no ſmall importance in the management of the dairy. It is not certain, however, but that a greater quantity of cream may, upon the whole, be obtained from the milk by taking it away at different times: but the proceſs is ſo troubleſome as not to be counterbalanced by the increaſed quantity obtained, if indeed an increaſed quantity be thus obtained, which is not as yet quite certain.

Aphoriſm 3. "Thick milk always throws up a ſmaller proportion of the cream it actually contains, to the ſurface, than milk that is thinner; but that cream is of a richer quality. If water be added to that thick milk, it will afford a conſiderably greater quantity of cream than it would have done if allowed to remain pure, but its quality is, at the ſame time, greatly debaſed."

This is a fact that every perſon attentive to a dairy muſt have remarked; but I have never (ſays our author) heard of any experiment that could aſcertain, either the preciſe amount of the increaſed quantity of cream that might thus be obtained, or of the ratio in the decreaſe of its quality. The effects of mixing water with the milk in a dairy are at leaſt aſcertained; and the knowledge of the fact will enable attentive perſons to follow that practice which they think will beſt promote their own intereſt.

Aphoriſm 4. "Milk which is put into a bucket or other

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other proper veſſel, and carried in it to any conſiderable diſtance, ſo as to be much agitated, and in part cooled, before it be put into the milk-pans to ſettle for cream, never throws up ſo much, nor ſo rich cream, as if the ſame milk had been put into the milk-pans directly after it was milked."

In this caſe, it is believed the loſs of cream will be nearly in proportion to the time that has elapſed, and the agitation the milk has ſuſtained, after being drawn from the cow. But Dr Anderſon ſays that he is not yet in poſſeſſion of any experiments which ſufficiently aſcertain how much is to be aſcribed to the time, and the agitation, taken ſeparately. On every branch of agriculture we find experiments wanting, at each ſtep we advance in our inquiries; and it is the duty of every inquirer to point out, as he goes along, where they are wanted, ſince the labours of no one man can poſſibly complete the whole.

From the above facts, the following corollaries ſeem to be clearly deducible:

Firſt, It is of importance that the cows ſhould be always milked as near the dairy as poſſible, to prevent the neceſſity of carrying and cooling the milk before it is put into the diſhes; and as cows are much hurt by far driving, it muſt be a great advantage in a dairy-farm to have the principal graſs fields as near the dairy or homeſtead as poſſible.

Secondly, The practice of putting the milk of all the cows of a large dairy into one veſſel, as it is milked, there to remain till the whole milking is finiſhed, before any part of it is put into the milk-pans—ſeems to be highly injudicious; not only on account of the loſs that is ſuſtained by agitation and cooling, but alſo, more eſpecially, becauſe it prevents the owner of the dairy from diſtinguiſhing the good from the bad cow's milk ſo as to ſeparate theſe from each other, where it is neceſſary. He may thus have the whole of his dairy product greatly debaſed by the milk of one bad cow, for years together, without being able to diſcover it. A better practice, therefore, would be, to have the milk drown from each cow put ſeparately into the creaming-pans as ſoon as it is milked, without being ever mixed with any other. Thus would the careful manager of the dairy be able on all occaſions to obſerve the particular quality of each individual cow's milk, as well as its quantity, and to know with preciſion which of his cows it was his intereſt to diſpoſe of, and which of them he ought to keep and breed from.

Thirdly, If it be intended to make butter of a very fine quality, it will be adviſable in all caſes to keep the milk that is firſt drawn ſeparate from that which comes laſt; as it is obvious, that if this be not done, the quality of the butter will be greatly debaſed, without much augmenting its quantity. It is alſo obvious, that if this is done, the quality of the butter will be improved in proportion to the ſmallneſs of the quantity of the laſt-drawn milk that is retained; ſo that thoſe who wiſh to be ſingularly nice in this reſpect, will do well to retain only a very ſmall portion of the laſt drawn milk.

To thoſe owners of dairies who have profit only in view, it muſt ever be a matter of trial and calculation, how far it is expedient for them to carry the improving of the quality of their butter at the expence of diminiſhing its quantity. In different ſituations prudence will point out different kinds of practices moſt eligible; and all perſons muſt be left, after making accurate trials, to determine for themſelves. It is likewiſe a conſideration of no ſmall importance, to determine in what way the inferior milk, that is thus to be ſet apart where fine butter is wanted, can be employed with the greateſt profit. In the Highlands of Scotland they have adopted, without thinking of the improvement of their butter, a very ſimple and economical practice in this reſpect. As the rearing of calves is there a principal object with the farmer, every cow is allowed to ſuckle her own calf with a part of her milk, the remainder only being employed in the dairy. To give the calf its portion regularly, it is ſeparated from the cow, and kept in an incloſure, with all the other calves belonging to the ſame farm. At regular times, the cows are driven to the door of the incloſure, where the young calves fail not to meet them. Each calf is then ſeparately let out, and runs directly to its mother, where it ſucks till the dairy-maid judges it has had enough; ſhe then orders it to be driven away, having previouſly ſhackled the hinder legs of the mother, by a very ſimple contrivance, to oblige her to ſtand ſtill. Boys drive away the calf with ſwitches, and return it to the incloſure, while the dairy-maid milks off what was left by the calf: thus they proceed till the whole of the cows are milked. They obtain only a ſmall quantity of milk, it is true, but that milk is of an exceeding rich quality; which, in the hands of ſuch of the inhabitants as know how to manage it, is manufactured into the richeſt marrowy butter that can be anywhere met with. This richneſs of the Highland butter is univerſally aſcribed to the old graſs the cows feed upon in their remote glens; but it is in fact chiefly to be attributed to the practice here deſcribed, which has long prevailed in thoſe regions. Whether a ſimilar practice could be economically adopted elſewhere, our author takes not upon him to ſay; but doubtleſs other ſecondary uſes might be found for the milk of inferior quality. On ſome occaſions, it might be converted into butter of an inferior quality; on other occaſions, it might be ſold ſweet, where the ſituation of the farm was within reach of a market-town; and on others, it might be converted into cheeſes, which, by being made of ſweet milk, would be of a very fine quality if carefully made. Still other uſes might be deviſed for its application; of which the following is worthy of notice. Take common ſkimmed milk, when it has begun to turn ſour, put it into an upright ſtand-churn, or a barrel with one of its ends out, or any other convenient veſſel. Heat ſome water, and pour it into a tub that is large enough to contain with eaſe the veſſel in which the milk was put. Set the veſſel containing the milk into the hot water, and let it remain there for the ſpace of one night. In the morning it will be found that the milk has ſeparated into two parts; a thick cream-like ſubſtance, which occupies the upper part of the veſſel, and a thin watery part that remains at the bottom. Draw off the thin part (called in Scotland *wigg*) by opening a ſtop-cock placed for that purpoſe cloſe above the bottom, and reſerve the cream for uſe. Not much leſs than half of the milk is thus converted into a ſort of cream, which, when well made, ſeems to be as rich and fat as real cream itſelf, and is only diſtinguiſhable from it by its ſourneſs. It is eaten with ſugar, and eſteemed a great delicacy, and uſually ſells at double the price

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of freſh unſkimmed milk. It requires practice, however to be able to make this nicely; the degree of the heat of the water, and many other circumſtances, greatly affecting the operation.

Fourthly, If the quality of the butter be the chief object attended to, it will be neceſſary, not only to ſeparate the firſt from the laſt drawn milk, but alſo to take nothing but the cream that is firſt ſeparated from the beſt milk, as it is this firſt riſing cream alone that is of the prime quality. The remainder of the milk, which will be ſtill ſweet, may be either employed for the purpoſe of making ſweet-milk cheeſes, or may be allowed to ſtand, to throw up cream for making butter of an inferior quality, as circumſtances may direct.

Fifthly, From the above facts, we are enabled to perceive, that butter of the very beſt poſſible quality can only be obtained from a dairy of conſiderable extent, judiciouſly managed; for when only a ſmall portion of each cow's milk can be ſet apart for throwing up cream, and when only a ſmall proportion of that cream can be reſerved, of the prime quality, it follows (the quantity of milk being upon the whole very inconſiderable), that the quantity of prime cream produced would be ſo ſmall as to be ſcarcely worth manufacturing ſeparately.

Sixthly, From theſe premiſes we are alſo led to draw another concluſion, extremely different from the opinion that is commonly entertained on this ſubject, viz. That it ſeems probable, that the very beſt butter could be made with economy in thoſe dairies only where the manufacture of cheeſe is the principal object. The reaſons are obvious: If only a ſmall portion of milk ſhould be ſet apart for butter, all the reſt may be made into cheeſe, while it is yet warm from the cow, and perfectly ſweet; and if only that portion of cream which riſes during the firſt three or four hours after milking is to be reſerved for butter, the rich milk which is left after that cream is ſeparated, being ſtill perfectly ſweet, may be converted into cheeſe with as great advantage nearly as the newly-milked milk itſelf.

But as it is not probable that many perſons could be found who would be willing to purchaſe the very fineſt butter, made in the manner above pointed out, at a price that would be ſufficient to indemnify the farmer for his trouble in making it, theſe hints are thrown out merely to ſhew the curious in what way butter poſſeſſing this ſuperior degree of excellence may be obtained, if they chooſe to be at the expence; but for an ordinary market, Dr Anderſon is ſatisfied, from experience and attentive obſervation, that if in general about the firſt drawn half of the milk be ſeparated at each milking, and the remainder only ſet up for producing cream, and if that milk be allowed to ſtand to throw up the whole of its cream (even till it begins ſenſibly to taſte ſouriſh), and that cream be afterwards carefully managed, the butter thus obtained will be of a quality greatly ſuperior to what can uſually be procured at market, and its quality not conſiderably leſs than if the whole of the milk had been treated alike. This, therefore, is the practice that he thinks moſt likely to ſuit the frugal farmer, as his butter, though of a ſuperior quality, could be afforded at a price that would always enſure it a rapid ſale.

610 Dairy deſcribed.

Our author now proceeds to enumerate the properties of a dairy. The milk-houſe ought to be cool in ſummer and warm in winter; ſo that an equal temperature may be preſerved throughout the year. It ought alſo to be dry, ſo as to admit of being kept ſweet and clean at all times. A ſeparate building ſhould be erected for the purpoſe, near a cool ſpring or running water, where the cows may have eaſy acceſs to it, and where it is not liable to be incommoded by ſtagnant water. The apartment where the milk ſtands ſhould be well thatched, have thick walls, and a ventilator in the top for admitting a free circulation of air. There ſhould alſo be an apartment with a fire-place and caldron, for the purpoſe of ſcalding and cleaning the veſſels. The Doctor is of opinion, that the temperature of from 50 to 55 degrees is the moſt proper for ſeparating the cream from the milk, and by proper means this might eaſily be kept up, or nearly ſo, both ſummer and winter.

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611 Wooden utenſils preferable to every other kind.

The utenſils of the dairy ſhould be all made of wood, in preference either to lead, copper, or even caſt iron. Theſe metals are all very eaſily ſoluble in acids; the ſolutions of the two firſt highly poiſonous; and though the latter is innocent, the taſte of it might render the products highly diſagreeable.

612 Hiſtory of butter.

Butter, though uſed at preſent as food in moſt countries of Europe, was not known, or known very imperfectly, to the ancients. This, we think, is completely proved by Profeſſor Beckmann in the ſecond volume of his *Hiſtory of Inventions*. In our tranſlation of the Hebrew Scripture, there is indeed frequent mention made of butter at very early periods; but, as the Profeſſor well obſerves, the greateſt maſters of biblical criticiſm unanimouſly agree, that the word ſo tranſlated ſignifies milk or cream, or four thick milk, and cannot poſſibly mean what we call *butter*. The word plainly alludes to ſomething liquid, which was uſed for waſhing the feet, which was drunk, and which had ſometimes the power of intoxicating; and we know that mares milk may be ſo prepared as to produce the ſame effect. See KOUMISS.

The oldeſt mention of butter, the Profeſſor thinks, is in the account of the Scythians given by Herodotus (lib. iv. 2.), who ſays, that "theſe people pour the milk of their mares into wooden veſſels, cauſe it to be violently ſtirred or ſhaken by their blind ſlaves, and ſeparate the part which ariſes to the ſurface, as they conſider it as more valuable and delicious than what is collected below it." That this ſubſtance muſt have been a ſoft kind of butter, is well known; and Hippocrates gives a ſimilar account of Scythian butter, and calls it *πιειηδιον*, which Galen tranſlates by the word *βουτυρον*. The poet Anaxandrides, who lived ſoon after Hippocrates, deſcribing the marriage-feaſt of Iphicrates, who married the daughter of Cotys king of Thrace, ſays, that the Thracians ate butter, which the Greeks at that time conſidered as a wonderful kind of food.

Dioſcorides ſays, that good butter was prepared from the fatteſt milk, ſuch as that of ſheep or goats, by ſhaking it in a veſſel till the fat was ſeparated. To this butter he aſcribes the ſame effects, when uſed externally, as thoſe produced by our butter at preſent. He adds alſo, and he is the firſt writer who makes the obſervation, that freſh butter might be melted and poured over pulſe and vegetables inſtead of oil, and that it might be employed in paſtry in the room of other fat ſubſtances.

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substances. A kind of soot likewise was at that time prepared from butter for external applications, which was used in curing inflammation of the eyes and other disorders. For this purpose the butter was put into a lamp, and when consumed, the lamp was again filled till the desired quantity of soot was collected in a vessel placed over it.

Galen, who distinguishes and confirms in a more accurate manner the healing virtues of butter, expressly remarks, that cows milk produces the fattest butter; that butter made from sheep's or goats milk is less rich; and that asses milk yields the poorest. He expresses his astonishment, therefore, that Dioscorides should say that butter was made only from the milk of sheep and goats. He assures us that he had seen it made from cows milk, and that he believes it had thence acquired its name. "Butter (says he) may be very properly employed for ointments; and when leather is besmeared with it, the same purpose is answered as when it is rubbed over with oil. In cold countries, which do not produce oil, butter is used in the baths; and that it is a real fat, may be readily perceived by its catching fire when poured over burning coals." What has been here said is sufficient to shew that butter must have been very little known to or used by the Greeks and Romans in the time of Galen, that is, at the end of the second century.

The professor having collected, in chronological order, every thing which he could find in the works of the ancients respecting butter, concludes, that it is not a Grecian, and much less a Roman invention, but that the Greeks were made acquainted with it by the Scythians, the Thracians, and the Phrygians, and the Romans by the people of Germany. He is likewise decidedly of opinion, that when these two polished nations had learned the art of making it, they used it not as food, but only as an ointment, or sometimes as a medicine, "We never find it (says he) mentioned by Galen and others as a food, though they have spoken of it as applicable to other purposes. No notice is taken of it by Apicius; nor is there any thing said of it in that respect by the authors who treat on agriculture, though they have given us very particular information concerning milk, cheese, and oil."

The ancient Christians of Egypt burnt butter in their lamps instead of oil; and in the Roman churches, it was anciently allowed, during Christmas time, to burn butter instead of oil, on account of the great consumption of it otherwise.

613 Qualities of butter.

Butter is the fat, oily, and inflammable part of the milk. This kind of oil is naturally distributed through all the substance of the milk in very small particles, which are interposed betwixt the caseous and serous parts, amongst which it is suspended by a slight adhesion, but without being dissolved. It is in the same state in which oil is in emulsions: hence the same whiteness of milk and emulsions; and hence, by rest, the oily parts separate from both these liquors to the surface, and form a cream. See EMULSION.

When butter is in the state of cream, its proper oily parts are not yet sufficiently united together to form a homogeneous mass. They are still half separated by the interposition of a pretty large quantity of serous and caseous particles. The butter is completely formed by pressing out these heterogenous parts by means of continued percussion. It then becomes an uniform soft mass.

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Fresh butter, which has undergone no change, has scarcely any smell: its taste is mild and agreeable, it melts with a weak heat, and none of its principles are disengaged by the heat of boiling water. Those properties prove, that the oily part of butter is of the nature of the fat, fixed, and mild oils obtained from many vegetable substances by expression. See OILS.—The half fluid consistence of butter, as of most other concrete oily matters, is thought to be owing to a considerable quantity of acid united with the oily part; which acid is so well combined, that it is not perceptible while the butter is fresh, and has undergone no change; but when it grows old, and undergoes some kind of fermentation, then the acid is disengaged more and more; and this is the cause that butter, like oils of the same kind, becomes rancid by age.

Butter is constantly used in food, from its agreeable taste; but to be wholesome, it must be very fresh and free from rancidity, and also not fried or burnt; otherwise its acrid and even caustic acid, being disengaged, disorders digestion, renders it difficult and painful, excites acrid empyreumatic belchings, and introduces much acrimony into the blood. Some persons have stomachs so delicate, that they are even affected with these inconveniences by fresh butter and milk. This observation is also applicable to oil, fat, chocolate, and in general to all oleaginous matters.

614 Rules for making butter.

Dr James Anderson, whom we have already quoted, gives the following minute directions for making and preserving butter. The creaming dishes, when properly cleaned, sweet, and cool, ought to be filled with the milk as soon as it is drawn from the cow, having been first carefully strained through a cloth, or close strainer made of hair or wire: the doctor prefers silver wire to every other. The creaming dishes ought never to exceed three inches in depth; but they may be so broad as to contain a gallon and a half; when filled they ought to be put on the shelves of the milk-house, and remain there until the cream be fully separated. If the finest butter be intended, the milk ought not to stand above six or eight hours, but for ordinary butter it may stand 12 hours or more; yet if the dairy be very large, a sufficient quantity of cream will be separated in two, three, or four hours, for making the best butter. It is then to be taken off as nicely as possible by a skimming dish, without lifting any of the milk; and immediately after put into a vessel by itself, until a proper quantity for churning be collected. A firm, neat, wooden barrel seems well adapted for this purpose, open at one end, and having a lid fitted to close it. A cock or spigot ought to be fixed near the bottom, to draw off any thin or serous part which may drain from the cream; the inside of the opening should be covered with a bit of fine silver wire gauze, in order to keep back the cream while the serum is allowed to pass; and the barrel should be inclined a little on its stand, to allow the whole to run off.

615 Cream ought to be kept some time before it be made into butter.

The doctor contradicts the opinion that very fine butter cannot be obtained, except from cream that is not above a day old. On the contrary, he insists that it is only in very few cases that even tolerably good butter can be obtained from cream that is not above one day old. The separation of butter from cream only

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only takes place after the cream has attained a certain degree of acidity. If it be agitated before that acidity has begun to take place, no butter can be obtained, and the agitation muſt be continued till the time that the ſoundneſs is produced; after which the butter begins to form. "In ſummer, while the climature is warm, the heating may be, without very much difficulty, continued until the acidity be produced, ſo that butter may be got: but in this caſe the proceſs is long and tedious; and the butter is for the moſt part of a ſoft conſiſtence, and tough and gluey to the touch. If this proceſs be attempted during the cold weather in winter, butter can ſcarcely be in any way obtained, unleſs by the application of ſome great degree of heat, which ſometimes aſſiſts in producing a very inferior kind of butter, white, hard, and brittle, and almoſt unfit for any culinary purpoſe whatever. The judicious farmer, therefore, will not attempt to imitate this practice, but will allow his cream to remain in the veſſel appropriated for keeping it, until it has acquired the proper degree of acidity. There is no rule for determining how long it is to be kept; but our author is of opinion, that a very great latitude is allowable in this caſe; and that if no ſerous matter be allowed to lodge among the cream, it may be kept good for making butter a great many weeks.

616 Of the churn.

The churn in which butter is made likewiſe admits of conſiderable diverſity; but our author prefers the old-faſhioned upright churn to all others, on account of its being more eaſily cleaned. The labour, when the cream is properly prepared, he thinks, very trifling. Much greater nicety, he ſays, is required in the proceſs of churning than moſt people are aware of; as a few haſty and irregular ſtrokes will render butter bad, which otherwiſe would have been of the fineſt quality. After the proceſs is over, the whole ought to be ſeparated from the milk, and put into a clean diſh, the inſide of which, if made of wood, ought to be well rubbed with common ſalt, to prevent the butter from adhering to it. The butter ſhould be preſſed and worked with a flat wooden ladle or ſkimming diſh, having a ſhort handle, ſo as to force out all the milk that was lodged in the cavities of the maſs. This operation requires a conſiderable degree of ſtrength as well as dexterity; but our author condemns the beating up of the butter with the hand as "an indelicate and barbarous practice." In like manner he condemns the employing of cold water in this operation, to *waſh* the butter as it is called. Thus, he ſays, the quality of it is debaſed in an aſtoniſhing degree. If it is too ſoft, it may be put into ſmall veſſels, and theſe allowed to ſwim in a tub of cold water; but the water ought never to touch the butter. The beating ſhould be continued till the milk be thoroughly ſeparated, but not till the butter become tough and gluey; and after this is completely done, it is next to be ſalted. The veſſel into which it is to be put muſt be well ſeaſoned with boiling water ſeveral times poured into it: the inſide is to be rubbed over with common ſalt, and a little melted butter poured into the cavity between the bottom and ſides, ſo as to make it even with the bottom; and it is then fit for receiving the butter. Inſtead of common ſalt alone, the doctor recommends the following compoſition. "Take of ſugar one part, of nitre one part, and of the beſt Spaniſh great ſalt two parts. Beat the whole into a fine powder, mix them well together, and put them by for uſe. One ounce of this is to be thoroughly mixed with a pound of butter as ſoon as it is freed from the milk, and then immediately put into the veſſel deſigned to hold it; after which it muſt be preſſed ſo cloſe as to leave no air-holes; the ſurface is to be ſmoothed and covered with a piece of linen, and over that a piece of wet parchment; or, in defect of this laſt, fine linen that has been dipped in melted butter, exactly fitted to the edges of the veſſel all round, in order to exclude the air as much as poſſible. When quite full, the caſk is to be covered in like manner, and a little melted butter put round the edges, in order to fill up effectually every cranny, and totally to exclude the air. "If all this (ſays the doctor) be carefully done, the butter may be kept perfectly ſound in this climate for many years. How many years I cannot tell; but I have ſeen it two years old, and in every reſpect as ſweet and ſound as when only a month old. It deſerves to be remarked, that butter cured in this manner does not taſte well till it has ſtood at leaſt a fortnight after being ſalted; but after that period is elapſed, it eats with a rich marrowy taſte that no other butter ever acquires; and it taſtes ſo little ſalt, that a perſon who had been accuſtomed to eat butter cured with common ſalt only, would not imagine it had got one-fourth part of the ſalt neceſſary to preſerve it." Our author is of opinion, that ſtrong brine may be uſeful to pour upon the ſurface during the time it is uſing, in order the more effectually to preſerve it from the air, and to avoid rancidity.

617 Butter ought not to be put into water.

618 Compoſition for preſerving butter.

619 To prepare butter for ſending to warm climates.

As butter contains a quantity of mucilaginous matter much more putreſcible than the pure oily part, our author recommends the purifying it from this mucilage by melting in a conical veſſel, in which the mucilage will fall to the bottom; the pure oily part ſwimming at top. This will be uſeful when butter is to be ſent a long voyage to warm climates, as the pure part will keep much better than when mixed with the other.

620 Preſerved by honey.

He propoſes another method of preſerving butter, viz. by mixing it with honey, which is very antiſeptic, and mixes intimately with the butter. Thus mixed, it eats very pleaſantly, and may perhaps be ſucceſsfully uſed with a medicinal intention.

621 Epping butter.

In England no butter is eſteemed equal to that which is made in the county of Eſſex, well known by the name of Epping butter, and which in every ſeaſon of the year yields at London a much higher price than any other. The following directions concerning the making and management of butter, including the Epping method, are extracted from the 3d volume of the Bath Society Papers.

In general it is to be obſerved, that the greater the quantity made from a few cows, the greater will be the farmer's profit: therefore he ſhould never keep any but what are eſteemed good milkers. A bad cow will be equally expenſive in her keep, and will not perhaps (by the butter and cheeſe that is made from her) bring in more than from three to ſix pounds a-year; whereas a good one will bring from ſeven to ten pounds *per annum*: therefore it is obvious that bad cows ſhould be parted with, and good ones purchaſed in their room. When ſuch are obtained, a good ſervant ſhould be employed to milk them; as through the neglect and miſmanagement of ſervants, it frequently happens that the

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the beſt cows are ſpoiled. No farmer ſhould truſt entirely to ſervants, but ſometimes ſee themſelves that their cows are milked clean; for if any milk is ſuffered to remain in the udder, the cow will daily give leſs, till at length ſhe will become dry before the proper time, and the next ſeaſon ſhe will ſcarce give milk ſufficient to pay for her keep.

It ſometimes happens that ſome of a cow's teats may be ſcratched or wounded ſo as to produce foul or corrupted milk; when this is the caſe, we ſhould by no means mix it with the ſweet milk, but give it to the pigs; and that which is conveyed to the dairy-houſe ſhould remain in the pail till it is nearly cool, before it be ſtrained, that is, if the weather be warm; but in froſty weather it ſhould be immediately ſtrained, and a ſmall quantity of boiling water may be mixed with it, which will cauſe it to produce cream in abundance, and the more ſo if the pans or vats have a large ſurface.

During the hot ſummer months, it is right to riſe with or before the ſun, that the cream may be ſkimmed from the milk ere the dairy becomes warm; nor ſhould the milk, at that ſeaſon, ſtand longer in the vats, &c. than 24 hours, nor be ſkimmed in the evening till after ſunſet. In winter milk may remain unſkimmed for 36 or 48 hours. The cream ſhould be depoſited in a deep pan, which ſhould be kept during the ſummer in the cooleſt part of the dairy; or in a cool cellar where a free air is admitted, which is ſtill better. Where people have not an opportunity of churning every other day, they ſhould ſhift the cream daily into clean pans, which will keep it cool, but they ſhould never fail to churn at leaſt twice in the week in hot weather; and this work ſhould be done in a morning before the ſun appears, taking care to fix the churn where there is a free draught of air. If a pump-churn be to be uſed, it may be plunged a foot deep into a tub of cold water, and ſhould remain there during the whole time of churning, which will very much harden the butter. A ſtrong rancid flavour will be given to butter, if we churn ſo near the fire as to heat the wood in the winter ſeaſon.

After the butter is churned, it ſhould be immediately waſhed in many different waters till it is perfectly cleanſed from the milk; but here it muſt be remarked, that a warm hand will ſoften it, and make it appear greaſy, ſo that it will be impoſſible to obtain the beſt price for it. The cheeſemongers uſe two pieces of wood for their butter; and if thoſe who have a very hot hand were to have ſuch, they might work the butter ſo as to make it more ſaleable.

The Epping butter is made up for market in long rolls, weighing a pound each; in the county of Somerſet, they diſh it in half pounds for ſale; but if they forget to rub ſalt round the inſide of the diſh, it will be difficult to work it ſo as to make it appear handſome.

Butter will require and endure more working in winter than in ſummer; but it is remarked, that no perſon whoſe hand is warm by nature makes good butter.

Thoſe who uſe a pump-churn muſt endeavour to keep a regular ſtroke; nor ſhould they admit any perſon to aſſiſt them, except they keep nearly the ſame ſtroke: for if they churn more ſlowly, the butter will in the winter *go back*, as it is called; and if the ſtroke be more quick and violent in the ſummer, it will cauſe a fermentation, by which means the butter will imbibe a very diſagreeable flavour. Management of the Dairy.

Where people keep many cows, a barrel-churn is to be preferred; but if this be not kept very clean, the bad effects will be diſcovered in the butter; nor muſt we forget to ſhift the ſituation of the churn when we uſe it, as the ſeaſons alter, ſo as to fix it in a warm place in winter, and where there is a free air in ſummer.

In many parts of this kingdom they colour their butter in winter, but this adds nothing to its goodneſs; and it rarely happens that the farmers in or near Epping uſe any colour; but when they do, it is very innocent. They procure ſome round carrots, whoſe juice they expreſs through a ſieve, and mix with the cream when it enters the churn, which makes it appear like May butter; nor do they at any time uſe much ſalt, though a little is abſolutely neceſſary.

As they make in that county but very little cheeſe, ſo of courſe very little whey butter is made; nor indeed ſhould any perſon make it, except for preſent uſe, as it will not keep good more than two days; and the whey will turn to better account to fatten pigs with. Nothing feeds theſe faſter, nor will any thing make them ſo delicately white; at the ſame time it is to be obſerved, that no good bacon can be made from pigs thus fatted. Where much butter is made, good cheeſe for ſervants may be obtained from ſkimmed milk, and the whey will afterwards do for ſtore pigs.

622 Weſt of England mode of making butter.

The foregoing rules will ſuffice for making good butter in any country; but as ſome people are partial to the weſt country method, it ſhall be deſcribed as briefly as poſſible.

In the firſt place, they depoſite their milk in earthen pans in their dairy-houſe, and (after they have ſtood twelve hours in the ſummer, and double that ſpace in the winter) they remove them to ſtoves made for that purpoſe, which ſtoves are filled with hot embers; on theſe they remain till bubbles riſe, and the cream changes its colour; it is then deemed heated enough, and this they call ſcalded cream; it is afterwards removed ſteadily to the dairy, where it remains 12 hours more, and is then ſkimmed from the milk and put into a tub or churn: if it be put into a tub, it is beat well with the hand, and thus they obtain butter; but a cleanlier way is to make uſe of a churn. Some ſcald it over the fire, but then the ſmoke is apt to affect it; and in either caſe, if the pans touch the fire, they will crack or fly, and the milk and cream will be waſted.

623 Cambridgeſhire butter.

The Cambridgeſhire ſalt butter is held in the higheſt eſteem, and is made nearly after the ſame method as the Epping; and by waſhing and working the ſalt from it the cheeſemongers in London often ſell it at a high price for freſh butter. They depoſite it when made into wooden tubs or firkins, which they expoſe to the air for two or three weeks, and often wath them; but a readier way is to ſeaſon them with unſlaked lime, or a large quantity of ſalt and water well boiled will do; with this they muſt be ſcrubbed ſeveral times, and afterwards thrown into cold water, where they ſhould remain three or four days, or till they are wanted; then they ſhould be ſcrubbed as before, and well rinſed with cold water; but before they receive the butter,

care

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care muſt be taken to rub every part of the firkin with ſalt: then, if the butter be properly made, and perfectly ſweet, it may be gently preſſed into the firkin; but it muſt be well ſalted when it is made up, and the ſalt ſhould be equally diſtributed through the whole maſs, and a good handful of ſalt muſt be ſpread on the top of the firkin before it is heated, after which the head ſhould be immediately put on.

624 Yorkſhire and Suffolk butter.

They purſue nearly the ſame method in Suffolk and Yorkſhire; nor is the butter that is made in theſe counties much inferior to that made in Cambridgeſhire; indeed it is often ſold in London for Cambridge butter: and no people make more butter from their cows than the Yorkſhire farmers do, which is certainly owing to the care they take of their cows in the winter; as at that ſeaſon they houſe them all, feed them with good hay, and never ſuffer them to go out (except to water) but when the weather is very ſerene; and when their cows calve, they give them comfortable malt meſhes for two or three days after; but theſe cows never anſwer if they are removed to other counties, except the ſame care and attendance be given them, and then none anſwer better.

Land whereon cows feed does very often affect the butter. If wild garlic, charlock, or May-weed, be found in a paſture ground, cows ſhould not feed therein till after they have been mown, when ſuch pernicious plants will appear no more till the following ſpring; but thoſe cows that give milk muſt not partake of the hay made therefrom, as that will alſo diffuſe its bad qualities.

Great part of the Epping butter is made from cows that feed during the ſummer months in Epping Foreſt, where the leaves and ſhrubby plants contribute greatly to the flavour of the butter. The mountains of Wales, the highlands of Scotland, and the moors, commons, and heaths in England, produce excellent butter where it is properly managed; and though not equal in quantity, yet far ſuperior in quality to that which is produced from the richeſt meadows; and the land is often blamed when the butter is bad through miſmanagement, ſluttiſhneſs, or inattention.

Turnips and rape affect milk and butter, but brewers grains are ſweet and wholeſome food, and will make cows give abundance of milk; yet the cream thereon will be thin, except good hay be given at the ſame time, after every meal of grains. Coleworts and cabbages are alſo excellent foods; and if theſe and ſavoys were cultivated for this purpoſe, the farmers in general would find their account in it.

Cows ſhould never be ſuffered to drink improper water; ſtagnated pools, water wherein frogs, &c. ſpawn, common ſewers, and ponds that receive the drainings of ſtables, are improper.

625 Frauds in the ſale of butter.

Divers abuſes are committed in the packing and ſalting of butter, to increaſe its bulk and weight, againſt which we have a ſtatute expreſs. Pots are frequently laid with good butter for a little depth at the top, and with bad at the bottom; ſometimes the butter is ſet in rolls, only touching at top, and ſtanding hollow at bottom. To prevent theſe cheats, the factors at Utoxeter keep a ſurveyor, who, in caſe of ſuſpicion, tries the pots with an iron inſtrument called a *butter-bore*, made like a cheeſe-taſter, to be ſtuck in obliquely to the bottom.

In the Annals of Agriculture, vol. xvii. the following mode of preventing butter and cream from receiving a taint from the cows feeding on cabbages and turnips is ſtated by J. Jones, Eſq. of Bolas-heath, Newport, Shropſhire. "I find by experience (ſays he), that a ſmall bit of ſaltpetre, powdered and put into the milk-pan, with the new milk, does effectually prevent the cream and butter from being tainted, although the cows be fed on the refuſe leaves of cabbages and turnips. In the beginning of this laſt winter, my men were very careful in not giving to the cows any outſide or decayed leaves of the cabbages or turnips; yet the cream and butter were ſadly tainted: but as ſoon as the maid uſed the ſaltpetre, all the taint was done away; and afterwards no care was taken in feeding the cows, for they had cabbages and turnips in all ſtates. Our milk-pans hold about nine pints of milk."

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626 How but may be kept un-tainted b cabbages and turni

627 Extent of the butter trade.

The trade in butter is very conſiderable. Some compute 50,000 tons annually conſumed in London. It is chiefly made within 40 miles round the city. Fifty thouſand firkins are ſaid to be ſent yearly from Cambridge and Suffolk alone; each firkin containing 56 lbs. Utoxeter, in Staffordſhire, is a market famous for good butter, inſomuch, that the London merchants have eſtabliſhed a factory there for that article. It is bought by the pot, of a long cylindrical form, weighing 14 lbs.

628 Cheeſe de ſcribed.

The other grand object of the dairy is cheeſe-making. Cheeſe is the curd of milk, precipitated or ſeparated from the whey by an acid. Cheeſe differs in quality according as it is made from new or ſkimmed milk, from the curd which ſeparates ſpontaneouſly upon ſtanding, or that which is more ſpeedily produced by the addition of runnet. Cream alſo affords a kind of cheeſe, but quite fat and butyraceous, and which does not keep long. Analyzed chemically, cheeſe appears to partake much more of an animal nature than butter, or the milk from which it was made. It is inſoluble in every liquid except ſpirit of nitre, and cauſtic alkaline ley. Shaved thin, and properly treated with hot water, it forms a very ſtrong cement if mixed with quicklime *. When prepared with the hot water, it is recommended in the Swediſh Memoirs to be uſed by anglers as a bait. It may be made into any form, is not ſoftened by the cold water, and the fiſhes are fond of it. As a food, phyſicians condemn the too free uſe of cheeſe. When new, it is extremely difficult of digeſtion: when old, it becomes acrid and hot; and, from Dr Percival's experiments, is evidently of a ſeptic nature. It is a common opinion that old cheeſe digeſts every thing, yet is left undigeſted itſelf; but this is without any ſolid foundation. Cheeſe made from the milk of ſheep digeſts ſooner than that from the milk of cows, but is leſs nouriſhing; that from the milk of goats digeſts ſooner than either, but is alſo the leaſt nouriſhing. In general, it is a kind of food fit only for the laborious, or thoſe whoſe organs of digeſtion are ſtrong.

* See *Cement.*

Every country has places noted for this commodity: thus Cheſter and Glouceſter cheeſe are famous in England; and the Parmeſan cheeſe is in no leſs repute abroad, eſpecially in France. This ſort of cheeſe is entirely made of ſweet cow-milk: but at Rochefort in Languedoc, they make it of ewes milk; and in other places it is uſual to add goat or ewes milk in a certain proportion to that of the cow. There is likewiſe a kind

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kind of medicated cheese made by intimately mixing the expressed juice of certain herbs, as sage, baum, mint, &c. with the curd before it is fashioned into a cheese. The Laplanders make a sort of cheese of the milk of their rein-deer; which is not only of great service to them as food, but on many other occasions. It is a very common thing in these climates to have a limb numbed and frozen with the cold: their remedy for this is the heating an iron red hot, and thrusting it through the middle of one of these cheeses; they catch what drops out, and with this anoint the limb, which soon recovers. They are subject also to coughs and diseases of the lungs, and these they cure by the same sort of medicine: they boil a large quantity of the cheese in the fresh deer's milk, and drink the decoction in large draughts warm several times a-day. They make a less strong decoction of the same kind also, which they use as their common drink, for three or four days together, at several times of the year. They do this to prevent the mischiefs they are liable to from their water, which is otherwise their constant drink, and is not good.

619 Making of cheese.

In making cheese the same precaution is to be observed as with regard to butter, viz. the milk ought not to be agitated by carrying to any distance; nor ought the cows to be violently driven before they are milked, which reduces the milk almost to the same state as if agitated in a barrel or churn. To this cause Mr Twamley, who has written a treatise upon dairy management, attributes the great difficulty sometimes met with in making the milk coagulate; four or five hours being sometimes necessary instead of one (the usual time employed); and even after all, the curd will be of such a soft nature, that the cheese will swell, puff up, and rent in innumerable places, without ever coming to that solid consistence which it ought to have. As this frequently happens in consequence of heat, Mr Twamley advises to mix a little cold spring water with the milk. It is a bad practice to put in more runnet when the curd appears difficult to be formed, for this, after having once formed the curd by the use of a certain quantity, will dissolve it again by the addition of more.

630 General defects of cheese.

The most common defects of cheese are its appearing when cut full of small holes called *eyes;* its puffing up, cracking, and pouring out quantities of thin serous liquor; becoming afterwards rotten and full of maggots in those places from which the liquor issued. All this, according to our author, proceeds from the formation of a substance called by him *slip curd*, a kind of half coagulum, incapable of a thorough union with the true curd, and which when broken into very small bits produces *eyes;* but if in larger pieces, occasions those rents and cracks in the cheese already mentioned; for though this kind of curd retains its coagulated nature for some time, it always sooner or later dissolves into a serous liquid. This kind of curd may be produced, 1. By using the milk too hot. 2. By bad runnet. 3. By not allowing the curd a proper time to form. The first of these is remedied by the use of cold water, which our author says is so far from being detrimental to the quality of the cheese, that it really promotes the action of the runnet upon the milk. The second, viz. a knowledge of good from bad runnet, can only be acquired by long practice, and no particular directions can be given, farther than that the utmost care must be taken that it have no putrid tendency, nor any rancidity from too great heat in drying. The only rule that can be given for its preparation is to take out the maw of a calf which has fed entirely upon milk; and if it is cold, swill it a little in water; rub it well with salt; then fill it with the same, and afterwards cover it. Some cut them open and spread them in salt, putting them in layers above one another, letting them continue in the brine they produce, sometimes stirring or turning them for four, six, or nine months; after which they are opened to dry, stretched out upon sticks or splints. They may be used immediately after being dried, though it is reckoned best to keep them till they be a year old before they are used. The best method of making the runnet from the skins, according to our author, is the following: "Take pure spring water, in quantity proportioned to the runnet you intend to make; it is thought best by some two skins to a gallon of water; boil the water, which makes it softer or more pure: make it with salt into brine that will swim an egg: then let it stand till the heat is gone off to about the heat of blood-warm; then put your maw skin in, either cut in pieces or whole; the former I should imagine best or most convenient; letting it steep 24 hours, after which it will be fit for use. Such quantity as is judged necessary must then be put into the milk; about a tea-cupful being necessary for ten cows milk; though in this respect very particular directions cannot be given."

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631 Of preparing runnet.

632 Mr Hazard's receipt for runnet.

In the Bath Papers Mr Hazard gives the following receipt for making runnet: "When the maw-skin is well prepared and fit for the purpose, three pints or two quarts of soft water, clean and sweet, should be mixed with salt, wherein should be put sweet brier, rose leaves and flowers, cinnamon, cloves, mace, and in short almost every sort of spice and aromatic that can be procured; and if these are put into two quarts of water, they must boil gently till the liquor is reduced to three pints, and care should be taken that this liquid is not smoked; it should be strained clear from the spices, &c. and when found not to be warmer than milk from the cow; it should be poured upon the vell or maw; a lemon may then be sliced into it, when it may remain a day or two; after which it should be strained again and put into a bottle, where, if well corked, it will keep good for twelve months or more; it will smell like a perfume, and a small quantity of it will turn the milk, and give the cheese a pleasing flavour." He adds, that if the vell or maw be salted and dried for a week or two near the fire, it will do for the purpose again almost as well as before.

633 Particulars to be observed in making of cheese.

In the making of cheese, supposing the runnet to be of a good quality, the following particulars must be observed: 1. The proper degree of heat. This ought to be what is called *milk-warm*, or, "a few degrees removed from coolness," according to Mr Twamley; considerably below the heat of milk taken from the cow. If too hot, it may be reduced to a proper temperature by cold water, as already mentioned. 2. The time allowed for the runnet to take effect. This, our author observes ought never to be less than an hour and a half. The process may be accelerated, particularly by putting salt to the milk before

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for the runnet is added. Mr Twamley adviſes two handfuls to ten or twelve cows milk; but he aſſures us, that no bad conſequence can follow from the curd being formed ever ſo ſoon; as it then only becomes more ſolid and fit for making cheeſe of a proper quality. 3. To prevent any difficulty in ſeparating the curd from the whey, prepare a long cheeſe-knife from lath; one edge being ſharpened to cut the curd acroſs from top to bottom in the tub, croſſing it with lines checkerwiſe: by which means the whey riſes through the vacancies made by the knife, and the curd ſinks with much more eaſe. A ſieve has been uſed with ſucceſs, in order to ſeparate the whey perfectly from the curd. 4. Having got the curd all firm at the bottom of the tub, take the whey from it; let it ſtand a quarter of an hour to drain before you put it into the vat to break it. If any bits of ſlip-curd ſwim among the whey, pour it all off together rather than put it among the cheeſe, for the reaſons already given. Some dairy-women allow the curd to ſtand for two hours; by which time it is become of ſo firm a nature that no breaking is neceſſary: they have only to cut it in ſlices, put it into the vat, and work it well by ſqueezing thoroughly to make it ſit cloſe; then put it into the preſs. Our author, however, approves more of the method of breaking the curd, as leſs apt to make the cheeſe hard and horny. 5. When the whey is of a white colour, it is a certain ſign that the curd has not ſubſided; but if the method juſt now laid down be followed, the whey will always be of a green colour; indeed this colour of the whey is always a certain criterion of the curd having been properly managed. 6. The beſt method of preventing cheeſe from heaving, is to avoid making the runnet too ſtrong; to take care that it be clean, and not tainted; to be certain that the curd is fully come, and not to ſtir it before the air has had time to eſcape; a quantity of air being always diſcharged in this as in many other chemical proceſſes. 7. Cheeſe is very apt to ſplit in conſequence of being "ſalted within," eſpecially when the vat is about half filled. In this caſe the curd, though ſeparated only in a ſmall degree by the ſalt, never cloſes or joins as it ought to do. Mr Twamley preſers ſalting in the milk greatly to this method. 8. Dry cracks in cheeſe are generally produced by keeping curd from one meal to another, and letting the firſt become too ſtiff and hard before it is mixed with the other. 9. Curdly or wrinkle-coated cheeſe is cauſed by ſour milk. Cheeſe made of cold milk is apt to be hard, or to break and fly before the knife. 10. Such coated cheeſe is cauſed by being made too cold, as cheeſe that is made in winter or late in autumn is apt to be, unleſs laid in a warm room after it is made.

634 Different kinds of cheeſe.

Cheeſe is of very different quality, according to the milk from which it is made: Thus, in Glouceſterſhire, what is called the *ſecond* or *two-meal* cheeſe, is made from one meal of new milk and one of ſkimmed or old milk, having the cream taken away. Skimmed cheeſe or *ſlet-milk* cheeſe, is made entirely from ſkimmed milk, the cream having been taken off to make butter. It goes by the name of *Suffolk cheeſe*, and is much uſed at ſea; being leſs liable to be affected by the heat of warm climates than the other kinds. A great deal of difference, however, is to be obſerved in the quality of it, which our author ſuppoſes to ariſe chiefly from greater care being taken in ſome places than in others.

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Slip-coat or ſoft cheeſe is made entirely of ſlip-curd, and diſſolves into a kind of creamy liquor; which is a demonſtration of the nature of this curd, as already mentioned. It is commonly computed, that as much milk is required to make one pound of butter as two of cheeſe; and even more where the land is poor, and the paſtures afford but little cream.

635 Double Glouceſte

Beſt methods of making cheeſe in England. The double Glouceſter is a cheeſe that pleaſes almoſt every palate. The beſt of this kind is made from new, or (as it is called in that and the adjoining counties) *covered milk*. An inferior ſort is made from what is called *half-covered milk*; though when any of theſe cheeſes turn out to be good, people are deceived, and often purchaſe them for the beſt *covered milk cheeſe*: but farmers who are honeſt have them ſtamped with a piece of wood made in the ſhape of a heart, ſo that any perſon may know them.

It will be every farmer's intereſt (if he has a ſufficient number of cows) to make a large cheeſe from one meal's milk. This, when brought in warm, will be eaſily changed or turned with the runnet; but if the morning or night's milk be to be mixed with that which is freſh from the cow, it will be a longer time before it turns, nor will it change ſometimes without being heated over the fire, by which it often gets duſt or ſoot, or ſmoke, which will give the cheeſe a very diſagreeable flavour.

When the milk is turned, the whey ſhould be carefully ſtrained from the curd. The curd ſhould be broken ſmall with the hands; and when it is equally broken, it muſt be put by a little at a time into the vat, carefully breaking it as it is put in. The vat ſhould be filled an inch or more above the brim, that when the whey is preſſed out, it may not ſhrink below the brim; if it does, the cheeſe will be worth very little. But firſt, before the curd is put in, a cheeſe-cloth or ſtrainer ſhould be laid at the bottom of the vat: and this ſhould be ſo large, that when the vat is filled with the curd, the ends of the cloth may turn again over the top of it. When this is done, it ſhould be taken to the preſs, and there remain for the ſpace of two hours, when it ſhould be turned and have a clean cloth put under it and turned over as before. It muſt then be preſſed again, and remain in the preſs ſix or eight hours; when it ſhould again be turned and rubbed on each ſide with ſalt. After this it muſt be preſſed again for the ſpace of 12 or 14 hours more; when, if any of the edges project, they ſhould be pared off: it may then be put on a dry board, where it ſhould be regularly turned every day. It is a good way to have three or four holes bored round the lower part of the vat, that the whey may drain ſo perfectly from the cheeſe as not the leaſt particle of it may remain.

The prevailing opinion of the people of Glouceſterſhire and the neighbouring counties is, that the cheeſes will ſpoil if they do not ſcrape and waſh them when they are found to be mouldy. But others think that ſuffering the mould to remain mellows them, provided they are turned every day. Thoſe, however, who will have the mould off, ſhould cauſe it to be removed with a clean dry flannel, as the waſhing the cheeſes

is

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is only a means of making the mould (which is a ſpecies of fungus rooted in the coat) grow again immediately.

Some people ſcald the curd: but this is a bad and mercenary practice; it robs the cheeſe of its fatneſs, and can only be done with a view to raiſe a greater quantity of whey butter, or to bring the cheeſes forward for ſale, by making them appear older than they really are.

As moſt people like to purchaſe high coloured cheeſe, it may be right to mix a little arnotto with the milk before it is turned. No cheeſe will look yellow without it; and though it does not in the leaſt add to the goodneſs, it is perfectly innocent in its nature and effects.

636 Chedder cheeſe.

Chedder cheeſe is held in high eſteem; but its goodneſs is ſaid to be chiefly owing to the land whereon the cows feed, as the method of making it is the ſame as is purſued throughout Somerſetſhire, and the adjoining counties.

637 Cheſhire cheeſe.

Cheſhire cheeſe is much admired; yet no people take leſs pains with the runnet than the Cheſhire farmers. But their cheeſes are ſo large as often to exceed one hundred pounds weight each; to this (and the age they are kept, the richneſs of the land, and the keeping ſuch a number of cows as to make ſuch a cheeſe without adding a ſecond meal's milk) their excellence may be attributed. Indeed they ſalt the curd (which may make a difference), and keep the cheeſes in a damp place after they are made, and are very careful to turn them daily.

The following account of the mode of making this cheeſe is ſtated in the Annals of Agriculture, by Mr John Chamberlaine of Cheſter. "The proceſs of making Cheſhire cheeſe is as follows, viz. on a farm capable of keeping 25 cows, a cheeſe of about ſixty pounds weight may be daily made, in the months of May, June, and July.

"The evening's milk is kept untouched until next morning, when the cream is taken off, and put to warm in a braſs pan heated with boiling water; then one-third part of that milk is heated in the ſame manner, ſo as to bring it to the heat of new milk from the cow; (This part of the buſineſs is done by a perſon who does not aſſiſt in milking the cows during that time.) Let the cows be milked early in the morning; then the morning's new milk and the night's milk, thus prepared, are put into a large tub together with the cream; then a portion of runnet that has been put into water milk-warm the evening before is put into the tub, ſufficient to coagulate the milk; and at the ſame time, if arnotto be uſed to colour the cheeſe, a ſmall quantity, as requiſite for colouring, (or a marigold or carrot infuſion) is rubbed very fine, and mixed with the milk, by ſtirring all together; then covering it up warm, it is to ſtand about half an hour, or until coagulated; at which time it is firſt turned over with a bowl, to ſeparate the whey from the curds, and broken ſoon after with the hand and bowl into very ſmall particles; the whey being ſeparated by ſtanding ſome time, is taken from the curd, which ſinks to the bottom; the curd is then collected into a part of the tub which has a ſlip or looſe board acroſs the diameter of the bottom of it, for the ſole uſe of ſeparating them; and a board is placed thereon, with weights, from ſixty to a hundred and twenty pounds, to preſs out the whey: when it is getting into a more ſolid conſiſtence, it is cut, and turned over in ſlices ſeveral times, to extract all the whey, and then weighted as before; which operations may take up about an hour and a half. It is then taken from the tub, as near the ſide as poſſible, and broken very ſmall by hand, and ſalted, and put into a cheeſe vat, enlarged in depth by a tin hoop to hold the quantity, it being more than bulk when finally put into the preſs. Then preſs the ſide well by hand, and with a board at top well weighted; and placing wooden ſkewers round the cheeſe to the centre, and drawing them out frequently, the upper part of the cheeſe will be drained of its whey: then ſhift it out of the vat; firſt put a cloth upon the top of it, and reverſe it on the cloth into another vat, or the ſame, which vat ſhould be well ſcalded before the cheeſe is returned into it; then the top part is broken by hand down to the middle, and ſalt mixed with it, and ſkewered as before, then preſſed by hand, weighted, and all the whey extracted. This done, reverſe the cheeſe again into another vat, warmed as before, with a cloth under it; then a tin hoop or binder is put round the upper edge of the cheeſe and within the ſides of the vat, the cheeſe being firſt incloſed in a cloth, and the edges of it put within the vat.

"N. B. The cloth is of fine hemp, one yard and a half long by one yard wide. It is ſo laid, that on one ſide of the vat it ſhall be level with the ſide of it, on the other it ſhall lap over the whole of the cheeſe, and the edges put within the vat; and the tin fillet to go over the whole. All the above operations will take from ſeven in the morning till one at noon. Finally, it is put into a preſs of fifteen or twenty cwt. and ſtuck round the vat into the cheeſe with thin wire ſkewers, which are ſhifted occaſionally. In four hours more, it ſhould be ſhifted and turned, and in four hours more, the ſame, and the ſkewering continued. Next morning, let it be turned by the woman who attends the milk, and put under another or the ſame preſs, and ſo turned at night and the next morning; at noon, taken out finally to the ſalting room, there ſalt the outſide, and put a cloth binder round it. The cheeſe ſhould, after ſuch ſalting, be turned twice a-day for ſix or ſeven days, then left two or three weeks to dry, turned and cleaned every day, taken to the common cheeſe room, laid on ſtraw on a boarded floor, and daily turned until grown hard.

"The room ſhould be moderately warm; but no wind or draught of air ſhould be permitted, which generally cracks them. Some rub the outſides with butter or oil to give them a coat.

"The ſpring-made cheeſe is often ſhipped for the London market in the following autumn, and it is ſuppoſed to be much ameliorated by the heating on board the veſſel."

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638 Stilton cheeſe.

But of all the cheeſe this kingdom produces, none is more highly eſteemed than the Stilton, which is called the *Parmeſan* of England, and (except faulty) is never ſold for leſs than 1s. or 1s. 2d. per pound.

The Stilton cheeſes are uſually made in ſquare vats, and weigh from ſix to twelve pounds each cheeſe. Immediately after they are made, it is neceſſary to put them into ſquare boxes made exactly to fit them; they being ſo extremely rich, that except this precaution

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be taken they are apt to bulge out, and break aſunder. They ſhould be continually and daily turned in theſe boxes, and muſt be kept two years before they are properly mellowed for ſale.

Some make them in a net ſomewhat like a cabbage net; ſo that they appear, when made, not unlike an acorn. But theſe are never ſo good as the other, having a thicker coat, and wanting all that rich flavour, and mellowneſs which make them ſo pleaſing.

It is proper to mention that the making of theſe cheeſes is not confined to the Stilton farmers, as many others in Huntingdonſhire (not forgetting Rutland and Northamptonſhire) make a ſimilar ſort, ſell them for the ſame price, and give all of them the name of *Stilton cheeſes*.

Though theſe farmers are remarked for cleanlineſs, they take very little pains with the runnet, as they in general only cut pieces from the vell or maw, which they put into the milk, and move gently about with the hand, by which means it breaks or turns it ſo, that they eaſily obtain the curd. But if the method above deſcribed for making runnet were put in practice, they would make their cheeſe ſtill better; at leaſt they would not have ſo many faulty and unſound cheeſes; for notwithſtanding their cheeſes bear ſuch a name and price, they often find them ſo bad as not to be ſaleable; which is probably owing to their being ſo careleſs about the runnet.

It has been alleged, that as good cheeſe might be made in other counties, if people would adhere to the Stilton plan, which is this: They make a cheeſe every morning; and to this meal of new milk they add the cream taken from that which was milked the night before. This, and the age of their cheeſes, have been ſuppoſed the only reaſons why they are preferred to others; for, from the niceſt obſervation, it does not appear that their land is in any reſpect ſuperior to that of other counties.

Excellent cream cheeſes are made in Lincolnſhire, by adding the cream of one meal's milk to milk which comes immediately from the cow; theſe are preſſed gently two or three times, turned for a few days, and are then diſpoſed of at the rate of 1s. per pound, to be eaten while new with radiſhes, ſalad, &c.

Many people give ſkimmed milk to pigs; but the whey will do equally well after cheeſes are made from this milk: ſuch cheeſes will always ſell for at leaſt 2d. per pound, which will amount to a large ſum annually where they make much butter. The peaſants and many of the farmers in the north of England never eat any better cheeſe; and though they appear harder, experience hath proved them to be much eaſier of digeſtion than any new milk cheeſes. A good market may always be found for the ſale of them at Briſtol.

630 Parmeſan cheeſe.

Account of the making of Parmeſan cheeſe; by Mr Zappa of Milan: in anſwer to queries from Arthur Young, Eſq.

"Are the cows regularly fed in ſtables?"—From the middle of April, or ſooner, if poſſible, the cows are ſent to paſture in the meadows till the end of November uſually.

"Or only fed in ſtables in winter?"—When the ſeaſon is paſt, and ſnow comes, they are put into ſtables for the whole winter, and fed with hay.

"Do they remain in the paſture from morning till night, or only in hot weather?"—Between nine and ten in the morning the cows are ſent to water, and then to the paſtures, where they remain four or five hours at moſt, and at three or four o'clock are driven to the ſtables if the ſeaſon is freſh, or under porticoes if hot; where, for the night, a convenient quantity of hay is given them. Management of the Dairy.

"In what months are they kept at paſture the whole day?"—Moſtly anſwered already; but it might be ſaid, that no owner will leave his cattle, without great cauſe, in uncovered places at night. It happens only to the ſhepherds from the Alps, when they paſs, becauſe it is impoſſible to find ſtables for all their cattle.

"What is the opinion in the Lodeſan, on the beſt conduct for profit in the management of meadows?"—For a dairy farm of 100 cows, which yields daily a cheeſe weighing 70 or 75 lb. of 28 ounces, are wanted 1000 perticas of land. Of theſe about 800 are ſtanding meadows, the other 200 are in cultivation for corn and graſs fields in rotation.

"Do they milk the cows morning and evening?"—Thoſe that are in milk are milked morning and evening, with exception of ſuch as are near calving.

"One hundred cows being wanted to make a Lodeſan each day, it is ſuppoſed that it is made with the milk of the evening and the following morning; or of the morning and evening of the ſame day: how is it?"—The 100 cows form a dairy farm of a good large cheeſe; it is reckoned that 80 are in milk, and 20 with calves ſucking, or near calving. They reckon one with the other about 32 boccalis of 32 oz. of milk. Such is the quantity for a cheeſe of about 70 lb. of 28 ounces. They join the evening with the morning milk, becauſe it is freſher than if it was that of the morning and evening of the ſame day. The morning milk would be 24 hours old when the next morning the cheeſe ſhould be made.

"Do they ſkim or not the milk to make butter before they make the cheeſe?"—From the evening milk all the cream poſſible is taken away for butter, maſcarponi (cream cheeſe), &c. The milk of the morning ought to be ſkimmed ſlightly; but every one ſkims as much cream as he can. The butter is ſold on the ſpot immediately at 24 ſous: the cheeſe at about 28 ſous. The butter loſes nothing in weight: the cheeſe loſes one-third of it, is ſubject to heat, and requires expences of ſervice, attention, warehouſes, &c. before it is ſold; and a man in two hours makes 45 or 50 lb. of butter that is ſold directly. However, it is not poſſible to leave much cream in the milk to make Lodeſan cheeſe, called *grained cheeſe;* becauſe, if it is too rich, it does not laſt long, and it is neceſſary to conſume it while young and ſound.

"Is Parmeſan or Lodeſan cheeſe made every day in the year or not?"—With 100 cows it is. In winter, however, the milk being leſs in quantity, the cheeſe is of leſſer weight, but certainly more delicate.

"After gathering or uniting the milk, either ſkimmed or not, what is exactly the whole operation?"—The morning of the 3d of March 1786, I have ſeen the whole operation, having gone on purpoſe to the ſpot to ſee the whole work from beginning to end. "At 16 Italian hours, or ten in the morning, according to the

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the northern way to account hours, the ſkimming of that morning's milk, gathered only two hours before, was finiſhed. I did, meanwhile, examine the boiler or pot. At the top it was eight feet (Engliſh) diameter, or thereabout; and about five feet three inches deep, made like a bell, and narrowing towards the bottom to about two and one-half feet. They joined the cream produced that morning with the other produced by the milk of the evening before. That produced by this laſt milk was double in quantity to that of the morning milk, becauſe it had the whole night to unite, and that of the morning had only two hours to do it: in which it could not ſeparate much. Of the cream, ſome was deſtined to make maſcarponics (cream cheeſe), and they put the reſt into the machine for making butter. Out of the milk of the evening before and of that morning, that was all put together after ſkimming, they took and put into the boiler 272 boccali, and they put under it two faggots of wood; which being burnt, were ſufficient to give the milk a warmth a little ſuperior to lukewarm. Then the boiler being withdrawn from the fire, the foreman put into it the runnet, which they prepare in ſmall balls of one ounce each, turning the ball in his hand always kept in the milk entirely covered; and after it was perfectly diſſolved, he covered the boiler to keep the milk defended, that it might not ſuffer from the coldneſs of the ſeaſon, particularly as it was a windy day. I went then to look on the man that was making maſcarponies, &c. and then we went twice to examine if the milk was ſufficiently coagulated. At the 18 hours, according to the Italian clocks, or noon, the true manufactory of cheeſe began. The milk was coagulated in a manner to be taken from the boiler in pieces from the ſurface. The foreman, with a ſtick that had 18 points, or rather nine ſmall pieces of wood fixed by their middle in the end of it, and forming nine points on each ſide, began to break exactly all the coagulated milk, and did continue to do ſo for more than half an hour, from time to time examining it to ſee its ſtate. He ordered to renew the fire, and four faggots of willow branches were uſed all at once: he turned the boiler that the fire might act; and then the underman began to work in the milk with a ſtick, like the above, but only with four ſmaller ſticks at the top, forming eight points, four at each ſide, a ſpan long each point. In a quarter of an hour the foreman mixed in the boiler the proper quantity of ſaffron, and the milk was all in knobs, and finer grained than before, by the effect of turning and breaking the coagulation, or curd, continually. Every moment the fire was renewed or fed; but with a faggot only at a time, to continue it regular. The milk was never heated much, nor does it hinder to keep the hand in it to know the fineneſs of the grain, which refines continually by the ſtick-work of the underman. It is of the greateſt conſequence to mind when the grain begins to take a conſiſtence. When it comes to this ſtate, the boiler is turned from the fire, and the underman immediately takes out the whey, putting it into proper receivers. In that manner the grain ſubſides to the bottom of the boiler; and leaving only in it whey enough to keep the grain covered a little, the foreman extending himſelf as much as he can over and in the boiler, unites with his hands the grained milk, making like a body of paſte of it. Then a large piece of linen is run by him under that paſte, while another man keeps the four corners of it, and the whey is directly put again into the boiler, by which is facilitated the means of raiſing that paſte that is taken out of the boiler, and put for one quarter of an hour into the receiver where the whey was put before, in the ſame linen it was taken from the boiler; which boiler is turned again directly on the fire, to extract the maſcarpa (whey cheeſe); and is a ſecond product, eaten by poor people. After the paſte remained for a quarter of an hour in that receiver, it was taken out and turned into the wooden form called *faſſera*, without any thing elſe made than the rotundity, having neither top nor bottom. Immediately after having turned it into that round wooden form, they put a piece of wood like a cheeſe on it, putting and increaſing gradually weights on it, which ſerve to force out the remnant of the whey; and in the evening the cheeſe ſo formed is carried into the warehouſe, where, after 24 hours, they begin to give the ſalt. It remains in that warehouſe for 15 or 20 days; but in ſummer only from 8 to 12 days. Meanwhile the air and ſalt form the cruſt to it; and then it is carried into another warehouſe for a different ſervice. In the ſecond warehouſe they turn every day all the cheeſes that are not older than ſix months; and afterwards it is enough if they are only turned every 48 or 60 hours, keeping them clean, in particular, of that bloom which is inevitable to them, and which, if neglected, turns muſty, and cauſes the cheeſe to acquire a bad ſmell. The Lodeſan, becauſe it is a province watered, has a great deal of meadows, and abounds with cows, its product being moſtly in cheeſe, butter, &c. However, the province of Pavia makes a great deal of that cheeſe; and we Milaneſe do likewiſe the ſame from the ſide of Porte Toſa, Romana, Ticineſe, and Vercilino, becauſe we have fine meadows and dairy farms.

Making of Fruit-Liquors.

SECT. IX. *Making of Fruit-Liquors.*

640 Fruit-liquors.

THESE, as objects of Britiſh huſbandry, are principally two, *Cyder* and *Perry*; the manufacturing of which forms a capital branch in our fruit-counties, and of which the improvement muſt be conſidered as of great importance to the public, but particularly ſo to the inhabitants of thoſe diſtricts where theſe liquors conſtitute their common beverage.

641 Excellence of cyder and perry.

Cyder and perry, when genuine and in high perfection, are excellent vinous liquors, and are certainly far more wholeſome than many others which at preſent are in much higher eſtimation. When the muſt is prepared from the choiceſt fruit, and undergoes the exact degree of vinous fermentation requiſite to its perfection, the acid and the ſweet are ſo admirably blended with the aqueous, oily, and ſpirituous principles, and the whole ſo imbued with the grateful flavour of the rinds, and the agreeable aromatic bitter of the kernels, that it aſſumes a new character; grows lively, ſparkling, and exhilarating; and when completely mellowed by time, the liquor becomes at once highly delicious to the palate, and congenial to the conſtitution; ſuperior in every reſpect to moſt other Engliſh wines, and perhaps not inferior to many of the beſt foreign wines. Such (ſays Dr Fothergill *) would

* *Bath Papers*, vol. v. p. 343.

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would it be pronounced by all competent judges, were it not for the popular prejudice annexed to it as a cheap home-brewed liquor, and conſequently within the reach of the vulgar. To compare ſuch a liquor with the foreign fiery ſophiſticated mixtures often imported under the name of wines, would be to degrade it; for it certainly ſurpaſſes them in flavour and pleaſantneſs, as much as it excels them in wholeſomeneſs and cheapneſs. But rarely do we meet with perry or cyder of this ſuperior quality. For what is generally ſold by dealers and inn-keepers is a poor, meagre, vapid liquor, prone to the acetous fermentation, and of courſe very injurious to the conſtitution. Is it not very mortifying, after the experience of ſo many centuries, that the art of preparing thoſe ancient Britiſh liquors ſhould ſtill be ſo imperfectly underſtood as to ſeem to be in its very infancy?—That throughout the principal cyder diſtricts, the practice ſhould ſtill reſt on the moſt vague indeterminate principles, and that the excellence of the liquor ſhould depend rather on a lucky random hit, than on good management? Yet ſuch appears to be really the caſe even among the moſt experienced cyder-makers of Herefordſhire and Glouceſterſhire.

642 Art of making them not yet perfectly underſtood.

Mr Marſhall, that nice obſerver of rural affairs, in his tour† through thoſe counties (expreſsly undertaken for the purpoſe of inquiry on this ſubject), informs us, that ſcarcely two of theſe profeſſional artiſts are agreed as to the management of ſome of the moſt eſſential parts of the proceſs: That palpable errors are committed as to the time and manner of gathering the fruit—in laying it up—in neglecting to ſeparate the unſound—and to grind properly the rinds and kernels, &c.: That the method of conducting the vinous fermentation, the moſt critical part of the operation, and which ſtamps the future value of the liquor, is by no means aſcertained; while ſome promote the fermentation in a ſpacious open vat, others repreſs it by incloſing the liquor in a hogſhead, or ſtrive to prevent it altogether: That no determinate point of temperature is regarded, and that the uſe of the thermometer is unknown or neglected: That they are as little conſiſtent as to the time of racking off; and whether this ought to be done only once, or five or ſix times repeated: That for fining down the liquor, many have recourſe to that odious article, bullocks blood, when the intention might be much better anſwered by whites of eggs or iſinglaſs. And, finally that the capricious taſte of particular cuſtomers is generally conſulted, rather than the real excellence of the liquor; and conſequently that a very imperfect liquor is often vended, which tends to reduce the price, to diſgrace the vender, and to bring the uſe of cyder and perry into diſrepute.

† *Rural Econ. of Glouceſterſhire*, ii. p. 308.

643 Errors pointed out.

The art of making vinous liquors is a curious chemical proceſs; and its ſucceſs chiefly depends on a dexterous management of the vinous fermentation, beſides a cloſe attention to ſundry minute circumſtances, the theory of which is perhaps not yet fully underſtood by the ableſt chemiſts. Can we longer wonder then that ſo many errors ſhould be committed by illiterate cyder-makers, totally unverſed in the firſt principles of the chemical art? Some few, indeed, more enlightened than their brethren, and leſs bigotted to their own opinions, by dint of obſervation ſtrike out improvements, and produce every now and then a liquor of ſuperior quality, though perhaps far ſhort of excellence, yet ſtill ſufficient to ſhow what might poſſibly be accompliſhed by a ſeries of new experiments conducted on philoſophical principles. This might lead to ſucceſſive improvements, till at length our Engliſh fruit-liquors might be carried to a pitch of perfection hitherto unknown, by which the demand, both at home and abroad, would ſoon be enlarged, the prices augmented according to the quality, the value of eſtates increaſed, and the health and proſperity of theſe counties proportionably advanced. This might alſo help to point out a method of correcting the imperfections of theſe liquors; and of meliorating thoſe of a weak meagre quality, by ſafer and more effectual means than are now practiſed: and though nothing can fully compenſate the defect of ſunſhine in maturing the ſaccharine juices in unfavourable ſeaſons, yet probably ſuch liquors might, without the dangerous and expenſive method of boiling in a copper veſſel, admit of conſiderable improvement by the addition of barm or other ſuitable ferment, as yet unknown in the practice of the cyder diſtricts; or perhaps rather by a portion of rich muſt, or ſome wholeſome ſweet, as honey, ſugar-candy, or even molaſſes, added in due proportion, previous to the fermentation. In fact, it appears from a late publication *, that the Germans are known to meliorate their thin harſh wines by an addition of concentrated muſt, not by evaporation, but by freezing. By this ſimple proceſs they are made to emulate good French wines: a practice worthy of imitation, eſpecially in the northern climates.

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644 Means of improvement.

* *Hopſon's Chemiſtry.*

Cyder, as is well known, is made from apples, and *perry* from pears only. The general method of preparing both theſe liquors is very much the ſame; and under the article CYDER a deſcription will be given of the way in which thoſe fruits are gathered, ground, and preſſed. The mill is not eſſentially different from that of a common tanner's mill for grinding bark. It conſiſts of a millſtone from two and a half to four feet and a half in diameter, running on its edge in a circular ſtone trough, from nine to twelve inches in thickneſs, and from one to two tons in weight. The bottom of the trough in which this ſtone runs is ſomewhat wider than the thickneſs of the ſtone itſelf; the inner ſide of the groove riſes perpendicularly, but the outer ſpreads in ſuch a manner as to make the top of the trough ſix or eight inches wider than the bottom; by which means there is room for the ſtone to run freely, and likewiſe for putting in the fruit, and ſtirring it up while grinding. The bed of a middle-ſized mill is about 9 feet, ſome 10, and ſome 12; the whole being compoſed of two, three, or four ſtones cramped together and finiſhed after being cramped in this manner. The beſt ſtones are found in the foreſt of Dean; generally a dark reddiſh gritſtone, not calcareous; for if it were of a calcareous quality, the acid juice of the fruits would act upon it and ſpoil the liquor: a clean grained grindſtone grit is the fitteſt for the purpoſe. The runner is moved by means of an axle paſſing through the centre, with a long arm reaching without the bed of the mill, for a horſe to draw by; on the other ſide is a ſhorter arm paſſing through the centre of the ſtone, as repreſented

645 Deſcription of a cyder mill and mill-houſe.

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fented in the figure. An iron bolt, with a large head, paſſes through an eye, in the lower part of the ſwivel on which the ſtone turns, into the end of the inner arm of the axis; and thus the double motion of it is obtained, and the ſtone kept perfectly upright. There ought alſo to be fixed on the inner arm of the axis, about a foot from the runner, a cogged wheel working in a circle of cogs, fixed upon the bed of the mill. The uſe of theſe is to prevent the runner from ſliding, which it is apt to do when the mill is full; it likewiſe makes the work more eaſy for the horſe. Theſe wheels ought to be made with great exactneſs. Mr Marſhall obſerves, that it is an error to make the horſe draw by traces: "The acting point of draught (ſays he), the horſes ſhoulder, ought, for various reaſons, to be applied immediately at the end of the arm of the axis; not two or three yards before it; perhaps of a ſmall mill near one fourth of its circumference." The building in which the mill is incloſed ought to be of ſuch a ſize, that the horſe may have a path of three feet wide betwixt the mill and the walls; ſo that a middling-ſized mill, with its horſe-path, takes up a ſpace of 14 or 15 feet every way. The whole dimenſions of the mill-houſe, according to our author, to render it any way convenient, are 24 feet by 20: it ought to have a floor thrown over it at the height of ſeven feet; with a door in the middle of the front, and a window oppoſite, with the mill on one ſide and the preſs on the other ſide of the window. The latter muſt be as near the mill as convenience will allow, for the more eaſy conveying the ground fruit from the one to the other. The preſs, which is of a very ſimple conſtruction, has its bed or bottom about five feet ſquare. This ought to be made entirely either of wood or ſtone; the practice of covering it with lead being now univerſally known to be pernicious. It has a channel cut a few inches within its outer edge, to catch the liquor as it is expreſſed, and convey it to a lip formed by a projection on that ſide of the bed oppoſite to the mill; having under it a ſtone trough or wooden veſſel, ſunk within the ground, when the bed is fixed low, to receive it. The preſs is worked with levers of different lengths; firſt a ſhort, and then a moderately long one, both worked by hand; and laſtly, a bar eight or nine feet long worked by a capſtan or windlaſs. The expence of fitting up a mill-houſe is not very great. Mr Marſhall computes it from 20l. to 25l. and, on a ſmall ſcale, from 10l. to 15. though much depends on the diſtance and and carriage of the ſtone: when once fitted up it will laſt many years.

The making of the fruit-liquors under conſideration requires an attention to the following particulars. I. The fruit. II. The grinding. III. Preſſing. IV. Fermenting. V. Correcting. VI. Laying up. VII. Bottling; each of which heads is ſubdivided into ſeveral others.

646 Management of the fruit.

I. In the *management of the fruit* the following particulars are to conſidered.

1. The time of gathering; which varies according to the nature of the fruit. The early pears are fit for the mill in September; but few apples are ready for gathering before Michaelmas; though, by reaſon of accidental circumſtances, they are frequently manufactured before that time. For ſale cyder, and keeping drink, they are ſuffered to hang upon the trees till fully ripe: and the middle of October is generally looked upon to be a proper time for gathering the ſtire-apple. The criterion of a due degree of ripeneſs is the fruit falling from the tree: and to force it away before that time, in Mr Marſhall's opinion, is robbing it of ſome of its moſt valuable particles. "The harveſting of fruits (ſays he) is widely different in this reſpect from the harveſting of grain; which has the entire plant to feed it after its ſeparation from the ſoil; while fruit, after it is ſevered from the tree, is cut off from all poſſibility of a further ſupply of nouriſhment; and although it may have reached its wonted ſize, ſome of its more eſſential particles are undoubtedly left behind in the tree. Sometimes, however, the fruits which are late in ripening are apt to hang on the tree until ſpoiled by froſts; though weak watery fruits ſeem to be moſt injured in this manner; and Mr Marſhall relates an inſtance of very fine liquor being made from golden pippins, after the fruit had been frozen as hard as ice.

647 Method of gathering it.

2. The method of gathering. This, as generally practiſed, is directly contrary to the principle laid down by Mr Marſhall, viz. beating them down with long ſlender poles. An evident diſadvantage of this method is that the fruit is of unequal ripeneſs; for the apples on the ſame trees will differ many days, perhaps even weeks, in their time of coming to perfection; whence ſome part of the richneſs and flavour of the fruit will be effectually and irremediably cut off. Nor is this the only evil to be dreaded; for as every thing depends on the fermentation it has to undergo, if this be interrupted, or rendered complex by a mixture of ripe and unripe fruits, and the liquor be not in the firſt inſtance ſufficiently purged from its feculencies, it is difficult to clear the liquor afterwards. The former defect the cyder-makers attempt to remedy by a mixture of brown ſugar and brandy, and the latter by bullocks blood and brimſtone; but neither of theſe can be expected to anſwer the purpoſe very effectually. The beſt method of avoiding the inconveniences ariſing from an unequal ripening of the fruit is to go over the trees twice, once with a hook, when the fruit begins to fall ſpontaneouſly; the ſecond time, when the latter are ſufficiently ripened, or when the winter is likely to ſet in, when the trees are to be cleared with the poles above mentioned.

648 Maturing it, &c.

3. Maturing the gathering fruit. This is uſually done by making it into heaps, as is mentioned under the article CYDER: but Mr Marſhall entirely diſapproves of the practice; becauſe, when the whole are laid in a heap together, the ripeſt fruit will begin to rot before the other has arrived at that degree of artificial ripeneſs which it is capable of acquiring. "The due degree of maturation of fruit for liquor (he obſerves) is a ſubject about which men, even in this diſtrict, differ much in their ideas. The prevailing practice of gathering into heaps until the ripeſt begins to rot, is waſting the beſt of the fruit, and is by no means an accurate criterion. Some ſhake the fruit, and judge by the rattling of the kernels; others cut through the middle and judge by their blackneſs; but none of theſe appear to be a proper teſt. It is not the ſtate of the kernels but of the fleſh; not of a few individuals, but of the greater part of the prime fruits, which render the collective body

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dy fit or unfit to be ſent to the mill. The moſt rational teſt of the ripeneſs of the fruit, is that of the fleſh having acquired ſuch a degree of mellowneſs, and its texture ſuch a degree of tenderneſs, as to yield to moderate preſſure. Thus, when the knuckle or the end of the thumb can with moderate exertion be forced into the pulp of the fruit, it is deemed in a fit ſtate for grinding."

4. Preparation for the mill. The proper management of the fruit is to keep the ripe and unripe fruit ſeparate from each other: but this cannot be done without a conſiderable degree of labour; for as by numberleſs accidents the ripe and unripe fruits are frequently confounded together, there cannot be any effectual method of ſeparating them except by hand; and Mr Marſhall is of opinion, that this is one of the grand ſecrets of cyder-making, peculiar to thoſe who excel in the buſineſs; and he is ſurpriſed that it ſhould not before this time have come into common practice.

5. Mixing fruits for liquor. Our author ſeems to doubt the propriety of this practice; and informs us, that the finer liquors are made from ſelect fruits; and he hints that it might be more proper to mix liquors after they are made, than to put together the crude fruits.

649 Grinding.

II. *Grinding*, and management of the fruit when ground.

1. For the greater convenience of putting the fruit into the mill, every mill-houſe ſhould have a fruit-chamber over it, with a trap-door to lower the fruit down into the mill. The beſt manner in which this can be accompliſhed, is to have the valve over the bed of the mill, and furniſhed with a cloth ſpout or tunnel reaching down to the trough in which the ſtone moves. No ſtraw is uſed in the lofts; but ſometimes the fruit is turned. In Herefordſhire, it is generally believed, that grinding the rind and ſeeds of the fruit as well as the fleſhy part to a pulp, is neceſſary towards the perfection of the cyder; whence it is neceſſary, that every kind of pains ſhould be taken to perform the grinding in the moſt perfect manner. Mr Marſhall complains, that the cyder-mills are ſo imperfectly finiſhed by the workmen, that for the firſt *fifty years* they cannot perform their work in a proper manner. Inſtead of being nicely fitted to one another with the ſquare and chiſel, they are hewn over with a rough tool in ſuch a careleſs manner, that horſe-beans might lie in ſafety in their cavities. Some even imagine this to be an advantage, as if the fruit was more effectually and completely broken by rough than ſmooth ſtones. Some uſe fluted rollers of iron; but theſe will be corroded by the juice, and thus the liquor might be tinged. Smooth rollers will not lay hold of the fruit ſufficiently to force it through.

Another improvement requiſite in the cyder-mills is to prevent the matter in the trough from riſing before the ſtone in the laſt ſtage of grinding, and a method of ſtirring it up in the trough more effectually than can be done at preſent. To remedy the former of theſe defects, it might perhaps be proper to grind the fruit firſt in the mill to a certain degree; and then put it between two ſmooth rollers to finiſh the operation in the moſt perfect manner. It is an error to grind too much at once; as this clogs up the mill, and prevents it from going eaſily. The uſual quantity for a middle-ſized mill is a bag containing four corn buſhels; but our author had once an opportunity of ſeeing a mill in which only half a bag was put; and thus the work ſeemed to go on more eaſily as well as more quickly than when more was put in at once. The quantity put in at one time is to be taken out when ground. The uſual quantity of fruit ground in a day is as much as will make three hogſheads of perry or two of cyder.

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2. Management of the ground fruit. Here Mr Marſhall condemns in very ſtrong terms the practice of preſſing the pulp of the fruit as ſoon as the grinding is finiſhed; becauſe thus neither the rind nor ſeeds have time to communicate their virtues to the liquor. In order to extract theſe virtues in the moſt proper manner, ſome allow the ground fruit to lie 24 hours or more after grinding, and even regrind it, in order to have in the moſt perfect manner the flavour and virtues of the ſeeds and rind.

650 Preſſing, &c.

III. *Preſſing the fruit*, and management of the *reſiduum*. This is done by folding up the ground fruit in pieces of hair-cloth, and piling them up above one another in a ſquare frame or mould, and then pulling down the preſs upon them, which ſqueezes out the juice, and forms the matter into thin and almoſt dry cakes. The firſt runnings come off foul and muddy; but the laſt, eſpecially in perry, will be as clear and fine as if filtered through paper. It is common to throw away the reſiduum as uſeleſs: ſometimes it is made uſe of when dry as fuel; ſometimes the pigs will eat it, eſpecially when not thoroughly ſqueezed; and ſometimes it is ground a ſecond time with water, and ſqueezed for an inferior kind of liquor uſed for the family. Mr Marſhall adviſes to continue the preſſure as long as a drop can be drawn. "It is found (ſays he), that even by breaking the cakes of refuſe with the hands only gives the preſs freſh power over it; for though it has been preſſed to the laſt drop, a gallon or more of additional liquor may be got by this means. Regrinding them has a ſtill greater effect: In this ſtate of the materials the mill gains a degree of power over the more rigid parts of the fruits, which in the firſt grinding it could not reach. If the face of the runner and the bottom of the trough were dreſſed with a broad chiſel, and made true to each other, and a moderate quantity of reſiduum ground at once, ſcarcely a kernel could eſcape unbroken, or a drop of liquor remain undrawn."

But though the whole virtue of the fruit cannot be extracted without grinding it very fine, ſome inconvenience attends this practice, as part of the pulp thus gets through the haircloth, and may perhaps be injurious to the ſubſequent fermentation. This, however, may be in a great meaſure remedied by ſtraining the firſt runnings through a ſieve. The whole ſhould alſo be allowed to ſettle in a caſk, and drawn off into a freſh veſſel previous to the commencement of the fermentation. The reduced fruit ought to remain ſome time between the grinding and preſſing, that the liquor may have an opportunity of forming an extract with the rind and kernels: but this muſt not be puſhed too far, as in that caſe the colour of the cyder would be hurt; and the moſt judicious managers object to the pulp remaining longer than 12 hours without preſſure. "Hence (ſays our author), upon the whole, the moſt

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eligible management in this ſtage of the art appears to be this: Grind one preſsful a day; preſs and regrind the reſiduum in the evening; infuſe the reduced matter all night among part of the firſt runnings; and in the morning repreſs while the next preſsful is grinding.

651 Fermentation.

IV. *Fermentation.* The common practice is to have the liquor turned; that is, put into caſks or hogſheads immediately from the preſs, and to fill them quite full: but it is undoubtedly more proper to leave ſome ſpace empty to be filled up afterwards. No accurate experiment has been made with regard to the temperature of the air proper to be kept up in the place where the fermentation goes on. Froſt is prejudicial: but when the proceſs uſually commences, that is, about the middle of October, the liquor is put into airy ſhades, where the warmth is ſcarce greater than in the open atmoſphere; nay, the caſks are frequently expoſed to the open air without any covering farther than a piece of tile or flat ſtone over the bunghole, propped up by a wooden pin on one ſide to cauſe the rain water to run off. In a complete manufactory of fruit liquor, the fermenting room ſhould be under the ſame roof with the mill-houſe; a continuation of the preſs-room, or at leaſt opening into it, with windows or doors on every ſide, to give a free admiſſion of air into it; ſufficient defences againſt froſt; fruit-lofts over it, and vaults underneath for laying up the liquors after fermentation; with ſmall holes in the crown of the arch to admit a leathern pipe, for the purpoſe of conveying the liquors occaſionally from the one to the other.

In making of fruit-liquors, no ferment is uſed as in making of beer; though, from Mr Marſhall's account of the matter, it ſeems far from being unneceſſary. Owing to this omiſſion, the time of the commencement of the fermentation is entirely uncertain. It takes place ſometimes in one, two, or three days; ſometimes not till a week or month after turning: but it has been obſerved, that liquor which has been agitated in a carriage, though taken immediately from the preſs, will ſometimes paſs almoſt immediately into a ſtate of fermentation. The continuance of the fermentation is no leſs uncertain than the commencement of it. Liquors when much agitated, will go through it perhaps in one day; but when allowed to remain at reſt, the fermentation commonly goes on two or three days, and ſometimes five or ſix. The fermenting liquor, however, puts on a different appearance according to circumſtances. When produced from fruits improperly managed, it generally throws up a thick ſcum reſembling that of malt liquor, and of a thickneſs proportioned to the ſpecies and ripeneſs of the fruit; the riper the fruit, the more ſcum being thrown up. Perry gives but little ſcum, and cyder will ſometimes alſo do the ſame; ſometimes it is intentionally prevented from doing it.

After having remained ſome time in the fermenting veſſel, the liquor is racked or drawn off from the lees and put into freſh caſks. In this part of the operation alſo Mr Marſhall complains greatly of the little attention that is paid to the liquor. The ordinary time for racking perry is before it has done hiſſing, or ſometimes when it begins to emit fixed air in plenty. The only intention of the operation is to free the liquor from its faeces by a cock placed at a little diſtance from the bottom; after which the remainder is to be filtered through a canvas or flannel bag. This filtered liquor differs from the reſt in having a higher colour; having no longer any tendency to ferment, but on the contrary checking the fermentation of that which is racked off; and if it loſes its brightneſs, it is no longer eaſily recovered.—A freſh fermentation uſually commences after racking; and if it become violent, a freſh racking is neceſſary in order to check it; in conſequence of which the ſame liquor will perhaps be racked five or ſix times: but if only a ſmall degree of fermentation takes place, which is called *fretting*, it is allowed to remain in the ſame caſk; though even here the degree of fermentation which requires racking is by no means determined. Mr Marſhall informs us that the beſt manufacturers, however, repeat the rackings until the liquor will lie quiet, or nearly ſo; and if it be found impracticable to accompany this by the ordinary method of fermentation, recourſe muſt be had to fumigation with ſulphur, which is called *ſtumming* the caſks. For this fumigation it is neceſſary to have matches made of thick linen cloth about ten inches long, and an inch broad, thickly coated with brimſtone for about eight inches of their length. The caſk is then properly ſeaſoned, and every vent except the bunghole tightly ſtopped; a match is kindled, lowered down into the caſk, and held by the end undipped until it be well lighted, and the bung be driven in; thus ſuſpending the lighted match within the caſk. Having burnt as long as the contained air will ſupply the fire, the match dies, the bung is raiſed, the remnant of the match drawn out, and the caſk ſuffered to remain before the liquor be put into it for two or three hours, more or leſs according to the degree of power the ſulphur ought to have. The liquor retains a ſmell of the ſulphureous acid; but this goes off in a ſhort time, and no bad effect is ever obſerved to follow.

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In ſome places the liquor is left to ferment in open caſks, where it ſtands till the firſt fermentation be pretty well over; after which the froſt or yeaſt collected upon the ſurface is taken off, it being ſuppoſed that it is this yeaſt mixing with the clear liquor which cauſes it to fret after racking. The fermentation being totally ceaſed, and the lees ſubſided, the liquor is racked off into a freſh caſk, and the lees filtered as above directed. The author mentions a way of fermenting fruit-liquors in broad ſhallow vats, not leſs than five feet in diameter, and little more than two feet deep; each vat containing about two hogſheads. In theſe the liquor remains until it has done riſing, or till the fermentation has nearly ceaſed, when it is racked off without ſkimming, the critical juncture being caught before the yeaſt fall; the whole ſinking gradually together as the liquor is drawn off. In this practice alſo the liquor is ſeldom drawn off a ſecond time.

652 Different kinds of cyder.

Cyder is made of three different kinds, viz. *rough*, *ſweet*, and *of a middle richneſs*. The firſt kind being uſually deſtined for ſervants, is made with very little ceremony. "If it is but *cyder* (ſays Mr Marſhall), and has body enough to keep, no matter for the richneſs and flavour. The rougher it is, the further it will go, and the more acceptable cuſtom has rendered it not only to the workmen but to their maſters. A palate accuſtomed to rough cedar would judge the

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rough cyder of the farm-houſes to be a mixture of vinegar and water, with a little diſſolved alum to give it roughneſs." The method of producing this auſtere liquor is to grind the fruit in a crude under-ripe ſtate, and ſubject the liquor to a full fermentation.—For the ſweet liquor, make choice of the ſweeter fruits: mature them fully; and check the fermentation of the liquor.—To produce liquors of a middle richneſs, the nature of the fruit, as well as the ſeaſon in which it is matured, muſt be conſidered. The fruits to be made choice of are ſuch as yield juices capable of affording a ſufficiency both of richneſs and ſtrength; though much depends upon proper management. Open vats, in our author's opinion, are preferable to cloſe veſſels: but if caſks be uſed at all, they ought to be very large, and not filled; nor ought they to lie upon their ſides, but to be ſet on their ends with their heads out, and to be filled only to ſuch a height as will produce the requiſite degree of fermentation: but in whatever way the liquor be put to ferment, Mr Marſhall is of opinion that the operation ought to be allowed to go on freely for the firſt time; though after being racked off, any ſecond fermentation ought to be prevented as much as poſſible.

653 Of correcting or doctoring the liquors.

V. *Correcting*, provincially called *doctoring*. The imperfections which art attempts to ſupply in theſe liquors are, 1. Want of ſtrength; 2. Want of richneſs; 3. Want of flavour; 4. Want of colour and brightneſs.

The want of ſtrength is ſupplied by brandy or any other ſpirit in ſufficient quantity to prevent the acetous fermentation. The want of richneſs is ſupplied by what are generally termed *ſweets*, but prepared in a manner which our author ſays has never fallen under his notice. To ſupply the want of flavour, an infuſion of hops is ſometimes added, which is ſaid to communicate an agreeable bitter, and at the ſame time a fragrance; whence it becomes a ſubſtitute for the juices of the rind and kernels thrown away to the pigs and poultry, or otherwiſe waſted. The want of colour is ſometimes ſupplied by elder berries, but more generally by burnt ſugar, which gives the deſired colour, and a degree of bitter which is very much liked. The ſugar is prepared either by burning it on a ſalamander, and ſuffering it to drop, as it melts, into water; or by boiling it over the fire (in which caſe brown ſugar is to be uſed), until it acquire an agreeable bitter; then pouring in boiling water in the proportion of a gallon to two pounds of ſugar, and ſtir until the liquor become uniform. A pint of this preparation will colour a hogſhead of cyder. Brightneſs is obtained by a mixture of the blood of bullocks or ſheep; that of ſwine being rejected, though it does not appear to be more unfit for the purpoſe than either of the other two. The only thing neceſſary to be done here is to ſtir the blood well as it is drawn from the animal, to prevent the parts from ſeparating; and it ought to be ſtirred "both ways, for a quarter of an hour." The liquor, however, is not always in a proper condition for being refined with this ingredient: on which account a little of it ought frequently to be tried in a vial. A quart or leſs will be ſufficient for a hogſhead. After the blood is poured in, the liquor ſhould be violently agitated, to mix the whole intimately together. This is done by a ſtick ſlit into four, and inſerted into the bunghole; working it briſkly about in the liquor until the whole be thoroughly mixed. In about 24 hours the blood will be ſubſided, and the liquor ought inſtantly to be racked off; as by remaining upon the blood even for two or three days, it will receive a taint not eaſily to be got rid of. It is remarkable that this refinement with the blood carries down not only the fæces, but the colour alſo; rendering the liquor, though ever ſo highly coloured before, almoſt as limpid as water. Iſinglaſs and eggs are ſometimes made uſe of in fining cyder as well as wine.

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654 Of laying up, or caſking.

VI. The *laying up* or ſhutting up the cyder in cloſe caſks, according to Mr Marſhall, is as little underſtood as any of the reſt of the parts; the bungs being commonly put in at ſome certain time, or in ſome particular month, without any regard to the ſtate the liquor itſelf is in. "The only criterion (ſays he) I have met with for judging the critical time of laying up, is when a fine white cream-like matter firſt begins to form upon the ſurface. But this may be too late; it is probably a ſymptom at leaſt of the acetous fermentation, which if it take place in any degree muſt be injurious. Yet if the caſks be bunged tight, ſome criterion is neceſſary; otherwiſe, if the vinous fermentation have not yet finally ceaſed, or ſhould recommence, the caſks will be endangered, and the liquor injured. Hence, in the practice of the moſt cautious manager whoſe practice I have had an opportunity of obſerving, the bungs are firſt driven in lightly, when the liquor is fine, and the vinous fermentation is judged to be over; and ſome time afterward, when all danger is paſt, to fill up the caſks, and drive the bungs ſecurely with a rag, and roſin them over at top. Moſt farmers are of opinion, that after the liquor is done fermenting, it ought to have ſomething to *feed upon*; that is, to prevent it from running into the acetous fermentation. For this purpoſe ſome put in parched beans, others egg-ſhells, ſome mutton ſuet, &c. Mr Marſhall does not doubt that ſomething may be uſeful; and thinks that iſinglaſs may be as proper as any thing that can be got.

655 Bottling.

VII. *Bottling*. This depends greatly on the quality of the liquors themſelves. Good cyder can ſeldom be bottled with propriety under a year old: ſometimes not till two. The proper time is when it has acquired the utmoſt degree of richneſs and flavour in the caſks; and this it will preſerve for many years in bottles. It ought to be quite fine at the time of bottling; or if not ſo naturallly, ought to be fined artificially with iſinglaſs and eggs.

656 Of cyderkin.

The liquor, called *cyderkin*, *purre*, or *perkin*, is made of the murk or groſs matter remaining after the cyder is preſſed out. To make this liquor, the murk is put into a large vat, with a proper quantity of boiled water, which has ſtood till it be cold again: if half the quantity of water be uſed that there was of cyder, it will be good; if the quantities be equal, the cyderkin will be ſmall. The whole is left to infuſe 48 hours, and then well preſſed; what is ſqueezed out by the preſs is immediately tunned up and ſtopped; it is fit to drink in a few days. It clarifies of itſelf, and ſerves in families inſtead of ſmall beer. It will keep, if boiled, after preſſure, with a convenient quantity of hops.

657 Of cyder wine, according to Dr Ruſh's recipe.

We muſt not conclude this ſection without particular

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cular notice of the liquor called *cyder wine*, which is made from the juice of apples taken from the preſs and *boiled*, and which being kept three or four years is ſaid to reſemble Rheniſh. The method of preparing this wine, as communicated by Dr Ruſh of America, where it is much practiſed, conſiſts in evaporating in a brewing copper the freſh apple-juice till half of it be conſumed. The remainder is then immediately conveyed into a wooden cooler, and afterwards is put into a proper caſk, with an addition of yeaſt, and fermented in the ordinary way. The proceſs is evidently borrowed from what has long been practiſed on the recent juice of the grape, under the term of *vin cuit*, or boiled wine, not only in Italy, but alſo in the iſlands of the Archipelago, from time immemorial.

This proceſs has lately become an object of imitation in the cyder counties, and particularly in the weſt of England, where it is reported that many hundred hogſheads of this wine have already been made: and as it is ſaid to betray no ſign of an impregnation of copper by the uſual chemical teſts, it is conſidered as perfectly wholeſome, and is accordingly drunk without apprehenſion by the common people. Others, however, ſuſpect its innocence; whence it appeared an object of no ſmall moment to determine in ſo doubtful a matter, whether or not the liquor acquires any noxious quality from the copper in which it is boiled. With this view Dr Fothergill* made a variety of experiments; and the reſult ſeemed to afford a ſtrong preſumption that the cyder wine *does* contain a minute impregnation of copper; not very conſiderable indeed, but yet ſufficient, in the doctor's opinion, to put the public on their guard concerning a liquor that comes in ſo very "queſtionable a ſhape."

* *Bath Papers*, vol. v. p. 330.

It is a curious chemical fact, he obſerves, if it be really true, that acid liquors, while kept boiling in copper veſſels, acquire little or no impregnation from the metal, but preſently begin to act upon it when left to ſtand in the cold. Can this be owing to the agitation occaſioned by boiling, or the expulſion of the aerial acid? Atmoſpheric air powerfully corrodes copper, probably through the intervention of the aerial or rather nitrous acid, for both are now acknowledged to be preſent in the atmoſphere. But the latter is doubtleſs a much ſtronger menſtruum of copper than the former.

In the preſent proceſs the liquor is properly directed to be paſſed into a wooden cooler as ſoon as the boiling is completed. But as all acids, and even common water, acquire an impregnation and unpleaſant taſte, from ſtanding in copper veſſels in the cold, why may not the acid juice of apples act in ſome degree on the copper before the boiling commences? Add to this, that brewing coppers, without far more care and attention than is generally beſtowed on them in keeping them clean, are extremely apt to contract verdigriſe, (a rank poiſon), as appears from the blue or green ſtreaks very viſible when theſe veſſels are minutely examined. Should the unfermented juice be thought incapable of acting on the copper either in a cold or boiling ſtate, yet no one will venture to deny its power of waſhing off or diſſolving verdigriſe already formed on the internal ſurface of the veſſel. Suppoſe only one-eighth part of a grain of verdigriſe to be contained in a bottle of this wine, a quantity that may elude the ordinary teſts, and that a bottle ſhould be drunk daily by a perſon without producing any violent ſymptoms or internal uneaſineſs; yet what perſon in his ſenſes would knowingly chooſe to hazard the experiment of determining how long he could continue even this quantity of a ſlow poiſon in his daily beverage with impunity? And yet it is to be feared the experiment is but too often unthinkingly made, not only with cyder wine, but alſo with many of the foreign wines prepared by a ſimilar proceſs. For the grape juice, when evaporated in a copper veſſel, under the denomination of *vino cotto* or boiled wine, cannot but acquire an equal, if not yet ſtronger impregnation of the metal, than the juice of apples, ſeeing that verdigriſe itſelf is manufactured merely by the application of the acid huſks of grapes to plates of copper.

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Independent of the danger of any metallic impregnation, the doctor thinks, it may be juſtly queſtioned how far the proceſs of preparing boiled wines is neceſſary or reconcileable to reaſon or economy. The evaporation of them muſt by long boiling not only occaſion an unneceſſary waſte of both liquor and fuel, but alſo diſſipates certain eſſential principles, without which the liquor can never undergo a complete fermentation; and without a complete fermentation there can be no perfect wine. Hence the boiled wines are generally crude, heavy, and flat, liable to produce indigeſtion, flatulency, and diarrhœa. If the evaporation be performed haſtily, the liquor contracts a burnt empyreumatic taſte, as in the preſent inſtance; if ſlowly, the greater is the danger of a metallic impregnation. For the proceſs may be preſumed to be generally performed in a veſſel of braſs or copper, as few families poſſeſs any other that is ſufficiently capacious. Nor can a veſſel of caſt iron, though perfectly ſafe, be properly recommended for this purpoſe, as it would probably communicate a chalybeate taſte and dark colour to the liquor. At all events, braſs and copper veſſels ought to be entirely baniſhed from this and every other culinary proceſs.

Sect. X. *Of Fences.*

653 Kinds of fences enumerated.

We ſhall conclude the preſent ſubject of agriculture by taking notice of the various kinds of fences that may be found valuable in it.—Robert Somerville, Eſq. of Haddington, in a communication to the Board of Agriculture, has endeavoured to enumerate the whole ſimple and compound fences that are at preſent uſed. *Simple fences* are thoſe that conſiſt of one kind only, as a ditch, a hedge, or a wall.—*Compound fences* are made by the union of two or more of theſe, as a hedge and ditch, or hedge and wall. The following is the liſt which he has given of them:

"*Simple Fences.*

I. Simple ditch, with a bank on one ſide.
II. Double ditch, with a bank of earth between.
II. Bank of earth, with a perpendicular facing of ſod.
IV. Ha-ha, or ſunk fence.
V. Palings, or *timber fences*, of different kinds, viz.
1. Simple nailed paling of rough timber.
2. Jointed horizontal paling.
3. Upright lath paling.

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4. Horizontal paling of young firs.
5. Upright ditto of do.
6. Chain fence.
7. Net fence.
8. Rope fence.
9. Flake or hurdle fence.
10. Ozier or willow fence.
11. Fence of growing poſts.
12. Shingle fence, horizontal.
13. Ditto, upright.
14. Warped paling.
15. Open paling, warped with dead thorns or branches of trees.

VI. Dead hedges, various kinds.

VII. Live hedges.

VIII. Walls.

1. Dry ſtone wall, coped and uncoped.
2. Stone and lime ditto, do.
3. Stone and clay, do.
4. Stone and clay, harled, or daſhed with lime.
5. Dry ſtone, ditto, lipped with lime.
6. Dry ſtone, ditto, lipped and harled.
7. Dry ſtone, pirned and harled.
8. Brick walls.
9. Frame walls.
10. Galloway dike or wall.
11. Turf wall.
12. Turf and ſtone, in alternate layers.
13. Mud walls, with ſtraw.

"*Compound Fences.*

1. Hedge and ditch, with or without paling.
2. Double ditto.
3. Hedge and bank, with or without paling.
4. Hedge in the face of a bank.
5. Hedge on the top of a bank.
6. Devonſhire fence.
7. Hedge, with ſingle or double paling.
8. Hedge and dead hedge.
9. Hedge and wall.
10. Hedge, ditch, and wall.
11. Hedge in the middle of a wall.
12. Hedge and ditch, with row of trees.
13. Hedge, or hedge and wall, with belt of planting.
14. Hedge with the corners planted.
15. Reed fence, or port and rail, covered with reeds."

659 Ditches.

Of the nature of each of theſe, and the advantages attending the uſe of them, we ſhall take ſome ſhort notice. The ditch, which is one of the ſimple fences, is moſt frequently conſidered merely as an open drain intended to relieve the ſoil of ſuperfluous moiſture. It is frequently, alſo, however, made uſe of without any ſuch intention, as a fence for the confinement of cattle; but it is more frequently uſed with the double view of ſerving as a fence, and as a drain. It is made in a variety of ways, according to the object in view. If a ditch is meant to be uſed merely as a drain, the earth thrown out of it ought by no means to be formed into a bank upon the ſide of it, becauſe ſuch a practice, as formerly ſtated, when treating of draining, has a tendency to injure its utility by cutting off its communication with one ſide of the field to be drained; but when a ditch is intended to be uſed as a fence, a different rule of proceeding muſt be followed. In that caſe, the object in view will be greatly forwarded by forming the earth taken out of the ditch into a bank upon its ſide, and when added to the depth of the ditch, will form a barrier of conſiderable value. Fences.

Ditches are ſometimes formed of an uniform breadth at top and bottom. This kind of ditch is liable to many objections. After froſts and rains, its ſides are perpetually crumbling down and falling in, and if the field in which ſuch a ditch is placed have a conſiderable declivity, the bottom of the ditch will be extremely liable to be undermined by any current of water, that either permanently or caſually takes place in it; at the ſame time, ſuch ditches have been found very uſeful in low-lying clay or carſe ſoils where the country is level. From the nature of the ſoil, the ſides of the ditches in ſuch ſituations are tolerably durable. No rapid current of water can exiſt to undermine them; and, by their figure, they withdraw from the plough the ſmalleſt poſſible portion of ſurface.

Other ditches are conſtructed wide above, with a gradual ſlope from both ſides downwards. This form of a ditch is in general the beſt, where it is at all to be uſed for the drainage of the field, as the ſides are not ſo liable as in the former caſe to be excavated by the current of water. Hence it is more durable, and by diminiſhing the quantity of digging at the bottom, it is more eaſily executed.

A third kind of ditches are ſo formed as to have one ſide ſloping, and the other perpendicular. This kind of ditch partakes of the whole perfections and imperfections of the two former. It is extremely uſeful, however, in fields of which ſheep form a part of the ſtock, and where the bottom of the ditch contains a current of water; for, in ſuch caſes, when ſheep tumble into a deep ditch, whoſe ſides are pretty ſteep, they are very apt to periſh; but by making one ſide of the ditch very much ſloped, while the other approaches to the perpendicular, they are enabled to make their eſcape; while at the ſame time by the bed of the ſtream being widened, the perpendicular ſide of the ditch is leſs liable to be undermined. When the earth taken out of a ditch is formed into a bank on one ſide, a projecting vacant ſpace of ſix or eight inches ought always to be left between the bank and the ditch, to prevent the earth from tumbling in and filling up the ditch.

A double ditch, with a bank of earth between the two, formed out of the earth obtained by digging them, has many obvious advantages over the ſingle ditch, when conſidered as a fence; for the earth taken out of the two ditches, when properly laid up in the middle, will naturally become a very formidable rampart, which cattle will not readily attempt to croſs. It is alſo excellently adapted for the purpoſe of open drainage, and it ought always to be uſed upon the ſides of highways, where the adjoining lands have a conſiderable declivity towards the road. In ſuch caſes the inner ditch receives the water from the field, and prevents it from waſhing down or overflowing the road in the time of heavy rains; an inconvenience which frequently cannot otherwiſe be avoided.

660 Bank of earth.

The bank of earth, with a perpendicular facing of ſod, and a ſlope behind, is uſeful in ſome ſituations, as in making folds for the confinement of ſheep or cattle, in which caſe the front or perpendicular ſide of the bank,

Fences. bank muſt be turned inwards. It is alſo valuable on the ſides of highways to protect the adjoining fields, and alſo for fencing belts of planting, or incloſing ſtack-yards and cottages. The front of the bank is made with the turfs taken from the ſurface of the ſloping ditch, and the mound at the back with the earth taken out of it. This fence, when well executed, is ſaid to laſt a conſiderable time.

661 The ha-ha, or ſunk fence. The ha-ha, or ſunk fence, very nearly reſembles the mound of earth with the perpendicular facing of turf, with this difference, that the facing of the ha-ha is of ſtone. The height of both depends almoſt entirely upon the depth of the ditch; both of them in truth conſiſt of the kind of ditch already mentioned, of which the one ſide ſlopes while the other is perpendicular, and differ from it chiefly in this reſpect, that the perpendicular ſide is faced with turf or ſtone. The ſtone-facing is made either of dry ſtone, or of ſtone and lime. In the Agricultural Report of Cromarty, the mode of making the ſunk fence is thus deſcribed: "Upon the line where this fence is intended, begin to ſink your ditch, taking the earth from as far as eight feet outward, and throwing it up on the inſide of the lines. This ditch and bank is not made quite perpendicular, but inclining inward towards the field as it riſes; to this is built a facing of dry ſtone, four feet and a half in height, one foot and three quarters broad at bottom, and one foot at top, over which a coping of turf is laid: the ditch or ſunk part forms an excellent drain. The whole of this is performed, when the ſtones (we ſhall ſuppoſe) can be procured at a quarter of a mile's diſtance, for 6d. per yard." The principal defect of the ſunk fence conſiſts in this, that unleſs the bank at the back of it is conſiderably ſteep, or has a railing at the top, it forms a kind of ſnare on that ſide for cattle, as they muſt always be apt to tumble over it in dark nights.

662 Palings. Paling or timber fences, are in many places much uſed, though they can never be conſidered with propriety as forming permanent incloſures. Of whatever materials they are formed, their decay commences from the inſtant they are erected. This decay begins with the part of the paling that is put into the ground, which is ſpeedily rotted by the moiſture, or conſumed by worms or other animals that attack it. To guard as much as poſſible againſt this cauſe of decay, various devices have been adopted. It is a very general practice to burn the ſurface of that part of the ſtandards of the paling which is meant to be driven into the earth. It is alſo cuſtomary to cover the ſame part of the wood with a ſtrong coat of coarſe oil paint, and Lord Dundonald's coal varniſh has been recommended with this view. The points of the ſtandards that are to be fixed in the earth, ought to be dipped in the varniſh while it is boiling hot. Common tar or melted pitch have alſo been uſed with tolerable ſucceſs to defend the extremities of the ſtandards of paling. In ſome caſes where the expence could be afforded, large ſtones have been ſunk into the earth, with holes cut into them of a ſize adapted to receive the ends of the poſts of the paling. The durability of the wood in this caſe is greater, but it bears no proportion to the additional expence incurred. When poſts for paling can be obtained conſiſting of branches of trees, with the bark ſtill upon them, this natural covering enables them to remain uncorrupted for a longer period than can be accompliſhed by any artificial coating. It is no objection to this, that a part of the uncovered wood, or the bottom of the ſtake or poſt muſt be inſerted in the earth; for it is not at the bottom that ſtakes or poſts begin to decay, but at the uppermoſt place at which the earth touches them, or between the wet and the dry as it is called. Of the kinds of paling it is unneceſſary to ſay much. Fences

The ſimple nailed paling of rough timber, conſiſts of poſts or ſtakes inſerted in the earth, and croſſed with three, four, or more horizontal bars or ſlabs as they are called in Scotland. It is the moſt common of all, and is uſed to protect young hedges, or to ſtrengthen ditches when uſed as fences.

The jointed horizontal paling, conſiſts of maſſy ſquare poles drove into the earth, and having openings cut into them for the reception of the extremities of the horizontal bars. Theſe openings, however, weaken the poles much, and cauſe them ſoon to decay; but this kind of paling has a very handſome and ſubſtantial appearance.

The upright lath paling, is formed by driving ſtrong piles of wood into the earth, and croſſing theſe at top and bottom, with horizontal pieces of ſimilar ſtrength. Upon theſe laſt are nailed, at every 6 or 12 inches diſtance, laths or pieces of ſwan wood, of the ſhape and ſize of the laths uſed for the roofs of tiled houſes. This kind of paling prevents cattle from putting their heads through to crop or injure young hedges or trees.

The horizontal paling of firs, or the weedings of other young trees, does not differ from the palings already deſcribed, unleſs in this reſpect, that the materials of which it is formed, conſiſt not of timber cut down for the purpoſe, but of the thinnings of woods or belts of planting. Such palings are uſually more formidable to cattle than any other, becauſe when the lateral twigs that grow out of large branches are loped off in a coarſe manner, the branch ſtill retains a roughneſs which keeps cattle at a diſtance.

The chain horizontal fence is made by fixing ſtrong piles of wood in the earth in the direction in which the fence is to run, and fixing three chains at regular diſtances, extending horizontally from pile to pile, inſtead of croſs bars of wood. Inſtead of poſts of wood, pillars of maſon work are ſometimes uſed, and between theſe the chains are extended. A chain fence will confine horſes or cattle, but is unfit to confine ſheep or hogs. From its expenſive nature, it can only be uſed in public walks, or for ſtretching acroſs ſtreams or pieces of water, where the incloſure can be completed in no other way.

The net fence is uſed for pleaſure grounds, and inſtead of chains, as in the former caſe, it conſiſts of a ſtrong net extended between upright piles. Such a fence may be a very pretty ornament, but could be of little uſe againſt the horns of cattle.

The rope fence is conſtructed like the chain fence, and differs from it only in the uſe of cords inſtead of metal chains, and has the ſame defect of being uſeleſs againſt ſwine and ſheep.

The moveable wooden fence or ſtake, or hurdle fence, conſiſts of a kind of moveable paling, uſed for confining ſheep or cattle to a certain ſpot when feeding upon a turnip field, and in this view it is extremely uſeful;

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useful; for if the cattle were allowed to range at large over the field, a great quantity of the turnips would be deſtroyed by having pieces eaten from them, which would immediately ſpoil and rot before the remainder could be conſumed; whereas, by the uſe of theſe moveable palings, the ſheep or cattle having only a certain quantity of food allotted to them at a time, are compelled to eat it clean up without any loſs.

The oſier or willow fence, or wattled fence, is made by driving in the direction of the fence, ſtakes of willow or poplar, of half the thickneſs of a man's wriſt, into the earth, about 18 inches aſunder. They are then bound together with ſmall twigs of the willows or poplars twiſted and interwoven with them. If the upright ſtakes have been recently cut down, and if the fence is made about the end of autumn, they will take root and grow in the ſpring. If their new lateral branches are afterwards properly interwoven and twiſted together, they will become in two or three years a permanent and almoſt impenetrable fence.

The paling of growing trees, or rails nailed to growing poſts, is formed by planting beech, larch, or other trees, at the diſtance of a yard from each other, in the direction in which the fence is wanted. When 10 or 12 feet high, they muſt be cut down to ſix feet. The cutting of the tops will make them puſh out a great number of lateral branches, which may be interwoven with the upright part of the tree, as in the caſe of the willow fence already mentioned.

The horizontal and upright ſhingle fence is formed in this manner; ſtout piles are driven into the earth, and deals, of from half an inch to an inch thick, are nailed horizontally upon them in ſuch a way, that the under edge of the uppermoſt deal projects over the upper edge of the one immediately below it, like ſlates or tiles upon houſes. In like manner, the ſhingles or boards may be placed perpendicularly and bound together, by being nailed to horizontal bars of wood.

The warped paling conſiſts of pieces of wood driven into the earth, which are twiſted and interwoven with each other, ſo as to form a very open net-work; the tops of the pieces of wood being bound together by willow or other twigs.

The light open fence with thorns, or branches of trees wove into it, is nothing more than a common paling, whoſe interſtices are filled up with thorns or branches of trees. It is a very effectual fence while it laſts.

Dead hedges are made of the prunings of trees, or the tops of live hedges that have been cut down. They are ſometimes made upon the top of the mound of earth taken out of a ditch, by inſerting the thick ends of the twigs in the earth, and making them reſt in an oblique manner. Sometimes the ſtronger pieces or ſtakes are fixed in the earth, and the ſmaller twigs are uſed to faſten them together at top, by a kind of net-work. What is called the ſtake and rue fence in Scotland, conſiſts of a dead hedge or fence, formed of upright poſts, the intervals between which are filled up with twigs woven horizontally. All theſe, however, can only be regarded as fences of a very temporary nature, which are conſtantly in want of repairs, and therefore requiring a continual expence.

663 General directions for planting hedges.

Before planting live hedges, it is proper to conſider the nature of the land, and what ſorts of plants will thrive beſt in it; and alſo, what is the ſoil from whence the plants are to be taken. As for the ſize, the ſets ought to be about the thickneſs of one's little finger, and cut within about four or five inches of the ground; they ought to be freſh taken up, ſtraight, ſmooth, and well-rooted. Thoſe plants that are raiſed in the nurſery are to be preferred. Fences

In planting outſide hedges, the turf is to be laid, with the graſs-ſide downwards, on that ſide of the ditch on which the bank is deſigned to be made; and ſome of the beſt mould ſhould be laid upon it to bed the quick, which is to be ſet upon it a foot aſunder. When the firſt row of quick is ſet, it muſt be covered with mould; and when the bank is a foot high, you may lay another row of ſets againſt the ſpaces of the former, and cover them as you did the others: the bank is then to be topped with the bottom of the ditch, and a dry or dead hedge laid, to ſhade and defend the under plantation. Stakes ſhould then be driven into the looſe earth, ſo low as to reach the firm ground: theſe are to be placed at about two feet and a half diſtance: and in order to render the hedge yet ſtronger, you may edder it, that is, bind the top of the ſtakes with ſmall long poles; and when the eddering is finiſhed, drive the ſtakes anew.

664 Of managing the hawthorn

The quick muſt be kept conſtantly weeded, and ſecured from being cropped by cattle; and in February it will be proper to cut it within an inch of the ground, which will cauſe it ſtrike root afreſh, and help it much in the growth.

665 Of the crab.

The crab is frequently planted for hedges; and if the plants are raiſed from the kernels of the ſmall wild crabs, they are much to be preferred to thoſe raiſed from the kernels of all ſorts of apples without diſtinction; becauſe the plants of the true ſmall crab never ſhoot ſo ſtrong as thoſe of the apples, and may therefore be better kept within the proper compaſs of a hedge.

666 Black thorn.

The black thorn, or ſloe, is frequently planted for hedges; and the beſt method of doing it, is to raiſe the plants from the ſtones of the fruit, which ſhould be ſown about the middle of January, if the weather will permit, in the place where the hedge is intended; but when they are kept longer out of the ground, it will be proper to mix them with ſand, and keep them in a cool place. The ſame fence will do for it when ſown, as when it is planted.

667 Holly.

The holly is ſometimes planted for hedges; but where it is expoſed, there will be great difficulty in preventing its being deſtroyed: otherwiſe, it is by far the moſt beautiful plant; and, being an evergreen, will afford much better ſhelter for cattle in winter than any other ſort of hedge. The beſt method of raiſing theſe hedges, is to ſow the ſtones in the place where the hedge is intended; and, where this can be conveniently done, the plants will make a much better progreſs than thoſe that are tranſplanted: but theſe berries ſhould be buried in the ground ſeveral months before they are ſown. The way to do this, is to gather the berries about Chriſtmas, when they are uſually ripe, and put them into large flower-pots, mixing ſome ſand with them; then dig holes in the ground, into which the pots muſt be ſunk, covering them over with earth, about ten inches thick. In this place they muſt remain till the following October, when they ſhould be taken

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taken up, and ſown in the place where the hedge is intended to be made. The ground ſhould be well trenched, and cleared from the roots of all bad weeds, buſhes, trees, &c. Then two drills ſhould be made, at about a foot diſtance from each other, and about two inches deep, into which the ſeeds ſhould be ſcattered pretty cloſe, leſt ſome ſhould fail. When the plants grow up, they muſt be carefully weeded: and if they are deſigned to be kept very neat, they ſhould be cut twice a year, that is in May and in Auguſt; but if they are only deſigned for fences, they need only be ſheered in July. The fences for theſe hedges, while young, ſhould admit as much free air as poſſible; the beſt ſort are thoſe made with poſts and rails, or with ropes drawn through holes made in the poſts; and if the ropes are painted over with a compoſition of melted pitch, brown Spaniſh colour and oil, well mixed, they will laſt ſeveral years.

668 Of garden hedges.

Hedges for ornament in gardens are ſometimes planted with evergreens, in which caſe the holly is preferable to any other; next to this, moſt people prefer the yew; but the dead colour of its leaves renders thoſe hedges leſs agreeable. The laurel is one of the moſt beautiful evergreens; but the ſhoots are ſo luxuriant that it is difficult to keep it in any tolerable ſhape; and as the leaves are large, to prevent the diſagreeable appearance given them by their being cut through with the ſheers, it will be the beſt way to prune them with a knife, cutting the ſhoots juſt down to a leaf. The lauruſtinus is a very fine plant for this purpoſe; but the ſame objection may be made to this as to the laurel: this, therefore, ought only to be pruned with a knife in April when the flowers are going off; but the new ſhoots of the ſame ſpring muſt by no means be ſhortened. The ſmall-leaved and rough-leaved lauruſtinus are the beſt plants for this purpoſe. The true phillyrea is the next beſt plant for hedges, which may be led up to the height of 10 or 12 feet; and if they are kept narrow at the top, that there may be not too much width for the ſnow to lodge upon them, they will be cloſe and thick, and make a fine appearance. The ilex, or evergreen oak, is alſo planted for hedges, and is a fit plant for thoſe deſigned to grow very tall.—The deciduous plants uſually planted to form hedges in gardens are, the hornbeam, which may be kept neat with leſs trouble than moſt other plants. The beech, which has the ſame good qualities with the hornbeam; but the gradual falling of its leaves in winter cauſes a continual litter. The ſmall-leaved Engliſh elm is a proper tree for tall hedges, but theſe ſhould not be planted cloſer than eight or ten feet. The lime-tree has alſo been recommended for the ſame purpoſe; but after they have ſtood ſome years, they grow very thin at bottom, and their leaves frequently turn of a black diſagreeable colour.

669 Of flowering ſhrubs.

Many of the flowering ſhrubs have alſo been planted in hedges, ſuch as roſes, honeyſuckles, ſweet briar, &c. but theſe are difficult to train; and if they were cut to bring them within compaſs, their flowers, which are their greateſt beauty, will be entirely deſtroyed. A correſpondent of the ſociety for improving agriculture in Scotland, however, informs us, that he tried with ſucceſs the eglantine, ſweet briar, or dog-roſe, when all the methods of making hedges practiſed in Eſſex and Hampſhire had been tried in vain. His method was to gather the hips of this plant, and to lay them in a tub till March; the ſeeds were then eaſily rubbed out; after which they were ſowed in a piece of ground prepared for garden peaſe. Next year they came up; and the year after they were planted in the following manner. After marking out the ditch, the plants were laid about 18 inches aſunder upon the ſide graſs, and their roots covered with the firſt turfs that were taken off from the ſurface of the intended ditch. The earth ſide of theſe turfs was placed next to the roots, and other earth laid upon the turfs which had been taken out of the ditch. In four or five years theſe plants made a fence which neither horſes nor cattle of any kind could paſs. Even in two or three years none of the larger cattle will attempt a fence of this kind. Sheep indeed will ſometimes do ſo, but they are always entangled to ſuch a degree, that they would remain there till they died unleſs relieved. Old briars dug up and planted ſoon make an excellent fence; and, where thin, it may be eaſily thickened by laying down branches, which in one year will make ſhoots of ſix or ſeven feet. They bear clipping very well.

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670 Dr Anderſon's directions.

Dr Anderſon, who hath treated the ſubject of hedging very particularly, is of opinion, that ſome other plants beſides thoſe above mentioned might be uſefully employed in the conſtruction of hedges. Among theſe he reckons the common willow. This, he ſays, by no means requires the wetneſs of ſoil which is commonly ſuppoſed. "It is generally imagined (ſays he), that the willow can be made to thrive nowhere except in wet or boggy ground: but this is one of thoſe vulgar errors, founded upon inaccurate obſervation, too often to be met with in ſubjects relating to rural affairs; for experience has ſufficiently convinced me, that this plant will not only grow, but thrive, in any rich well cultivated ſoil (unleſs in particular circumſtances that need not here be mentioned), even although it be of a very dry nature. It could not, however, in general be made to thrive, if planted in the ſame manner as thorns; nor would it, in any reſpect, be proper to train it up for a fence in the ſame way as that plant. The willow, as a fence, could ſeldom be ſucceſsfully employed, but for dividing into ſeparate incloſures any extenſive field of rich ground: and, as it is always neceſſary to put the ſoil into as good order as poſſible before a hedge of this kind is planted in it, the eaſieſt method of putting it into the neceſſary high tilth, will be to mark off the boundaries of your ſeveral fields in the winter, or early in the ſpring, with a deſign to give a complete fallow to a narrow ridge, ſix or eight feet broad, in the middle of which the hedge is intended to be planted the enſuing winter. This ridge ought to be frequently ploughed during the ſummer ſeaſon, and in the autumn to be well manured with dung or lime, or both (for it cannot be made too rich), and be neatly formed into a ridge before winter.

* *Eſſays on Agriculture*, i. 54, &c.

671 Of the willow.

"Having prepared the ground in this manner, it will be in readineſs to receive the hedge, which ought to be planted as early in winter as can be got conveniently done; as the willow is much hurt by being planted late in the ſpring. But before you begin to make a fence of this kind, it will be neceſſary to provide a ſufficient number of plants: which will be beſt done:

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done by previouſly rearing them in a nurſery of your own, as near the field to be incloſed as you can conveniently have it; for as they are very bulky, the carriage of them would be troubleſome if they were brought from any conſiderable diſtance. The beſt kinds of willow for this uſe, are ſuch as make the longeſt and ſtrongeſt ſhoots, and are not of a brittle nature. All the large kinds of hood willows may be employed for this uſe; but there is another kind with ſtronger and more taper ſhoots, covered with a dark green bark when young, which, upon the older ſhoots, becomes of an aſh gray, of a firm texture, and a little rough to the touch. The leaves are not ſo long, and a great deal broader than thoſe of the common hoop-willow, pretty thick, and of a dark-green colour. What name this ſpecies is uſually known by, I cannot tell; but as it becomes very quickly of a large ſize at the root, and is ſtrong and firm, it ought to be made choice of for this purpoſe in preference to all other kinds that I have ſeen. The ſhoots ought to be of two or three years growth before they can be properly uſed, and ſhould never be leſs than eight or nine feet in length. Theſe ought to be cut over cloſe by the ground immediately before planting, and carried to the field at their whole length. The planter having ſtretched a line along the middle of the ridge which was prepared for their reception, begins at one end thereof, thruſting a row of theſe plants firmly into the ground, cloſe by the ſide of the line, at the diſtance of 18 or 20 inches from one another; making them all ſtant a little to one ſide in a direction parallel to the line. This being finiſhed, let him begin at the oppoſite end of the line, and plant another row in the intervals between the plants of the former row; making theſe incline as much as the others, but in a direction exactly contrary; and then, plaiting theſe baſket-ways, work them into lozenges like a net, faſtening the tops by plaiting the ſmall twigs with one another, which with very little trouble may be made to bind together very firmly. The whole, when finiſhed, aſſumes a very beautiful net-like appearance, and is even at firſt a tolerable good defence; and, as theſe plants immediately take root and quickly increaſe in ſize, it becomes, after a few years, a very ſtrong fence which nothing can penetrate. This kind of hedge I myſelf have employed; and find that a man may plant and twiſt properly about a hundred yards in a day, if the plants be laid down to his hand: and in a ſituation ſuch as I have deſcribed, I know no kind of fence which could be reared at ſuch a ſmall expence ſo quickly become a defence, and continue ſo long in good order. But it will be greatly improved by putting a plant of eglantine between each two plants of willow, which will quickly climb up and be ſupported by them; and, by its numerous prickles, would effectually preſerve the defenceleſs willow from being browſed upon by cattle.

"As it will be neceſſary to keep the narrow ridge, upon which the hedge is planted, in culture for one year at leaſt, that the plants of eglantine may not be choked by weeds, and that the roots of the willow may be allowed to ſpread with the greater eaſe in the tender mould produced by this means, it will be proper to ſtir the earth once or twice by a gentle horſe-hoe in the beginning of ſummer; and, in the month of June, it may be ſowed with turnips, or planted with cole-worts, which will abundantly repay the expence of the fallow."

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672 Of Plant hedges in expoſed ſituations, and recovering them when decayed. Vol. ii. p. 16, &c.

The ſame author alſo gives the following uſeful directions for planting hedges in ſituations very much expoſed to the weather, and recovering them when on the point of decaying. "Thoſe who live in an open uncultivated country, have many difficulties to encounter, which others who inhabit more warm and ſheltered regions never experience; and, among the difficulties, may be reckoned that of hardly getting hedges to grow with facility. For, where a young hedge is much expoſed to violent and continued guſts of wind, no art will ever make it riſe with ſo much freedom, or grow with ſuch luxuriance, as it would do in a more ſheltered ſituation and favourable expoſure.

"But although it is impoſſible to rear hedges in this ſituation to ſo much perfection as in the others, yet they may be reared even there, with a little attention and pains, ſo as to become very fine fences.

"It is adviſeable in all caſes, to plant the hedges upon the face of a bank; but it becomes abſolutely neceſſary in ſuch an expoſed ſituation as that I have now deſcribed: for the bank, by breaking the force of the wind, ſcreens the young hedge from the violence of the blaſt, and allows it to advance, for ſome time at firſt, with much greater luxuriance than it otherwiſe could have done.

"But as it may be expected ſoon to grow as high as the bank, it behoves the provident huſbandman to prepare for that event, and guard, with a wiſe forecaſt, againſt the inconvenience that may be expected to ariſe from that circumſtance.

"With this view, it will be proper for him, inſtead of making a ſingle ditch, and planting one hedge, to raiſe a pretty high bank, with a ditch on each ſide of it, and a hedge on each face of the bank; in which ſituation, the bank will equally ſhelter each of the two hedges while they are lower than it; and, when they at length become as high as the bank, the one hedge will in a manner afford ſhelter to the other, ſo as to enable them to advance with much greater luxuriance than either of them would have done ſingly.

"To effectuate this ſtill more perfectly, let a row of ſervice trees be planted along the top of the bank, at the diſtance of 18 inches from each other, with a plant of eglantine between each two ſervices. This plant will advance, in ſome degree, even in this expoſed ſituation; and by its numerous ſhoots, covered with large leaves, will effectually ſcreen the hedge on each ſide of it, which, in its turn, will receive ſome ſupport and ſhelter from them; ſo that they will be enabled to advance all together, and form, in time, a cloſe, ſtrong, and beautiful fence.

"The *ſervice* is a tree but little known in Scotland; although it is one of thoſe that ought perhaps to be often cultivated there in preference to any other tree whatever, as it is more hardy, and, in an expoſed ſituation, affords more ſhelter to other plants than almoſt any other tree I know: for it ſends out a great many ſtrong branches from the under part of the ſtem, which, in time, aſſume an upright direction, and continue to advance with vigour, and carry many leaves to the

Fences. the very bottom, almoſt as long as the tree exiſts: ſo that if it is not pruned, it riſes a large cloſe buſh, till it attains the height of a foreſt tree.

" It is of the ſame genus with the rawn-tree, and has a great reſemblance to it both in flower and fruit; its branches are more waving and pliant; its leaves undivided, broad, and round, ſomewhat reſembling the elm, but white and mealy on the under ſide. It deſerves to be better known than it is at preſent.

" But if, from the poorneſs of the ſoil in which your hedge is planted, or from any other cauſe, it ſhould ſo happen, that, after a few years, the hedge becomes ſickly, and the plants turn poor and ſtunted in appearance, the eaſieſt and only effectual remedy for that diſeaſe, is to cut the ſtems of the plants clean over, at the height of an inch or two above the ground; after which they will ſend forth much ſtronger ſhoots than they ever would have done without this operation. And if the hedge be kept free of weeds, and trained afterwards in the manner above deſcribed, it will, in almoſt every caſe, be recovered, and rendered freſh and vigorous.

" This amputation ought to be performed in autumn, or the beginning of winter; and in the ſpring, when the young buds begin to ſhow themſelves, the ſtumps ought to be examined with care, and all the buds be rubbed off, excepting one or two of the ſtrongeſt and beſt placed, which ſhould be left for a ſtem. For if the numerous buds that ſpring forth round the ſtem are allowed to ſpring up undiſturbed, they will become in a few years as weak and ſtunted as before; and the hedge will never afterwards be able to attain any conſiderable height, ſtrength, or healthfulneſs.—I have ſeen many hedges, that have been repeatedly cut over, totally ruined by this circumſtance not having been attended to in proper time.

" If the ground for ſixteen or twenty feet on each ſide of the hedge be fallowed at the time that this operation is performed, and get a thorough dreſſing with rich manures, and be kept in high order for ſome years afterwards by good culture and meliorating crops, the hedge will proſper much better than if this had been omitted, eſpecially if it had been planted on the level ground, or on the bank of a ſhallow ditch."

673 Of the black alder.

Mr Miller greatly recommends the black alder as ſuperior to any other that can be employed in moiſt ſoils. It may either be propagated by layers or truncheons about three feet long. The beſt time for planting theſe laſt is in February or the month of March. They ought to be ſharpened at their largeſt end, and the ground well looſened before they are thruſt into it, leſt the bark ſhould be torn off, which might occaſion their miſcarriage. They ſhould be ſet at leaſt two feet deep, to prevent their being blown out of the ground by violent winds after they have made ſtrong ſhoots; and they ſhould be kept clear of tall weeds until they have got good heads, after which they will require no farther care. When raiſed by laying down the branches, it ought to be done in the month of October; and by that time twelvemonth they will have roots ſufficient for tranſplantation, which muſt be done by digging a hole and looſening the earth in the place where the plant is to ſtand. The young ſets muſt be planted at leaſt a foot and a half deep; and their tops ſhould be cut off to within about nine inches of the ground; by which means they will ſhoot out many branches. This tree may be trained into very thick and cloſe hedges, to the height of 20 feet and upwards. It will thrive exceedingly on the ſides of brooks; for it grows beſt when part of its roots are in water; and may, if planted there, as is uſual for willows, be cut for poles every fifth or ſixth year. Its wood makes excellent pipes and ſtaves; for it will laſt a long time under ground or in water: and it is likewiſe in great eſtimation among plough-wrights, turners &c. as well as for making ſeveral of the utenſils neceſſary for agriculture. Its bark alſo dies a good black. Fences.

674 Of the birch.

The birch is another tree recommended by Mr Miller as proper for hedges; and in places where the young plants can be eaſily procured, he ſays that the plantation of an acre will not coſt 40 ſhillings, the after expence will not exceed 20 ſhillings: ſo that the whole will not come above three pounds. Aſh trees ought never to be permitted in hedges, both becauſe they injure the corn and graſs by their wide extended roots, and likewiſe on account of the property their leaves have of giving a rank taſte to butter made from the milk of ſuch cattle as feed upon the leaves. No aſh trees are permitted to grow in the good dairy-counties.

675 Of hedges raiſed on the top of ſtone fences.

Where there are plenty of rough flat ſtones, the fences which bound an eſtate or farm are frequently made with them. In Devonſhire and Cornwall it is common to build as it were two walls with theſe ſtones laid upon one another; firſt two and then one between: as the walls riſe they fill the intermediate ſpace with earth, beat the ſtones in flat to the ſides, which makes them lie very firm, and ſo proceed till the whole is raiſed to the intended height. Quick hedges, and even large timber trees, are planted upon theſe walls, and thrive exceeding well. Such incloſures are reckoned the beſt defence that can be had for the ground and cattle; though it can ſcarcely be ſuppoſed but they muſt be diſagreeable to the eye, and ſtand in need of frequent repairs, by the ſtones being forced out of the way by cattle. The beſt way to prevent this is to build ſuch wall in the bottom of a ditch made wide enough on purpoſe, and ſloped down on each ſide. Thus the deformity will be hid; and as the cattle cannot ſtand to face the wall ſo as to attempt to leap over it, the ſtones of which it is compoſed will be leſs liable to be beaten down. The earth taken out of the ditch may be ſpread on the adjacent ground, and its ſides planted with ſuch trees or underwood as will beſt ſuit the ſoil. By leaving a ſpace of ſeveral feet on the inſide for timber, a ſupply of that valuable commodity may be had without doing any injury to the more valuable paſture.

676 Method of conſtructing an excellent fence in graſſy places.

The following is an excellent method of making a durable and beautiful fence in graſſy places. Dig pieces of turf four or five inches thick, the breadth of the ſpade, and about a foot in length. Lay theſe turfs even by a line on one ſide, with the graſs outward, at the diſtance of ten or twelve inches within the mark at which the ditch afterwards to be dug in the ſolid ground is to begin. Then lay, in the ſame manner, but with their graſs ſides turned out the contrary way, another row of turfs, at ſuch a diſtance as to make a breadth of foundation proportioned to the intended

Fences. height of the bank. Thus, even though the ground ſhould prove defective, the bank would be prevented from giving way. A ditch may then be dug of what depth and breadth you pleaſe; or the ground may be lowered with a ſlope on each ſide; and in this caſe there will be no loſs of paſture by the fence; becauſe it may be ſowed with hay-ſeeds, and will bear graſs on both ſides. Part of the earth taken out of the ditches or ſlopes will fill the chaſm between the rows of turf, and the reſt may be ſcattered over the adjacent ground. Three, four, or more layers of turf, may be thus placed upon one another, and the interval between them filled up as before till the bank is brought to its deſired height; only obſerving to give each ſide of it a gentle ſlope for greater ſtrength. The top of this bank ſhould be about two feet and a half wide, and the whole of it filled up with earth, except a ſmall hollow in the middle to retain ſome rain. Quickſets ſhould then be planted along this top, and they will ſoon form an admirable hedge. By this means a bank four feet high, and a ſlope only two feet deep, will make, beſides the hedge, a fence ſix feet high, through which no cattle will be able to force their way: for the roots of the graſs will bind the turf ſo together, that in one year's time it will become entirely ſolid; and it will be yet much ſtronger when the roots of the quick ſhall have ſhot out among it. The only precautions neceſſary to be obſerved in making this bank are, 1. Not to make it when the ground is too dry; becauſe, if a great deal of wet ſhould ſuddenly follow, it will ſwell the earth ſo much as, perhaps, to endanger the falling of ſome of the outſide; which, however, is eaſily remedied if it ſhould happen. 2. If the ſlope be ſuch as ſheep can climb up, ſecure the young quicks, at the time of planting them, by a ſmall dead hedge, either on or near the top, on both ſides. If any of the quicks ſhould die, which they will hardly be more apt to do in this than in any other ſituation, unleſs perhaps in extremely dry ſeaſons, they may be renewed by ſome of the methods already mentioned.—Such fences will anſwer even for a park; eſpecially if we place poſts and rails, about two feet high, a little ſloping over the ſide of the bank, on or near its top: no deer can creep through this, nor even be able to jump over it. It is likewiſe one of the beſt fences for ſecuring cattle; and if the quicks on the banks be kept clipped, it will form a kind of green wall pleaſing to the eye.

677 Elms recommended. In the firſt volume of the Bath Papers we find elms recommended for fences; and the following method of raiſing them for this purpoſe is ſaid to be the beſt. When elm timber is felled in the ſpring, ſow the chips made in trimming or hewing them green, on a piece of ground newly ploughed, as you would corn, and harrow them in. Every chip which has an eye, or bud-knot, or ſome bark on it, will immediately ſhoot like the cuttings of potatoes; and the plants thus raiſed having no tap-roots, but ſhooting their fibres horizontally in the richeſt part of the ſoil, will be more vigorous, and may be more ſafely and eaſily tranſplanted, than when raiſed from ſeeds, or in any other method. The plants thus raiſed for elm fences have greatly the advantage of others; as five, ſix, and ſometimes more, ſtems will ariſe from the ſame chip; and ſuch plants, if cut down within three inches of the ground, will multiply their ſide ſhoots in proportion, and make a hedge thicker, without running to naked wood, than by any other method yet practiſed. If kept clipped for three or four years, they will be almoſt impenetrable. Fences

678 Obſervations on quick hedges. In the ſecond volume of the ſame work, we meet with ſeveral obſervations on quick hedges by a gentleman near Bridgewater. He prefers the white and black thorns to all other plants for this purpoſe; but is of opinion, that planting timber trees in them at proper intervals is a very eligible and proper method. He raiſed ſome of his plants from haws in a nurſery; others he drew up in the woods, or wherever they could be found. His banks were made flat, and three feet wide at the top, with a ſloping ſide next the ditches, which laſt were dug only two feet below the ſurface, and one foot wide at bottom. The turfs were regularly laid, with the graſs downwards, on that ſide of the ditch on which the hedge was to be raiſed, and the beſt of the mould laid at top. The ſets were ſtraight, long, ſmooth, and even growing ones planted as ſoon as poſſible after taking up. They were planted at a foot diſtance; and about every 40 feet young fruit-trees, or thoſe of other kinds, ſuch as aſh, oak, elm, beech, as the ſoil ſuited them. A ſecond row of quickſets was then laid on another bed of freſh earth at the ſame time, and covered with good mould; after which the bank was finiſhed and ſecured properly from injuries by a dead hedge well wrought together, and faſtened by ſtakes of oak-trees on the top of the bank at three feet diſtance. Wherever any of the quickſets had failed or were of a dwindling appearance, he had them replaced with freſh ones from the nurſery, as well as ſuch of the young trees as had been planted on the top of the bank; and cleared the whole from weeds. Thoſe moſt deſtructive to young hedges are the white and black bryony, bindweed, and the traveller's joy. The root of white bryony is as big as a man's leg, and runs very deep: that of black bryony often grows to 30 feet long, and with a kind of tendrils takes hold of the root of the young quick, and chokes it. This root muſt be dug very deep in order to deſtroy it. The third is ſtill more deſtructive to young quicks than the other two, overſhadowing the hedge like an arbour. Its root is ſmaller than that of the two former, but muſt be dug out very clean, as the leaſt piece left will ſend up freſh ſhoots. It is very deſtructive to hedges to allow cattle to browze upon them, which they are very apt to do; but where cattle of ſome kind muſt be allowed acceſs to them, horſes will do by far the leaſt miſchief.

679 Cyder fruit-trees recommended in hedges. With regard to the advantages ariſing from hedges, our author obſerves, that if they were of no farther uſe than as mere fences, it would be the farmer's intereſt to keep them up carefully; for the better they are, the more ſecure are his cattle and crops. But if a judicious mixture of cyder fruit-trees were planted in hedges, the profit ariſing from them only would abundantly repay the coſt of the whole without any loſs of ground. It may poſſibly be objected by ſome, that the hedges would often be hurt by the boys climbing up to get the fruit; but thoſe who make it ſhould remember, or be told, that the beſt kinds of cyder-fruit are ſo hard and auſtere at the time of their being gathered, that nobody can eat them, and even

hogs

Fences.

hogs will hardly touch them. But the greateſt benefit, where no fruit-trees are planted, ariſes from the thorns and wood which quick hedges yield for the fire and other purpoſes."

680 Method of raiſing hornbeam hedges in Germany.

The author of the Eſſays on Huſbandry recommends the hornbeam plant as one of the beſt yet known for making fences, according to the method practiſed in Germany, where ſuch fences are common. "When the German huſbandman (ſays he) erects a fence of this nature, he throws up a parapet of earth, with a ditch on each ſide, and plants his hornbeam ſets in ſuch a manner, that every two plants may be brought to interſect each other in the form of St Andrew's croſs. In that part where the two plants croſs each other, he gently ſcrapes off the bark, and binds them with ſtraw thwartwiſe. Here the two plants conſolidate in a kind of indiſſoluble knot, and puſh from thence horizontal ſtanting ſhoots, which form a ſort of living paliſado or *chevaux de friſe*; ſo that ſuch a protection may be called a rural fortification. The hedges being pruned annually, and with diſcretion, will in a few years render the fence impenetrable in every part.

681 Dr Anderſon's method of mending decayed hedges.

"It ſometimes happens (ſays Dr Anderſon) that a hedge may have been long neglected, and be in general in a healthy ſtate, but full of gaps and openings, or ſo thin and ſtraggling, as to form but a very imperfect ſort of fence. On theſe occaſions, it is in vain to hope to fill up the gaps by planting young quicks; for theſe would always be outgrown, choked, and ſtarved, by the old plants: nor could it be recovered by cutting clear over by the roots, as the gaps would ſtill continue where they formerly were. The only methods that I know of rendering this a fence are, either to mend up the gaps with dead wood, or to *plaſh* the hedge; which laſt operation is always the moſt eligible where the gaps are not too large to admit of being cured by this means.

"The operation I here call *plaſhing*, may be defined, "a wattling made of living wood." To form this, ſome ſtems are firſt ſelected, to be left as ſtakes at proper diſtances, the tops of which are all cut over at the height of four feet from the root. The ſtraggling ſide-branches of the other part of the hedge are alſo lopped away. Several of the remaining plants are then cut over, cloſe by the ground, at convenient diſtances; and the remaining plants are cut perhaps half through, ſo as to permit them to be bent to one ſide. They are then bent down almoſt to a horizontal poſition, and interwoven with the upright ſtakes, ſo as to retain them in that poſition. Care ought to be taken that theſe be laid very low at thoſe places where there were formerly gaps; which ought to be farther ſtrengthened by ſome dead ſtakes or truncheons of willows, which will frequently take root in this caſe, and continue to live. And ſometimes a plant of eglantine will be able to overcome the difficulties it there meets with, ſtrike root, and grow up ſo as to ſtrengthen the hedge in a moſt effectual manner.

"The operator begins at one end of the field, and proceeds regularly forward, bending all the ſtems in one direction, ſo that the points riſe above the roots of the others, till the whole wattling is completed to the ſame height as the uprights.

"An expert operator will perform this work with much greater expedition than one who has not ſeen it done could eaſily imagine. And as all the diagonal wattlings continue to live and ſend out ſhoots from many parts of their ſtems, and as the upright ſhoots that riſe from the ſtumps of thoſe plants that have been cut over quickly ruſh up through the whole hedge, theſe ſerve to unite the whole into one entire maſs, that forms a ſtrong, durable, and beautiful fence. Fences.

"This is the beſt method of recovering an old neglected hedge that hath as yet come to my knowledge.

"In ſome caſes it happens that the young ſhoots of a hedge are killed every winter; in which caſe it ſoon becomes dead and unſightly, and can never riſe to any conſiderable height. A remedy for this diſeaſe may therefore be wiſhed for.

"Young hedges are obſerved to be chiefly affected with this diſorder; and it is almoſt always occaſioned by an injudicious management of the hedge, by means of which it has been forced to ſend out too great a number of ſhoots in ſummer, that are thus rendered ſo ſmall and weakly as to be unable to reſiſt the ſevere weather in winter.

"It often happens that the owner of a young hedge, with a view to render it very thick and cloſe, cuts it over with the ſhears a few inches above the ground the firſt winter after planting; in conſequence of which, many ſmall ſhoots ſpring out from each of the ſtems that has been cut over:—Each of which, being afterwards cut over in the ſame manner, ſends forth a ſtill greater number of ſhoots, which are ſmaller and ſmaller in proportion to their number.

"If the ſoil in which the hedge has been planted is poor, in conſequence of this management, the branches, after a few years, become ſo numerous, that the hedge is unable to ſend out any ſhoots at all, and the utmoſt exertion of the vegetative powers enables it only to put forth leaves. Theſe leaves are renewed in a ſickly ſtate for ſome years, and at leaſt ceaſe to grow at all—the branches become covered with fog, and the hedge periſhes entirely.

"But if the ſoil be very rich, notwithſtanding this great multiplication of the ſtems, the roots will ſtill have ſufficient vigour to force out a great many ſmall ſhoots, which advance to a great length, but never attain a proportional thickneſs. And as the vigour of the hedge makes them continue to vegetate very late in autumn, the froſts come on before the tops of theſe dangling ſhoots have attained any degree of woody firmneſs, ſo that they are killed almoſt entirely by it; the whole hedge becomes covered with theſe long dead ſhoots, which are always diſagreeable to look at, and uſually indicate the approaching end of the hedge.

"The cauſes of the diſorder being thus explained, it will readily occur, that the only radical cure is amputation; which, by giving an opportunity to begin with training the hedge anew, gives alſo an opportunity of avoiding the errors that occaſioned it. In this caſe, care ought to be taken to cut the plants as cloſe to the ground as poſſible, as there the ſtems will be leſs numerous than at any greater height. And particular attention ought to be had to allow very few ſhoots to ariſe from the ſtems that have been cut over, and to guard carefully againſt ſhortening them.

"But as the roots, in the caſe here ſuppoſed, will

Fences. be very ſtrong, the ſhoots that are allowed to ſpring from the ſtems will be very vigorous, and there will be ſome danger of their continuing to grow later in the ſeaſon than they ought in ſafety to do; in which caſe, ſome part of the top of the ſhoot may perhaps be killed the firſt winter, which ought if poſſible to be prevented. This can only be effectually done by giving a check to the vegetation in autumn, ſo as to allow the young ſhoots to harden in the points before the winter approaches. If any of the leaves or branches of a tree are cut away while it is in the ſtate of vegetation, the whole plant feels the loſs, and it ſuffers a temporary check in its growth in proportion to the loſs that it thus ſuſtains. To check, therefore, the vigorous vegetation at the end of autumn, it will be prudent to chooſe the beginning of September for the time of lopping off all the ſupernumerary branches from the young hedge, and for clipping off the ſide-branches that have ſprung out from it; which will, in general, be ſufficient to give it ſuch a check in its growth at that ſeaſon, as will prevent any of the ſhoots from advancing afterwards. If the hedge is extremely vigorous, a few buds may be allowed to grow upon the large ſtumps in the ſpring, with a view to be cut off at this ſeaſon, which will tend to ſtop the vegetation of the hedge ſtill more effectually.

"By this mode of management, the hedge may be preſerved entire through the firſt winter. And as the ſhoots become leſs vigorous every ſucceſſive ſeaſon, there will be leſs difficulty in preſerving them at any future period. It will always be proper, however, to trim the ſides of a very vigorous hedge for ſome years while it is young, about the ſame ſeaſon of the year, which will tend powerfully to prevent this malady. But when the hedge has advanced to any conſiderable height, it will be equally proper to clip it during any of the winter-moths, before Candlemas."

682 Lord Kames's obſervations.

Lord Kames, in his work entitled the Gentleman Farmer, gives ſeveral directions for the raiſing and mending of hedges conſiderably different from thoſe above related. For a deer-park he recommends a wall of ſtone coped with turf, having laburnums planted cloſe to it. The heads of the plants are to be lopped off, in order to make the branches extend laterally, and interweave in the form of a hedge. The wall will prevent the deer from breaking through; and if the hedge be trained eight feet high, they will not attempt to leap over. He prefers the laburnum plant, becauſe no beaſt will feed upon it except a hare, and that only when young and the buſh tender. Therefore, no extraordinary care is neceſſary except to preſerve them from the hare for four or five years. A row of alders may be planted in front of the laburnums, which no hare nor any other beaſt will touch. The wall he recommends to be built in the following manner, as being both cheaper and more durable than one conſtructed entirely of ſtone. Raiſe it of ſtone to the height of two feet and a half from the ground, after which it is to be copped with ſod as follows. Firſt, lay on the wall, with the graſſy ſide under, ſod cut with the ſpade four or five inches deep, and of a length equal to the thickneſs of the wall. Next, cover this ſod with looſe earth rounded like a ridge. Third, prepare thin ſod, caſt with the paring ſpade, ſo long as to extend, beyond the thickneſs of the wall, two inches on each ſide. With theſe cover the looſe earth, keeping the graſſy ſide above; place them ſo much on the edge, that each ſod ſhall cover part of another, leaving only about two inches without cover: when 20 or 30 yards are thus finiſhed, let the ſod be beat with mallets by two men, one on each ſide of the wall, ſtriking both at the ſame time. By this operation, the ſod becomes a compact body that keeps in the moiſture, and encourages the graſs to grow. Laſtly, cut off the ragged ends of the ſod on each ſide of the wall, to make the covering neat and regular. The month of October is the proper ſeaſon for this operation, becauſe the ſun and wind, during ſummer, dry the ſod, and hinder the graſs from vegetating. Moiſt ſoil affords the beſt ſod. Wet ſoil is commonly too fat for binding; and, at any rate, the watery plants it produces will not thrive in a dry ſituation. Dry ſoil, on the other hand, being commonly ill bound with roots, ſhakes to pieces in handling. The ordinary way of coping with ſod, which is to lay them flat and ſingle, looks as if intended to dry the ſod and kill the graſs; not to mention that the ſoil is liable to be blown off the wall by every high wind.

683 Fence for a deer-park.

684 Advantages of a thorn hedge.

The advantages of a thorn hedge, according to our author, are, that it is a very quick grower, when planted in a proper ſoil; ſhooting up ſix or ſeven feet in a ſeaſon. Though tender, and apt to be hurt by weeds when young, it turns ſtrong, and may be cut into any ſhape. Even when old, it is more diſpoſed than other trees to lateral ſhoots; and laſtly, its prickles make it the moſt proper of all for a fence. None of theſe thorns ought to be planted in a hedge till five years of age, and it is of the utmoſt importance that they be properly trained in the nurſery. The beſt ſoil for a nurſery, his lordſhip obſerves, is between rich and poor. In the latter the plants are dwarfiſh: in the former, being luxuriant and tender, they are apt to be hurt during the ſeverity of the weather; and theſe imperfections are incapable of any remedy. An eſſential requiſite in a nurſery is free ventilation. "How common (ſays his lordſhip) is it to find nurſeries in hollow ſheltered places, ſurrounded with walls and high plantations, more fit for pine-apples than barren trees! The plants thruſt out long ſhoots, but feeble and tender: when expoſed in a cold ſituation, they decay, and ſometimes die. But there is a reaſon for every thing: the nurſeryman's view is to make profit by ſaving ground, and by impoſing on the purchaſer tall plants, for which he pretends to demand double price. It is ſo difficult to purchaſe wholeſome and well nurſed plants, that every gentleman farmer ought to raiſe plants for himſelf.

685 Of a proper nurſery for raiſing the plants.

686 Of raiſing them from the roots of old hedges.

"As thorns will grow pleaſantly from roots, I have long practiſed a frugal and expeditious method of raiſing them from the wounded roots that muſt be cut off when thorns are to be ſet in a hedge. Theſe roots, cut into ſmall parts, and put in a bed of freſh earth, will produce plants the next ſpring no leſs vigorous than what are produced from ſeed; and thus a perpetual ſucceſſion of plants may be obtained without any more ſeed. It ought to be a rule, never to admit into a hedge plants under five years old; they deſerve all the additional ſum that can be demanded for them. Young and feeble plants in a hedge are of ſlow growth; and, beſides the loſs of time, the paling neceſſary to ſecure

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Fences. secure them from cattle muſt be renewed more than once before they become a fence. A thorn hedge may be planted in every month of winter and ſpring, unleſs it be froſt. But I have always obſerved, that thorns planted in October are more healthy, puſh more vigorouſly, and fewer decay, than at any other time. In preparing the thorns for planting, the roots ought to be left as entire as poſſible, and nothing cut away but the ragged parts.

687 Proper method of planting.

"As a thorn hedge ſuffers greatly by weeds, the ground where they are planted ought to be made perfectly clean. The common method of planting, is to leave eight or nine inches along a ſide of the intended ditch, termed a *ſcarſement;* and behind the ſcarſement to lay the ſurface ſoil of the intended ditch, cut into ſquare ſods two or three inches deep, its graſſy ſurface under. Upon that ſod, whether clean or dirty, the thorns are laid, and the earth of the ditch above them. The graſs in the ſcarſement, with what weeds are in the moved earth, ſoon grow up, and require double diligence to prevent the young thorns from being choked. The following method deſerves all the additional trouble it requires. Leaving a ſcarſement as above of 10 inches, and alſo a border for the thorns, broad or narrow according to their ſize; lay behind the border all the ſurface of the intended ditch, champed ſmall with the ſpade, and upon it lay the mouldery earth that fell from the ſpade in cutting the ſaid ſurface. Cover the ſcarſement and border with the under earth, three inches thick at leaſt; laying a little more on the border to raiſe it higher than the ſcarſement, in order to give room for weeding. After the thorns are prepared by ſmoothing their ragged roots with a knife, and lopping off their heads to make them grow buſhy, they are laid fronting the ditch, with their roots on the border, the head a little higher than the root. Care muſt be taken to ſpread the roots among the ſurface-earth, taken out of the ditch, and to cover them with the mouldery earth that lay immediately below. This article is of importance, becauſe the mouldery earth is the fineſt of all. Cover the ſtems of the thorns with the next ſtratum of the ditch, leaving always an inch at the top free. It is no matter how poor this ſtratum be, as the plants draw no nouriſhment from it. Go on to finiſh the ditch, preſſing down carefully every row of earth thrown up behind the hedge, which makes a good ſolid mound impervious to rain. It is a ſafeguard to the young hedge to raiſe this mound as perpendicular as poſſible; and for that reaſon, it may be proper, in looſe ſoil, when the mound is raiſed a foot or ſo, to bind it with a row of the tough ſod, which will ſupport the earth above till it become ſolid by lying. In poor ſoil more care is neceſſary. Behind the line of the ditch the ground intended for the ſcarſement and border ſhould be ſummer fallowed, manured, and cleared of all graſs roots; and this culture will make up for the inferiority of the ſoil. In very poor ſoil, it is vain to think of planting a thorn hedge. In ſuch ground there is a neceſſity for a ſtone fence.

"The only reaſon that can be given for laying thorns as above deſcribed, is to give the roots ſpace to puſh in all directions; even upward into the mound of earth. There may be ſome advantages in this; but, in my apprehenſion, the diſadvantage is much greater of heaping ſo much earth upon the roots as to exclude not only the ſun, but the rain which runs down the ſloping bank, and has no acceſs to the roots. Inſtead of laying the thorns fronting the ditch, would it not do better to lay them parallel to it; covering the roots with three or four inches of the beſt earth, which would make a hollow between the plants and the ſloping bank? This hollow would intercept every drop of rain that falls on the bank, to ſink gradually among the roots. Why, at any rate, ſhould a thorn be put into the ground ſloping? This is not the practice with regard to any other tree; and I have heard of no experiment to perſuade me that a thorn thrives better ſloping than erect. There occurs, indeed, one objection againſt planting thorns erect, that the roots have no room to extend themſelves on that ſide where the ditch is. But does it not hold, that when, in their progreſs, roots meet with a ditch, they do not puſh onward; but, changing their direction, puſh downward at the ſide of the ditch? If ſo, theſe downward roots will ſupport the ditch, and prevent it from being mouldered down by froſt. One thing is evident without experiment, that thorns planted erect may ſooner be made a complete fence than when laid ſloping as uſual. In the latter caſe, the operator is confined to thorns that do not exceed a foot or 15 inches; but thorns five or ſix feet high may be planted erect; and a hedge of ſuch thorns, well cultivated in the nurſery, will in three years arrive to greater perfection than a hedge managed in the ordinary way will do in twice that time."

688 Of ſecuring a hedge after it is planted.

After the hedge is finiſhed, it is abſolutely neceſſary to ſecure it for ſome time from the depredations of cattle; and this is by no means an eaſy matter. "The ordinary method of a paling (ſays his lordſhip) is no ſufficient defence againſt cattle: the moſt gentle make it a rubbing poſt, and the vicious wantonly break it down with their horns. The only effectual remedy is expenſive; viz. two ditches and two hedges, with a mound of earth between them. If this remedy, however, be not palatable, the paling ought at leaſt to be of the ſtrongeſt kind. I recommend the following as the beſt I am acquainted with: Drive into the ground ſtrong ſtakes three feet and a half long, with intervals from eight to twelve inches, according to the ſize of the cattle that are to be incloſed; and all preciſely of the ſame height. Prepare plates of wood ſawed out of logs, every plate three inches broad and half an inch thick. Fix them on the head of the ſtakes with a nail driven down into each. The ſtakes will be united ſo firmly, that one cannot be moved without the whole; and will be proof accordingly againſt the rubbing of cattle. But, after all, it is no fence againſt vicious cattle. The only proper place for it is the ſide of a high road, or to fence a plantation of trees. It will indeed be a ſufficient fence againſt ſheep, and endure till the hedge itſelf becomes a fence. A fence thus completed, including thorns, ditching, wood, nails, &c. will not much exceed two ſhillings every ſix yards."

689 Of training up hedges.

His lordſhip diſcommends the ordinary method of training hedges by cutting off the top and ſhortening the lateral branches in order to make it thick and buſhy. This, as well as the method of cutting off the ſtems two or three inches above the ground, indeed produces

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produces a great number of ſhoots, and makes a very thick fence, but which becomes ſo weak when bare of leaves, that cattle break through it in every part. To determine the beſt method of proceeding in this caſe, his lordſhip made an experiment on three hedges, which were twelve years old at the time he wrote. The firſt was annually pruned at the top and ſides; the ſides of the ſecond were pruned, but not the top; and the third was allowed to grow without any pruning. The firſt, at the time of writing, was about four feet broad, and thick from top to bottom; but weak in the ſtems, and unable to reſiſt any horned beaſt: the ſecond was ſtrong in its ſtems, and cloſe from top to bottom: the third was alſo ſtrong in its ſtems, but bare of branches for two feet from the ground; the lower ones having been deprived of air and rain by the thick ſhade of thoſe above them. Hence he directs that hedges ſhould be allowed to grow till the ſtems be five or ſix inches in circumference, which will be in ten or twelve years; at which time the hedge will be fifteen feet or more in height. The lateral branches next the ground muſt be pruned within two feet of the ſtem; thoſe above muſt be made ſhorter and ſhorter in proportion to their diſtance from the ground; and at five feet high they muſt be cut cloſe to the ſtem, leaving all above full freedom of growth. By this dreſſing the hedge takes on the appearance of a very ſteep roof; and it ought to be kept in that form by pruning. This form gives free acceſs to rain, ſun, and air: every twig has its ſhare, and the whole is preſerved in vigour. When the ſtems have arrived at their proper bulk, cut them over at five feet from the ground, where the lateral branches end. This anſwers two excellent purpoſes: the firſt is to ſtrengthen the hedge, the ſap that formerly aſcended to the top being now diſtributed to the branches; the next is, that a tall hedge ſtagnates the air, and poiſons both corn and graſs near it. A hedge trained in this manner is impenetrable even by a bull.

690 Plaſhing of hedges diſcommended.

With regard to the practice of *plaſhing* an old hedge recommended by Dr Anderſon, his lordſhip obſerves that "it makes a good interim fence, but at the long run is deſtructive to the plants: and accordingly there is ſcarcely to be met with a complete good hedge where plaſhing has been long practiſed. A thorn is a tree of long life. If, inſtead of being maſſacred by plaſhing, it were raiſed and dreſſed in the way here deſcribed, it would continue a firm hedge perhaps 500 years.

691 Hedges ought to be planted on the ſide of the bank, and no trees allowed in them.

"A hedge ought never to be planted on the top of the mound of earth thrown up from the ditch. It has indeed the advantage of an awful ſituation; but being planted in bad ſoil, and deſtitute of moiſture, it cannot thrive: it is at beſt dwarfiſh, and frequently decays and dies. To plant trees in the line of the hedge, or within a few feet of it, ought to be abſolutely prohibited as a pernicious practice. It is amazing that people ſhould fall into this error, when they ought to know that there never was a good thorn hedge with trees in it. And how ſhould it be otherwiſe? An oak, a beech, an elm, grows faſter than a thorn. When ſuffered to grow in the midſt of a thorn hedge, it ſpreads its roots everywhere, and robs the thorns of their nouriſhment. Nor is this all: the tree, overſhadowing the thorns, keeps the ſun and air from them. At the ſame time, no tree takes worſe with being overſhadowed than a thorn.

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692 Of filling up gaps.

"It is ſcarcely neceſſary to mention gaps in a hedge, becauſe they will ſeldom happen where a hedge is trained as above recommended. But in the ordinary method of training, gaps are frequent, partly by the failure of plants, and partly by the treſpaſſing of cattle. The ordinary method of filling up gaps is to plant ſweet briar where the gap is ſmall, and a crab where it is large. This method I cannot approve for an obvious reaſon: a hedge ought never to be compoſed of plants which grow unequally. Thoſe that grow faſt, overtop and hurt the ſlow growers; and with reſpect, in particular, to a crab and ſweet briar, neither of them thrive under the ſhade. It is a better method to remove all the withered earth in the gap, and to ſubſtitute freſh ſappy mould mixed with ſome lime or dung. Plant upon it a vigorous thorn of equal height with the hedge, which in its growth will equal the thorns it is mixed with. In that view there ſhould be a nurſery of thorns of all ſizes, even to five feet high, ready to fill up gaps. The beſt ſeaſon for this operation is the month of October. A gap filled with ſweet briar, or a crab lower than the hedge, invites the cattle to break through and trample the young plants under foot; to prevent which, a paling raiſed on both ſides is not ſufficient, unleſs it be raiſed as high as the hedge.

693 In what caſes whins are neceſſary.

"Where a field is too poor to admit of a thorn hedge, if there be no quantity of ſtones eaſily procurable, whins are the only reſource. Theſe are commonly placed on the top of a dry earth dyke, in which ſituation they ſeldom thrive well. The following ſeems preferable. Two parallel ditches three feet wide and two deep, border a ſpace of twelve feet. Within this ſpace raiſe a bank at the ſide of each ditch with the earth that comes out of it, leaving an interval between the two banks. Sow the banks with whin ſeed, and plant a row of trees in the interval. When the whins are pretty well grown, the hedge on one of the banks may be cut down, then the other as ſoon as it becomes a fence, and ſo on alternately. While the whins are young, they will not be diſturbed by cattle, if paſſages be left to go out and in. Theſe paſſages may be cloſed up when the hedge is ſufficiently ſtrong to be a fence. A whin hedge thus managed, will laſt many years, even in ſtrong froſt, unleſs very ſevere. There are many whin hedges in the ſhire of Kincardine not ſo ſkilfully managed, and yet the poſſeſſors appear not to be afraid of froſt. Such fences ought to be extremely welcome in the ſandy grounds of the ſhire of Moray, where there is ſcarcely a ſtone to be found. The few earth fences that are there raiſed, compoſed moſtly of ſand, very ſoon crumble down."

In the fourth volume of Mr Young's Northern Tour, the author recommends the tranſplanting of old hedges, which his correſpondent Mr Beverly ſays he has tried with prodigious ſucceſs. *Annals of Agriculture*, vol. vi p. 357. ib. p 144.

694 Mr Bakewell's fences.

Mr Bakewell, we are told, is very curious in his fences, and plants his quicks in a different manner from what is common in various parts of the kingdom. He plants one row at a foot from ſet to ſet, and making his ditch, lays the earth which comes out of it to form a bank on the ſide oppoſite to the quick. In the common method, the bank is made on the quick ſide above it. Reaſons are not wanting to induce a preference of this

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this method. The plants grow only in the ſurface the earth uncovered from the atmoſphere, which muſt neceſſarily be a great advantage; whereas, in the uſual way of planting, that earth, which is always the beſt, is loaded by a thick covering obliquely of the earth out of the ditch. If the roots ſhoot in the beſt ſoil, they will be out of the reach of the influences of the air; the conſequence of which is, that they cannot have ſo large a ſpace of that earth as if ſet on the flat. The way to have a tree or a quick thrive in the beſt manner poſſible, is to ſet it on the ſurface without any ditch or trench, that cuts off half its paſture. But if a ditch is neceſſary, the next beſt way muſt of courſe be ſtill to keep it on the flat ſurface; and the worſt way to cover up that ſurface, by loading it with the dead earth out of a trench. To ſay that there are good hedges in the common method is not a concluſive argument, unleſs both were tried on the ſame ſoil and expoſure.

695 Hedges ſtony and gravelly ſoils.

In the 7th volume of the ſame work, a correſpondent, who ſigns himſelf M. M. obſerves, that notwithſtanding all the improvements that have been made in the conſtruction of hedges and fences, there are many ſoils in England, which, from their ſandy and gravelly natures, are little adapted to any of the plants in common uſe, and are therefore ſubject to all the inconveniences of dead hedges and gaps. Of this kind are all the ſandy and gravelly incloſures, which conſtitute ſo large a part of many diſtricts in the iſland. For theſe our author recommends a triple row of furze; though, notwithſtanding its advantages, he ſays it is liable to be deſtroyed by ſevere winters, contrary to the aſſertion of Lord Kames above related. "It is liable (ſays he) to be ſo completely cut off by a ſevere winter, that I have ſeen tracts of many hundred acres laid open in the ſpace of a few weeks, and reduced to as defenceleſs a ſtate as the ſurrounding waſtes. On ſuch ſoils therefore he recommends the holly; the only diſadvantage of which, he ſays, is its ſlow growth. On moſt of theſe ſoils alſo the black thorn will riſe ſpontaneouſly; and even the quick, though ſlowly, will advance to a ſufficient degree of perfection. The birch, however, he particularly recommends, as growing equally on the drieſt and on the wetteſt ſoils, propagating itſelf in ſuch numbers, that, were they not deſtroyed, all the ſandy waſtes of this kingdom would be quickly covered with them. He recommends particularly the keeping of a nurſery for ſuch plants as

696 A proper nurſery.

are commonly uſed for hedges. "I generally (ſays he) pick out a bit of barren land, and after ploughing it three or four times to bury and deſtroy the heath, I find it anſwer extremely well for a nurſery. Into this ſpot I tranſplant quick hollies, and every tree which I uſe for fences or plantations. By eſtabliſhing ſuch a nurſery, a gentleman will always be able to command a ſufficiency of ſtrong and hardy plants which will not deceive his expectations. I look upon thorns of five or ſix years old, which have been twice tranſplanted from the ſeed-bed, to be the beſt of all; but as it may be neceſſary to fill up caſual gaps in hedges that have been planted ſeveral years, a proviſion ſhould be made of plants of every age, to twelve or fourteen years old. All plants which are intended to be moved, ſhould be tranſplanted every two, or at moſt three years; without this attention, they attach themſelves ſo firmly to the ſoil as renders a ſubſequent operation dangerous. All who tranſplant quicks or hollies ought to begin their labours as early as convenient in the autumn; for I have found, by repeated experience, that neither of theſe plants ſucceed ſo well in the ſpring."

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697 Of repairing ruinous hedges.

When the fences of a tract of ground are in a very ruinous condition, it is abſolutely neceſſary to ſcour the ditches, throw up the banks, and ſecure the whole immediately by the fineſt dead fences we can procure. If there is a total want of living plants, the cultivator can do nothing but plant new hedges; but if, as is generally the caſe, the banks are furniſhed with a multitude of old ſtems, though totally unconnected as a fence, the time and labour requiſite for the intended improvement will be conſiderably abridged. All the ſtraggling branches which add no ſolidity to the fence are to be cut off; after which the reſt of the ſtems muſt be ſhortened to the height of three or four feet. The method of cutting down every thing to the ground, which is now ſo general, our author highly condemns. "Such a fence (ſays he) has within it no principle of ſtrength and connection; it is equally expoſed in every part to depredations of cattle and ſportſmen: and even ſhould it eſcape theſe, the firſt fall of ſnow will nearly demoliſh it. On the contrary, wherever theſe vegetable paliſades can be left, they are impenetrable either for man or horſe, and form ſo many points of union which ſupport the reſt."

Another method of ſtrengthening defective fences is, to bend down ſome of the lateral ſhoots in a horizontal direction, and to ſpread them along the line of the farm, like eſpalier trees in a garden. A ſingle ſtem, when it riſes perpendicularly, will not ſecure a ſpace of more than two or three feet, but when bent longitudinally, it will form a barrier at leaſt ſufficient to repel all cattle but hogs for twelve or fourteen on one ſide. By bending down, our author does not mean the common *plaſhing* method, which is very injurious to the plants; but the ſpreading two or three of the moſt convenient branches along the hedge, and faſtening them down either by pegs or tying, without injury to the ſtem, until they habitually take the propoſed direction. Thoſe who make the experiment for the firſt time will be aſtoniſhed how ſmall a number of plants may be made to fill a bank, with only trifling intervals. The birch is particularly uſeful for this purpoſe; being of ſo flexible a nature, that ſhoots of ten or twelve feet in length may be eaſily forced into a horizontal direction; and if the other ſhoots are pruned away, all the juices of the plant will be applied to nouriſh the ſelected few: by which means they will in a few years acquire all the advantages of poſts and rails, with this material difference, that inſtead of decaying, they become annually better. It is beſides the property of all inclined branches to ſend up a multitude of perpendicular ſhoots; ſo that by this horizontal inclination, if judiciouſly made, you may acquire almoſt all the advantages of the thickeſt fence; but when the ſtems are too old and brittle to bear this operation, it will be adviſable cut off all the uſeleſs ones cloſe to the ground, and next ſpring they will be ſucceeded by a number of young and vigorous ones. Select the beſt of theſe to be trained in the manner already directed, and extirpate all the reſt, to increaſe

698 Plaſhing of hedges diſcommended.

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their vigour. The ſhoots of ſuch old ſtems as have been juſt now deſcribed will attain a greater ſize in three or four years than any young ones that can be planted will do in twelve.

699 Of thickening hedges by laying down the young ſhoots.

Another method which our author has practiſed with the greateſt ſucceſs is the following. The tender ſhoots of moſt trees, if bended downwards and covered with earth, will put forth roots, and being divided from the parent ſtem at a proper time, become freſh plants; an operation well known to gardeners, under the name of *laying*. This may be as advantageous to the farmer, if he will take the very moderate trouble of laying down the young and flexible branches in his fences. Moſt ſpecies of trees, probably all, will be propagated by this method; but particularly the withy, the birch, the holly, the white thorn, and the crab, will alſo take root in this method, though more ſlowly; the latter being an excellent plant for fences, and not at all nice in the ſoil on which it grows. The advantage of laying down branches in this manner over the planting of young ones is, that when you endeavour to fill up a gap by the latter method, they advance very ſlowly, and are in danger of being ſtifled by the ſhade of the large trees; whereas, if you fortify a gap by ſpreading the branches along it in the manner juſt mentioned, and at the ſame time inſert ſome of the moſt thriving ſhoots in the ground, they will advance with all the vigour of the parent plant, and you may allow them to grow until they are ſo fully rooted as to be free from danger of ſuffocation.

700 In what caſe the cutting down of hedges is proper.

It frequently happens, that the fences of an eſtate have been neglected for many years, and exhibit nothing but ragged and deformed ſtems at great intervals. In this caſe it will be proper to cut them all off level with the ground: the conſequence of this is, that next year they will put forth a great number of ſhoots, which may be laid down in every direction, and trained for the improvement of the fence. When this operation is performed, however, it ought always to be done with an axe, and not with a ſaw; it being found that the latter inſtrument generally prevents the vegetation of the plant. All the ſhoots laid down in this manner ſhould be allowed to remain for ſeveral years, that they may be firmly rooted. Thus they will make prodigious advances; and it is to be obſerved, that the more the parent plant is diveſted of all ſuperfluous branches, the greater will be the nouriſhment tranſmitted to the ſcions.

Our author, however, is inclined to ſuſpect that the moſt perfect form of a hedge, at leaſt in all but thoſe compoſed of thorns and prickly plants, is to train up as many ſtems as will nearly touch each other. The force of every fence conſiſts chiefly in the upright ſtems: where theſe are ſufficiently near and ſtrong, the hedge reſiſts all oppoſition, and will equally repel the violence of the bull, and the inſidious attacks of the hogs. It is abſolutely proper that all hedges ſhould be inſpected once a-year; when not only the ditch ought to be thrown out, and the bank ſupported, but the ſtraggling ſhoots of all the live plants ought to be pruned. By theſe are meant all ſuch as project over the ditch beyond the line of the hedge, and which add nothing to its ſtrength, though they deprive the uſeful ſtems of part of their nouriſhment. Where a hedge is compoſed of plants of inferior value, it will be proper to train thoſe in the manner juſt now recommended, and to plant the bank with quick or holly. When theſe laſt have attained a ſufficient ſize, the others may be extirpated; which is beſt done by cutting down all the ſhoots repeatedly in the ſummer, and leaving the roots to rot in the hedge.

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701 Mr Erſkine's method of conſtructing hedges.

In the 13th volume of the Annals, W. Erſkine, Eſq. gives an account of a method of fencing very much reſembling that recommended by Lord Kames, and which has been already deſcribed. That gentleman is of opinion, that in ſome caſes *dead ſtone-walls*, as they are called, are more advantageous than hedges. "That hedges (ſays he) are more ornamental, cannot be denied; and they are generally allowed to afford more ſhelter: but the length of time, the conſtant attention, and continual expence of defending them until they bear even the reſemblance of a fence, induces many people in thoſe places where the materials are eaſily procured, to prefer the dry ſtone walls; for though the firſt coſt is conſiderable, yet as the farmer reaps the immediate benefit of the fence (which is undoubtedly the moſt ſecure one), they are thought on the whole to be the leaſt expenſive; beſides, the cattle in expoſed ſituations, and eſpecially in theſe northern parts, are ſo impatient of confinement at the commencement of the long, cold, wet nights, that no hedges I have ever yet ſeen, in any part of this iſland, are ſufficient to keep them in."

From conſiderations of this kind, the late Sir George Suttie of Eaſt Lothian was induced to think of a fence which might join the ſtrength of the wall to the ornament of the hedge. His thorns were planted in the uſual manner on the ſide of the ditch: but inſtead of putting behind them a poſt and rail or paling on the top of the bank, he erected a wall two feet and a half high; and being well ſituated for procuring lime, he uſed it in the conſtruction of theſe walls which Mr Erſkine greatly recommends; "as the ſatisfaction they afford, by requiring no repairs, and the duration of them, more than repay the expence: but where the price of lime is high they may be built without any cement, and anſwer the purpoſe very well if the work is properly executed."

In making a new fence of this kind, the ſurface of the ground ſhould be pared off the breadth of the ditch, and likewiſe for two feet more, in order to prevent as much as poſſible the thorns from being injured by the growth of graſs and weeds. The ditch ſhould be five feet broad, two and a half in depth, and one foot broad at the bottom. Leave one foot for an edging or ſcarſement, then dig the earth one ſpit of a ſpade for about one foot, and put about three inches of good earth below the thorn, which ſhould be laid nearly horizontal, but the point rather inclining upwards, in order to let the rain drip to the roots; then add a foot of good earth above it: leave three or four inches of a ſcarſement before another thorn is planted; it muſt not be directly over the lower one, but about nine inches or a foot to one ſide of it: then throw a foot of good earth on the thorn, and trample it well down, and level the top of the bank for about three feet and a half for the baſe of the wall to reſt on. This baſe ſhould be about nine or ten inches, but muſt not

exceed

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Warmth is undoubtedly extremely beneficial to hedges; and the walls give an effectual ſhelter, which in expoſed ſituations is abſolutely neceſſary for rearing young hedges; and they likewiſe preſerve a proper degree of moiſture about the roots. If the hedges have been planted for ſix or ſeven years before the wall is built, cut them over to two or three inches above the ground with a ſharp tool, either in October or November, or early in the ſpring; and erect the wall as quickly in that ſeaſon as poſſible (the ſpring in this country can ſcarcely be ſaid to begin till the end of March). It is almoſt impoſſible to imagine the rapidity with which hedges grow in favourable ſituations. Mr Erſkine had one cut over in the ſpring, and by the end of the year it was almoſt as high as the wall. In three years he ſuppoſed, that not even the Highland ſheep, who eaſily overleap a wall of four feet and a half in height, would have been able to break through it.

702 Reaſons for planting oak trees in hedges.

Notwithſtanding the reaſons that have been given already againſt the planting of timber trees in hedges, we find the practice recommended by ſome authors as one of the beſt ſituations for raiſing ſhip-timber. The reaſons are, that the roots have free range in the adjoining incloſures, and the top is expoſed to the exerciſe of the winds; by which means the trees are at once enabled to throw out ſtrong arms, and have a large ſpreading head at the ſame time; ſo that we thus at once obtain quickneſs of growth with ſtrength and crookedneſs of timber. Well trained timber trees it is alleged are not prejudicial to hedges, though pollards and low ſpreading trees are deſtructive to the hedge-wood which grows under them; neither are high trees prejudicial to corn-fields like high hedges and pollards, which prevent a proper circulation of air; and in Norfolk, where the cultivation of grain is carried on in great perfection, ſuch lands are ſaid to be *wood-bound*. But when a hedge is trimmed down to four or five feet high, with oaks interſperſed, a circulation of air is rather promoted than retarded by it: and a trimmed hedge will thrive quite well under tall ſtemmed trees, particularly oaks. For arable incloſures, therefore, hedges are recommended of four or five feet high, with oak-timbers from 15 to 25 feet ſtem. Higher hedges are more eligible for graſs-lands: the graſſes affect warmth, by which their growth is promoted, and conſequently their quantity is increaſed, though perhaps their quality may ſuffer ſome injury. A tall fence likewiſe affords ſhelter to cattle, provided it be thick and cloſe at the bottom; but otherwiſe, by admitting the air in currents, it does rather harm than good. The ſhade of trees is equally friendly to cattle in ſummer: for which reaſon it is recommended in graſs incloſures to allow the hedge to make its natural ſhoots, and at the ſame time to have oak-trees planted in it at proper intervals. Upon bleak hills, and in expoſed ſituations, it will be proper to have two or even three rows of hedge-wood, about four feet diſtant from each other; the middle row being permitted to reach, and always to remain at, its natural height: whilſt the ſide rows are cut down alternately to give perpetual ſecurity to the bottom, and afford a conſtant ſupply of materials for dead hedges and other purpoſes of underwood.

703 Beſt method of planting and raiſing holly for hedges.

Much has been ſaid of the excellency of the holly as a material for hedges; and indeed the beauty of the plant, with its extreme cloſeneſs, and continuing green throughout the winter, evidently give it the preference to all others; and could it be raiſed with equal eaſe, there is no doubt that it would come into univerſal practice. Beſides the above properties, the holly will thrive almoſt upon any ſoil; but thin-ſoiled ſtony heights ſeem to be its natural ſituation; and it may properly enough be ſaid, that holly will grow wherever corn will. Its longevity is likewiſe exceſſive; and being of ſlow growth, it does not *ſuck the land*, as the farmers expreſs it, or deprive the crop of its nouriſhment, as other hedges do. The difficulty of raiſing holly may be obviated by planting it under crabs, which have a tendency to grow more upright than hawthorns, and conſequently affording more air, will not impede its progreſs though they afford ſhelter. It may even be raiſed alone without any great difficulty; only in this caſe the dead fence, to ſecure it, muſt be kept up at leaſt ten or twelve years, inſtead of ſix or ſeven, as in the other caſe; and indeed, conſidering the advantages to be derived from fences of this kind, they ſeem to merit all the additional trouble requiſite.

The holly may be raiſed either under the crab or hawthorn in two ways, viz. by ſowing the berries when the quick is planted, or by inſerting the plants themſelves the enſuing midſummer. The former is by much the more ſimple, and perhaps upon the whole the better method. The ſeeds may either be ſcattered among the roots of the deciduous plants, or be ſown in a drill in front: and if plants of holly

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be put in, they may either be planted between thoſe of the crab, or otherwiſe in front in the quincunx manner.

704 Hedges of whins or furze.

"Whins (furze) have been often employed, ſays Dr Anderſon, as a fence when ſown upon the top of a bank. They are attended with the convenience of coming very quickly to their perfection, and of growing upon a ſoil on which few other plants could be made to thrive: but in the way that they are commonly employed, they are neither a ſtrong nor a laſting fence. The firſt of theſe defects may, in ſome meaſure, be removed, by making the bank upon which they are ſowed (for they never ſhould be tranſplanted) of a conſiderable breadth; in order that the largeneſs of the aggregate body, conſidered as one maſs, may, in ſome meaſure, make up for the want of ſtrength in each individual plant. With this view, a bank may be raiſed of five or ſix feet in breadth at the top, with a large ditch on each ſide of it; raiſing the bank as high as the earth taken from the ditches will permit; the ſurface of which ſhould be ſowed pretty thick with whin ſeeds. Theſe will come up very quickly: and in two or three years will form a barrier that few animals will attempt to break through, and will continue in that ſtate of perfection for ſome years. But the greateſt objection to this plant as a fence is, that, as it advances in ſize, the old prickles always die away; there being never more of theſe alive at any time upon the plant, than thoſe that have been the produce of the year immediately preceding: and theſe thus gradually falling away, leave the ſtems naked below as they advance in height; ſo that it very ſoon becomes an exceeding poor and unſightly fence; the ſtems being entirely bare, and ſo ſlender withal as not to be able to make a ſufficient reſiſtance to almoſt any animal whatever. To remedy this great defect, either of the two following methods may be adopted. The firſt is to take care to keep the bank always ſtored with young plants; never allowing them to grow to ſuch a height as to become bare below: and it was principally to admit of this, without loſing at any time the uſe of the fence, that I have adviſed the bank to be made of ſuch an unuſual breadth. For if one ſide of the hedge be cut quite cloſe to the bank, when it is only two or three years old, the other half will remain as a fence till that ſide become ſtrong again; and then the oppoſite ſide may be cut down in its turn; and ſo on alternately as long as you may incline: by which means the bank will always have a ſtrong hedge upon it without ever becoming naked at the root. And as this plant, when bruiſed, is one of the moſt valuable kinds of winter food yet known for all kinds of domeſtic animals, the young tops may be carried home and employed for that purpoſe by the farmer; which will abundantly compenſate for the trouble of cutting, and the waſte of ground that is occaſioned by the breadth of the bank.

"The other method of preſerving a hedge of whins from turning open below, can only be practiſed where ſheep are kept: but may be there employed with great propriety. In this caſe it will be proper to ſow the ſeeds upon a conical bank of earth, ſhoved up from the ſurface of the ground on each ſide without any ditches. If this is preſerved from the ſheep for two or three years at firſt, they may then be allowed free acceſs to it; and, as they can get up cloſe to the foot of the bank upon each ſide, if they have been accuſtomed to this kind of food, they will eat up all the young ſhoots that are within their reach, which will occaſion them to ſend out a great many lateral ſhoots: and theſe being continually browſed upon, ſoon become as cloſe as could be deſired, and are then in no ſort of danger of becoming naked at the root, although the middle part ſhould advance to a conſiderable height. Fences.

Where furze or whins are to be uſed either as a fence by themſelves, or in aſſiſtance to another, it is perhaps more proper to uſe the French ſeed than that produced in Great Britain, as the former ſeldom ripens in this country, and conſequently cannot like the latter overrun the adjacent incloſure. It may be had at the ſeed-ſhops in London for about 15d. per pound, and one pound will ſow 40 ſtatute roods. When uſed as an aſſiſtant to a hedge, it is more proper to ſow it on the back of the bank than on the top of it; as in this caſe it is more apt to overhang the young plants in the face of the bank; whilſt in the other it is better ſituated for guarding the bank, and preventing it from being torn down by cattle. The method of ſowing is as follows: Chop a drill with a ſharp ſpade about two-thirds of the way up the back of the bank, making the cleft gape as wide as may be without breaking off the lip; and having the ſeed in a quart bottle, ſtopped with a cork and gooſe quill, or with a perforated wooden ſtopper, trickle it along the drill, covering it by means of a broom drawn gently above and over the mouth of the drill. Cloſing the drill with the back of the ſpade, ſhuts up the ſeeds too much from the air, and thus keeps them too long from riſing.

705 Gooſeberry hedge.

We do not know that any perſon has yet attempted to make uſe of the gooſeberry for the purpoſe of making hedges, though few plants ſeem better adapted for that purpoſe. It grows readily. Some varieties of it riſe to a conſiderable height, and by the ſtrength and number of its prickles, it would effectually prevent any animal from breaking through.—It is ſaid that ſome ſpecies of the mulberry not only grow and thrive in England, but are capable of being reared to perfection in Scotland, as has been experienced at Dalkeith. As the leaves of this plant are the food of the ſilk-worm, which produces the moſt beautiful and valuable of all the materials that can occupy the loom, it is perhaps worthy of attention how far it might be worth while to rear it as a fence in hedge-rows with a view to its becoming the baſis of a valuable manufacture.

706 Fences of ſtone walls.

Dry ſtone walls are ſometimes erected of thoſe round and apparently water-worn ſtones which the plough throws out, and which may be gathered in every field. They are uſually coped with ſod. This, however, is a very indifferent fence. In moſt inſtances it is erected by common labourers, and is therefore ill conſtructed, ſo as not even to be of an uniform thickneſs from top to bottom. The round figure of the ſtones alſo prevents the building from being well bound together. Even the cattle rubbing themſelves againſt it are apt to make conſiderable gaps, which render conſtant attention neceſſary to keep it in repair. It is cheaply executed, however, and affords the means of at once fencing the land and clearing it of ſtones. When dry ſtone walls are ſkillfully built by

Fences. by maſons, and made with quarried ſtones finiſhed with a good coping, they look well and laſt for many years; but the coping ought to be of ſtone and not of turf or mud.

To render ſtone and lime walls valuable as fences, they ſhould have a broad baſe, and have a foundation ſufficiently deep to prevent their being injured by the looſening of the ſoil which is produced by froſt. This fence is very durable, but it is alſo very expenſive. To be in perfection, it ought to be executed not with common ſtones gathered from the fields, but with ſtones from the quarry: It ought to be ſecured at the top with a coping of ſtone of the flag kind laid together in ſuch a way as to render the wall narrow at top like the roof of a houſe. If the coping is neglected, the moiſture ſoon finds its way into the heart of the wall, and it is alſo liable to various accidents from idle perſons climbing over it.

707 The Galloway dike. The Galloway dike owes its name to the county in which it was firſt uſed. It conſiſts of a broad building of dry ſtones tapering upwards. Large flat ſtones are then laid on like a coping, and project over the wall on each ſide. Above theſe ſtones large rugged round ſtones are laid, and ſmaller ſtones above theſe, ſo as to admit a free paſſage to the winds which whiſtle through them. The Galloway dike is never raiſed very high, but its tottering appearance ſo terrifies the cattle and ſheep, that they dare not touch it; ſo that it is a very effectual fence, though it neither affords ſhelter nor ornament to the country. It has the advantage, however, of being erected at a very trifling expence; it is not unſuitable to thoſe lower parts of the country in which the ſhelter of high trees and hedges would prove pernicious to the corn crop, and where the confinement of the ſtock is all that is required.

Clay is ſometimes uſed inſtead of lime for binding ſtone walls; but it is a very defective cement; for if froſt ſuddenly ſucceed to wet weather it is apt to ſwell and to tumble down at the next thaw. To guard againſt the effects of moiſture, theſe ſtone and clay walls are ſometimes rough-caſt or coated over with lime. If the coating is very thick and the wall properly coped, it may laſt in this way as long as a wall of ſtone and lime.

For the ſake of the appearance, dry-ſtone walls have ſometimes two or three inches at the top of them on each ſide lipped or waſhed with lime, which adds nothing to their ſtrength, but gives them the appearance of being built entirely with ſtone and lime. With the ſame view, and with the ſame effect, they are ſometimes alſo broad-caſt or coated with lime over their whole ſurface. Dry-ſtone walls, after they are finiſhed are ſometimes pinned and harled, or rough-caſt, that is, the maſon fills up all the interſtices of the building with ſmall ſtones, and afterwards coats it over with lime, which adds conſiderably to its durability.

Low dry-ſtone walls have ſometimes a light paling at the top, which gives them a handſome appearance.

Brick walls are ſometimes uſed where ſtones are extremely ſcarce, but they are chiefly employed for facing garden walls.

708 Frame walls. Frame walls are conſtructed in the following manner. A frame of boards of the width and heighth intended for the future wall is placed upon the line that has been dug for a foundation. The frame is filled to the top with ſtones gathered from the adjoining fields, and a quantity of liquid mortar is poured in amongſt them ſufficient to fill up every interſtice. The whole is allowed to remain for a day or two, or longer, till the building is dried ſo far as to have acquired ſome ſtability. The frame is then removed, and placed a little farther on in the ſame line, but in contact with the laſt-made piece of wall, and the operation is renewed. This is ſuppoſed to have been a very ancient mode of building. Fences

Turf walls are found very uſeful in upland diſtricts for temporary purpoſes, ſuch as for folds, or for protecting young plantations or young hedges. Their ſtrength is ſometimes increaſed, without augmenting the expence of the conſtruction, by intermingling them with ſtones, that is, by forming the wall of alternate layers of turf and ſtone.

709 Mud walls. Mud walls with a mixture of ſtraw, are very frequent in many places both of England and Scotland, and they are uſed not only for fences, but alſo for conſtructing the walls of farm houſes and offices, in the poorer parts of the country. They are formed in the following manner. Straw and clay are incorporated with each other, like hair with plaiſter lime, and formed into large pieces. A ſtratum of theſe is laid at the bottom of the intended wall. The different pieces are then firmly kneaded with the hand, and preſſed at each ſide with a flat board, which not only conſolidates, but gives ſmoothneſs and uniformity to the work. Succeſſive ſtrata are added till the wall is reared to its intended height. If walls thus conſtructed are properly coated with lime, to protect them againſt moiſture, they become very durable; and their appearance is not inferior to that of a ſtone and lime building.

710 Compound fences. Of compound fences, the moſt ordinary is the ſingle hedge and ditch, with or without paling. The mode of planting theſe hedges has been already ſtated on the authority of Lord Kames and others; and we ſhall only add, that if a hedge is wiſhed to riſe with rapidity, the ſpot in which it is planted ought to be enriched with lime, compoſt, or other manures, as hedge plants cannot, any more than other plants, ſpring rapidly without cultivation. When a hedge is planted at the top of a ditch, it may alſo be remarked, that it is doubly neceſſary to give the ditch a proper degree of ſlope, that it may not be undermined by any accident, which would have the effect to lay bare the roots of the hedge, or entirely to bring it down. Where it is wiſhed to render lands incloſed with hedge and ditch fencible at once, a kind of Galloway dike, conſiſting of ſome rows of large coarſe looſe ſtones, may be placed upon the top of the bank, which will have the effect of protecting the hedge againſt cattle.

The double ditch with a hedge in the front of each, is now practiſed, particularly on cold lands, in many parts of Great Britain, It may be remarked, that where theſe double ditches are wanted for drains, it is undoubtedly a proper practice; but in other ſituations it is exceptionable, as laying out unprofitably a large portion of the ſoil.

When a hedge and ditch is uſed, whether ſingle or double, the hedge is ſometimes placed not at the bottom of the bank, which is the uſual way, but in the middle of it, at ſome height above the ordinary ſurface of the field. In ſuch a mode of planting, the hedge is

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exposed to great injury from the bank mouldering down, and from want of proper nourishment; but the practice is sometimes necessary upon wet lands, where hedges would not thrive, if placed upon the common surface. Sometimes the face of a natural declivity is cut down, in a sloping direction, to within 18 or 20 inches of the bottom. Here a bed is made and covered with good earth, in which the plants are inserted. A hedge planted in this way looks formidable, from the side facing the bank; but it is exposed to more accidents, from a failure of its soil in consequence of frosts, than if planted at the bottom of the banks.

711 Hedge and bank fences.

Sometimes what is called a hedge and bank, or hedge on the top of a bank, is made use of. It consists of a bank of earth taken from the adjoining grounds, broad at bottom and tapering towards the top, along the summit of which the hedge is planted. Such hedges are extremely liable to decay, in consequence of the artificial mound, on which they stand, being unable to retain sufficient moisture for their support, or being washed away from about their roots.

712 Devonshire fences.

The Devonshire fence resembles the one now described. It consists of an earthen mound seven feet wide at bottom, and four at the top, and five feet in height. In the middle of the top of it a row of quicks is planted, and on each side at two feet distance a row of willow stakes, of about an inch in diameter each, and from 18 inches to two feet in length, is stuck in, sloping a little outwards. These stakes take root, and form a kind of live fence for the preservation of the quicks in the middle.

Palings are frequently employed for the protection of young hedges, whether planted on the plain soil or on the top of a ditch: dead hedges, of the kinds formerly mentioned, are also employed for the same purpose. The dead hedge is preferable to the paling, as it shelters the young plants from the inclemency of the weather. The dead hedge, however, ought always to be at some distance from the living one, to allow the latter freely to put forth its branches. As already noticed, walls of different kinds are sometimes erected, whether Galloway dikes or of stone and lime, for the protection of young hedges; but there is a mode of making a hedge in the middle or in the face of a wall which deserves attention. It is executed in the following manner: The face of the bank is first cut down not quite perpendicular, but nearly so. A facing of stone is then begun at the bottom, and carried up regularly in the manner that stone walls are generally built. When it is raised about 18 inches or two feet high, according to circumstances, the space between the wall and the bank is filled up with good earth, well broke and mixed with lime or compost. The thorns are laid upon the earth in such a manner, as that at least four inches of the root and stem shall rest upon the earth, and the extremity of the top shall project beyond the wall. When the plants are thus regularly laid, the roots are covered with earth, and the wall continued upwards, a hole having been left which each plant peeps through. As the wall advances upwards, the space between it and the bank is gradually filled up: when completed the wall is finished with a cop of sod or of stone and lime. When the plants begin to vegetate, the young shoots appear in the face of the wall, rising in a perpendicular direction.

713 Hedges in the face of a wall.

It is said, that Sir James Hall of Dunglass has adopted this mode of inclosing to a considerable extent in East Lothian; that the hedges have made great progress; and that they exhibit, upon the whole, an extremely handsome appearance.

Fences.

714 Belts of Planting.

Whatever may be thought of the propriety of planting trees in hedge-rows, there can be no doubt, that in certain situations the addition to a hedge or hedge and ditch of a belt of planting is a valuable acquisition to its owner and to the country. It is certain, however, as formerly stated, that in low rich soils where corn is chiefly cultivated, particularly when surrounded by hills, belts of planting are not only unnecessary, but even hurtful to the crop. But there are other situations in which they are of the highest value. The peninsula, which forms the county of Caithness, is said to be a proof of this. Its soil is of a good quality, but its value is greatly impaired by its being exposed to sea winds, whose severity checks all vegetation. Many tracts throughout the island are nearly in the same situation; and in all of them nothing more is wanted to improve the country than to intersect it in a judicious manner with hedges and belts of planting. Where belts of planting are meant to remain as an efficient fence, they ought to be of a considerable breadth. In poor and cold situations the breadth ought to be such as to allow space for planting a great number of trees, which, from the shelter they mutually afford, may protect each others growth against the severity of the climate. With the same view, in cold and exposed situations, the young trees should be planted very thick; perhaps four or five times the number that can grow to a full size should be planted. This practice affords a choice of the most healthy plants to be left when the plantation is thinned. In belts of planting an error is sometimes committed of mingling firs, larches, and pines, with oaks, ashes, &c. with the intention that the evergreens should protect for a certain time the other trees, and thereafter be removed. The effect of which too frequently is, that when the evergreens are taken away, their growth is not only checked for several years; but being unable, after experiencing so much shelter, to resist the severity of the climate, they die altogether. This is the more likely to happen in consequence of the rapidity with which the firs and larches grow; for the oaks and other trees are drawn up along with them, and acquire, in some measure, the nature of hot-house plants, unfit to encounter the blasts of a northern climate: hence belts of planting should either be made altogether of evergreens or altogether of deciduous plants, such as oak, ash, &c. If the evergreens are at all introduced among these last, it ought to be sparingly, and at the outside of the belt, with the view to afford only a moderate degree of shelter.

Where fields are meant to remain constantly in pasturage, the belts may be made in a serpentine, and sometimes in a circular form, both for the sake of ornament, and to afford more complete shelter; but this cannot be done where the plough is meant to be introduced. Upon a north exposure, the belts should cross each other, at proper distances, to afford more complete shelter. Upon a south exposure, they ought to run from south to north, to afford a defence against the east and west winds which are the strongest in this country.

Fences. country. Belts of planting require themſelves to be fenced. A fence, which is merely intended to protect their growth, may conſiſt of a mud wall; but if a permanent ſecurity is wanted, a hedge and ditch will be neceſſary.

In ſome ſituations, inſtead of the belt of planting, it is cuſtomary to plant only the corners of the fields; and this plan is adviſable where the country requires but a moderate degree of ſhelter, added to that which it may derive from thriving hedges.

It has been propoſed, that on all ſheep farms of any extent, there ought to be one or more circular belts of planting, incloſing a ſpace of about an acre or an acre and a half in the centre, with a ſerpentine road leading through the belt into this incloſure, the uſe of which is evident. In heavy falls of ſnow numerous flocks are ſometimes buried, and the lives of the ſhepherds are not unfrequently loſt in attempting to drive them to a place of ſafety. On ſuch occaſions, the incloſures we have now mentioned, would be of the utmoſt value. When a ſtorm threatened, the ſheep might be driven to theſe incloſures, where the ſnow could never be piled up by driving winds; and they might there be fed and remain with entire ſafety. If due care were taken to litter the place, a quantity of valuable dung might be collected, if the ſtorm ſhould remain for any length of time.

715 The reed fence.

The reed fence has hitherto been only uſed in gardens. It conſiſts of a kind of wall, formed by ſewing with wrought yarn bundles of reeds, applied perpendicularly to a railing. This fence ſeems well adapted for giving temporary ſhelter to cattle, but as the materials of it cannot be everywhere found, its uſe muſt be very limited.

Fences. The entry to every incloſure ought to be ſecured by gate-poſts; which, if circumſtances will permit, ought always to be of ſtone, and if poſſible, of hewn ſtone, as theſe, when properly conſtructed, will never fail. Trees are ſometimes planted for this purpoſe, and when they have acquired a certain ſize, they are cut over about ten feet above the ſurface of the ground. Theſe form the moſt durable of all gate-poſts. They ſometimes, however, miſgive; in which caſe it is difficult to repair the defect. When gate-poſts are made of dead timber they ſhould be ſtrong, and the wood well prepared by a coat of oil paint, as already mentioned.

716 Gate-poſts.

Of gates for incloſures there are different kinds. What is called the *ſwing-gate*, that croſſes the whole breadth of a carriage road, and is of one piece, is by no means an adviſable form. The length of its bars renders it expenſive, and its great weight with which it pulls againſt the gate-poſt, overſtrains its own hinges, and is apt to bring down the ſide of the gate, unleſs it is erected in a very coſtly and ſolid manner. For this reaſon, a gate with two folding doors is preferable: it hangs upon the gate-poſt only with half its weight, in conſequence of its being divided into two parts. Its hinges are not ſo liable to be hurt by ſtraining, nor are its joints ſo liable to be broke. What is called the *flip-bar gate*, conſiſting of three ſeparate bars which are taken out, and put into the gate poſts every time the entry to the fields is opened and ſhut, is the beſt kind of gate, ſo far as cheapneſs and durability are concerned; but it does not admit of being locked, which renders it unfit for uſe near a public road, and the opening and ſhutting of it are alſo attended with a conſiderable degree of trouble.

717 Gates.

INDEX.

Agrifolium || Agrigentum.

AGRIFOLIUM, or AQUIFOLIUM. See ILEX, BOTANY *Index*.

AGRIGAN, or iſland of St Francis Xavier, in *Geography*, one of the Ladrone or Marianne iſlands. It is 50 miles in circumference, is very mountainous, and has a volcano in it; ſituated in N. Lat. 19. 4. E. Long. 146.

AGRIGENTUM, in *Ancient Geography*, a city of Sicily, part of the ſite of which is now occupied by a town called *Girgenti* from the old name. See GIRGENTI.

According to ancient authors, Dedalus, the moſt famous mechanician of fabulous antiquity, fled to this ſpot for protection againſt Minos, and built many wonderful edifices for Cocalus king of the iſland. Long after his flight, the people of Gela ſent a colony hither 600 years before the birth of Chriſt; and from the name of a neighbouring ſtream called the new city *Acragas*, whence the Romans formed their word *Agrigentum*. Theſe Greeks converted the ancient abode of the Siculi into a citadel to guard the magnificent city which they erected on the hillocks below.

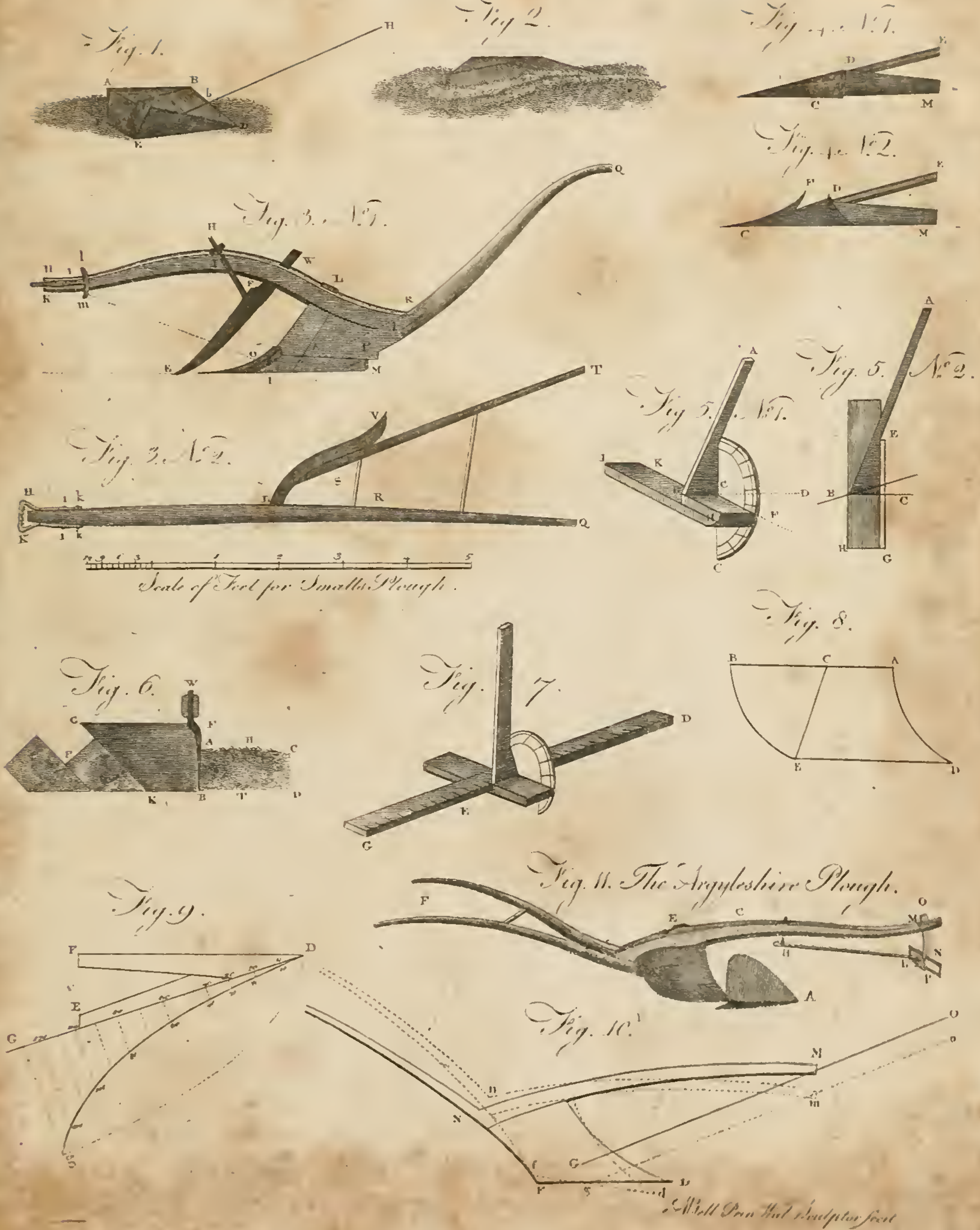
An advantageous ſituation, a free government with all its happy effects, and an active commercial ſpirit, exalted their commonwealth to a degree of riches and power unknown to the other Greek ſettlements, Syracuſe alone excepted. But the proſperity of Agrigentum appears to have been but of ſhort duration, and tyranny ſoon deſtroyed its liberties.

Phalaris was the firſt who reduced it to ſlavery. His name is familiar to moſt readers on account of his cruelty, and the brazen bull in which he tortured his enemies. (See PHALARIS.)—Phalaris met with the common fate of tyrants, and after his death the Agrigentines enjoyed their liberty for 150 years; at the expiration of which term Thero uſurped the ſovereign authority. The moderation, juſtice, and valour of this prince preſerved him from oppoſition while living, and have reſcued his memory from the obloquy of poſterity. He joined his ſon-in-law Gelo, king of Syracuſe, in a war againſt the Carthaginians; in the courſe of which victory attended all his ſteps, and Sicily ſaw herſelf for a time delivered from her African oppreſſors. Soon after his deceaſe, his ſon Thraſydeus was deprived of the diadem, and Agrigentum reſtored to her old democratical government. Ducetius next diſturbed the general tranquillity. He was a chief of the mountaineers, deſcendants of the Siculi; and was an overmatch for the Agrigentines while they were unſupported by alliances, but ſank under the weight of their union with the Syracuſans. Some trifling altercations diſſolved this union, and produced a war, in which the Agrigentines were worſted, and compelled to ſubmit to humiliating terms of peace. Reſentment led them to embrace with joy the propoſals of the Athenians, then meditating an attack upon Syracuſe. Their new friends ſoon made them feel that the ſacrifice of liberty and fortune would be the price of their protection; and this conſideration brought them ſpeedily back to their old connections. But as if it had been decreed that all friendſhip ſhould be fatal to their repoſe, the reconciliation and its effects drew upon them the anger of the Carthaginians. By this enemy their armies were routed, their city taken, their race almoſt extirpated, and ſcarce a veſtige of magnificence was left. Agrigentum lay 50 years buried under its own ruins; when Timoleon, after triumphing over the Carthaginians, and reſtoring liberty to Sicily, collected the deſcendants of the Agrigentines, and ſent them to re-eſtabliſh the dwellings of their forefathers. Their exertions were rewarded with aſtoniſhing ſucceſs; for Agrigentum roſe from its aſhes with ſuch a renewal of vigour, that in a very ſhort time we find it engaged in the bold ſcheme of ſeizing a lucky moment, when Agathocles and Carthage had reduced Syracuſe to the loweſt ebb, and arrogating to itſelf ſupremacy over all the Sicilian republics. Xenodicus was appointed the leader of this arduous enterpriſe; and had his latter operations been as fortunate as his firſt campaign, Agrigentum would have acquired ſuch a preponderance of reputation and power, that the rival ſtates would not have even dared to attack it. But a

Agrigentum.

few

AGRICULTURE. Plate VI.



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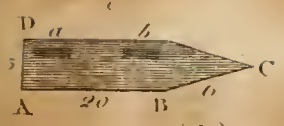

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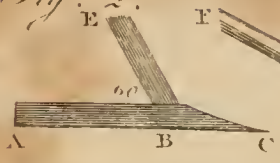

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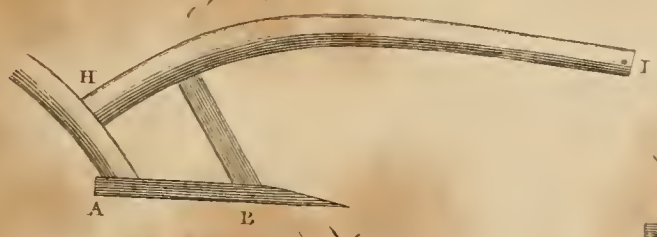

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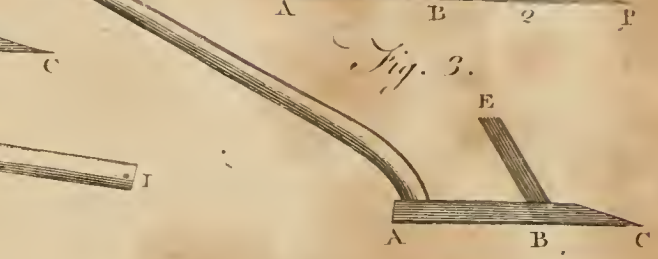

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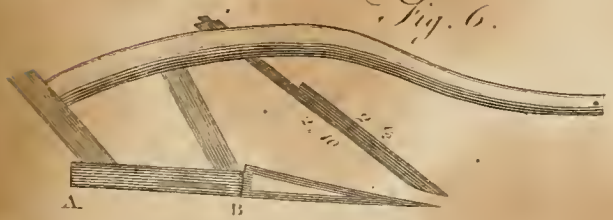

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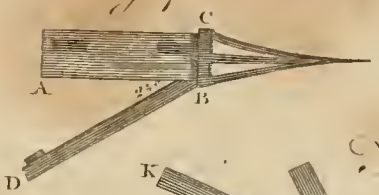

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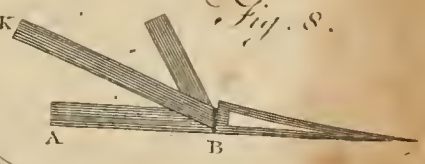

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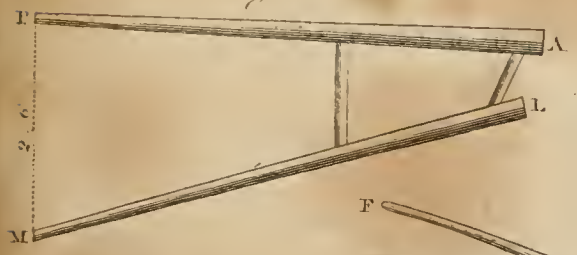

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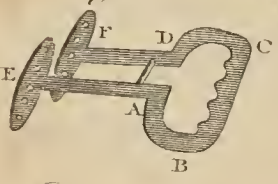

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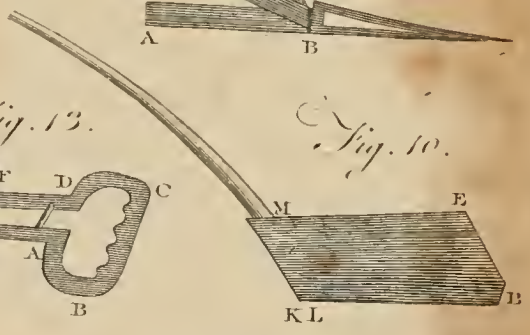

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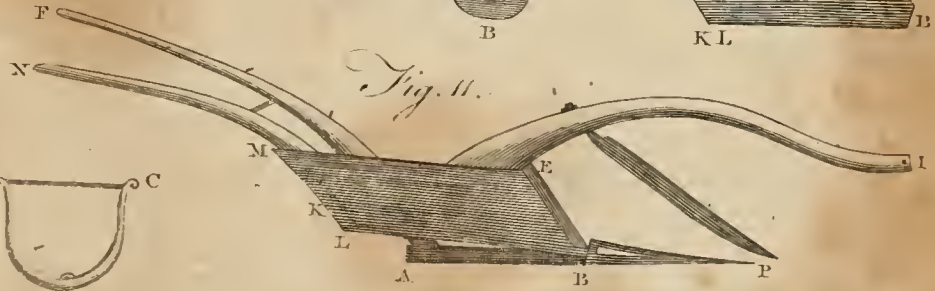

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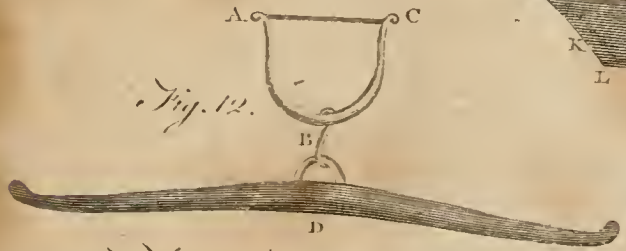

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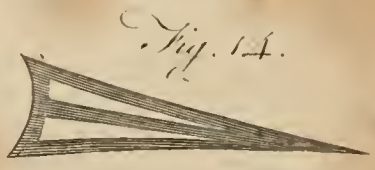

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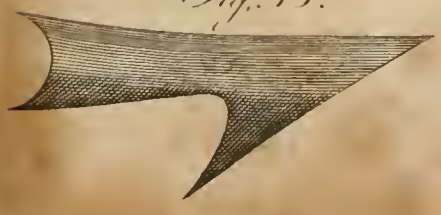

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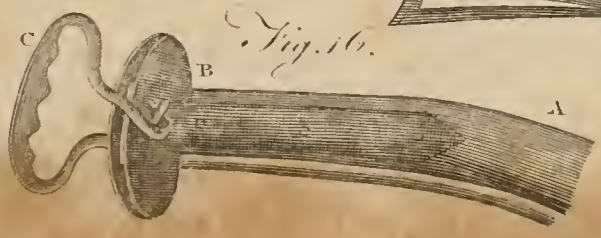
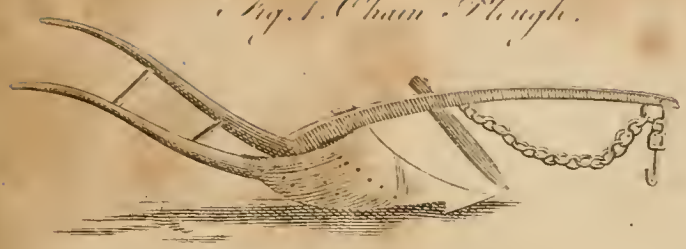


I. Bell del. Fin. Mus. Sculptor fecit

Fig. 1. Chain Plough.



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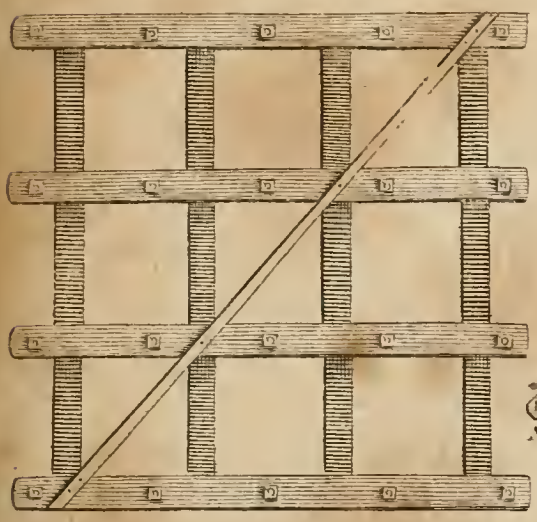

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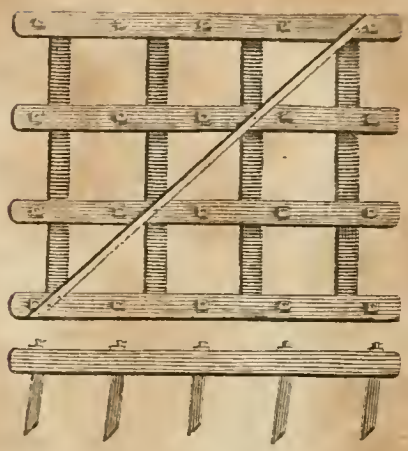
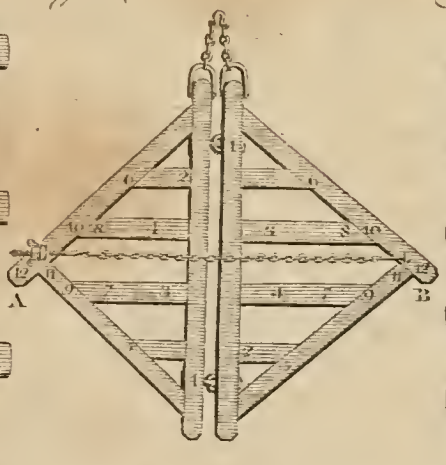


Fig. 8. Chain & Screw Harrow.



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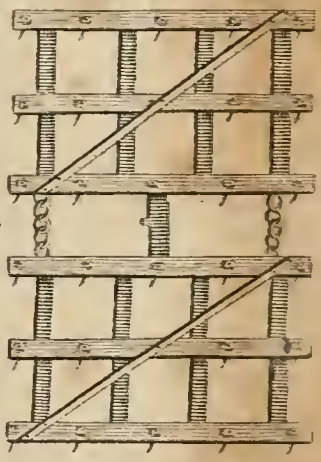


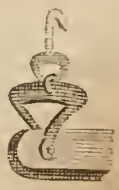


Fig. 5. third Harrow.

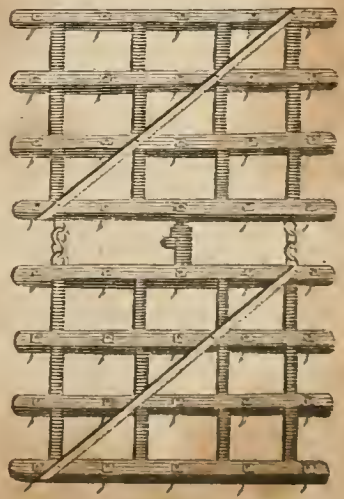


Fig. 6. Clumy Harrow.

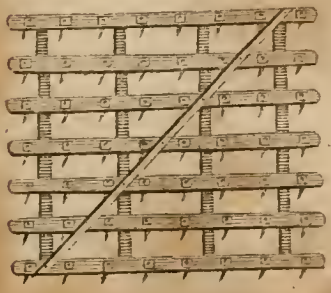
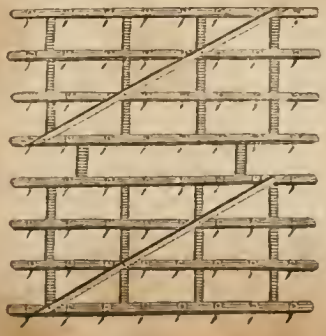
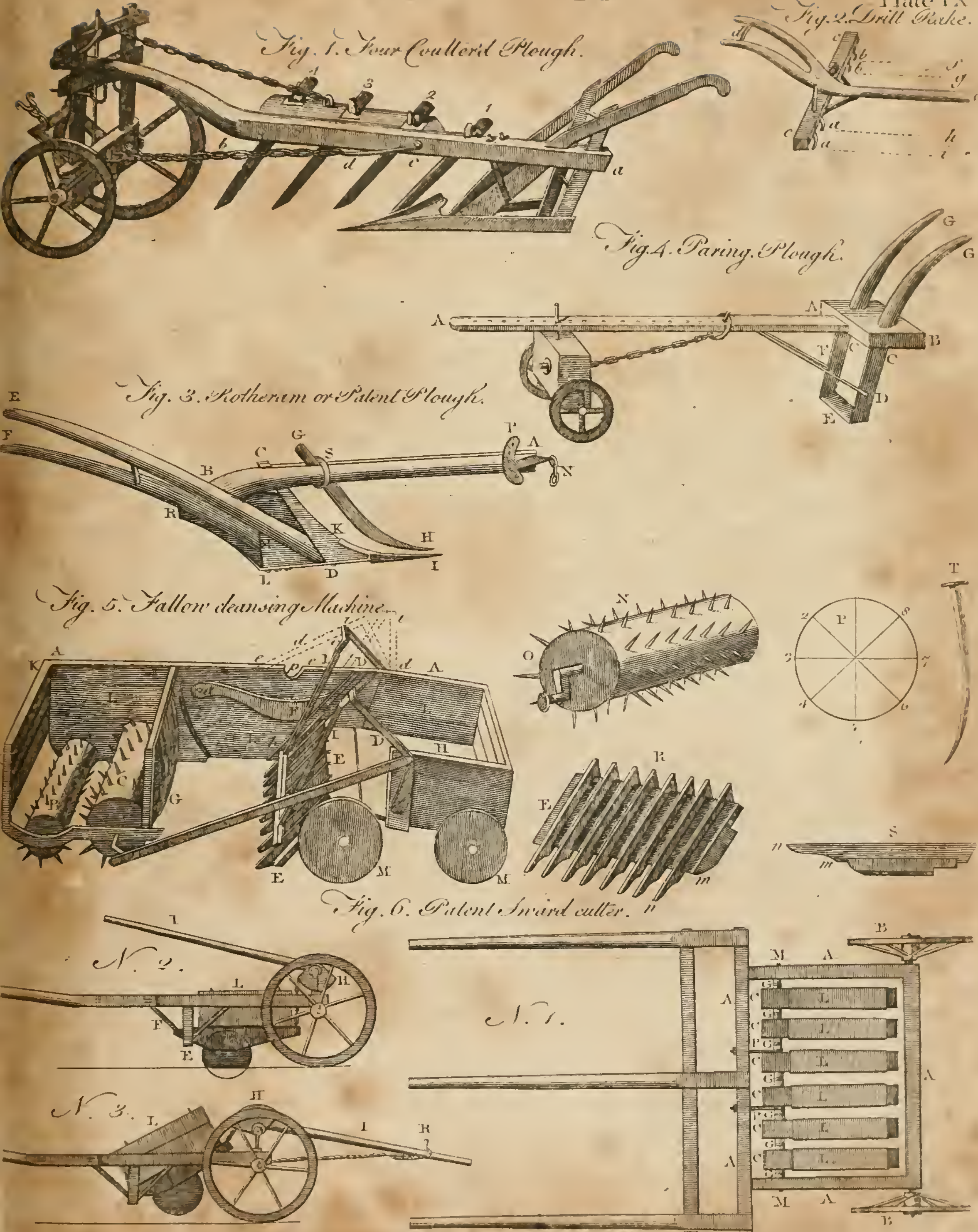


Fig. 7. Grass seed Harrow.



A. Bell & Pin. Mal. Sculpt.



A. Bell Prin. Wal. Sculptor fecit.

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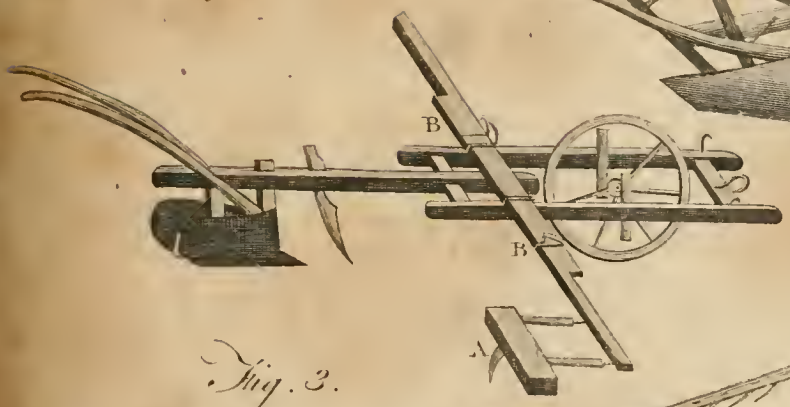

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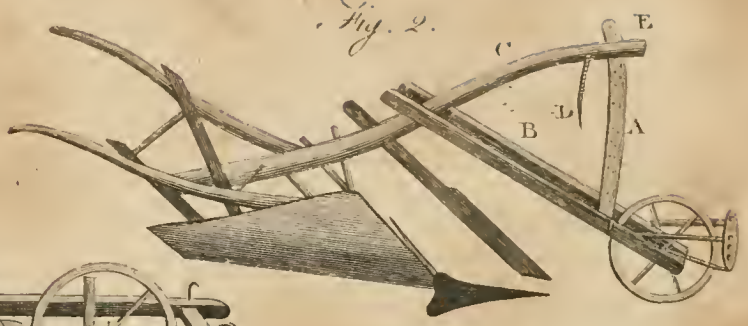

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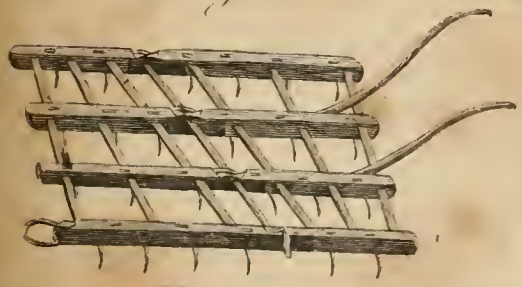

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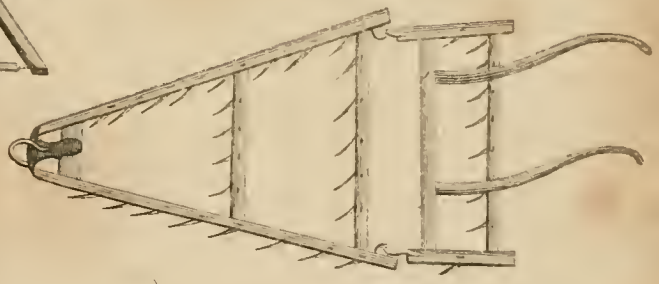

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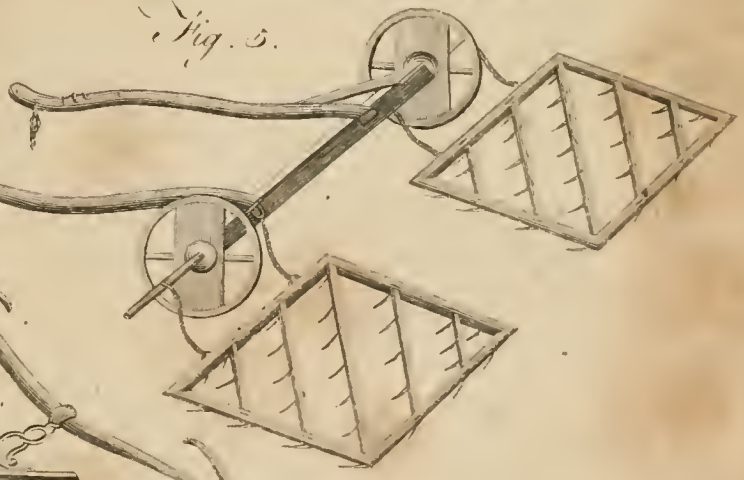

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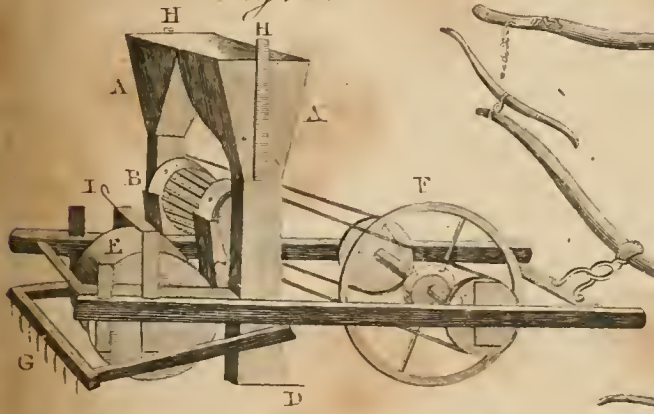

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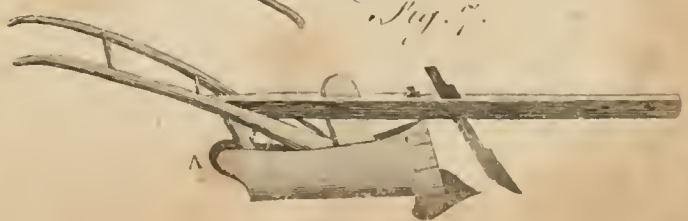

the Universal Sowing Machine.

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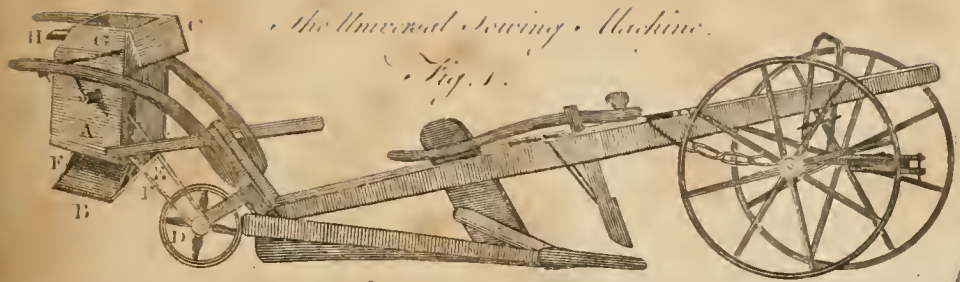

Fig. 8.

Fig. 3.

Fig. 2.

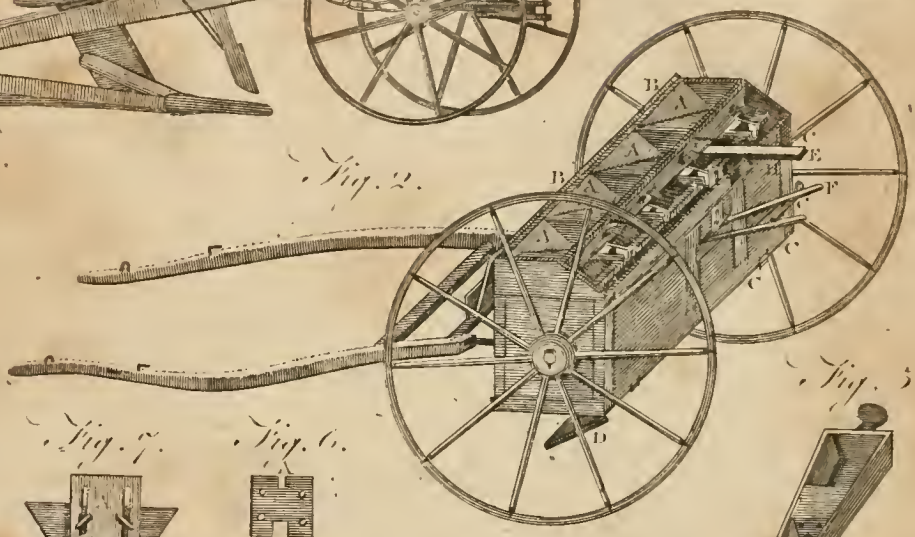

Fig. 10.

Fig. 7.

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Fig. 5.

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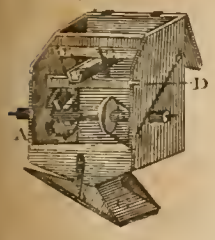

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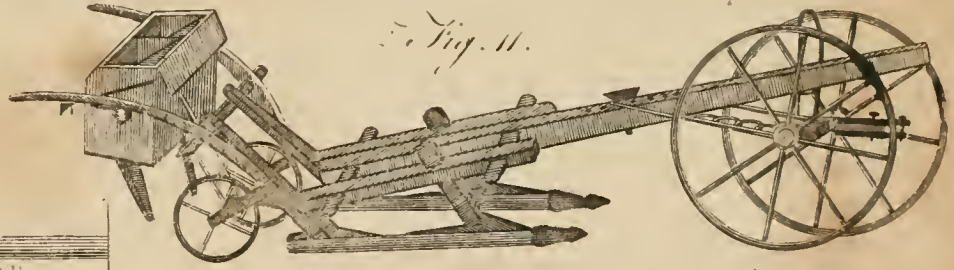
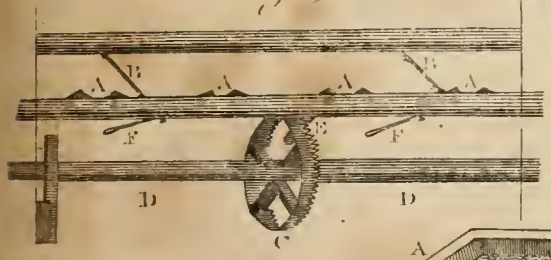


Fig. 9.



Cooke's Drill Machine.

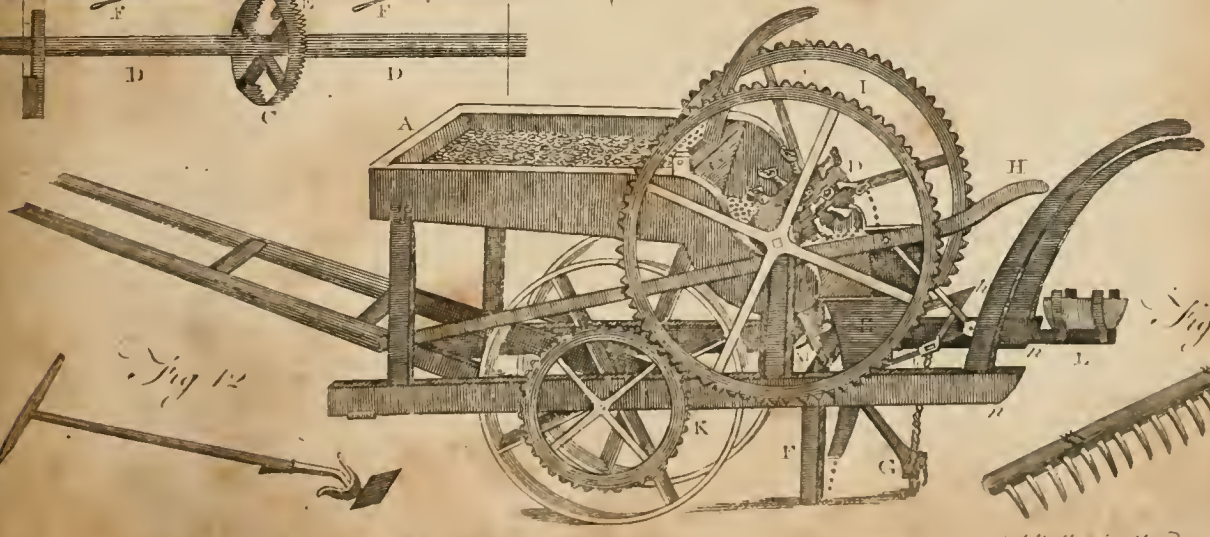
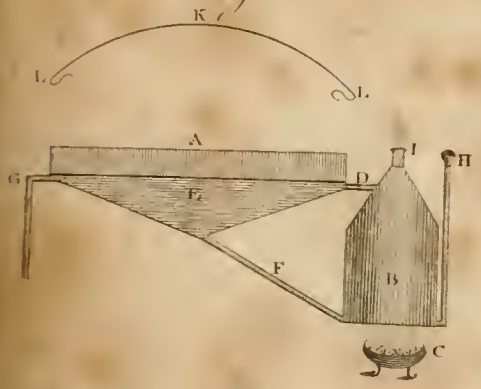


Fig. 12

Fig. 13.

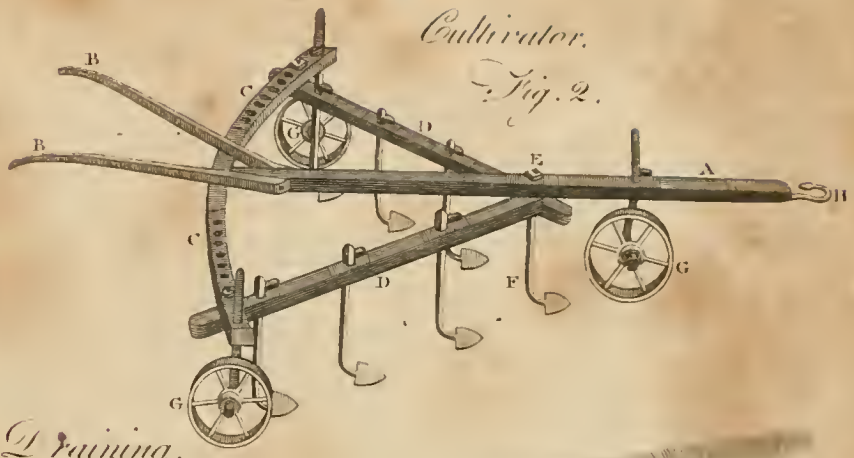
J. Bell. Prin. Mot. Sculpsit.

Fig. 1.



Cultivator.

Fig. 2.



Draining.

Fig. 3.

Fig. 4.

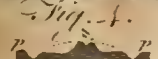


Fig. 6.

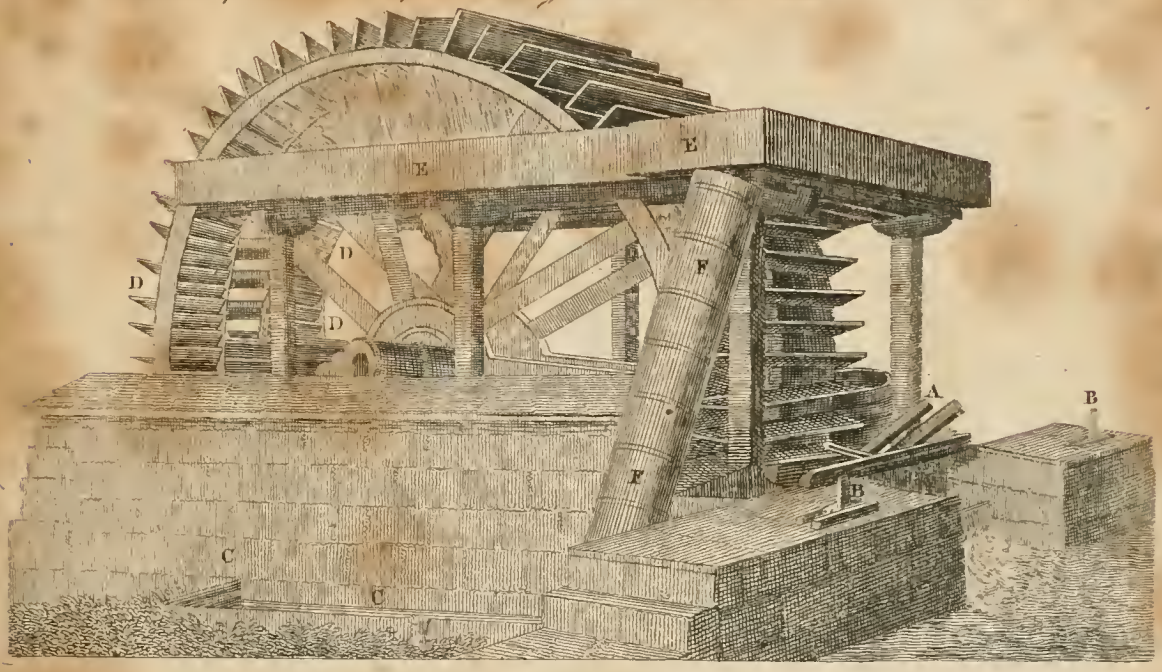
Irrigation.

Fig. 7.

Fig. 5.

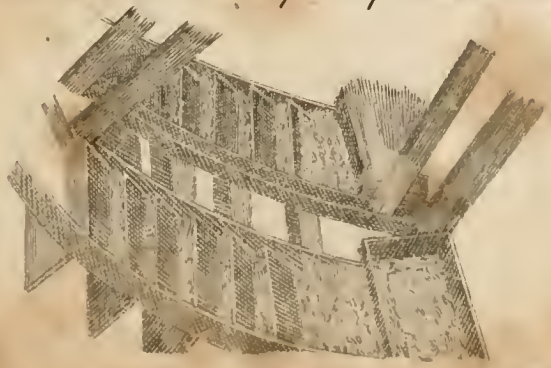
Fig. 8.

Sketch of the Wheel for raising Water at Blair Drummond



Sketch of the Cistern as seen from above

Sketch of the manner in which the Water is filled from the Troughs into the Buckets



Agrigentum. few brilliant exploits were ſucceeded by a ſevere overthrow; the Agrigentines loſt courage, diſagreed in council, and humbly ſued for peace to Agathocles. This commonwealth afterwards took a ſtrong part with Pyrrhus; and when he left Sicily to the mercy of her enemies, threw herſelf into the arms of Carthage. During the firſt Punic war Agrigentum was the head quarters of the Carthaginians, and was beſieged by the Roman conſuls, who after eight months blockade took it by ſtorm. It nevertheleſs changed maſters ſeveral times during the conteſt between theſe rival ſtates, and in every inſtance ſuffered moſt cruel outrages. After this period very little mention of it occurs in hiſtory, nor do we know the preciſe time of the deſtruction of the old city and the building of the new one. See GIRGENTI.

The principal part of the ancient city lay in the vale; the preſent town, called *Girgenti*, occupies the mountain on which the citadel of Cocalus ſtood.

It was difficult to be more judicious and fortunate in the choice of ſituation for a large city. The inhabitants were here provided with every requiſite for defence, pleaſure, and comfort of life; a natural wall, formed by abrupt rocks, preſented a ſtrong barrier againſt aſſailants; pleaſant hills ſheltered them on three ſides without impeding the circulation of air; before them a broad plain, watered by the Acragas, gave admittance to the ſea breeze, and to a noble proſpect of that awful element; the port or emporium lay in view at the mouth of the river, and probably the road acroſs the flat was lined with gay and populous ſuburbs.

The hoſpitality and parade for which the Agrigentines are celebrated in hiſtory were ſupported by an extenſive commerce; by means of which, the commonwealth was able to reſiſt many ſhocks of adverſity, and always to riſe again with freſh ſplendour. It was, however, cruſhed by the general fall of Grecian liberty; the feeble remnants of its population, which had ſurvived ſo many calamities, were at length driven out of its walls by the Saracens, and obliged to lock themſelves up for ſafety among the bleak and inacceſſible rocks of the preſent city.

At the north-eaſt angle of the ancient limits, upon ſome foundations of large regular ſtones, a church has been erected; a road appears hewn in the ſolid rock for the convenience of the votaries who viſited this temple in ancient days. It was then dedicated to Ceres and her daughter Proſerpine, the peculiar patroneſſes of Sicily.

At the ſouth-eaſt corner, where the ground, riſing gradually, ends in a bold eminence, which is crowned with majeſtic columns, are the ruins of a temple ſaid to have been conſecrated to Juno. To the weſt of this ſtands the building commonly called the temple of Concord; the ſtone of which, and the other buildings, is the ſame as that of the neighbouring mountains and cliffs, a conglutination of ſea ſand and ſhells, full of perforations, of a hard and durable texture, and a deep reddiſh brown colour. This Doric temple has all its columns, entablature, pediments, and walls entire; only part of the roof is wanting. It owes its preſervation to the piety of ſome Chriſtians, who have covered half the nave, and converted it into a church conſecrated under the invocation of St Gregory biſhop of Girgenti. Agrigentum.

Proceeding in the ſame direction, you walk between rows of ſepulchres cut in the rock wherever it admitted of being excavated by the hand of men, or was ſo already by that of nature. Some maſſes of it are hewn into the ſhape of coffins; others drilled full of ſmall ſquare holes employed in a different mode of interment, and ſerving as receptacles of urns. One ponderous piece of the rock lies in an extraordinary poſition; by the failure of its foundation, or the ſhock of an earthquake, it has been looſened from the general quarry, and rolled down the declivity, where it now remains ſupine with the cavities turned upwards. Only a ſingle column marks the confuſed heap of moſs-grown ruins belonging to the temple of Hercules. It ſtood on a projecting rock above a chaſm in the ridge, which was cut through for a paſſage to the emporium.

In the ſame tract, over ſome hills, is ſituated the building uſually called the tomb of Thero. It is ſurrounded by aged olive-trees, which caſt a wild irregular ſhade over the ruin. The edifice inclines to the pyramidical ſhape, and conſiſts at preſent of a triple plinth, and a baſe ſupporting a ſquare pedeſtal; upon this plain ſolid foundation is raiſed a ſecond order, having a window in each front, and at each angle two Ionic pilaſters crowned with an entablature of the Doric order. Its inſide is divided into a vault, a ground room, and one in the Ionic ſtory, communicating with each other by means of a ſmall internal ſtaircaſe.

In the plain are ſeen the fragments of the temple of Eſculapius; part of two columns and two pilaſters, with an intermediate wall, ſupport the end of a farmhouſe, and were probably the front of the cells. Purſuing the track of the walls towards the weſt, you arrive at a ſpot which is covered with the gigantic remains of the temple of the Olympian Jupiter, minutely deſcribed by Diodorus Siculus. It may literally be ſaid that it has not one ſtone left upon another; and it is barely poſſible, with the help of much conjecture, to diſcover the traces of its plan and dimenſions. Diodorus calls it the largeſt temple in the whole iſland: but adds, that the calamities of war cauſed the work to be abandoned before the roof could be put on; and that the Agrigentines were ever after reduced to ſuch a ſtate of poverty and dependence, that they never had it in their power to finiſh this ſuperb monument of the taſte and opulence of their anceſtors. The length of this temple was 370 Greek feet, its breadth 60, and its height 220, excluſive of the foundations or baſement ſtory: the extent and ſolidity of its vaults and underworks were wonderful; its ſpacious porticoes and exquiſite ſculpture were ſuited to the grandeur of the whole. It was not built in the uſual ſtyle of Sicilian temples with a cella of maſſive walls and a periſtyle, but was deſigned in a mixt taſte with half columns let into the walls on the outſide, the inſide exhibiting a plain ſurface.

The next ruin belongs to the temple of Caſtor and Pollux: vegetation has covered the lower parts of the building, and only a few fragments of columns appear between the vines. This was the point of the hill where the wall ſtopt on the brink of a large fiſh-pond ſpoken of by Diodorus: it was cut in the ſolid rock

Agrigentum
‖
Agrippa.

30 feet deep, and water was conveyed to it from the hills. In it was bred a great quantity of fish for the use of public entertainments; swans and various other kinds of wild fowl swam along its surface, for the amusement of the citizens, and the great depth of water prevented an enemy from surprising the town on that side. It is now dry and used as a garden. On the opposite bank, are two tapering columns without their capitals, most happily placed in a tuft of carob trees. Monte Toro, where Hanno encamped with the Carthaginian army, before the Roman consuls drew him into a engagement that ruined his defensive plan, is a noble back-ground to this picturesque group of objects. —The whole space comprehended within the walls of the ancient city abounds with traces of antiquity, foundations, brick-arches, and little channels for the conveyance of water; but in no part are any ruins that can be presumed to have belonged to places of public entertainment. This is the more extraordinary, as the Agrigentines were a sensual people, fond of shows and dramatic performances, and the Romans never dwelt in any place long without introducing their savage games. Theatres and amphitheatres seem better calculated than most buildings to resist the outrages of time; and it is surprising that not even the vestiges of their form should remain on the ground.

AGRIMONIA, AGRIMONY. See BOTANY *Index*.

Hemp AGRIMONY. See EUPATORIUM, BOTANY *Index*.

Water Hemp AGRIMONY. See BIDENS, BOTANY *Index*.

AGRIONIA, in Grecian antiquity, festivals annually celebrated by the Bœotians in honour of Bacchus. At these festivals, the women pretended to search after Bacchus as a fugitive; and, after some time, gave over their inquiry, saying, that he had fled to the Muses, and was concealed among them.

AGRIOPHAGI, in antiquity, a name given to those who fed on wild beasts. The word is Greek, compounded of αγριος, "wild," "savage," and φαγω, "I eat." The name is given, by ancient writers, to certain people, real or fabulous, said to have fed altogether on lions or panthers. Pliny and Solinus speak of *Agriophagi* in Ethiopia, and Ptolemy of others in India on this side the Ganges.

AGRIPPA, CORNELIUS, born at Cologne in 1486, a man of considerable learning, and by common report a great magician; for the monks at that time suspected every thing of heresy or sorcery which they did not understand. He composed his Treatise of the Excellence of Women, to insinuate himself into the favour of Margaret of Austria, governess of the Low-Countries. He accepted of the charge of historiographer to the emperor, which that princess gave him. The treatise of the Vanity of the Sciences, which he published in 1530, enraged his enemies extremely; as did that of Occult Philosophy, which he printed soon after at Antwerp. He was imprisoned in France for something he had written against Francis I.'s mother; but was enlarged, and went to Grenoble, where he died in 1534. His works are printed in two volumes octavo.

AGRIPPA, *Herod*, the son of Aristobulus and Mariamne, and grandson to Herod the Great, was born in the year of the world 3997, three years before the birth of our Saviour, and seven years before the vulgar era. After the death of Aristobulus his father, Josephus informs us, that Herod his grandfather took care of his education, and sent him to Rome to make his court to Tiberius. The emperor conceived a great affection for Agrippa, and placed him near his son Drusus. Agrippa very soon won the graces of Drusus, and of the empress Antonia. But Drusus dying suddenly, all those who had been much about him were commanded by Tiberius to withdraw from Rome, lest the sight and presence of them should renew his affliction. Agrippa, who had indulged his inclination to liberality, was obliged to leave Rome overwhelmed with debts, and in a very poor condition. He did not think it fit to go to Jerusalem, because he was not able to make a figure there suitable to his birth. He retired therefore to the castle of Massada, where he lived rather like a private person than a prince. Herod the tetrarch, his uncle, who had married Herodias his sister, assisted him for some time with great generosity. He made him principal magistrate of Tiberias, and presented him with a large sum of money: but all this was not sufficient to answer the excessive expences and profusion of Agrippa; so that Herod growing weary of assisting him, and reproaching him with his bad economy, Agrippa took a resolution to quit Judea, and return to Rome. Upon his arrival, he was received into the good graces of Tiberius, and commanded to attend Tiberius Nero the son of Drusus. Agrippa, however, having more inclination for Caius the son of Germanicus, and grandson of Antonia, chose rather to attach himself to him; as if he had some prophetic views of the future elevation of Caius, who at that time was beloved by all the world. The great assiduity and agreeable behaviour of Agrippa so far engaged this prince, that he kept him continually about him. Agrippa

Agrippa being one day overheard by Eutyches, a slave whom he had made free, to express his wishes for Tiberius's death and the advancement of Caius, the slave betrayed him to the emperor; whereupon Agrippa was loaded with fetters, and committed to the custody of an officer. Tiberius soon after dying, and Caius Caligula succeeding him, the new emperor heaped many favours and much wealth upon Agrippa; changed his iron fetters into a chain of gold; set a royal diadem upon his head; and gave him the tetrarchy which Philip, the son of Herod the Great, had been possessed of, that is, Batanæa and Trachonitis. To this he added that of Lysanias; and Agrippa returned very soon into Judea to take possession of his new kingdom.

Caius being soon after killed, Agrippa, who was then at Rome, contributed much by his advice to maintain Claudius in possession of the imperial dignity, to which he had been advanced by the army. But in this affair Agrippa acted a part wherein he showed more cunning and address than sincerity and honesty; for while he made a show of being in the interest of the senate, he secretly advised Claudius to be resolute, and not to abandon his good fortune. The emperor, as an acknowledgment for his kind offices, gave him all Judea and the kingdom of Chalcis, which had been possessed by Herod his brother. Thus Agrippa became of a sudden one of the greatest princes of the east; and was possessed of as much, if not more territories

Agrippa, Agrippina. ritories than had been held by Herod the Great his grandfather. He returned to Judea, and governed it to the great ſatisfaction of the Jews. But the deſire of pleaſing them, and a miſtaken zeal for their religion, induced him to commit an unjuſt action, the memory of which is preſerved in Scripture, Acts xii. 1, 2, &c.; for about the feaſt of the paſſover, in the year of Jeſus Chriſt 44, St James major, the ſon of Zebedee and brother of St John the Evangeliſt, was ſeized by his order and put to death. He proceeded alſo to lay hands on St Peter, and impriſoned him, waiting till the feſtival was over, that he might then have him executed. But God having miraculouſly delivered St Peter from the place of his confinement, the deſigns of Agrippa were fruſtrated. After the paſſover, this prince went from Jeruſalem to Cæſarea, and there had games performed in honour of Claudius. Here the inhabitants of Tyre and Sidon waited on him to ſue for peace. Agrippa being come early in the morning to the theatre, with a deſign to give them audience, ſeated himſelf on his throne, dreſſed in a robe of ſilver-tiſſue, worked in the moſt admirable manner. The riſing ſun darted on it with its rays, and gave it ſuch a luſtre as the eyes of the ſpectators could not endure. When therefore the king ſpoke to the Tyrians and Sidonians, the paraſites around him began to ſay, that it was the voice of a god, and not that of a man. Inſtead of rejecting theſe impious flatteries, Agrippa received them with an air of complacency; but at the ſame time obſerved an owl above him on a cord. He had ſeen the ſame bird before when he was in bonds by order of Tiberius: and it was then told him, that he ſhould be ſoon ſet at liberty; but that whenever he ſaw the ſame thing a ſecond time, he ſhould not live above five days afterwards. He was therefore extremely terrified; and he died at the end of five days, racked with tormenting pains in his bowels, and devoured with worms. Such was the death of Herod Agrippa, after a reign of ſeven years, in the year of Chriſt 44.

Agrippa II. ſon of the preceding Herod, was made king of Chalcis; but three or four years after, he was deprived of that kingdom by Claudius, who gave him in the place of it other provinces. In the war Veſpaſian carried on againſt the Jews, Herod ſent him a ſuccour of 2000 men; by which it appears that though a Jew by religion, he was yet entirely devoted to the Romans, whoſe aſſiſtance indeed he wanted to ſecure the peace of his own kingdom. He lived to the third year of Trajan, and died at Rome A. C. 100. He was the ſeventh and laſt king of the family of Herod the Great. It was before him and Berenice his ſiſter that St Paul pleaded his cauſe at Cæſarea.

Agrippa, *Marcus Viſpanius*, ſon-in-law to Auguſtus, of mean birth, but one of the moſt conſiderable generals among the Romans. Auguſtus's victory over Pompey and Mark Antony was owing to his counſel. He adorned the city with the Pantheon, baths, aqueducts, &c.

AGRIPPINA, daughter of Germanicus, ſiſter of Caligula, and mother of Nero; a woman of wit, but exceſſively lewd. She was thrice married, the laſt time to Claudius her own uncle, whom ſhe poiſoned to make way for Nero her ſon. Nero afterwards cauſed her to be murdered in her chamber, when ſhe bid the executioner ſtab her firſt in the belly that had brought forth ſuch a monſter.

Agrippina ‖ Aguillaneuf.

AGRIPPINA COLONIA UBIORUM, in *Ancient Geography*, now *Cologne:* ſo called from Agrippina, the daughter of Germanicus, and mother of Nero, who had a colony ſent thither at her requeſt by the emperor Claudius, to honour the place of her birth. See COLOGNE.

AGRIPPINIANS, in *Church Hiſtory*, the followers of Agrippinus biſhop of Carthage, in the third century, who firſt introduced and defended the practice of re-baptization.

AGROM, a diſeaſe frequent in Bengal and other parts of the Indies, in which the tongue is parched, chaps, and is ſometimes covered with white ſpots. The Indians are very fearful of this diſeaſe, which they attribute to extreme heat of the ſtomach. Their remedy is, to drink ſome chalybeate liquor, or the juice of mint.

AGROSTEMMA, WILD LYCHNIS, or CAMPION, in *Botany*. See BOTANY *Index*.

AGROSTIS, BENT-GRASS, in *Botany*. See BOTANY *Index*.

AGROSTOGRAPHIA, ſignifies the hiſtory or deſcription of graſſes.

AGROUND, the ſituation of a ſhip whoſe bottom, or any part of it, hangs, or reſts upon the ground, ſo as to render her immoveable, till a greater quantity of water floats her off, or till ſhe is drawn out into the ſtream by the application of mechanical powers.

AGRYPNIA, among *Phyſicians*, implies an inaptitude to ſleep; a troubleſome ſymptom of feveriſh and other diſorders.

AGRYPNIA, in the *Greek Church*, implies the vigil of any of the greater feſtivals.

AGUE, a general name for all periodical fevers, which, according to the different times of the returns of the feveriſh paroxyſm, are denominated tertian, quartan, and quotidian. See MEDICINE *Index*.

AGUE-Cake, the popular name for a hard tumour on the left ſide of the belly, lower than the falſe ribs, ſaid to be the effect of intermittent fevers.

AGUE-Tree, a name given to the ſaſſafras, on account of its febrifuge qualities.

AGUEPERSE, a town of France, ſituated in the Lyonnois, in the department of Puy-de-Dome, about 15 miles north of Clermont.

AGUILLANEUF, or AUGILLANEUF, a form of rejoicing uſed among the ancient Franks on the firſt day of the year. The word is compounded of the French *A* "to," *gui* "miſleto," and *l'an neuf* "the new year." Its origin is traced from a druid ceremony: the prieſts uſed to go yearly in December, which with them was reputed a ſacred month, to gather miſleto of the oak in great ſolemnity. The prophets marched in the front, ſinging hymns in honour of their deities; after them came a herald with a caduceus in his hand; theſe were followed by three druids abreaſt, bearing the things neceſſary for ſacrifice; laſt of all came the chief or arch druid, accompanied with the train of people. The chief druid climbing the oak, cut off the miſleto with a golden ſickle, and the other druids received it in a white cloth; on the firſt day of the year it was diſtributed among the people, after having bleſſed and conſecrated it by crying *A gui l'an neuf*, to proclaim

Aguilar || Agurium.

proclaim the new year. This cry is ſtill continued in Picardy, with the addition of *Plantez, Plantez*, to wiſh a plentiful year. In Burgundy and ſome other parts, the children uſe the ſame word to beg a new-year's gift. In latter times the name *Aguillanneuf* was alſo given to a ſort of begging, practiſed in ſome dioceſes, for church tapers, on new-year's day, by a troop of young people of both ſexes, having a chief, &c. It was attended with various ridiculous ceremonies, as dancing in the church, &c. which occaſioned the ſynods to ſuppreſs it.

AGUILAR, a town of Spain, in the province of Navarre, about 24 miles weſt from Eſtella.

Aguilar del Campo, a town of Old Caſtile, with the title of marquiſate, about 15 leagues north of the city of Burgos.

AGUILLON, or AGUILLONIUS, FRANCIS, a Jeſuit, born at Bruſſels: he was rector of the Jeſuits college at Antwerp, and eminent for his ſkill in mathematics. He was the firſt who introduced that ſcience among the Jeſuits in the Low Countries: he wrote a book of Optics, and was employed in finiſhing his Catoptrics and Dioptrics, when he died in 1617.

AGUIRRA, JOSEPH SÆNZ DE, a Benedictine, and one of the moſt learned men of the 17th century, was born March 24. 1630. He was cenſor and ſecretary of the ſupreme council of the inquiſition in Spain, and interpreter of the Scriptures in the univerſity of Salamanca. He printed three volumes in folio upon Philoſophy, a commentary upon Ariſtotle's ten books of Ethics, and other pieces. He died at Rome in 1699.

AGUL, in *Botany*, a ſynonyme of the hedyſarum. See HEDYSARUM, BOTANY *Index*.

AGUR. The xxxth chapter of the Proverbs begins with this title: The words of Agur, the ſon of Jakeh;" which, according to the ſignification of the original terms, may be tranſlated, as the Vulgate has it, *Verba congregantis, filii vomentis*; which tranſlation Le Clerc condemns, ſuppoſing theſe to be proper names which ought not to be tranſlated. Theſe words are rendered by Louis de Dieu, "the words of him who has recollected himſelf, the ſon of obedience." The generality of the fathers and commentators will have it, that Solomon deſcribes himſelf under the name Agur the ſon of Jakeh; others conjecture that Agur, as well as Lemuel (in chap. xxxi. 1.) were wiſe men who lived in the time of Solomon, and were his interlocutors in the book of Proverbs; an opinion which F. Calmet thinks is without the leaſt ſhow of probability, this book being nothing like a dialogue. This laſt expoſitor thinks it probable, that Agur was an inſpired author different from Solomon, whoſe ſentences it was thought fit to join with thoſe of this prince, becauſe of the conformity of their matter.

AGURAH, in Jewiſh antiquity, the name of a ſilver coin, otherwiſe called *gerah* and *keſhita*

AGURIUM, or AGYRIUM, in *Ancient Geography*, a town of Sicily in the Val di Demona, near the river Semetus. The people were called *Populus Agyrinenſis* by Cicero; *Agyrinus* by Pliny. It was the birth-place of Diodorus Siculus, as he himſelf teſtifies; but he calls it *Argyrium*, as it is now called *S. Philippo d'Argyrone*, which modern name ſeems to confirm that *Argyrium* is the true reading.

AGUSADURA, in ancient cuſtoms, a fee due from vaſſals to their lord for the ſharpening their ploughing tackle. Anciently the tenants in ſome manors were not allowed to have their rural implements ſharpened by any but whom the lord appointed; for which an acknowledgment was to be paid, called *agu ſadura*, in ſome places *aguſage*: which ſome take to be the ſame with what was otherwiſe called *reillage*, from the ancient French *reille*, a ploughſhare. Aguſadura || Ahab.

AGUSTINA, a new earth; which, as the word ſignifies, is taſteleſs, inſoluble in water, and when pure reſembles alumina. It was diſcovered in the year 1800 by Trommſdorff in the Saxon beryl. But as his experiments have not been repeated, the exiſtence of this earth reſts ſolely on his authority.

AGUTI, in *Zoology*, the trivial name of a ſpecies of the mouſe, belonging to the mammalia glires of Linnæus.

AGYEI, in antiquity, a kind of obeliſks, ſacred to Apollo, erected in the veſtibules of houſes, by way of ſecurity.

AGYNEIA, in *Botany*. See BOTANY *Index*.

AGYNIANI, in *Church Hiſtory*, a ſect who condemned all uſe of fleſh, and marriage, as not inſtituted by God, but introduced at the inſtigation of the devil. The word is compounded of the privative α and γυνη woman. They are ſometimes alſo called *Agynenſes*, and *Agynii*: and are ſaid to have appeared about the year 694. It is no wonder they were of no long continuance. Their tenets coincide in a great meaſure with thoſe of the Abelians, Gnoſtics, Cerdonians, and other preachers of chaſtity and abſtinence.

AGYRTÆ, in antiquity, a kind of ſtrolling impoſtors running about the country, to pick up money, by telling fortunes at rich men's doors, pretending to cure diſeaſes by charms, ſacrifices, and other religious myſteries; alſo to expiate the crimes of their deceaſed anceſtors, by virtue of certain odours and fumigations; to torment their enemies, by the uſe of magical verſes, and the like. The word is Greek Αγυρται, formed of the verb αγυρω, *I congregate*; alluding to the practice of charlatans or quacks, who gather a crowd about them.

Agyrtæ, among the Greeks, amount to the ſame with *Æruſcatores* among the Latins, and differ not much from gypſies among us.

AHAB, ſon of Omri king of Iſrael, ſucceeded his father A. M. 3086, and ſurpaſſed all his predeceſſors in impiety and wickedneſs. He married Jezebel the daughter of Ethbaal king of the Zidonians, who introduced the idols of Baal and Aſtarte among the Iſraelites, and engaged Ahab in the worſhip of theſe falſe deities. God, being provoked by the ſins of Ahab, ſent the prophet Elijah to him (1 Kings xvii. 1. *ſeq.*), who declared to him, that there would be a famine of three years continuance. The dearth having laſted three years, the prophet deſired Ahab to gather all the people to Mount Carmel, and with them the prophets of Baal: when they were thus aſſembled, Elijah cauſed fire to deſcend from heaven upon his ſacrifice, after which he obtained of God that it ſhould rain; and then the earth recovered its former fertility. Six years after this, Ben-hadad king of Syria (chap. xx.) laid ſiege to Jeruſalem. But God, provoked at this proud Syrian, ſent a prophet to Ahab, not only

Ahab. to assure him of victory, but to instruct him likewise in what manner he was to obtain it. Ahab was ordered to review the princes of the provinces, which he found to be a chance company, consisting of 232 young men, who were to command the people in Samaria, amounting to about 7000 men; with this small army Ahab was directed to fall upon the great host of the Syrians, and that at noon-day, while Ben-hadad and the 32 kings that accompanied him were drinking and making merry. Ben-hadad having notice that they were marching out of the city, ordered them to be brought before him alive, whatever their designs were; but the young men, followed by this small army, advanced, and killed all that opposed them. Such a panic seized the Syrian troops, that they began to fly, and even Ben-hadad himself mounted his horse and fled with his cavalry: which Ahab perceiving, pursued them, killed great numbers of them, and took a considerable booty. After this the prophet came to Ahab, to animate him with fresh courage, and to caution him to keep upon his guard; assuring him, that Ben-hadad would return against him the year following. According to this prediction, at the end of the year he returned and encamped at Aphek, with a resolution to give the Israelites battle. Both armies being ranged in order of battle for seven days successively, at length upon the seventh day, a battle ensued, wherein the Israelites killed 100,000 of the Syrians, and the rest fled to Aphek; but as they were pressing to get into the city, the walls of Aphek fell upon them and killed 27,000 more. Ben-hadad throwing himself upon the mercy of Ahab, this prince received him into his own chariot, and made an alliance with him. The year following, Ahab desiring to make a kitchen garden near his palace (chap. xxi.), requested of one Naboth, a citizen of Jezreel, that he would sell him his vineyard, because it lay convenient for him. But being refused, he returned in great discontentment to his house, threw himself upon the bed, turned towards the wall, and would eat nothing. Jezebel his wife coming in, asked the reason of his great concern; of which being informed, she procured the death of Naboth, and Ahab took possession of his vineyard. As he returned from Jezreel to Samaria, the prophet Elijah met him, and said, "Hast thou killed and also taken possession? Now saith the Lord, In the place where dogs licked up the blood of Naboth, shall dogs lick thy blood, even thine. As for Jezebel, of her the Lord spoke, saying, The dogs shall eat Jezebel by the way of Jezreel." Ahab, hearing these and other denunciations, rent his clothes, put sackcloth upon his flesh, and gave other indications of his sorrow and repentance. But his repentance was neither sincere nor persevering. Two years after these things, Jehoshaphat king of Judah came to Samaria to visit Ahab (chap. xxii.) at a time when he was preparing to attack Ramoth-gilead, which Ben-hadad king of Syria unjustly withheld from him. The king of Israel invited Jehoshaphat to accompany him in this expedition; which that prince agreed to do, but desired that some prophet might first be consulted. Ahab therefore assembled the prophets of Baal, in number about 400; who all concurred in exhorting the king to march resolutely against Ramoth gilead But Micaiah being also consulted, at Jehoshaphat's suggestion, prophesied the ruin of Ahab. Upon this, Ahab gave orders to his people to seize Micaiah, and to carry him to Amon the governor of the city, and to Joash the king's son; telling him in his name, "Put this fellow in prison, and feed him with the bread of affliction, and with the water of affliction, until I come in peace." But Micaiah said, "If thou return at all in peace, the Lord hath not spoken by me." Ahab, therefore, and Jehoshaphat marched up to Ramoth-gilead; and the king of Israel said unto Jehoshaphat, "I will disguise myself, and enter into the battle, but put thou on my robe:" for he knew that the king of Syria had commanded two-and thirty captains that had rule over his chariots, saying, "Fight neither with small nor with great, save only with the king of Israel." These officers, therefore, having observed that Jehoshaphat was dressed in royal robes, took him for the king of Israel, and fell upon him with great impetuosity: but this prince seeing himself pressed so closely, cried out; and the mistake being discovered, the captains of the king of Syria gave over pursuing him. But one of the Syrian army shot a random arrow, which pierced the heart of Ahab. The battle lasted the whole day, and Ahab continued in his chariot with his face turned towards the Syrians. In the mean time, his blood was still issuing from his wound, and falling in his chariot; and towards the evening he died: whereupon proclamation was made by sound of trumpet, that every man should return to his own city and country. The king of Israel being dead, was carried to Samaria and buried: but his chariot and the reins of his horses were washed in the fish-pool of Samaria, and the dogs licked his blood, according to the word of the prophet. Such was the end of Ahab. His son Ahaziah succeeded him in the year of the world 3107.

Ahab ‖ Ahaz.

AHÆTULA, the trivial name of a species of the coluber. See COLUBER.

AHASUERUS, or ARTAXERXES, the husband of Esther; and according to Archbishop Usher and F. Calmet, the Scripture name for Darius, the son of Hystaspes, king of Persia; though Scaliger supposed Xerxes to have been the husband of Esther, or the Ahasuerus of Scripture: and Dr Prideaux believes him to be Artaxerxes Longimanus. See History of PERSIA.

AHAZ, king of Judah, the son of Jotham, remarkable for his vices and impieties. One of his sons he consecrated, by making him pass through and perish by the fire, in honour of the false god Moloch; and he offered sacrifices and incense upon the high places, upon hills, and in groves. Rezin king of Syria and Pekah king of Israel invaded Judah in the beginning of the reign of Ahaz; and having defeated his army and pillaged the country, they laid siege to Jerusalem. When they found that they could not make themselves masters of that city, they divided their army, plundered the country, and made the inhabitants prisoners of war. Rezin and his part of the confederate army marched with all their spoil to Damascus; but Pekah with his division of the army having attacked Ahaz, killed 120,000 men of his army in one battle, and carried away men, women, and children, without distinction, to the number of 200,000. But as they were carrying those captives to Samaria, the prophet Oded, with the principal inhabitants of the city, came out to meet

Ahaziah II Ahijah.

meet them; and by their remonſtrances prevailed with them to ſet their priſoners at liberty. At the ſame time, the Philiſtines and Edomites invaded other parts of his land, killed multitudes of the people, and carried off much booty. In this diſtreſſed condition, Ahaz finding no other remedy for his affairs, ſent ambaſſadors to Tiglath-pileſer king of the Aſſyrians; and to engage him to his intereſt, he ſtripped the temple and city of all the gold which he could meet with, and ſent it as a preſent. Accordingly Tiglath-pileſer marched to the aſſiſtance of Ahaz, attacked Rezin and killed him, took his capital Damaſcus, deſtroyed it, and removed the inhabitants thereof to Cyrene.

The misfortunes of this prince had no influence to make him better: on the contrary, in the times of his greateſt affliction, he ſacrificed to the Syrian deities, whom he looked upon as the authors of his calamities, and endeavoured to render propitious to him, by honouring them in this manner. He broke in pieces the veſſels of the houſe of God, ſhut up the gates of the temple, and erected altars in all parts of Jeruſalem. He ſet up altars likewiſe in all the cities of Judah, with a deſign to offer incenſe on them. At length he died, and was buried in Jeruſalem, but not in the ſepulchres of the kings of Judah his predeceſſors: which honour he was deprived of, on account of his iniquitous courſe of life. Hezekiah his ſon ſucceeded him in the year of the world 3287, before Jeſus Chriſt 726.

AHAZIAH, the ſon and ſucceſſor of Ahab king of Iſrael, reigned two years, part alone and part with his father Ahab, who ordained him his aſſociate in the kingdom, a year before his death. Ahaziah imitated his father's impieties (1 Kings xxii. 52, *ſeq.*), and paid his adoration to Baal and Aſtarte, the worſhip of whom had been introduced in Iſrael by Jezebel his mother. The Moabites, who had been always obedient to the kings of the ten tribes ever ſince their ſeparation from the kingdom of Judah, revolted after the death of Ahab, and refuſed to pay the ordinary tribute. Ahaziah had not leiſure or power to reduce them (2 Kings i. 1, 2, &c.); for about the ſame time, having fallen through a lattice from the top of his houſe, he hurt himſelf conſiderably, and ſent meſſengers to Ekron, in order to conſult Baalzebub, the god of that place, whether he ſhould recover of the indiſpoſition occaſioned by this accident. But the prophet Elijah went to Ahaziah, and declared that he ſhould not recover from his illneſs: and accordingly he died in the year of the world 3108, and Jehoram his brother ſucceeded to the crown.

AHAZIAH, king of Judah, the ſon of Jehoram and Athaliah, ſucceeded his father in the kingdom of Judah, in the year of the world 3119. He walked in the ways of Ahab's houſe, to which he was allied. He reigned only one year. He was ſlain by Jehu the ſon of Nimſhi.

AHEAD, a ſea term, ſignifying further onward than the ſhip, or at any diſtance before her, lying immediately on that point of the compaſs to which her ſtem is directed. It is uſed in oppoſition to *aſtern*, which expreſſes the ſituation of any object behind the ſhip.

AHIJAH, the prophet of Shilo. He is thought to be the perſon who ſpoke twice to Solomon from God, once while he was building the temple (1 Kings vi. 11.), at which time he promiſed him his protection; and at another time (*id.* xi. 6.) after his falling into all his irregularities, when God expreſſed his indignation with great threatenings and reproaches. Ahijah was one of thoſe who wrote the annals or hiſtory of this prince (2 Chr. ix. 29.). The ſame prophet declared to Jeroboam that he would uſurp the kingdom (1 Kings xi. 29, &c.), and that two heifers ſhould alienate him from the Lord, meaning the golden calves erected by Jeroboam, one at Dan, the other at Bethel. About the end of Jeroboam's reign, towards the year of the world 3046, Abijah the ſon of that prince fell ſick; upon which Jeroboam ſent his wife to this prophet to inquire what would become of the child. The queen therefore went to Ahijah's houſe in Shilo, diſguiſed: But the prophet, upon hearing the ſound of her feet, ſaid, Come in, thou wife of Jeroboam, why feigneſt thou thyſelf to be another? for I am ſent to thee with heavy tidings." Then he commanded her to go and tell Jeroboam all the evil that the Lord had declared he would bring upon his houſe for his impieties; that ſo ſoon as ſhe ſhould enter into the city her ſon Abijah ſhould die, and ſhould be the only one of Jeroboam's houſe that ſhould come to the grave or receive the honours of a burial. Ahijah in all probability did not long ſurvive the time of this laſt prophecy; but with the time and manner of his death we are not acquainted.

Ahitophel.

AHITOPHEL, a native of Gillo, was for ſome time the counſellor of King David, whom he at length deſerted, by joining in the rebellion of Abſalom. This prince, upon his being preferred to the crown by the greateſt part of the Iſraelites, ſent for Ahitophel from Gillo (2 Sam. xv. 12.) to aſſiſt him with his advice in the preſent ſtate of his affairs: for at that time Ahitophel's counſels were received as the oracles of God himſelf (chap. xvi. *ult.*) Nothing gave David more uneaſineſs than this event; and when Huſhai his friend came to wait on him and attend him in his flight, he intreated him to return rather to Jeruſalem, make a ſhow of offering his ſervices to Abſalom, and endeavour to fruſtrate the prudent meaſures which ſhould be propoſed by Ahitophel. When Abſalom was come to Jeruſalem, he deſired Ahitophel to deliberate with his other counſellors upon the meaſures which were proper for him to take. Ahitophel adviſed him in the firſt place to abuſe his father's concubines; ſo that when his party ſhould underſtand that he had diſhonoured his father in this manner, they might conclude that there were no hopes of a reconciliation, and therefore eſpouſe his intereſt more reſolutely. A tent, therefore, being prepared for this purpoſe upon the terrace of the king's palace, Abſalom, in the ſight of all Iſrael, lay with his father's concubines. The next thing Ahitophel propoſed was in the terms following: "Let me now chooſe out 12,000 men, and I will ariſe and purſue after David this night, and I will come upon him while he is weary and weak-handed, and I will make him afraid, and all the people that are with him flee, and I will ſmite the king only; and I will bring back all the people unto thee; the man whom thou ſeekeſt is as if all returned: ſo all the people ſhall be in peace." This advice was very agreeable to Abſalom and all the elders of Iſrael. However,

Abſalom

Ahmella || Ai.

Abſalom deſired Huſhai to be called to have his opinion. Huſhai being come, and hearing what advice Ahitophel had given, ſaid, "The counſel which Ahitophel has given is not good at this time; what, for the preſent, in my opinion, may do better, is this: Let all Iſrael be gathered unto thee, from Dan even to Beerſheba, as the ſand that is by the ſea for multitude, and put thyſelf in the midſt of them, and whereever David is, we may fall upon him, and overwhelm him with our numbers, as the dew falleth upon the ground." This laſt advice being more agreeable to Abſalom and all the elders of Iſrael, was preferred; upon which Ahitophel ſaddled his aſs, went to his houſe at Gillo, hanged himſelf, and was buried in the ſepulchre of his fathers. He foreſaw, without doubt, all that would happen in conſequence of Huſhai's advice, and was determined to prevent the death which he had deſerved, and which David would probably have inflicted on him, as ſoon as he ſhould be reſettled on his throne.

AHMELLA, in *Botany*. See BIDENS, BOTANY *Index*.

AHOLIBAH and AHOLAH, are two feigned names made uſe of by Ezekiel (xxiii. 4.) to denote the two kingdoms of Judah and Samaria. Aholah and Aholibah are repreſented as two ſiſters of Egyptian extraction. Aholah ſtands for Samaria, and Aholibah for Jeruſalem. The firſt ſignifies a *tent;* and the ſecond, *my tent is in her.* They both proſtituted themſelves to the Egyptians and Aſſyrians, in imitating their abominations and idolatries; for which reaſon they were abandoned to thoſe very people for whom they had ſhown ſo paſſionate and ſo impure an affection; they were carried into captivity, and reduced to the ſevereſt ſervitude.

AHULL, in the ſea-language, the ſituation of a ſhip when all her ſails are furled on account of the violence of the ſtorm, and when having laſhed her helm on the lee-ſide, ſhe lies nearly with her ſide to the wind and ſea, her head being ſomewhat inclined to the direction of the wind.

AHUN, a town of France, in the Upper Marche and generality of Moulins, in the department of Creuſe. It is ſeated on the river Creuſe, eight miles ſouth-eaſt of Gueret, 30 north-eaſt of Lomages, and 55 ſouth-eaſt of Moulins. E. Long. 1. 52. N. Lat. 49. 5.

AHUYS, a town of Gothland in Sweden. It is ſmall, but very ſtrong by its ſituation, and has a good port. It is in the principality of Gothland, in the territory of Bleckingy, near the Baltic ſea, about 18 miles from Chriſtianſtadt. E. Long. 14. 10. N. Lat. 56. 20.

AI, in *Ancient Geography*, a town in Judea, to the north of Jericho, called AIN by Joſephus, and the inhabitants *Ainatæ*. Joſhua having ſent a detachment of 3000 men againſt Ai, God permitted them to be repulſed on account of Achan's ſin, who had violated the anathema pronounced againſt the city of Jericho. But after the expiation of this offence, God commanded Joſhua (chap. viii.) to march with the whole army of the Iſraelites againſt Ai, and treat this city and the kingdom thereof as he had treated Jericho, with this difference, that he gave the plunder of the town to the people. Joſhua ſent by night 30,000 men to lie in ambuſh behind Ai; having firſt well inſtructed thoſe who had the command of them in what they were to do; and the next day, early in the morning, he marched againſt the city with the remainder of his army. The king of Ai, perceiving them, ſallied haſtily out of the town with all his people, and fell upon the forces of the Iſraelites, who, upon the firſt onſet, fled, as if they had been under ſome great terror.

Ai || Ajn.

As ſoon as Joſhua ſaw the enemy all out of the gates, he raiſed his ſhield upon the top of a pike, which was the ſignal given to the ambuſcade; whereupon they immediately entered the place, which they found without defence, and ſet fire it. The people of Ai perceiving the ſmoke aſcending, were willing to return, but diſcovered thoſe who had ſet fire to the city in their rear, while Joſhua and thoſe who were with him turning about, fell upon them, and cut them in pieces. The king was taken alive, and afterwards put to death.

The chevalier Foland obſerves, that Joſhua's enterpriſe on Ai, excepting in ſome particulars of military art, is very like that of Gibeah, which is ſcarcely any thing more than a copy of it. It would appear, ſays that writer, by the Scripture account, that Joſhua was not the author of the ſtratagem made uſe of by him: for when God directs himſelf to Joſhua, he ſays, "Go up againſt Ai; lay an ambuſcade behind the town; I have delivered the king and the people of it into thine hands:" yet notwithſtanding this, God might leave the whole glory of the invention and execution of it to him, as to a great general. "Joſhua aroſe, (ſays the ſacred author), and all the people of war, to go up againſt Ai (verſe 3.); and Joſhua choſe out 30,000 mighty men of valour, and ſent them away by night." Foland remarks, that there is a manifeſt contradiction between this verſe and the 12th, wherein it is ſaid that Joſhua choſe out 500 men, whom he ſent to lie in ambuſh, between Bethel and Ai. How is this to be reconciled? Calmet ſays, that Maſius allows but 5000 men for the ambuſcade, and 25,000 for the attack of the city, being perſuaded that an army of 60,000 men could only create confuſion on this occaſion, without any neceſſity for, or advantage in, ſuch numbers; but the generality of interpreters, continues Calmet, acknowledge two bodies to be placed in ambuſcade, both between Bethel and Ai; one of 25,000 and the other of 5000 men.

With regard to the ſignal Joſhua made to that part of his army which lay in ambuſcade, the learned Foland embraces the opinion of the Rabbins, who believe what is called the ſhield to be too ſmall to ſerve for a ſignal: hence they make it to be the ſtaff of one of their colours: from this, our author concludes, that the whole colours were uſed on this occaſion; for in the Aſiatic ſtyle, which is very near the poetic, the part is oftentimes to be taken for the whole.

AJALON, in *Ancient Geography*, a town of the tribe of Dan, one of the Levitical. Another in the tribe of Benjamin, in whoſe valley Joſhua commanded the moon to ſtand ſtill, being then in her decreaſe, and conſequently to be ſeen at the ſame time with the ſun.

AJAN, a coaſt and country of Africa, has the river Quilmanci on the ſouth; the mountains from which the river ſprings, on the weſt; Abyſſinia, or Ethiopia, and the ſtrait of Babelmandel, on the north; and the Eaſtern or Indian ocean, on the eaſt. The

Ajax || Aichſtat.

coaſt abounds with all neceſſaries of life, and has plenty of very good horſes. The kings of Ajan are often at war with the emperor of the Abyſſins; and all the priſoners they take they ſell to the merchants of Cambaya, thoſe of Aden, and other Arabs, who come to trade in their harbours, and give them in exchange, coloured cloths, glaſs-beads, raiſins, and dates; for which they alſo take back, beſides ſlaves, gold and ivory. The whole ſea coaſt, from Zanguebar to the ſtrait of Babelmandel, is called the coaſt of Ajan; and a conſiderable part of it is ſtyled the Deſert coaſt.

AJAX, the ſon of Oileus, was one of the principal generals who went to the ſiege of Troy. He raviſhed Caſſandra the daughter of Priam, even in the temple of Minerva, where ſhe thought to have found ſanctuary. It is ſaid, he made a ſerpent of 15 feet long ſo familiar with him, that it ate at his table, and followed him like a dog. The Locrians had a ſingular veneration for his memory.

AJAX, the ſon of Telamon, was, next to Achilles, the moſt valiant general among the Greeks at the ſiege of Troy. He commanded the troops of Salamis, and performed many great actions, of which we have an account in the Iliad, in *Dictys Cretenſis*, and in the 23d book of Ovid's Metamorphoſes. He was ſo enraged, that the arms of Achilles were adjudged to Ulyſſes, that he immediately became mad. The Greeks paid great honour to him after his death, and erected a magnificent monument to his memory upon the promontory of Rhetium.

AJAX, in antiquity, a ſurious kind of dance, in uſe among the Grecians; intended to repreſent the madneſs of that hero after his defeat by Ulyſſes, to whom the Greeks had given the preference in his conteſt for Achilles's arms. Lucian, in his treatiſe of Dancing, ſpeaks of dancing the *Ajax*.—There was alſo an annual feaſt called *Ajantia*, Αἰάντεια, conſecrated to that prince, and obſerved with great ſolemnity in the iſland of Salamis, at well as in Attica: where, in memory of the valour of Ajax, a bier was expoſed, ſet out with a complete ſet of armour.

AJAZZO, a ſea-port of the iſland of Corſica, in the Mediterranean, with a biſhop's ſee. It is ſituated in a fertile territory, which produces excellent wines. It has a ſmall citadel; the ſtreets are ſpacious, the houſes well built, and the walks agreeable. The number of inhabitants is computed about 4000; many of them are Greeks. The trade of Ajazzo conſiſts of timber, and black, red, and white coral; in the fiſhery of which the inhabitants are employed. E. Long. 8. 50. N. Lat. 41. 50.

AJAZZO, a ſea-port town of Natolia, in the province of Caramania, anciently Cilicia, ſeated on the coaſt of the Mediterranean, 30 miles north of Antioch and 50 weſt of Aleppo, where the city of Iſſus anciently ſtood, and near which Alexander fought his ſecond battle with Darius. E. Long. 33. 10. N. Lat. 37. 0.

AICHSTAT, a town of Germany, in Franconia, and capital of a biſhopric of the ſame name. It is remarkable for a curious piece of workmanſhip, called the Sun of the Holy Sacrament, which is in the church. It is of maſſy gold, of great weight; and is enriched with 350 diamonds, 1400 pearls, 250 rubies, and other precious ſtones. This place is moderately large, and ſeated in a valley on the river Altmul, 10 miles north of Nienburg, and 37 ſouth of Nuremberg. E. Long. 11. 10. N. Lat. 49. 0. The biſhopric is 45 miles in length and 17 in breadth; and the biſhop is chancellor of the church of Mayence or Mentz.

Aid || Aigle.

AID, in a general ſenſe, denotes any kind of aſſiſtance given by one perſon to another.

AID in *Law*, denotes a petition made in court to call in help from another perſon who has intereſt in land, or any thing conteſted.

AID-de-Camp, in military affairs, an officer employed to receive and carry the orders of a general.

AID, *Auxilium*, in ancient cuſtoms, a ſubſidy paid by vaſſals to their lords on certain occaſions. Such were the aid of relief, paid upon the death of the lord meſne to his heir; the *aid cheval*, or capital aid, due to the chief lord on ſeveral occaſions, as, to make his elder ſon a knight, to make up a portion for marrying his daughter, &c.

AIDS, in the French cuſtoms, were certain duties paid on all goods exported or imported into that kingdom.

Court of AIDS, in France, a ſovereign court formerly eſtabliſhed in ſeveral cities, which had cognizance of all cauſes relating to the taxes, gabelles, and aids, impoſed on ſeveral ſorts of commodities, eſpecially wine.

AIDS, in the manege, are the ſame with what ſome writers call *cheriſhings*, and uſed to avoid the neceſſity of corrections.—The inner heel, inner leg, inner rein, &c. are called *inner aids*; as the outer heel, outer leg, outer rein, &c. are called *outer aids*.

AIDAN, a famous Scottiſh biſhop of Lindisfarne, or Holy Iſland, in the 7th century, was employed by Oſwald king of Northumberland in the converſion of the Engliſh, in which he was very ſucceſsful. He was a monk in the monaſtery of Jona, one of the Hebrides. He died in 651.

AIGHENDALE, the name of a liquid meaſure uſed in Lancaſhire, containing ſeven quarts.

AIGE, a bailiwick in the territory of Romand in Switzerland, conſiſts of mountains and valleys, the principal of which are the Aigle and Bex. Through theſe is the great road from Valais into Italy. When you paſs by Villeneuve, which is at the head of the lake of Geneva, you enter into a deep valley three miles wide, bordered on one ſide with the Alps of Switzerland, on the other ſide with thoſe of Savoy, and croſſed by the river Rhone. Six miles from thence you meet with Aigle, a large town, ſeated in a wide part of the valley, where there are vineyards, fields and meadows. The governor's caſtle is on an eminence that overlooks the town, and has a lofty marble tower. This government has nine large pariſhes; and is divided into four parts, Aigle, Bex, Olon, and Ormont. This laſt is among the mountains, and joins to Rougemont. It is a double valley, abounding in paſture-lands. Ivorna, in the diſtrict of Aigle, was in part buried by the fall of a mountain, occaſioned by an earthquake, in 1584.

AIGLE, a ſmall town of France, in Upper Normandy, 23 miles from D'Evereux, and 38 from Roueu, in the department of Orne. It is ſurrounded with walls and ditches, and has ſix gates, three ſuburbs, and three pariſhes. It trades in corn, toys, and more particularly in needles and pins. E. Long. 1. 5. N. Lat. 48. 35.

AIGUILLON,

Aiguillon ſt Ailana.

AIGUILLON, a ſmall town of France, in the province of Guienne, and department of Garonne and Lot, which has a conſiderable trade in wines, brandy, and hemp. E. Long. 0. 22. N. Lat. 44. 45.

AIGUISCE, in *Heraldry*, denotes a croſs with its four ends ſharpened, but ſo as to terminate in obtuſe angles. It differs from the croſs fitchee, in as much as the latter tapers by degrees to a point, and the former only at the ends.

AIKMAN, WILLIAM, a painter of conſiderable eminence, was born in Scotland, October 24. 1682. He was the ſon of William Aikman Eſq. of Cairney, and was intended by his father to follow his own profeſſion, which was that of an advocate at the Scotch bar. But the genius of the ſon led him to other ſtudies. He devoted himſelf to the fine arts, eſpecially that of painting, and having for ſome time proſecuted his ſtudies in Britain, in the year 1707 he went to Italy, reſided in Rome for three years, afterwards travelled to Conſtantinople and Smyrna, and in 1712 returned to his own country. About the year 1723 he fixed his reſidence in London, where he followed the profeſſion of painting, and had the good fortune to be patroniſed by the duke of Argyle, the earl of Burlington, Sir Godfrey Kneller, and other liberal encouragers of the arts. He painted many portraits of perſons of the firſt rank in England and Scotland; and a large picture of the royal family for the earl of Burlington, now in the poſſeſſion of the duke of Devonſhire, which was unfiniſhed at his death. Some of his portraits painted in Scotland are in the poſſeſſion of the duke of Argyle, the duke of Hamilton and others. Mr Aikman died in London, June 4. 1731. Six months previous to his death he had loſt a ſon at the age of 17. The remains of both were removed to Edinburgh, and were interred in the Grayfriars churchyard on the ſame day. Mr Somerville the author of the Chace, Mr Mallet, Mr Allan Ramſay the Scottiſh poet, and Mr Thomſon, were among Mr Aikman's intimate acquaintance; and the muſe of each, in elegiac numbers, offered a warm tribute to the memory of their departed friend. The following epitaph from the pen of Mr Mallet, was engraved on his tomb:

Dear to the good and wiſe, diſprais'd by none,
Here ſleep in peace the father and the ſon;
By virtue as by nature cloſe ally'd,
The painter's genius, but without the pride:
Worth unambitious, wit afraid to ſhine,
Honour's clear light, and friendſhip's warmth divine:
The ſon fair riſing knew too ſhort a date;
But, oh! how more ſevere the father's fate!
He ſaw him torn untimely from his ſide,
Felt all a father's anguiſh—wept and died.

Mr Aikman's ſtile of painting was an imitation of the pleaſing ſimplicity of nature. It is diſtinguiſhed by ſoftneſs of light, mellowneſs of ſhade, and mildneſs and harmony of colouring. His compoſitions have more placid tranquillity of eaſe, than boldneſs of touch and brilliancy of effect. His portraits are ſuppoſed to have ſome reſemblance to thoſe of Kneller, and not only in the imitation of the dreſſes of the time, but in the ſimilarity of tint and manner of working.

AILANA, AILATH, or AHELOTH, anciently a town of Arabia Petræa, ſituated near the Sinus Elanites of the Red ſea. It was alſo called *Elath*, and *Eloth* (Stephanus, Strabo, Moſes). The ſame with *Elana*.

Ailanthus ſt Ailſa.

AILANTHUS, in *Botany*. See BOTANY *Index*.

AILE, in *Law*, a writ which lies where a perſon's grandfather, or great-grandfather, being ſeiſed of lands, &c. in fee-ſimple, the day that he died, and a ſtranger abates and enters the ſame day, and diſpoſſeſſes the heir of his inheritance.

AILESBURY, AYLESBURY, or ALESBURY, a borough town in Buckinghamſhire, conſiſting of about 400 houſes. The ſtreets lie round the market-place, in the middle of which is a convenient hall, where the ſeſſions are held, and ſometimes the aſſizes for the county. It ſends two members to parliament. It is ſixty miles ſouth-eaſt of Buckingham, and forty-four north-weſt of London. W. Long. 0. 40. N. Lat. 51. 40.

AILMER, or ÆTHELMARE, earl of Cornwall and Devonſhire, in the reign of King Edgar. It is not known of what family he was. His authority and riches were great, and ſo alſo in appearance was his piety. He founded the abbey of Cernel, in Dorſetſhire; and had ſo great a veneration for Eadwald, the brother of St Edmund the Martyr, who had lived a hermit in that country, near the Silver Well, as they called it, that with the aſſiſtance of Archbiſhop Dunſtan, he tranſlated his relics to the old church of Cernel. In 1016, when Canute, the ſon of Sueno, invaded England, and found himſelf ſtoutly oppoſed by that valiant Saxon prince Edmund Ironſide, the ſon of Æthelred, this Earl Ailmer, with that arch traitor Eadric Streone, earl of Mercia, and Earl Algar, joined the Dane againſt their natural prince, which was one great cauſe of the Saxons ruin. He did not long ſurvive this; and we find mentioned in hiſtory only one ſon of his, whoſe name was Æthelward, earl of Cornwall, who followed his father's maxims, and was properly rewarded for it. For in 1018, Canute reaping the benefit of their treaſons, and perceiving that the traitors were no longer uſeful, he cauſed the infamous Eadric Streone, and this Earl Æthelward, to be both put to death.

AILRED, or EALRED, abbot of Reveſby in Lincolnſhire, in the reigns of Stephen and Henry II. He was born in 1109, of a noble family, and educated in Scotland with Henry the ſon of King David. On his return to England, he became a monk of the Ciſtertian order, in the monaſtery of Reveſby, of which he afterwards was made abbot. He died on the 12th of January 1166, aged 57, and was buried in his monaſtery. "He was (ſays Leland) in great eſteem during his life; celebrated for the miracles wrought after his death; and admitted into the catalogue of ſaints." He was author of ſeveral works; moſt of which were publiſhed by Gilbo the Jeſuit at Douay, 1631; part of them may be alſo found in the *Bibliotheca-Ciſtertienſis*, and *Bibliotheca Patrum*. His principal work is the *Speculum charitatis*. Leland, Bale, and Pits, mention ſeveral manuſcripts which never were publiſhed.

AILSA, an inſulated rock on the weſtern coaſt of Scotland, between the ſhores of Ayrſhire and Cantire. It is two miles in circumference at the baſe, is acceſſible only at one place, and riſes to a great height in a pyramidical form. A few goats and rabbits pick up a ſubſiſtence among the ſhort graſs and furze; but the

Ainſworth || Air.

importance of the rock conſiſts in the great variety and immenſe numbers of birds which frequent it, particularly the gannets or ſolan geeſe, ſome of which are taken for the table, and others for the feathers. The rock is rented from the earl of Caſſilis at 25l. per annum. The depth of water around the baſe is from 7 to 48 fathoms. It is ſurrounded with excellent banks, well ſtocked with cod and other white fiſh. On one part of the rock are the remains of an old caſtle, which is ſaid to have been erected by Philip II. of Spain, about the time that the Spaniſh armada invaded Britain.

AINSWORTH, Dr Henry, an eminent nonconformiſt divine, who, about the year 1590, diſtinguiſhed himſelf among the Browniſts; which drew upon him ſuch troubles that he was obliged to retire to Holland, and became miniſter of a church at Amſterdam. His ſkill in the Hebrew language, and his excellent Annotations on the Holy Scriptures, which are ſtill highly eſteemed, gained him great reputation. He alſo wrote ſeveral pieces in defence of the Browniſts, and ſeveral other works.

Ainsworth, *Robert*, born at Woodyale in Lancaſhire in 1660, was maſter of a boarding ſchool at Bethnal green, from whence he removed to Hackney, and to other places in the neighbourhood of London. After acquiring a moderate fortune, he retired, and lived privately to the time of his death, which happened in 1743. We are indebted to his induſtry for a Latin and Engliſh Dictionary, which has been much uſed in ſchools: he publiſhed it in quarto 1736; and in 1752, the fourth edition, under the care of Dr Ward of Greſham College, and the Rev. William Younge, was enlarged to two vols. folio.

AIR, in *Phyſics*, a thin, fluid, elaſtic, tranſparent, ponderous, compreſſible, and dilatable body, ſurrounding the terraqueous globe to a conſiderable height. See Atmosphere, Meteorology, and Pneumatics.

Air, in *Mythology*, was adored by the Heathens under the names of Jupiter and Juno; the former repreſenting the ſuperior and finer part of the atmoſphere, and the latter the inferior and groſſer part. The augurs alſo drew preſages from the clouds, thunder, lightning, &c.

Air, in *Painting*, &c. denotes the manner and very life of action; or it is that which expreſſes the diſpoſition of the agent.—It is ſometimes alſo uſed in a ſynonymous ſenſe with geſture or attitude.

Air, in *Muſic*, is taken in different ſenſes. It is ſometimes contraſted with harmony; and in this ſenſe, it is ſynonymous with melody in general.—Its proper meaning is, A tune, which is ſet to words, or to ſhort pieces of poetry that are called *ſongs*.

In operas, we give the name of *air* to ſuch pieces of muſic as are formed with meaſures and cadences, to diſtinguiſh it from the recitative; and, in general, every piece of muſic is called an *air*, which is formed for the voice, or even for inſtruments, and adapted to ſtanzas, whether it forms a whole in itſelf, or whether it can be detached from any whole of which it forms a part, and be executed alone.

If the ſubject admits of harmony, and is ſet in parts, the *air* is, according to their number, denominated a *duett*, a *trio*, a *quartetto*, &c. We need not follow Rouſſeau, and the other philologiſts, in their endeavours to inveſtigate the etymon of the word *air*. Its derivation, though found and aſcertained, would contribute little to illuſtrate its meaning in that remote ſenſe, to which, through a long continuance of time, and the various viciſſitudes of language, it has now paſſed. The curious may conſult the ſame article in the *Dictionaire de Muſique* by M. Rouſſeau. Air.

In modern muſic, there are ſeveral different kinds of *airs*, each of which agrees to a certain kind of dancing; and from theſe dances the airs themſelves take their ſpecific names.

The *airs* of our operas are, if we may be permitted the expreſſion, the canvas or ſubſtratum upon which are painted all the pictures of imitative muſic; melody is the deſign, and harmony the colouring; every picturesque object ſelected from the moſt beautiful parts of nature, every reflected ſentiment of the human heart, are the models which the artiſt imitates; whatever gains attention, whatever intereſts the ſoul, whatever charms the ear, or cauſes emotion in the heart, theſe are the objects of his imitation. An air which delights the ear, and diſcovers the learning of the compoſer; an air invented by genius, and compoſed with taſte; is the nobleſt effort of muſic: it is this which explores the compaſs, and diſplays the delicacy, of a beautiful voice; it is in this where the charms of a well conducted ſymphony ſhine; it is by this, that the paſſions, excited and inflamed by nice gradations, reach and agitate the ſoul through the avenues of external ſenſe. After hearing a beautiful *air*, the mind is acquieſcent and ſerene: the ear is ſatisfied, not diſguſted: it remains impreſſed on the fancy, it becomes a part of our eſſence, we carry it with us, we are able to repeat it at pleaſure: without the ability acquired by habit to breathe a ſingle note of it, we execute it in our imagination in the ſame manner as we heard it upon the theatre: one ſees the ſcene, the actor, the theatre; one hears the accompaniments and the applauſes. The real enthuſiaſt in muſic never forgets the beautiful airs which he has heard; when he chooſes, he cauſes the opera to recommence.

The words to which *airs* are adapted are not always rehearſed in regular ſucceſſion, nor ſpoken in the ſame manner with thoſe of the recitative; and though, in general, they are very ſhort, yet they are interrupted, repeated, tranſpoſed, at the pleaſure of the artiſt. They do not conſtitute a narrative, which once told is over: they either delineate a picture, which it is neceſſary to contemplate in different points of view; or inſpire a ſentiment in which the heart acquieſces with pleaſure, and from which it is neither able nor willing to be diſengaged; and the different phraſes of the *air*, are nothing elſe but different manners of beholding the ſame image. This is the reaſon why the ſubject of an *air* ſhould be one. It is by theſe repetitions properly placed, it is by theſe redoubled efforts, that an impreſſion, which at firſt was not able to move you, at length ſhakes your ſoul, agitates you, tranſports you out of yourſelf: and it is likewiſe upon the ſame principle, that the runnings, as they are called, or thoſe long, mazy, and inarticulated inflections of the voice, in pathetic *airs*, frequently ſeem, though they are not always ſo, improperly placed: for whilſt the heart is affected with a ſentiment exquiſitely moving, it often expreſſes its emotions by inarticulate ſounds, more ſtrongly and ſenſibly than it could do by words themſelves.

The

Air
Air-Pipes.

The form of *airs* is of two kinds. The ſmall airs are often compoſed of two ſtrains, which ought each of them to be ſung twice; but the important airs in operas are frequently in the form of rondeaus.

AIR, in *Geography*. See AYR.

AIR-Bladder, in fiſhes. See COMPARATIVE ANATOMY and ICHTHYOLOGY *Index*.

AIR-Gun, a pneumatic machine for exploding bullets, &c. with great violence. See PNEUMATICS.

AIR-Jacket, a ſort of jacket made of leather, in which are ſeveral bags, or bladders, compoſed of the ſame materials, communicating with each other. Theſe are filled with air through a leather tube, having a braſs ſtop-cock accurately ground at the extremity, by which means the air blown in through the tube is confined in the bladders. The jacket muſt be wet before the air be blown into the bags, as otherwiſe it will immediately eſcape through the pores of the leather. By the help of theſe bladders which are placed near the breaſt, the perſon is ſupported in the water, without making the efforts uſed in ſwimming.

AIR-Pipes, an invention for drawing foul air out of ſhips, or any other cloſe places, by means of fire. Theſe pipes were firſt found out by one Mr Sutton, a brewer in London; and from him have got the name of *Sutton's Air-pipes*. The principle on which their operation depends is known to every body, being indeed no other than that air is neceſſary for the ſupport of fire; and, if it has not acceſs from the places moſt adjacent, will not fail to come from thoſe that are more remote. Thus in a common furnace, the air enters through the aſh-hole; but if this is cloſed up, and a hole made in the ſide of the furnace, the air will ruſh in with great violence through that hole. If a tube of any length whatever be inſerted in this hole, the air will ruſh through the tube into the fire, and of conſequence there will be a continued circulation of air in that place where the extremity of the tube is laid. Mr Sutton's contrivance then, as communicated to the Royal Society by Doctor Mead, amounts to no more than this: "As, in every ſhip of any bulk, there is already provided a copper or boiling place proportionable to the ſize of the veſſel; it is propoſed to clear the bad air, by means of the fire already uſed under the ſaid coppers or boiling places for the neceſſary uſes of the ſhip.

"It is well known, that under every ſuch copper or boiler, there are placed two holes, ſeparated by a grate; the firſt of which is for the fire, and the other for the aſhes falling from the ſame; and that there is alſo a flue from the fire placed upward, by which the ſmoke of the fire is diſcharged at ſome convenient place of the ſhip.

"It is alſo well known, that the fire once lighted in theſe fire-places, is only preſerved by the conſtant draught of air through the forementioned two holes and flue; and that if the ſaid two holes are cloſely ſtopped up, the fire, though burning ever ſo briſkly before, is immediately put out.

"But if, after ſhutting up the above mentioned holes, another hole be opened, communicating with any other room or airy place, and with the fire; it is clear the ſaid fire muſt again be raiſed and burn as before, there being a light draught of air through the ſame as there was before the ſtopping up of the firſt holes; this caſe differing only from the former in this, that the air feeding the fire will now be ſupplied from another place. Air-Pipes.

"It is therefore propoſed, that, in order to clear the holds of ſhips of the bad air therein contained, the two holes above mentioned, the fire-place and aſh-place, be both cloſed up with ſubſtantial and tight iron doors; and that a copper or leaden pipe, of ſufficient ſize, be laid from the hold into the aſh-place, for the draught of air to come in that way to feed the fire. And thus it ſeems plain, from what has been already ſaid, that there will be, from the hold, a conſtant diſcharge of the air therein contained; and conſequently, that that air, ſo diſcharged, muſt be as conſtantly ſupplied by freſh air down the hatches or ſuch other communications as are opened into the hold; whereby the ſame muſt be continually freſhened, and its air rendered more wholeſome and fit for reſpiration.

"And if into this principal pipe ſo laid into the hold, other pipes are let in, communicating reſpectively either with the well or lower decks; it muſt follow, that part of the air, conſumed in feeding the fire, muſt be reſpectively drawn out of all ſuch places to which the communication ſhall be ſo made."

This account is ſo plain, that no doubt can remain concerning the efficacy of the contrivance: it is evident, that, by means of pipes of this kind, a conſtant circulation of freſh air would be occaſioned through thoſe places where it would otherwiſe be moſt apt to ſtagnate and putrefy. Several other contrivances have been uſed for the ſame purpoſe; and Dr Hales's ventilators, by ſome unaccountable prejudice, have been reckoned ſuperior in efficacy and even ſimplicity to Mr Sutton's machine, which at its firſt invention met with great oppoſition, and even when introduced by Dr Mead, who uſed all his intereſt for that purpoſe, was ſhamefully neglected.

A machine capable of anſwering the ſame purpoſe was invented by Mr Deſaguliers, which he called the *ſhip's* lungs. It conſiſted of a cylindrical box ſet up on its edge, and fixed to a wooden pedeſtal. From the upper edge of the box iſſued a ſquare trunk open at the end, and communicating with the cavity of the box. Within this box was placed a cylindrical wheel turning on an axis. It was divided into 12 parts, by means of partitions placed like the radii of a circle. Theſe partitions did not extend quite to the centre, but left an open ſpace of about 18 inches diameter in the middle; towards the circumference, they extended as far as poſſible without interfering with the caſe, ſo that the wheel might always be allowed to turn freely. —Things being thus circumſtanced, it is plain, that if the wheel was turned towards that ſide of the box on which the trunk was, every diviſion would puſh the air before it, and drive it out through the trunk, at the ſame time that freſh air would come in through the open ſpace at the centre, to ſupply that which was thrown out through the trunk. By turning the wheel ſwiftly, a ſtrong blaſt of air would be continually forced out through the ſquare trunk, on the ſame principles on which a common fanner winnows corn. If the wheel is turned the oppoſite way, a draught of air may be produced from the trunk to the centre. If this machine, then, is placed in a room where a circulation of air is wanted, and the trunk made to paſs through one

of

Air-Pump || Air-Shafts.

of the walls; by turning the wheel ſwiftly round, the air will be forced with great velocity out of that room, at the ſame time that freſh air will enter through any chinks by which it can have acceſs to ſupply that which has been forced out.

It is evident, that the circulation which is promoted by this machine is entirely of the ſame kind with that produced by Mr Sutton's; the turning of the wheel in Mr Deſaguliers's machine being equivalent to the rarefaction of the air by fire in Mr Sutton's: but that the latter is vaſtly ſuperior, as acting of itſelf, and without intermiſſion, requires no arguments to prove. Mr Sutton's machine has yet another conveniency, of which no other contrivance for the ſame purpoſe can boaſt; namely, that it not only draws out putrid air, but deſtroys it by cauſing it paſs through fire; and experience has abundantly ſhown, that though putrid air is thrown into a great quantity of freſh air, it is ſo far from loſing its pernicious properties, that it often produces noxious diſeaſes. We do not ſay, indeed, that putrid air becomes ſalutary by this means; but it is undoubtedly rendered leſs noxious than before; though whether it is equally innocent with the ſmoke of a fire fed in the common way, we cannot pretend to determine.

Beſides this machine by Mr Deſaguliers, the ventilators of Dr Hales, already mentioned, and thoſe called *wind-ſails*, are likewiſe uſed for the ſame purpoſe. The former of which is an improvement of the Heſſian bellows: the other is a contrivance for throwing freſh air into thoſe places where putrid air is apt to lodge; but this has the laſt-mentioned inconvenience in a much greater degree than any of the others, as the blaſt of freſh air throws out that which was rendered putrid by ſtagnation, in ſuch a manner as to contaminate all around it.

Air Pump, a machine by which the air contained in a proper veſſel may be exhauſted or drawn out. See PNEUMATICS.

Air-Sacs, in *Birds*. See COMPARATIVE ANATOMY.

Air-Shafts, among *Miners*, denote holes or ſhafts let down from the open air to meet the adits and furniſh freſh air. The damps, deficiency, and impurity of air which occur, when adits are wrought 30 or 40 fathoms long, make it neceſſary to let down air-ſhafts, in order to give the air liberty to play through the whole work, and thus diſcharge bad vapours, and furniſh good air for reſpiration: the expence of which ſhafts, in regard of their vaſt depths, hardneſs of the rock, drawing of water, &c. ſometimes equals, nay exceeds, the ordinary charge of the whole adit.

Sir Robert Murray deſcribes a method, uſed in the coal mines at Liege, of working mines without air-ſhafts.

When the miners at Mendip have ſunk a groove, they will not be at the charge of an air-ſhaft till they come at ore; and for the ſupply of air have boxes of elm exactly cloſed, of about ſix inches in the clear, by which they carry it down about twenty fathoms. They cut a trench at a little diſtance from the top of the groove, covering it with turf and rods diſpoſed to receive the pipe, which they contrive to come in ſideways to their groove, four feet from the top, which carries down the air to a great depth. When they come at ore, and need an air-ſhaft, they ſink it four or five fathoms diſtant, according to the convenience of the breadth, and of the ſame faſhion with the groove, to draw ore as well as air.

Air Threads || Airani

Air-Threads, in *Natural Hiſtory*, a name given to the long filaments, ſo frequently ſeen in autumn floating about in the air.

Theſe threads are the work of ſpiders, eſpecially of that ſpecies called the long-legged field-ſpider; which having mounted to the ſummit of a buſh or tree, darts from its tail ſeveral of theſe threads, till one is produced capable of ſupporting the creature in the air: on this it mounts in queſt of prey, and frequently riſes to a very conſiderable height. See ARANEA.

Air Trunk, is alſo a contrivance by Dr Hales to prevent the ſtagnation of putrid effluvia in jails and other places where a great number of people are crowded together in a ſmall ſpace. It conſiſts only of a long ſquare trunk open at both ends; one of which is inſerted into the ceiling of the room, the air of which is required to be kept pure; and the other extends a good way beyond the roof. Through this trunk a continued circulation is carried on: and the reaſon is, that the putrid effluvia which do ſo much miſchief when collected, being much lighter than the pure atmoſphere, ariſe to the top of the room; and, if they there find a vent, will continually go out through it. Theſe effluvia ariſe in very conſiderable quantity, being calculated by the late Dr Keil at no leſs than 39 ounces from one man in 24 hours.

Theſe trunks were firſt made trial of by Mr Yeoman, over the Houſe of Commons, where they were nine inches wide within; and over the Court of King's Bench in Weſtminſter-hall, where they were ſix inches wide. They are ſometimes made wider, and ſometimes narrower: but the wider they are the longer they ought to be, more effectually to promote the aſcent of the vapour. The reaſon why vapours of this kind aſcend more ſwift through a long trunk than a ſhort one, is, that the preſſure of fluids is always according to their different depth, without regard to the diameter of their baſis, or of the veſſel which contains them; and, upon this principle, a gallon of water may be made to ſplit a ſtrong caſk. See HYDROSTATICS. When the column of putrid effluvia is long and narrow, the difference between the column of atmoſphere preſſing on the upper end of the trunk, and that which preſſes on the lower end, is much greater than if the column of putrid effluvia was ſhort and wide; and conſequently the aſcent is much ſwifter.—One pan of a ſingle pair of ſcales; which was two inches in diameter, being held within one of theſe trunks over the Houſe of Commons, the force of the aſcending air made it riſe ſo as to require four grains to reſtore the equilibrium, and this when there was no perſon in the houſe; but when it was full, no leſs than 12 grains were requiſite to reſtore the equilibrium; which clearly ſhows that theſe trunks muſt be of real and very great efficacy.

Air-Veſſels, are ſpiral ducts in the leaves, &c. of plants, ſuppoſed to be analogous to the lungs of animals, in ſupplying the different parts of a plant with air. See BOTANY *Index*.

AIRA, in *Botany*, HAIR-GRASS. See BOTANY *Index*.

AIRANI, in *Church Hiſtory*, an obſcure ſect of Arians, in the fourth century, who denied the conſubſtantiality of the Holy Ghoſt with the Father and the Son. They are otherwiſe called *Airaniſts*; and are ſaid to

have

Aire || Aiton.

have taken their name from one *Airos*, who diſtinguiſhed himſelf at the head of this party, in the reigns of Valentinian and Gratian.

AIRE, in *Geography*, an ancient town of France, in the department of Landes, formerly Gaſcony. It is ſeated on the river Adour, on the declivity of a mountain, 155 leagues from Paris. E. Long. 5. 26. N. Lat. 43. 47.

AIRE, a ſtrong town in the Netherlands, in the county of Artois, now the department of Pas de-Calais, with a caſtle. It was taken by the French in 1710, and was confirmed to them by the treaty of Utrecht. It is ſeated on the river Lis, 22 miles ſouth of Dunkirk, and communicates with St Omer's by a canal cut from the river Aa. E. Long. 2. 31. N. Lat. 50. 38.

AIRING, a term peculiarly uſed for the exerciſing horſes in the open air. It purifies the blood; purges the body from groſs humours; and, as the jockies expreſs it, teaches the horſe how to make his wind rake equally, and keep time with the other motions of his body. It alſo ſharpens the ſtomach, and keeps the creature hungry; which is a thing of great conſequence, as hunters and racers are very apt to have their ſtomach fall off, either from want of exerciſe, or from the too violent exerciſe which they are often expoſed to. If the horſe be over fat, it is beſt to air him before ſunriſe and after ſunſetting; and in general, it is allowed by all, that nothing is more beneficial to thoſe creatures than early and late airings. Some of our modern manegers, however, diſpute this; they ſay, that the cold of theſe times is too great for the creature; and that if, in particular, he is ſubject to catarrhs, rheums, or the like complaints, the dews and cold fogs, in theſe early and late airings, will be apt to increaſe all thoſe diſorders. Nature, we ſee, alſo points out the ſun-beams as of great uſe to theſe animals; thoſe which are kept hardy and lie out all night, always running to thoſe places where the ſunſhine comes, as ſoon as it appears in a morning. This ſhould ſeem to recommend thoſe airings that are to be made before ſunſet, and a little time after ſunriſe. As to the caution, ſo earneſtly inculcated by Markham, of uſing theſe early and late airings for fat horſes, it is found unneceſſary by many: for they ſay, that the ſame effect may be produced by airings at warmer times, provided only that they are made longer; and that, in general, it is from long airings that we are to expect to bring a horſe to a perfect wind and ſound courage.

AIRS, in the *Manege*, are the artificial motions of taught horſes; as the demivolt, curvet, capriole, &c.

AIRY, or AERY, among *Sportſmen*, a term expreſſing the neſt of a hawk or eagle.

Airy Triplicity, among *Aſtrologers*, denotes the three ſigns, Gemini, Libra, and Aquarius.

AISNE, a river of France, which riſes in Champagne, and runs weſt by Soiſſons in the Iſle of France, falling into the river Oiſe, a little above Compiegne.

It gives name to one of the five departments which comprehend the ancient Iſle of France, and contains five communal diſtricts.

AITOCZU, a conſiderable river of Leſſer Aſia, which riſes in Mount Taurus, and falls into the ſouth part of the Euxine ſea.

AITON, WILLIAM, an eminent botaniſt and gardener, was born at a village near Hamilton in Scotland, in 1731. Having been regularly trained to the profeſſion of a gardener, he came into England in the year 1754, and ſoon obtained the notice of the celebrated Philip Miller, then ſuperintendent of the phyſic-garden at Chelſea, who engaged him as an aſſiſtant. His induſtry and abilities recommended him to the princeſs dowager of Wales as a fit perſon to manage the botanical garden at Kew. In 1759, he was appointed to this office, in which he continued during life, and which was the ſource of his fame and fortune. The garden at Kew, under the auſpices of his preſent Majeſty, was deſtined to be the grand repoſitory of all the vegetable riches which could be accumulated, by regal munificence, from reſearches through every quarter of the globe. Theſe treaſures were fortunately committed to the hands of Mr Aiton, whoſe care and ſkill in their cultivation, and intelligence in their arrangement, acquired him high reputation among the lovers of the ſcience, and the particular eſteem of his royal patrons. Under his ſuperintendence, many improvements took place in the plan and edifices of Kew-gardens, which rendered them the principal ſcene of botanical culture in the kingdom. In 1783, his merit was properly rewarded with the lucrative office of managing the pleaſure and kitchen-gardens of Kew, which he was allowed to retain with the botanical department. In 1789, he publiſhed his *Hortus Kewenſis*; or a Catalogue of the Plants cultivated in the Royal Botanic Garden at Kew, in three vols. 8vo. with 13 plates; a work which had been the labour of many years. The number of ſpecies contained in this work amounted to between five and ſix thouſand, many of which had not before been deſcribed. A new and curious article in it relates to the firſt introduction of particular exotics into the Engliſh gardens. The ſyſtem of arrangement adopted is the Linnæan, with improvements, which the advanced ſtate of botanical ſcience required. Mr Aiton with candour and modeſty acknowledges the aſſiſtance he received in this work from the two eminent Swediſh naturaliſts, Dr Solander and Mr Jonas Dryander. Indeed his character was ſuch as ſecured him the friendſhip and good offices of the moſt diſtinguiſhed names in ſcience of his time. He was for many years peculiarly honoured by the notice of Sir Joſeph Banks, the preſident of the Royal Society. The *Hortus Kewenſis* was received with avidity by the botanic world, and a large impreſſion was ſoon diſpoſed of.

Aiton || Aius.

Notwithſtanding the ſingular activity and temperance of Mr Aiton, he fell into that incurable malady, a ſchirrous liver, of which he died in 1793, in his ſixty-ſecond year. His eldeſt ſon, devoted to the ſame purſuits, was, by the king's own nomination, appointed to all his father's employments. Mr Aiton's private character was highly eſtimable for mildneſs, benevolence, piety, and every domeſtic and ſocial virtue. He was interred in the churchyard of Kew, amidſt a moſt reſpectable concourſe of friends. (*Gen. Biog.*)

AITONIA, in *Botany*. See BOTANY *Index*.

AJUGA, BUGLE, in *Botany*. See BOTANY *Index*.

AIUS LOCUTIUS, the name of a deity to whom the Romans erected an altar. The words are Latin, and ſignify "a ſpeaking voice." The following accident gave occaſion to the Romans erecting an altar to

Aius,

Ajutage, Aix

Aius Locutius. One M. Sedítius, a plebeian, acquainted the tribunes, that, in walking the ſtreets by night, he had heard a voice over the temple of Veſta, giving him notice that the Gauls were coming againſt them. This intimation was, however, neglected; but after the truth was confirmed by the event, Camillus acknowledged this voice to be a new deity, and erected an altar to it under the name of *Aius Locutius*.

AJUTAGE, or ADJUTAGE, a kind of tube fitted to the mouth of the veſſel through which the water of a fountain is to be played. To the different form and ſtructure of ajutages is owing the great variety of fountains.

AIX, a ſmall but ancient town in the duchy of Savoy, with the title of a marquiſate. It is ſeated on the lake Bourget, at the foot of a mountain, between Chamberry, Annecy, and Rumilly. There is here a triumphal arch of the ancient Romans, but it is almoſt entirely ruined. The mineral waters bring a great number of ſtrangers to this place. The place was originally called *Aquæ Gratianæ*, from the hot baths built there by the emperor Gratian. E. Long. 5. 48. N. Lat. 45. 40.

AIX, in *Geography*, an ancient city, the capital of the department of the Bouches du Rhone, formerly Provence, in France. This city has an air of ſilence and gloom commonly characteriſtic of places deſtitute of commerce or induſtry. It is, however, well built; and moſt like Paris of any place in the kingdom, as well for the largeneſs of the buildings as in reſpect of the politeneſs of the inhabitants. It is embelliſhed with abundance of fine fountains, and ſeveral beautiful ſquares. The Preachers ſquare is on the ſide of a hill; it is about 160 yards in length, and is ſurrounded with trees, and houſes built with ſtone three ſtories high. The town-hall is at one end of the city, and is diſtributed into ſeveral fine apartments: the two loweſt are taken up by the board of accounts, and by the ſeneſchal; that above is deſigned for the ſeſſions of parliament. The hall of audience is adorned with the pictures of the kings of France on horſeback. The hotel of the city is a handſome building, but hid by the houſes of the narrow ſtreet in which it is placed. The cathedral church is a Gothic ſtructure, with tombs of ſeveral earls of Provence, and ſome good pictures by French maſters. The Corſe, or Orbitelle, is a magnificent walk, above 300 yards long, formed by a triple avenue of elms, and two rows of regular and ſtately houſes. The church of the fathers of the oratory is a handſome building; and not far from thence is the chapel of the blue penitents, which is full of paintings. The convent of preachers is very fine; in their church is a ſilver ſtatue of the Virgin Mary almoſt as big as the life. There are other churches and buildings which contain a great number of raritics, The baths without the city, which were diſcovered not long ſince, have good buildings, raiſed at a vaſt expence, for the accommodation of thoſe who drink the waters. Although Aix was the firſt Roman ſettlement in Gaul, it is not remarkable for ancient remains. The warm ſprings, from which it is now known and frequented, induced Sextus Calvinus to found a colony here, to which he gave the name of *Aquæ Sextiæ*. They were ſuppoſed to poſſeſs particular virtues in caſes of debility; and ſeveral altars have been dug up ſacred to Priapus, the inſcriptions on which indicate their gratitude to that deity for his ſuppoſed ſuccour and aſſiſtance. E. Long. 5. 32. N. Lat. 43. 32.

Aix, Aix-la-Chapelle

AIX, a ſmall iſland on the coaſt of France, between the iſle of Oleron and the continent. It is 12 miles north-weſt of Rochfort, and 11 ſouth-ſouth-weſt of Rochelle. W. Long. 1. 4. N. Lat. 46. 5.

AIX-LA-CHAPELLE, a fine city of Germany, in the circle of Weſtphalia and duchy of Juliers, and capital of the department of Roer.

All authors are agreed about its antiquity, it being mentioned in Cæſar's Commentaries and the Annals of Tacitus. The Romans had colonies and fortreſſes there, when they were at war with the Germans; but the mineral waters and the hot bath ſo increaſed its fame, that, in proceſs of time, it was advanced to the privileges of a city, by the name of Aquægranii, that is, the waters of Granius; that which it has now, of *Aix-la-Chapelle*, was given it by the French, to diſtinguiſh it from the other Aix. It is ſo called, on account of a chapel built in honour of the Holy Virgin by Charlemagne; who having repaired, beautified, and enlarged the city, which was deſtroyed by the Huns in the reign of Attila in 451, made it the uſual place of his reſidence. The town is ſeated in a valley ſurrounded with mountains and woods, and yet the air is very wholeſome. It may be divided into the inward and outward city. The inward is encompaſſed with a wall about three quarters of a league in circumference, having ten gates; and the outward wall, in which there are eleven gates, is about a league and a half in circumference. There are rivulets which run through the town and keep it very clean, turning ſeveral mills; beſides 20 public fountains, and many private ones. They have ſtone quarries in the neighbourhood, which furniſh the inhabitants with proper materials for their magnificent buildings, of which the ſtadt-houſe and the cathedral are the chief. There are likewiſe 30 parochial or collegiate churches. The market-place is very ſpacious, and the houſes round it are ſtately. In the middle, before the ſtadt-houſe, is a fountain of blue ſtones, which throws out water; from ſix pipes, into a marble baſon placed beneath, 30 feet in circumference. On the top of this fountain is placed the ſtatue of Charlemagne, of gilt braſs, holding a ſceptre in his right hand, and a globe in his left. The ſtadt-houſe is adorned with the ſtatues of all the emperors ſince Charlemagne. This fabrick has three ſtories, the upper of which is one entire room of 160 feet in length and 60 in breadth. In this the new-elected emperor formerly entertained all the electors of the empire.

Aix-la-Chapelle is a free imperial city, and changes its magiſtracy every year on the eve of St John Baptiſt. The mayor is in the nomination of the elector palatine, in the quality of the duke of Juliers, as protector of the city. This place is famous for ſeveral councils and treaties of peace concluded here; particularly thoſe between France and Spain in 1668, and between Great Britain and France in 1748.

The hot ſulphureous waters for which this place has ſo long been celebrated, ariſe from ſeveral ſources, which ſupply eight baths conſtructed in different parts of the town. Theſe waters near the ſources are clear

Aix-la-Chapelle

and pellucid; and have a ſtrong ſulphureous ſmell reſembling the waſhings of a foul gun; but they loſe this ſmell by expoſure to air. Their taſte is ſaline, bitter, and urinous. They do not contain iron. They are alſo neutral near the fountain, but afterwards are manifeſtly and pretty ſtrongly alkaline, inſomuch that clothes are waſhed with them without ſoap. On the vaults above the ſprings and aqueducts of theſe waters is found, every year, when they are opened, a quantity of fine white-coloured flowers of ſulphur, which has been ſublimed from the waters.

The heat of the water of the hotteſt ſpring, by Dr Lucas's account, raiſes the quickſilver of Fahrenheit's thermometer to 136°—by Monſ. Monet's account, to 146°—and the heat of the fountain, where they commonly drink, by Dr Lucas's account, to 112°.

Dr Simmons has given the following account of their ſeveral temperatures, as repeatedly obſerved by himſelf with a thermometer conſtructed by Nairne.

The ſpring which ſupplies the Emperor's Bath *(Bain de l'Empereur)*, the New Bath *(Bain Neuf)*, and the Queen of Hungary's Bath *(Bain de la Reine de Hongrie)*, - - -	127°
St Quirin's Bath *(Bain de St Quirin)*, -	112°
The Roſe Bath *(Bain de la Roſe)*, and the Poor's Bath *(Bain des Pauvres)*, both which are ſupplied by the ſame ſpring,	112°
Charles's Bath *(Bain de Charles)*, and St Corneille's Bath *(Bain de St Corneille)*, -	112°
The ſpring uſed for drinking is in the High Street, oppoſite to Charles's Bath; the heat of it at the pump is - - - - - - -	106°

Dr Lucas evaporated the water of the hotteſt ſpring (of the Emperor's Bath), and obtained 268 grains of ſolid matter from a gallon, compoſed of 15 grains of calcareous earth, 10 grains of ſelenites, and 243 grains of a ſaline matter made of natron and ſea-ſalt. They are at firſt nauſeous and harſh, but by habit become familiar and agreeable. At firſt drinking, alſo, they generally affect the head. Their general operation is by ſtool and urine, without griping or diminution of ſtrength; and they alſo promote perſpiration.

The quantity to be drank as an alterative is to be varied according to the conſtitution and other circumſtances of the patient. In general, it is beſt to begin with a quarter or half a pint in the morning, and increaſe the doſe afterwards to a pint, as may be found convenient. The water is beſt drank at the fountain. When it is required to purge, it ſhould be drank in large and often repeated draughts.

In regard to bathing, this alſo muſt be determined by the age, ſex, ſtrength, &c. of the patient, and by the ſeaſon. The degree of heat of the bath ſhould likewiſe be conſidered. The tepid ones are in general the beſt, though there are ſome caſes in which the hotter ones are moſt proper. But even in theſe, it is beſt to begin with the temperate baths, and increaſe the heat gradually.

Theſe waters are efficacious in diſeaſes proceeding from indigeſtion and from foulneſs of the ſtomach and bowels; in rheumatiſms; in the ſcurvy, ſcrophula, and diſeaſes of the ſkin; in hyſteric and hypochondriacal diſorders; in nervous complaints and melancholy; in the ſtone and gravel; in paralytic complaints; in thoſe evils which follow an injudicious uſe of mercury; and in many other caſes. They ought not, however, to be given in hectic caſes where there is heat and fever, in putrid diſorders, or where the blood is diſſolved or the conſtitution much broken down.

Aix-la-Chapelle || Akenſide.

The time of drinking, in the firſt ſeaſon, is from the beginning of May to the middle of June; and, in the latter ſeaſon, from the middle of Auguſt to the latter end of September.

There are galleries or piazzas under which the company walk during the time of drinking, in order to promote the operation of the waters.—The Poor's Bath is free for every body, and is frequented by crowds of poor people.

It is ſcarcely neceſſary to add, that there are all kinds of amuſements common to other places of public reſort; but the ſharpers appear more ſplendid here than elſewhere, aſſuming titles, with an equipage ſuitable to them. This city was taken by the French in 1792. They loſt it in the year following, but retook it in 1794. Aix-la-Chapelle is 21 miles from Spa, 36 from Liege, and 30 from Cologne. E. Long. 5. 48. N. Lat. 51. 55.

AIZOON, in *Botany*. See BOTANY *Index*.

AKENSIDE, MARK, a phyſician, who publiſhed in Latin "A Treatiſe upon the Dyſentery," in 1764, and a few pieces in the firſt volume of the "Medical Tranſactions" of the college of phyſicians, printed in 1768; but far better known, and to be diſtinguiſhed chiefly hereafter, as a poet. He was born at Newcaſtle-upon-Tyne, November 9. 1721; and after being educated at the grammar-ſchool in Newcaſtle, was ſent to the univerſities of Edinburgh and Leyden; at which laſt he took his degree of doctor in phyſic. He was afterwards admitted by mandamus to the ſame degree at Cambridge; elected a fellow of the college of phyſicians, and one of the phyſicians at St Thomas's Hoſpital; and, upon the eſtabliſhment of the queen's houſehold, appointed one of the phyſicians to her majeſty.

That Dr Akenſide was able to acquire no other kind of celebrity than that of a ſcholar and a poet, is to be accounted for by the following particulars in his life and conduct, related by Sir John Hawkins.—Mr Dyſon and he were fellow-ſtudents, the one of law and the other of phyſic, at Leyden; where, being of congenial tempers, a friendſhip commenced between them that laſted through their lives. They left the univerſity at the ſame time, and both ſettled at London: Mr Dyſon took to the bar, and being poſſeſſed of a handſome fortune, ſupported his friend while he was endeavouring to make himſelf known as a phyſician; but in a ſhort time, having purchaſed of Mr Hardinge his place of clerk of the houſe of commons, he quitted Weſtminſter-hall; and for the purpoſe of introducing Akenſide to acquaintance in an opulent neighbourhood near the town, bought a houſe at North-End, Hampſtead; where they dwelt together during the ſummer ſeaſon, frequenting the long-room, and all clubs and aſſemblies of the inhabitants.

At theſe meetings, which, as they were not ſelect, muſt be ſuppoſed to have conſiſted of ſuch perſons as uſually meet for the purpoſe of goſſiping, men of wealth, but of ordinary endowments, and able to talk of little elſe than news and the occurrences of the day, Akenſide was for diſplaying thoſe talents which had acquired him the reputation he enjoyed in other com-

Akenſide. panies: but here they were of little uſe to him; on the contrary, they tended to engage him in diſputes that betrayed him into a contempt of theſe that differed in opinion from him. It was found out that he was a man of low birth, and a dependent on Mr Dyſon; circumſtances that furniſhed thoſe whom he offended with a ground of reproach, which reduced him to the neceſſity of aſſerting in terms that he was a gentleman.

Little could be done at Hampſtead after matters had proceeded to this extremity: Mr Dyſon parted with his villa at North-End, and ſettled his friend in a ſmall houſe in Bloomſbury-ſquare; aſſigning for his ſupport ſuch a part of his income as enabled him to keep a chariot.—In this new ſituation Akenſide uſed every endeavour to become popular, but defeated them all by the high opinion he everywhere manifeſted of himſelf, and the little condeſcenſion he ſhowed to men of inferior endowments; by his love of political controverſy, his authoritative cenſure of the public councils, and his peculiar notions reſpecting government. In the winter evenings he frequented Tom's coffee-houſe in Devereux-court, then the reſort of ſome of the moſt eminent men for learning and ingenuity of the time; with ſome of whom he was involved in diſputes and altercations, chiefly on ſubjects of literature and politics, which fixed on his character the ſtamp of haughtineſs and ſelf-conceit. Hence many, who admired him for his genius and parts, were ſhy of his acquaintance.

The value of that precept which exhorts us to live peaceably with all men, or, in other words, to avoid creating enemies, can only be eſtimated by the reflection on thoſe many amiable qualities againſt which the neglect of it will preponderate. Akenſide was a man of religion and ſtrict virtue; a philoſopher, a ſcholar, and a fine poet. His converſation was of the moſt delightful kind; learned, inſtructive, and without any affectation of wit, cheerful and entertaining.

Dr Akenſide died of a putrid fever, June 23. 1770; and is buried in the pariſh church of St James's, Weſtminſter.

His poems, publiſhed ſoon after his death in 4to and 8vo, conſiſt of "The Pleaſures of Imagination," two books of "Odes," a "Hymn to the Naiads," and ſome "Inſcriptions." "The Pleaſures of Imagination," his capital work, was firſt publiſhed in 1744; and a very extraordinary production it was from a man who had not reached his 23d year. He was afterwards ſenſible, however, that it wanted reviſion and correction; and he went on reviſing and correcting it for ſeveral years: but finding this taſk to grow upon his hands, and deſpairing of ever executing it to his own ſatisfaction, he abandoned the purpoſe of correcting, and reſolved to write the poem over anew upon a ſomewhat different and enlarged plan. He finiſhed two books of his new poem, a few copies of which were printed for the uſe of the author and certain friends; of the firſt book in 1757, of the ſecond in 1765. He finiſhed alſo a good part of a third book, and an introduction to a fourth; but his moſt munificent and excellent friend, conceiving all that is executed of the new work too inconſiderable to ſupply the place, and ſuperſede the republication, of the original poem, and yet too valuable to be withheld from the public, hath cauſed them both to be inſerted in the collection of his poems.

AKIBA, a famous rabbin, flouriſhed a little after the deſtruction of Jeruſalem by Titus. He kept the flocks of a rich citizen of Jeruſalem till the 40th year of his age, and then devoted himſelf to ſtudy in the academies for 24 years; and was afterwards one of the greateſt maſters in Iſrael. According to the Jewiſh accounts, he had 24,000 ſcholars. He declared for the impoſtor Barcochebas, whom he owned for the Meſſiah; and not only anointed him king, but took upon himſelf the office of his maſter of the horſe. The troops which the emperor Hadrian ſent againſt the Jews, who under the conduct of this falſe Meſſiah had committed horrid maſſacres, exterminated this faction. Akiba was taken, and put to death with great cruelty. He lived 120 years; and was buried with his wife in a cave upon a mountain not far from Tiberias, and his 24,000 ſcholars were buried round about him upon the ſame mountain. It is imagined he invented a ſuppoſititious work under the name of the patriarch Abraham. Akiba ll Alæ.

AKISSAT, the ancient Thyatira, a city of Natolia, in Aſia, ſituated in a plain 15 miles broad, which produces plenty of cotton and grain. The inhabitants, who are reckoned to be about 5000, are ſaid to be all Mahometans. The houſes are built of nothing but earth or turf dried in the ſun, and are very low and ill contrived: but there are ſix or ſeven moſques, which are all of marble. There are remarkable inſcriptions on marble in ſeveral parts of the town, which are part of the ruins of the ancient Thyatira. It is ſeated on the river Hermus, 50 miles from Pergamos. E. Long. 28. 30. N. Lat. 38. 50.

AKOND, an officer of juſtice in Perſia, who takes cognizance of the cauſes of orphans and widows; of contracts, and other civil concerns. He is the head of the ſchool of law, and gives lectures to all the ſubaltern officers; he has his deputies in all the courts of the kingdom, who, with the ſecond *ſadra*, make all contracts.

AL, an Arabic particle prefixed to words, and ſignifying much the ſame with the Engliſh particle *the*: Thus they ſay, alkermes, alkoran, &c. *i. e.* the kermes, the koran, &c.

AL, or ALD, a Saxon term frequently prefixed to the names of places, denoting their antiquity; as Aldborough, Aldgate, &c.

ALA, a Latin term properly ſignifying a wing; from a reſemblance to which ſeveral other things are called by the ſame name: Thus,

ALA, is a term uſed by botaniſts for the hollow of a ſtalk, which either the leaf, or the pedicle of the leaf, makes with it; or it is that hollow turning, or ſinus, placed between the ſtalk or branch of a plant and the leaf, whence a new offspring uſually iſſues. Sometimes it is uſed for thoſe parts of leaves otherwiſe called *lobes*, or *wings*.

ALÆ (the plural number) is uſed to ſignify thoſe petals or leaves of papilionaceous flowers, placed between thoſe others which are called the *vexillum* and *carina*, and which make the top and bottom of the flowers. Inſtances of flowers of this ſtructure are ſeen in thoſe of peaſe and beans, in which the top leaf or petal is the vexillum, the bottom the carina, and the ſide ones the alæ.

ALÆ is alſo uſed for thoſe extremely ſlender and membranaceous

Ala
Alabaſter.

membranaceous parts of ſome ſeed, which appear as wings placed on them; it likewiſe ſignifies thoſe membranaceous expanſions running along the ſtems of ſome plants, which are therefore called *alated ſtalks*.

ALÆ, in *Anatomy*, a term applied to the lobes of the liver, the cartilages of the noſtril, &c.

ALÆ, in the *Roman Art of War*, were the two wings or extreme parts of the army drawn up in order of battle.

ALABA, one of the three ſmalleſt diſtricts of Biſcay in Spain, but pretty fertile in rye, barley, and fruits. There are in it very good mines of iron, and it had formerly the title of a kingdom.

ALABANDA, in *Ancient Geography*, a town of Caria, near the Meander, ſituated beneath eminences reſembling aſſes with pack-ſaddles, which gave riſe to the jeſt; and between Amyzo to the weſt and Stratonice to the eaſt. Under the Romans they enjoyed aſſizes, or a convention of juriſdiction, by Pliny reckoned the fourth in order; hence the proverb in Stephanus, expreſſing their happineſs. It was built by Alabandus, whom therefore they deemed a god. The people were called *Alabandi*, *Alabandenſes*, (Cicero;) and *Alabandeis*, after the Greek manner, in coins of Auguſtus and Claudius; they were alſo called *Alabandeni* (Livy).

ALABARCHA, in *Antiquity*, a kind of magiſtrate among the Jews of Alexandria, whom the emperors allowed them to elect, for the ſuperintendency of their policy, and to decide differences and diſputes which aroſe among them.

ALABASTER, William, an Engliſh divine, was born at Hadley in the county of Suffolk. He was one of the doctors of Trinity college in Cambridge; and he attended the earl of Eſſex as his chaplain in the expedition to Cadiz in the reign of Queen Elizabeth. It is ſaid, that his firſt reſolutions of changing his religion were occaſioned by his ſeeing the pomp of the churches of the Roman communion, and the reſpect with which the prieſts ſeemed to be treated amongſt them; and appearing thus to waver in his mind, he ſoon found perſons who took advantage of this diſpoſition of his, and of the complaints which he made of not being advanced according to his deſerts in England, in ſuch a manner, that he did not ſcruple to go over to the Popiſh religion, as ſoon as he found that there was no ground to hope for greater encouragement in his own country. However that matter be, he joined himſelf to the Romiſh communion, but was diſappointed in his expectations. He was ſoon diſpleaſed at this; and he could not reconcile himſelf to the diſcipline of that church, which made no conſideration of the degrees which he had taken before. It is probable too that he could not approve of the worſhip of creatures, which Proteſtants are uſed to look upon with horror. Upon this he returned to England, in order to reſume his former religion. He obtained a prebend in the cathedral of St Paul, and after that the rectory of Therfield in Hertfordſhire. He was well ſkilled in the Hebrew tongue; but he gave a wrong turn to his genius by ſtudying the Cabala, with which he was ſtrangely infatuated. He gave a proof of this in a ſermon which he preached upon taking his degree of doctor of divinity at Cambridge. He took for his text the beginning of the firſt book of Chronicles, "Adam, Seth, Enos;" and having touched upon the literal ſenſe, he turned immediately to the myſtical, aſſerting, that Adam ſignified misfortune and miſery, and ſo of the reſt. His verſes were greatly eſteemed. He wrote a Latin tragedy intitled *Roxana*; which, when it was acted in a college at Cambridge, was attended with a very remarkable accident. There was a lady who was ſo terrified at the laſt word of the tragedy, *Sequar*, *Sequar*, which was pronounced with a very ſhocking tone, that ſhe loſt her ſenſes all her lifetime after. He died in the year 1640. His *Apparatus in Revelationem Jeſu Chriſti* was printed at Antwerp in 1607. His *Spiraculum tubarum, ſeu fons Spiritualium Expoſitionum ex æquivocis Pentaglotti ſignificationibus*, and his *Ecce Sponſus venit, ſex tuba pulchritudinis, hoc eſt demonſtratio quod non ſit illicitum nec impoſſibile computare durationem mundi et tempus ſecundi adventus Chriſti*, were printed at London. From theſe titles we may judge what were the taſte and genius of the author.

Alabaſter
Aladu'ia.

ALABASTER, in *Natural Hiſtory*, a mineral ſubſtance whoſe baſe is calcareous earth. It differs from marble in being combined, not with the carbonic, but with the ſulphuric acid. See CHEMISTRY, and MINERALOGY *Index*.

ALABASTER, in *Antiquity*, a term uſed for a vaſe wherein odoriferous liquors were anciently put. The reaſon of the denomination is, that veſſels for this purpoſe were frequently made of the alabaſter ſtone, which Pliny and other ancients repreſent as peculiarly proper for this purpoſe. Several critics will have the box mentioned in the Goſpels as made of alabaſter to have been of glaſs: And though the texts ſay that the woman broke it, yet the pieces ſeem miraculouſly to have been united, ſince we are told the entire box was purchaſed by the emperor Conſtantine, and preſerved as a relic of great price. Others will have it, that the name *alabaſter* denotes the form rather than the matter of this box: In this view they define alabaſter by a box without a handle, deriving the word from the privative α and λαβὴ, *anſa*, *handle*.

ALABASTER is alſo ſaid to have been uſed for an ancient liquid meaſure, containing ten ounces of wine, or nine of oil. In this ſenſe, the alabaſter was equal to half the ſextary.

ALABASTRUM DENDROIDE, a kind of laminated alabaſter, beautifully variegated with the figures of ſhrubs, trees, &c. found in great abundance in the province of Hohenſtein.

ALADINISTS, a ſect among the Mahometans, anſwering to freethinkers among us.

ALADULIA, a conſiderable province of Turkey in Aſia, in that part called Natolia, between the mountains of Antitaurus, which ſeparate it from Amaſia on the north, and from Carimania on the weſt. It has the Mediterranean ſea on the ſouth; and the Euphrates, or Frat, on the eaſt, which divides it from Diarbeker. It comprehends the Leſſer Armenia of the ancients, and the eaſt part of Cilicia. Formerly it had kings of its own; but the head of the laſt king was cut off by Selim I. emperor of the Turks, who had conquered the country. It is now divided into two parts: the north, comprehended between Taurus, Antitaurus, and the Euphrates, is a beglerbeglic, which bears the name of Marath, the capital town; and the ſouth, ſeated between Mount Taurus and the Mediterranean, is united to the beglerbeglic of Aleppo. The country is rough,

Alain
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Alamandus.

rugged, and mountainous; yet there are good paſtures, and plenty of horſes and camels. The people are hardy and thieviſh. The capital is Malatigah.

ALAIN, CHARTIER, ſecretary to Charles VII. king of France, born in the year 1386. He was the author of ſeveral works in proſe and verſe; but his moſt famous performance was his Chronicle of King Charles VII. Bernard de Girard, in his preface to the Hiſtory of France, ſtyles him "an excellent hiſtorian, who has given an account of all the affairs, particulars, ceremonies, ſpeeches, anſwers, and circumſtances, at which he was preſent himſelf, or had information of." Giles Coroxet tells us, that Margaret, daughter to the king of Scotland, and wife to the dauphin, paſſing once through a hall where Alain lay aſleep, ſhe ſtopped and kiſſed him before all the company who attended: ſome of them telling her, that it was ſtrange ſhe ſhould kiſs a man who had ſo few charms in his perſon, ſhe replied, "I did not kiſs the man, but the mouth from whence proceed ſo many excellent ſayings, ſo many wiſe diſcourſes, and ſo many elegant expreſſions." Mr Fontenelle, among his Dialogues of the Dead, has one upon this incident, between the princeſs Margaret and Plato. Mr Paſquier compares Alain to Seneca, on account of the great number of beautiful ſentences interſperſed throughout his writings.

ALAIS, a conſiderable town of France, in the department of Gard, and formerly the province of Languedoc, ſituated on the river Gard, at the foot of the Cevennes. The Jeſuits had a college in this place; and a fort was built here in 1689. It is 34 miles north of Montpelier, and 340 from Paris. E. Long. 4. 20. N. Lat. 44. 8.

ALAMAGAN, in *Geography*, one of the Ladrone or Marianne iſlands, in the Indian ocean, is ſituated in N. Lat. 18. 5. and E. Long. 146. 47. It is of an irregular form, and about 12 miles in circumference. The land in ſome places of this iſland is pretty high, ſo that it may be ſeen at the diſtance of 12 or 14 leagues. Near the north end of the iſland there is a volcano which emitted an immenſe body of ſmoke in the year 1799, when it was viſited by Captain Baſs. The volcano is in a mountain cloſe to the ſea, riſing above its level 1200 or 1500 feet. The high parts of the iſland are rugged and ſterile. In the lower parts there is a profuſion and luxuriance of vegetation. They abound with cocoa-nut trees, ſeveral kinds of ſtone fruit, and the mellora or bread-tree of the Nicobar iſlands. Some ſmall ſugar canes, ſome banana trees, and one bread-fruit tree, were diſcovered. Lizards, land-crabs, large partridges, quails, pigeons, owls, thruſhes, and bullfinches, are numerous. But no freſh water, which was the object of Captain Baſs's viſit, could be found.

ALAMANDUS, LEWIS, in French *Aleman*, archbiſhop of Arles, and cardinal of St Cecilia, was one of the greateſt men of the 15th century. The cardinal preſided in the council of Baſil, which depoſed Eugenius IV. and elected the antipope Felix V. He is much commended by Æneas Sylvius, as a man extremely well formed for preſiding in ſuch aſſemblies, firm and vigorous, illuſtrious by his virtue, learned, and of an admirable memory in recapitulating all that the orators and diſputants had ſaid. One day, when he harangued againſt the ſuperiority of the pope over the council, he diſtinguiſhed himſelf in ſuch an eminent manner, that ſeveral perſons went to kiſs him, while others preſſed even to kiſs his robe. They extolled to the ſkies his abilities and genius, which had raiſed him, though a Frenchman, to a ſuperiority over the Italians, notwithſtanding all their natural ſubtlety and fineſſe. There is no need of aſking, whether Pope Eugenius thundered againſt the preſident of a council which depoſed him. He deprived him of all his dignities, and treated him as a ſon of iniquity. However, notwithſtanding this, Lewis Alamandus died in the odour of ſanctity, and performed ſo many miracles after his death, that at the requeſt of the canons and Celeſtine monks of Avignon, and the ſolicitation of the cardinal of Clermont, legate *à latere* of Clement VII. he was beatified by the pope in the year 1527.

Alamanni
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Alamos.

ALAMANNI, LEWIS, was born at Florence, of a noble family, on the 28th of October 1495. He was obliged to fly his country for a conſpiracy againſt Julius de Medici, who was ſoon after choſen pope under the name of Clement VII. During this voluntary baniſhment, he went into France; where Francis I. from a love to his genius and merit, became his patron. This prince employed him in ſeveral important affairs, and honoured him with the collar of the order of St Michael. About the year 1540, he was admitted a member of the Inflammati, an academy newly erected at Padua, chiefly by Daniel Barbaro and Ugolin Martelli. After the death of Francis, Henry duke of Orleans, who ſucceeded him in 1537, ſhowed no leſs favour to Alamanni; and in the year 1551, ſent him as his ambaſſador to Genoa: this was his laſt journey to Italy; and being returned to France, he died at Amboiſe on the 18th of April 1556, being in the 61ſt year of his age. He left many beautiful poems, and other valuable performances, in the Italian language. We have alſo ſome notes of his upon Homer's Iliad and Odyſſey; thoſe upon the Iliad were printed in the Cambridge edition of Homer in 1689, and Joſhua Barnes has alſo inſerted them in his fine edition of Homer in 1711.

ALAMODALITY, in a general ſenſe, is the accommodating a perſon's behaviour, dreſs, and actions, to the prevailing taſte of the country or times in which he lives.

ALAMODALITY of writing, is defined the accommodation of mental productions, both as to the choice of ſubject and the manner of treating it, to the genius or taſte of the times, in order to render them more acceptable to the readers.

ALAMODE, a phraſe originally French, importing a thing to be in the faſhion or mode. The phraſe has been adopted not only into ſeveral of the living languages, as the Engliſh and High-Dutch, but ſome have even taken it into the Latin. Hence we meet with *Alamodicus* and *Alamodalitas*.

ALAMODE, in *Commerce*, a thin gloſſy black ſilk, chiefly uſed for women's hoods and men's mourning ſcarfs.

ALAMOS, BALTHASAR, a Spaniſh writer, born at Medina del Campo in Caſtile. After having ſtudied the law at Salamanca, he entered into the ſervice of Anthony Perez, ſecretary of ſtate under Philip II. He was in high eſteem and confidence with his maſter, upon which account he was impriſoned after the diſgrace

of

Alan, Aland.

of this miniſter. He was kept in confinement 11 years, when Philip III. coming to the throne, ſet him at liberty, according to the orders given by his father in his will. Alamos continued in a private capacity, till the duke of Olivarez, the favourite of Philip IV. called him to public employments. He was a man of wit as well as judgement, but his pen was ſuperior to his tongue. He died in the 88th year of his age. His Spaniſh tranſlation of Tacitus, and the aphoriſms which he added in the margin, gained him great reputation. This work was publiſhed at Madrid in 1614; and was to have been followed, as mentioned in the king's privilege, with a commentary, which however has never yet appeared. The author compoſed the whole during his impriſonment.

ALAN, Cardinal William, was born at Roſſal in Lancaſhire, in the year 1532. He went to Oxford at the age of 15, and in 1550 was elected fellow of Oriel college. In 1556, being then only 24 years old, he was choſen principal of St Mary's hall, and one of the proctors of the univerſity. In 1558 he was made canon of York; but, upon Queen Elizabeth's acceſſion to the throne, he left England, and ſettled at Louvain in an Engliſh college, of which he became the chief ſupport. In 1565 he viſited his native country; but on account of his extreme activity in the propagation of the Roman Catholic religion, he was obliged to fly the kingdom in 1568. He went firſt to Mechlin, and then to Douay, where he was made doctor of divinity. Soon after, he was appointed canon of Cambray, and then canon of Rheims. He was created cardinal on the 28th of July 1587, by the title of *St Martin in Montibus;* and obtained from the king of Spain a rich abbey in the kingdom of Naples, and afterwards the biſhoprick of Mechlin. It is ſuppoſed to have been by the advice and inſtigation of this prieſt, that Philip II. attempted to invade England. He died on the 20th of October 1594, aged 63; and was buried in the Engliſh college at Rome. He was a man of conſiderable learning, and an elegant writer. He wrote many books in defence of the Romiſh religion. The moſt remarkable are, 1. *A Defence of the 12 Martyrs in one Year.* Tho. Alfield was hanged for bringing, and publiſhing, this and other of Alan's works, into England, in the year 1584. 2. *A Declaration of the Sentence of Sextus V.* &c. A work intended to explain the pope's bull for the excommunication of Queen Elizabeth, and to exhort the people of England to take up arms in favour of the Spaniards. Many thouſand copies of this book, printed at Antwerp, were put on board the Armada; but the enterpriſe failing, they were afterwards deſtroyed. 3. *Of the Worſhip due to Saints and their Relicks*, 1583. This treatiſe was anſwered by Lord Burleigh, and is eſteemed the moſt elegant of the cardinal's writings.

ALAND, in *Geography*, with its dependant iſlands, to the number of eighty, is ſituated between the gulfs of Bothnia and Finland. Theſe iſlands lie between N. Lat. 59. 47. and 60. 30. and between E. Long. 19. 17. and 22. 7. Aland conſtitues the ſmalleſt of the poſſeſſions belonging to the crown of Sweden. It contains about ſeventy-ſeven ſquare Engliſh miles and is in length about twenty Engliſh miles, and ſixteen in breadth.

Aland has been ſuppoſed anciently to have been governed by its own monarchs; it is certain, however, that ſince the fourteenth century it has made part of the biſhoprick and government of Abo, with the exception that in the year 1743 Aland and the other iſlands ſubmitted to Ruſſia, and ſwore allegiance to the czarina, but were ſoon after reſtored to Sweden by the treaty of Abo. Theſe iſlands in former times frequently ſuffered from the invaſions of the Ruſſians, and the inhabitants had been forced to fly from their houſes and fertile plains. But in 1718 a congreſs was held here for the reſtoration of peace, by which the enjoyment of tranquillity was ſecured to them. Aland

Aland and the ſeveral iſles contain eight pariſhes, each of which has a church; and beſides theſe places of worſhip, there are ſeven chapels.

The Laplanders and Fins were undoubtedly the earlieſt inhabitants of theſe iſlands, and their reſidence here is plainly to be traced in the names of places which ſtill remain.

Several lakes are met with in theſe iſlands, and but one rivulet, which however is ſufficient to work two mills, one of which is a ſaw-mill. The mountains are numerous; the higheſt of them is called Ulfdubs Klint.

The revenues which the crown of Sweden receives from Aland and the other iſlands, amount annually to nineteen thouſand nine hundred and eight-ſix rix-dollars. Two hundred and ninety-eight ſailors are regiſtered in theſe iſlands, which coſt the king of Sweden about five thouſand rix-dollars yearly.

Aland contains about three thouſand ſeven hundred and fifty acres of land in cultivation, which produce rye, wheat, oats, and barley, in the proportion of ſeven for one. The annual growth of wheat is about twenty-two thouſand five hundred barrels. There is one pariſh which has no arable land, and in this reſpect reſembles Lapland. The inhabitants of this pariſh employ themſelves in fiſhing, and purchaſe all the corn they have occaſion for of their neighbours. They catch vaſt number of pilchards, of which they make great profit, it being the chief traffic of theſe iſlands.

It has been in agitation to build a city in the iſle of Aland, but the project has not hitherto been carried into execution, owing, it is ſaid, to the difficulty of chuſing a proper ſpot for it.

The uſual route from Sweden to Finland is from the poſt-office of Griſlehamn in Upland, which is eleven and a half Swediſh miles, to Eckero in Aland; and from that place acroſs the iſland to Abo, which is five miles more. A Swediſh mile makes between ſix and ſeven Engliſh miles.

In the year 1792 the number of inhabitants upon the iſland of Aland amounted to eleven thouſand two hundred and ſixty, which is upwards of a thouſand to every ſquare Swediſh mile; a very great number when it is conſidered how mountainous the iſland is. The inhabitants of theſe iſlands live to very great ages. From the year 1692 to the preſent time, nine perſons are recorded to have died at the great age of one hundred years; and perhaps the number had been found greater, had it been thought worth while to notice this particular. In 1703 there died a woman named Anna Berg, who was one hundred and nine years old: and at Kumblinge, in the year 1766, another perſon of the ſame ſex died at an age of upwards of one hundred and twenty years. One ſixth part of the inhabitants are above fifty years old;

Aland, Alaraf.

old; a circumſtance which affords a convincing proof of the healthineſs of the place.

The ſea which ſurrounds the iſle of Aland is very ſeldom frozen, and was leſs ſo formerly than at the preſent time. In 1546 it was remarked as an extraordinary event, that in that year the ſea was ſo frozen as to be croſſed on the ice. It ſeems latterly that theſe ſevere froſts happened once in ten years. The winter of the year 1702 was remarkably mild, ſo that barley was ſown on the twenty-fifth of March, at which time there was plenty of paſture for cattle: conſidering its high latitude, Aland enjoys a very favourable climate.

In their manners and cuſtoms the inhabitants of Aland do not differ greatly from the peaſants of Upland. Their marriages and funerals are celebrated much in the ſame manner.

The Alanders commonly uſe nouriſhing food; their bread is generally made of rye, even when the crops of that kind of corn have proved unfavourable. Freſh fiſh, and fiſh dried or ſalted, together with milk, butter, cheeſe, and fleſh-meat, are their uſual fare. They make uſe of the fleſh of ſeals; and prepare a diſh called *ſkalkroppe*, compoſed of collops of the fleſh mixed up with flour and lard, and this they reckon excellent. In their voyages by ſea they lay in a good ſtock of proviſions, and at theſe times are not ſparing of meat and butter.

The dreſs of the Alanders is becoming. The men wear, in general, ſhort jackets, which on holidays are commonly of blue cloth. The young peaſants commonly wear cotton ſtockings, and many of them have even watches. The women, when full dreſſed, wear a petticoat and apron of camlet, cotton, or printed linen, and ſometimes of ſilk. Their dreſs in mourning is generally of black ſilk, with a camlet petticoat.

The dwellings of the peaſants are very neat and convenient, kept in good repair, and well lighted. They are uſually built of wood, fir, or deal, and covered with the bark of the birch tree, or ſhingles. Their outhouſes are moſtly thatched. As they have no running ſtreams and water-mills, ſcarcely any peaſant is without a wind-mill.

The Alanders are an ingenious, lively, and courteous people; and on the ſea diſplay a great degree of ſkill and reſolution. They are far from being ſuperſtitious, but are ſaid to be of a litigious diſpoſition.

No bears or ſquirrels are to be found in theſe iſlands; and the elk, which formerly was uncommonly numerous, is now no longer ſeen in them. The animals chiefly found are wolves (which are ſaid to croſs the ſea from Finland, when it has happened to be frozen over), foxes, martens, hares, ermines, bats, moles, rats, mice, &c.; otters are but rarely met with: on the coaſt are found ſeals, &c. Above a hundred ſpecies of birds are found in the iſlands. Fiſh are in great abundance. The number of inſects amounts to eight hundred ſpecies, ſome of which are extremely deſtructive to trees and newly built houſes. The mountains are chiefly formed of red granite. (*Acerbi's Travels.*)

ALARAF, in the Mahometan theology, the partition wall that ſeparates heaven from hell. The word is plural, and properly written *al araf*; in the ſingular it is written *al arf*. It is derived from the Arabic verb *arafa*, to diſtinguiſh. Alaraf gives the denomination to the ſeventh chapter of the Alcoran, wherein mention is made of this wall. Mahomet ſeems to have copied his Alaraf, either from the great gulf of ſeparation mentioned in the New Teſtament, or from the Jewiſh writers, who alſo ſpeak of a thin wall dividing heaven from hell. Mahometan writers differ extremely as to the perſons who are to be found on Alaraf. Some take it for a ſort of limbus for the patriarchs, prophets, &c. others place here ſuch whoſe good and evil works ſo exactly balance each other, that they deſerve neither reward nor puniſhment. Others imagine this intermediate ſpace to be poſſeſſed by thoſe who, going to war without their parents leave, and ſuffering martyrdom there, are excluded paradiſe for their diſobedience, yet eſcape hell becauſe they are martyrs.

Alaraf || Alaſco.

ALARBES, a name given to thoſe Arabians who live in tents, and diſtinguiſh themſelves by their dreſs from the others who live in towns.

ALARES, in *Roman Antiquity*, an epithet given to the cavalry, on account of their being placed in the two wings of the army.

ALARIC, a famous general of the Goths. He entered Thrace at the head of 200,000 men, and laid waſte all the country through which he paſſed. He marched next to Macedonia and Theſſaly: The Theſſalians met him near the mouth of the river Peneus, and killed about 3000 of his army; nevertheleſs he advanced into Greece, and after having ravaged the whole country, returned to Epirus, loaded with immenſe ſpoils. After ſtaying here five years, he reſolved to turn his arms to the weſt. He marched through Pannonia; and, finding little reſiſtance, entered Italy, in the conſulſhip of Stilicho and Aurelianus, A. D. 400. After various battles and treaties, he at laſt took Rome by treachery, and permitted his ſoldiers to plunder it; this happened A. D. 400. Alaric, having laid waſte a great part of Italy, intended to paſs into Sicily: but a ſtorm obliging him to land again, he beſieged the city of Coſenza; and having taken it, he died there in 411, eleven years after he firſt entered Italy.

ALARM, in the *Military Art*, denotes either the apprehenſion of being ſuddenly attacked; or the notice thereof, ſignified by firing a cannon, firelock, or the like. Falſe alarms are frequently made uſe of, to haraſs the enemy, by keeping them conſtantly under arms. Sometimes alſo this method is taken to try the vigilance of the piquet-guard, and what might be expected from them in caſe of real danger.

Alarm-Bell, that rung upon any ſudden emergency, as a fire, mutiny, or the like.

Alarm-Poſt, or *Alarm-place*, the ground for drawing up each regiment in caſe of an alarm. This is otherwiſe called *the rendezvous*.

Alarm, in *Fencing*, is the ſame with what is otherwiſe called an appeal, or challenge.

ALASCANI, in *Church Hiſtory*, a ſect of Anti-Lutherans, whoſe diſtinguiſhing tenet, beſides their denying baptiſm, is ſaid to have been this, that the words, *This is my body*, in the inſtitution of the euchariſt, are not to be underſtood of the bread, but of the whole action, or celebration of the ſupper. They are ſaid to have taken the name from one Joannes Alaſco, a Poliſh baron, ſuperintendant of the church of that country, in England. See the next article.

ALASCO, John, a Poliſh nobleman of the 16th century,

Alatamaha || Alay.

century, who, imbibing the reformed opinions, was expelled his country, and became preacher to a Proteſtant congregation at Embden; but foreſeeing perſecution there, came to England about the year 1551, while the reformation was carrying on under Edward the VI. The publication of the Interim driving the Proteſtants to ſuch places as afforded them toleration, 380 were naturalized here, and obtained a charter of incorporation, by which they were erected into an eccleſiaſtical eſtabliſhment, independent on the church of England. The Auguſtine friars church was granted them, with the revenues, for the maintenance of Alaſco as ſuperintendant, with four aſſiſtant miniſters, who were to be approved by the king: and this congregation lived undiſturbed until the acceſſion of Queen Mary, when they were all ſent away. They were kindly received and permitted to ſettle at Embden; and Alaſco at laſt, after an abſence of 20 years, by the favour of Sigiſmund, returned to his own country, where he died in 1560. Alaſco was much eſteemed by Erafmus, and the hiſtorians of his time ſpeak greatly in his praiſe: we have of his writing, *De Cœna Domini liber; Epiſtola continens Summam controverſiæ de Cœna Domini*, &c. He had ſome particular tenets; and his followers are called *Alaſcani* in church-hiſtory.

ALATAMAHA, a large river of North America, which, riſing in the Apalachian mountains, runs ſouth-eaſt through the province of Georgia, and falls into the Atlantic ocean, below the town of Frederica.

ALATERNUS, in *Botany*, the trivial name of a ſpecies of the rhamnus. See RHAMNUS, BOTANY *Index*.

ALAVA, a diſtrict of Spain, about 20 miles in length, and 17 in breadth, containing very good iron mines. Victoria is the capital town.

ALAUDA, or LARK. See ORNITHOLOGY *Index*.

ALAUTA, a conſiderable river of Turkey in Europe, which, after watering the north-eaſt part of Tranſylvania and part of Walachia, falls into the Danube almoſt oppoſite to Nicopolis.

ALAY, ſignifying in the Turkiſh language "The Triumph," a ceremony which accompanies the aſſembling together the forces of that vaſt empire upon the breaking out of a war. It conſiſts of the moſt inſipid buffoonery, and is attended with acts of the moſt ſhocking barbarity. That which took place upon occaſion of the late war between the Porte and Ruſſia is deſcribed by Baron Tott in his Memoirs as follows:

"It conſiſts in a kind of maſquerade, in which each trade ſucceſſively preſents to the ſpectators the mechanical exerciſe of its reſpective art. The labourer draws his plough, the weaver handles his ſhuttle, the joiner his plane; and theſe different characters, ſeated in cars richly ornamented, commence the proceſſion, and precede the ſtandard of Mahomet, when it is brought out of the ſeraglio to be carried to the army, in order to inſure the victory to the Ottoman troops.

"This banner of the Turks, which they name *Sandjak-Cheriff*, or The Standard of the Prophet, is ſo revered among them, that, notwithſtanding its reputation has been ſo often tarniſhed, it ſtill retains their implicit confidence, and is the ſacred ſignal unto which they rally. Every thing proclaims its ſanctity. None but the emirs are allowed to touch it; they are its guards, and it is carried by their chief. The Muſſulmans alone are permitted to look upon it. If touched by other hands, it would be defiled; if ſeen by other eyes, profaned. In ſhort, it is encompaſſed by the moſt barbarous fanaticiſm.

"A long peace had unfortunately cauſed the ridiculouſneſs, and eſpecially the danger, of this ceremony to be forgotten. The Chriſtians imprudently crowded to ſee it; and the Turks, who, by the ſituation of their houſes, could make money of their windows, began to profit by the advantage; when an emir, who preceded the banner, proclaimed with a loud voice, 'Let no infidel dare to profane with his preſence the holy ſtandard of the prophet; and let every Muſſulman who perceives an unbeliever make it known under pain of reprobation.'

"From that moment no aſylum was to be found; even thoſe became informers, who, by letting out their houſes, had rendered themſelves accomplices in the crime. A religious fury ſeized on every mind, and put arms in every hand; the more atrocious the cruelty, the more was it meritorious. No regard was paid to ſex or age; pregnant women, dragged by the hair, and trodden under feet by the multitude, periſhed in the moſt deplorable manner. Nothing was reſpected by theſe monſters; and under ſuch auſpices the Turks commenced the war."

ALB, or ALBE, in the *Romiſh Church*, a veſtment of white linen hanging down to the feet, and anſwering to the ſurplice of the Engliſh clergy. In the ancient church, it was uſual, with thoſe newly baptized, to wear an alb, or white veſtment; and hence the Sunday after Eaſter was called *dominica in albis*, on account of the albs worn by the baptized on Eaſter-day.

ALB, is alſo a name of a Turkiſh coin, otherwiſe called *aſper*. See ASPER.

Alb || Alba.

ALBA, in *Ancient Geography*, a town of the Marſi in Italy, ſituated on the north ſide of the Lacus Fucinus, ſtill retaining its name. It ſtands upon an eminence, and is noted in Roman hiſtory for being the ſtate priſon where captive princes were ſhut up, after being barbarouſly dragged through the ſtreets of Rome at the chariot wheels of a triumphant conſul. Perſeus king of Macedon terminated his wretched career in this confinement, with his ſon, the laſt hope of an illuſtrious line of kings. Syphax the Numidian, and Bituinus king of the Averni, were alſo condemned to this gaol by the particular clemency of the ſenate, which ſometimes indulged its ſavage diſpoſition by putting its captives to death.

Alba being ſituated in the centre of Italy, amidſt difficult mountainous paſſes, and far from all means of eſcape, was eſteemed a moſt proper place for the purpoſe of guarding priſoners of importance. Artificial ſtrength was added to its natural ſecurity by fortifications, which remain to this day in a ſtate that proves their ancient ſolidity. For the entertainment of the garriſon, which was required in a place of ſuch conſequence, an amphitheatre was erected, of which the ruins are ſtill valuable, as well as the foundations of a temple, and other buildings of Roman times.

Lucius Vitellius, brother to the emperor of that name, had a villa near this place, famous for the variety and excellence of its fruit trees, which he had brought from Syria. His gardens were the nurſeries where ſeveral of the moſt delicious ſtone-fruits, that are now ſo common

Alba
||
Albanenſes.

mon in Europe, were firſt cultivated and multiplied. It muſt have been neceſſary at Alba to ſhelter trees tranſplanted from Aſia, and to treat them with great tenderneſs and care, in order to rear them to perfection: for the climate of this high region is extremely rigorous in winter; the cold ſeaſon laſts long, and is accompanied with violent ſtorms of wind and falls of ſnow. The lake has been often frozen entirely over.

Alba Firma, or *Album*, in our *Old Cuſtoms*, denoted rent paid in ſilver, and not in corn, which was called *black mail*.

Alba Terra, one of the numerous names for the philoſopher's ſtone.

Alba Regalis. See Stuhl Weissenburg.

Alba Helviorum, or *Albauguſta*, in *Ancient Geography*, afterwards called *Vivarium*, now *Viviers*, in the ſouth-eaſt of Languedoc, on the Rhone. In the lower age the inhabitants were called *Albenſes*, and their city *Civitas Albenſium*, in the Notitia Galliæ. E. Long. 4. 45. Lat. 44. 50.

Alba Julia, in *Ancient Geography*, now *Weiſſenburg*, a town of Tranſylvania, on the river Mariſius, or Meriſch, to the weſt of Hermanſtat, ſuppoſed to be called *Alba Julia*, after Julia Domna the mother of Caracalla. There are, however, ſeveral ſubſcriptions found at or near Weiſſenburg, which bear Col. Apul. that is, *Colonia Apulenſis*, without the leaſt mention of *Alba Julia*, though inſcribed after Caracalla's time. Add, that Ulpian, reciting the colonies of Dacia, calls this colony *Apulenſis*, and neither *Alba* nor *Julia*. Whence there is a ſuſpicion, that *Alba Julia* is a corruption of *Apulum*. It was alſo called *Apulum Auguſtum*. E. Long. 25. 0. Lat. 46. 46.

Alba Longa, in *Ancient Geography*, a colony from Lavinum, in Latium, eſtabliſhed by Aſcanius the ſon of Æneas, at the foot of the Mons Albanus: called *Alba*, from a white ſow found by Æneas, which farrowed 30 white pigs on that ſpot; which circumſtance was interpreted to portend the building of a city there in 30 years after (Propertius). The epithet *Longa* was added on account of its length. It was the royal reſidence till the building of Rome, as was foretold by Anchiſes (Virgil); was deſtroyed by Tullus Hoſtilius, all but the ſane or temple; and the inhabitants were tranſplanted to Rome (Strabo).

Alba Pompeia, in *Ancient Geography*, on the river Ceba, now *Ceva*, in Liguria, the birth-place of the emperor Pertinax; a colony either eſtabliſhed at firſt by Pompey, or re-eſtabliſhed by him after having been before ſettled by Scipio. The inhabitants were called *Albenſes Pompeiani*. At this day the town is ſimply called *Alba*, without any epithet.

ALBAHURIM, *figura ſexdecim laterum*, a figure of great importance according to aſtrological phyſicians, who built their prognoſtics on it.

ALBAN, St, is ſaid to have been the firſt perſon who ſuffered martyrdom for Chriſtianity in Britain; he is therefore uſually ſtyled the protomartyr of this iſland. He was born at Verulam, and flouriſhed towards the end of the third century. In his youth he took a journey to Rome, in company with Amphibalus a monk of Caerleon, and ſerved ſeven years as a ſoldier under the emperor Diocleſian. At his return home, he ſettled in Verulam; and, through the example and inſtructions of Amphibalus, renounced the errors of Paganiſm, in which he had been educated, and became a convert to the Chriſtian religion. It is generally agreed, that Alban ſuffered martyrdom during the great perſecution under the reign of Diocleſian; but authors differ as to the year when it happened: Bede and others fix it in 286; ſome refer it to the year 296; but Uſher reckons it amongſt the events of 303. The ſtory and circumſtances relating to his martyrdom, according to Bede, are as follows. Being yet a Pagan (or at leaſt it not being known that he was a Chriſtian), he entertained Amphibalus in his houſe. The Roman governor being informed thereof, ſent a party of ſoldiers to apprehend Amphibalus; but Alban, putting on the habit of his gueſt, preſented himſelf in his ſtead, and was carried before that magiſtrate. The governor having aſked him of what family he was? Alban replied, "To what purpoſe do you inquire of my family? if you would know my religion, I am a Chriſtian." Then being aſked his name, he anſwered, "My name is Alban; and I worſhip the only true and living God, who created all things." The magiſtrate replied, "If you would enjoy the happineſs of eternal life, delay not to ſacrifice to the great gods." Alban anſwered, "The ſacrifices you offer are made to devils; neither can they help the needy, or grant the petitions of their votaries." His behaviour ſo enraged the governor, that he ordered him immediately to be beheaded. In his way to execution, he was ſtopped by a river, over which was a bridge ſo thronged with ſpectators that it was impoſſible to croſs it; the ſaint, as we are told, lifted up his eyes to heaven, and the ſtream was miraculouſly divided, and afforded a paſſage for himſelf and a thouſand more perſons. Bede does not indeed give us the name of this river; but, notwithſtanding this omiſſion, the miracle, we ſuppoſe, will not be the leſs believed. This wonderful event converted the executioner upon the ſpot, who threw away his drawn ſword, and, falling at St Alban's feet, deſired he might have the honour to die with him. This ſudden converſion of the headſman occaſioning a delay in the execution till another perſon could be got to perform the office, St Alban walked up to a neighbouring hill, where he prayed for water to quench his thirſt, and a fountain of water ſprung up under his feet: here he was beheaded, on the 23d of June. The executioner is ſaid to have been a ſignal example of divine vengeance; for as ſoon as he gave the fatal ſtroke, his eyes dropt out of his head. We may ſee the opinion of Mr Milton in regard to this narrative, in his Hiſtory of England. His words are theſe, ſpeaking of St Alban: "The ſtory of whoſe martyrdom, ſoiled and worſe martyred with the fabling zeal of ſome idle fancies, more fond of miracles than apprehenſive of the truth, deſerves no longer digreſſion." Between 400 and 500 years after St Alban's death, Offa, king of the Mercians, built a very large and ſtately monaſtery to his memory; and the town of St Albans in Hertfordſhire takes its name from our protomartyr.

Alban,
Albana.

ALBANA, in *Ancient Geography*, a ſea-port town of Albania, on the Caſpian ſea, between the rivers Caſius and Albanus; now called *Bachu*, or *Bachy*, giving name to the Caſpian ſea, viz. *Mer de Bahu*. E. Long. 49. 0. N. Lat. 40. 0.

ALBANENSES, in *Church Hiſtory*, the ſame with Albigenſes. See Albigenses.

ALBANI,

Albani. ALBANI, in Roman antiquity, a college of the *Salii*, or prieſts of Mars; ſo called from Mount Albanus, the place of their reſidence. See SALII.

ALBANI, *Francis*, a celebrated painter, born in Bologna, March 17. 1578. His father was a ſilk merchant, and intended to bring up his ſon to that buſineſs; but Albani having a ſtrong inclination to painting, when his father died, devoted himſelf entirely to that art, though then but twelve years of age. He firſt ſtudied under Denys Calvert; Guido Rheni being at the ſame time under this maſter, with whom Albani contracted a very great friendſhip. Calvert drew but one profile for Albani, and afterwards left him entirely to the care of Guido; under whom he made great improvement, his fellow-diſciple inſtructing him with the utmoſt humanity and good humour. He followed Guido to the ſchool of the Caracci: but a little after their friendſhip for each other began to cool; which was owing perhaps to the pride of Albani, who could not bear to ſee Guido ſurpaſs him, or to the jealouſy of Guido at finding Albani make ſuch rapid progreſs. They certainly endeavoured to eclipſe one another; for when Guido had ſet up a beautiful altar-piece, Albani would oppoſe to it ſome fine picture of his: thus did they behave for ſome time, and yet ſpoke of each other with the higheſt eſteem. Albani, after having greatly improved himſelf under the Caracci, went to Rome, where he continued many years, and married in that city; but his wife dying in childbed, at the earneſt requeſt of his relations he returned to Bologna, where he entered again into the ſtate of matrimony. His ſecond wife (Doralice) was well deſcended, but had very little fortune; which he perfectly diſregarded, ſo ſtrongly was he captivated with her beauty and good ſenſe. Albani, beſides the ſatisfaction of poſſeſſing an accompliſhed wife, reaped likewiſe the advantage of having a moſt beautiful model; ſo that he had now no occaſion to make uſe of any other woman to paint a Venus, the Graces, Nymphs, and other deities, whom he took a particular delight in repreſenting. His wife anſwered this purpoſe admirably well; for beſides her bloom of youth, and the beauty of her perſon, he diſcovered in her ſo much modeſty, ſo many graces and perfections, ſo well adapted to painting, that it was impoſſible for him to meet with a more finiſhed woman. She afterwards brought him ſeveral boys, all extremely beautiful and finely proportioned; ſo that ſhe and her children were the originals of his moſt agreeable and graceful compoſitions. Doralice was ſo conformable to his intentions, that ſhe took a pleaſure in ſetting the children in different attitudes, holding them naked, and ſometimes ſuſpended by ſtrings, when Albani would draw them in a thouſand different ways. It was from them, too, that the famous ſculptors Flamand and Argaldi modelled their little Cupids.

Albani was of a happy temper and diſpoſition; his paintings, ſays Malvaſia, breathing nothing but content and joy. Happy in a force of mind that conquered every uneaſineſs, his poetical pencil carried him through the moſt agreeable gardens to Paphos and Cytheria: thoſe delightful ſcenes brought him over the lofty Parnaſſus to the delicious abodes of Apollo and the Muſes: whence what Du Freſnoy ſays of the famous Giulio Romano may be juſtly applied to Albani:

Albani. Albano.

> Taught from a child in the bright Muſes grots,
> He open'd all the treaſures of Parnaſſus,
> And in the lively poetry of painting
> The myſt'ries of Apollo has reveal'd.

He died the 4th of October 1660, to the great grief of all his friends and the whole city of Bologna. Malvaſia has preſerved ſome verſes of Franciſco de Lemene, intended for his monument; the ſenſe whereof is, "That the mortal remains of the illuſtrious Albani, he who gave life to ſhade, lie interred in this tomb: the earth never produced ſo wonderful an artiſt, or a hand equal to his immortal one; which gave colours to the ſoul, and a ſoul to colours. Prometheus animated clay, and gave life by means of the ſun; but Albani animated merely by the aſſiſtance of ſhade." He was very famous in his lifetime, and had been viſited by the greateſt painters. Several princes honoured him with letters; and amongſt the reſt King Charles I. who invited him to England by a letter ſigned with his own hand.

ALBANIA, a province of Turkey in Europe, on the gulf of Venice, bounded by Livadia on the ſouth, by Theſſaly and Macedonia on the eaſt, and on the north by Boſnia and Dalmatia. The people are ſtrong, large, courageous, and good horſemen; but are ſaid to be of a thieviſh diſpoſition. The grand ſeignior procures excellent ſoldiers from hence, particularly cavalry, known by the name of *Arnauts*. There are ſeveral large towns in this province; and the inhabitants are almoſt all Chriſtians of the Greek church, and deſcended from the ancient Scythians. Formerly it was part of the kingdom of Macedonia. Their chief manufacture is carpets. The principal places are Durazzo, Velona, Antivari, Scutari, Croya, Aleſſo, Dibra, Dolcigno, and Albanapoli. Long. from 18° to 21° E.; Lat. from 39° to 43° N.

ALBANIA, a country of Aſia, bounded on the weſt by Iberia; on the eaſt by the Caſpian ſea; on the north by Mount Caucaſus; on the ſouth by Armenia, and the river Cyrus, now Kur; which, ſpringing from the Moſchian mountains that ſeparate Colchis from Armenia, and watering the country of Mokan, receives the Aragus and Araxes, and falls into the Caſpian ſea within a ſmall diſtance from the ſouthern borders of this country.—The whole country formerly called *Albania*, now goes under the names of *Schirwan* and *Eaſt-Georgia*, and is extremely fruitful and pleaſant. The ancient hiſtorians take notice of the Albanian men being tall, ſtrong-bodied, and, generally ſpeaking, of a very graceful appearance; far excelling all other nations in comelineſs as well as ſtature. Modern travellers take no notice of the appearance of the men; but extol the beauty of the women, which ſeems to be unnoticed by the ancients. The Albanians were anciently an independent and pretty powerful people; but we find no mention made of their kings till the reign of Alexander the Great, to whom the king of Albania is ſaid to have preſented a dog of an extraordinary fierceneſs and ſize.—It does not appear that the Albanians were ever conquered by the Romans, even when their power was at the greateſt height; though when they ventured to engage in war with that powerful empire, they were always defeated, as might naturally be expected.

ALBANO, a town of Italy, on a lake of the ſame

Albano, Alban's.

name, in the Campagna of Rome. It was called by the ancients *Albanum Pompeii*, and built out of the ruins of the ancient Alba Longa, which was deſtroyed by Tullus Hoſtilius. It ſtands within twelve miles ſouth-eaſt of Rome, and for the pleaſantneſs of its ſituation is the ſummer retirement of a great many Roman princes. It is likewiſe the ſee of a biſhop, who is one of the ſix ſenior cardinals. The town is famous for its excellent wine, and the ruins of a mauſoleum, which, according to the tradition of the inhabitants, was made for Aſcanius. The proſpect from the garden of the Capuchins is extremely pleaſant, taking in the Campania of Rome, and terminating in a full view of the Tuſcan ſea. Cloſe by the town lies the Alban lake, of an oval figure, and about ſeven miles in circumference, which, by reaſon of the high mountains round it, looks like the area of a great amphitheatre. It abounds with excellent fiſh, and over againſt the hermitage it is ſaid to be unfathomable. The mountain of Albano is called *Monte Cavo*; on the top of which was a celebrated temple dedicated to Jupiter and Juno. Near the Capuchins there is another convent of Franciſcans; and not far from thence the palace of Cardinal Barberini, remarkable for very pleaſant gardens, with the ruins of ancient baths, and ſeveral old fragments of moſaic work. E. Long. 13. 10. N. Lat. 41. 43.

ALBANO is alſo a town in the kingdom of Naples remarkable for the fertility of the ſurrounding territory, and for the nobility of the inhabitants.

ALBAN'S, SAINT, a market town of Hertfordſhire, is a very great thoroughfare, accommodated with good inns, on the north-weſt road from London, at the diſtance of 21 miles. This town ſends two members to parliament, gives the title of *duke* to the noble family of Beauclerc, and has one of the beſt markets for wheat in England. St Alban's is ſeated near the ruins of the ancient Roman city, by Tacitus called *Verulam*; and by the Saxons *Watlingceſter*, becauſe it is ſeated on the road called *Watlingſtreet*. Nothing now remains of Verulam but the ruins of old walls; in the fields adjacent to which they continue to find Roman coins as they formerly found teſſelated pavements. In memory of St Alban, Offa, king of the Mercians, *anno* 795, erected an abbey, calling it *St Alban's*; and near it the town of the ſame name was afterwards built. The church of the abbey is remaining to this day: time and the weather have made it look like ſtone on the outſide; but if you break a bit off, the redneſs of the brick immediately appears. When the monaſteries were diſſolved, the townſmen paid 400l. to prevent its being levelled with the ground, and have ſince converted it into a pariſh-church, which, for its largeneſs, beauty, and antiquity, claims a particular regard. It had a very noble font of ſolid braſs, in which the children of the kings of Scotland were uſed to be baptized; and was brought from Edinburgh, by Sir Philip Lea, when the city was in flames; but in the times of the late civil wars, it was taken away. Not many years ſince, a tomb was diſcovered in this church, ſaid to be that of Humphry duke of Glouceſter: when the leaden coffin was opened, the body was pretty entire, being preſerved in a ſort of pickle. There was a ſtately croſs in the middle of the town, as there were in many other places, where Queen Eleanor's body reſted when it was brought out of the north for interment at Weſtminſter; but it is now demoliſhed. W. Long. 0. 12. N. Lat. 51. 44.

Albanus ‖ Albategr

ALBANUS MONS, in *Ancient Geography*, now called *Mont Albano*, 26 miles from Rome, near where Alba Longa ſtood.

ALBANUS MONS, in *Ancient Geography*, to the north of Iſtria, called *Albius* by Strabo; the extremity of the Alps, which, together with the mountains to the eaſt, joining it, called *Montes Bœbii*, ſeparate the farther Liburnia and Dalmatia from Pannonia.

ALBANY, a fortreſs belonging to the Britiſh, ſeated on the S. W. of Hudſon's bay. W. Long. 84. 20. N. Lat. 53. 20.

ALBANY, a town of North America, the capital of one of the ten counties of the province of New-York, which goes by the ſame name, is a well-built place, conſidering the country. Here the ſachems, or the kings of the Five Nations of Iroquois, met the governors of the Britiſh plantations, when they entered into any treaty with them. W. Long. 44. 29. N. Lat. 42. 30.

ALBARAZIN, a ſtrong town, and one of the moſt ancient of the kingdom of Arragon in Spain. It is ſeated upon an eminence, near the river Guadalquivir, a little below its ſource, and on the frontiers of Valencia and New Caſtile. It is the ſeat of a biſhop, and produces the beſt wool in all Arragon. It is about 100 miles eaſt of Madrid. E. Long. 2. 10. N. Lat. 40. 32.

ALBARII, in antiquity, properly denoted thoſe who gave the whitening to earthen veſſels, &c. In which ſenſe they ſtood contradiſtinguiſhed from *Dealbatores*, who whitened walls.

ALBARIUM OPUS, in the ancient building, the incruſtation or covering of the roofs of houſes with white plaſter, made of mere lime. This is otherwiſe called *opus album*. It differed from *Tectorium*, which is a common name given to all roofing or ceiling, including even that formed of lime and ſand, or lime and marble; whereas *Albarium* was reſtrained to that made of lime alone.

ALBATEGNI, an Arabic prince of Batan in Meſopotamia, and a celebrated aſtronomer, who lived about the year of Chriſt 880, as appears by his obſervations. He is alſo called *Muhammed ben Geber Albatani*, *Mahomet the ſon of Geber*, and *Muhamedes Aractenſis*. He made aſtronomical obſervations at Antioch, and at Racah or Aracta, a town of Chaldea. He is highly ſpoken of by Dr Halley, as a man of admirable genius, and an excellent obſerver.

Inſtead of the tables of Ptolemy which were imperfect, he computed new ones: theſe were adapted to the meridian of Aracta or Racah, and were long uſed as the beſt among the Arabs. Albategni compoſed in Arabic a work under the title of *The Science of the Stars*, compriſing all parts of aſtronomy, according to his own obſervations and thoſe of Ptolemy. This work was tranſlated into Latin by Plato of Tibur, and publiſhed at Nuremberg in 1537, with ſome additions and demonſtrations of Regiomontanus. It was reprinted at Bologna in 1645, with this author's notes. Dr Halley detected many faults in theſe editions: *Philoſ. Tranſ.* for 1693, N° 204. In this work, Albategni gives the motion of the ſun's apogee ſince Ptolemy's time, as well as the motion of the ſtars, which he

makes

Albati || Alberti.

makes one degree in 70 years. He made the longitude of the firſt ſtar of Aries to be 18° 2′; and the obliquity of the ecliptic 23° 35′. Upon Albategni's obſervations were founded the Alphonſine tables of the moon's motion. (*Hutton's Math. Dict.*)

ALBATI EQUI, an appellation given to ſuch horſes, in the games of the ancient circus, as wore white furniture.

ALBATROSS, in *Ornithology*, a ſpecies of the diomedea. See DIOMEDEA, ORNITHOLOGY *Index*.

ALBAZIN, a town of Greater Tartary, with a ſtrong caſtle. It is ſituated upon the river Amur, or Yamour, and belongs to the Muſcovites. E. Long. 103. 30. N. Lat. 54. 0.

ALBE, a ſmall piece of money, current in Germany, worth only a French ſol and ſeven deniers.

ALBEMARLE, or AUMARLE, a town of France, in Upper Normandy, and in the territory of Caux, from whence the noble family of Keppel takes the title of *earl*. The ſerges of this town are in high eſteem. It is ſeated on the declivity of a hill, on the confines of Picardy, 35 miles north-eaſt of Rouen, and 70 north-weſt of Paris. E. Long. 2. 21. N. Lat. 49. 50.

ALBEMARLE, the moſt northern part of the province of North Carolina in America.

ALBENGUA, a town of Italy, in the territory of Genoa. It is the ſee of a biſhop; and is a very ancient handſome town, but not well peopled on account of the inſalubrity of the air. It is ſeated in a very beautiful plain, which is well cultivated; and the outſide of the town is ſurrounded with olive-trees. It is a ſea-port, about 38 miles ſouth-weſt of Genoa. E. Long. 8. 13. N. Lat. 44. 4.

ALBERNUO, a kind of camlet, brought from the Levant by the way of Marſeilles.

ALBERONI, JULIUS, the ſon of a poor gardener in the ſuburbs of Placentia, born in 1664; who, by his great abilities and good fortune, roſe from this low origin to the employment of firſt miniſter of ſtate at the court of Spain, and to the dignity of cardinal. He rouſed that kingdom out of the lethargy it had ſunk into for a century paſt; awakened the attention, and raiſed the aſtoniſhment of all Europe, by his projects; one of which was to ſet the Pretender on the throne of Great Britain. He was at length deprived of his employment, and baniſhed to Rome. He died in 1752, at the great age of 89. His *Teſtament Politique*, collected from his memoirs and letters, was publiſhed at Lauſanne in 1753.

ALBERT, Margrave of Branbenburg, and the laſt grand maſter of the Teutonic order, laid aſide the habit of his order, embraced Lutheraniſm, and concluded a peace at Cracow in 1525, by which he was acknowledged duke of the eaſt part of Pruſſia (formerly called for that reaſon *Ducal Pruſſia*), but to be held as a fief of Poland, and to deſcend to his male heirs. See PRUSSIA.

ALBERTI, LEONE BATTISTA, was deſcended from a noble family in Florence; and was perfectly acquainted with painting, ſculpture, and architecture. He wrote of all three in Latin; but his ſtudies did not permit him to leave any thing conſiderable behind him in painting. He was employed by Pope Nicholas V. in his buildings, which he executed in a beautiful manner; and his work on architecture, which conſiſts of 10 books, is greatly eſteemed. He alſo wrote ſome treatiſes of morality, and a piece of arithmetic. He died in 1485.

Albertiſts || Albi

ALBERTISTS, a ſect of ſcholaſtics, ſo named from their leader Albertus Magnus.

ALBERTUS, MAGNUS, a Dominican friar, and afterwards biſhop of Ratiſbon, was one of the moſt learned men and moſt famous doctors of the 13th century. He is ſaid to have acted as a man-midwife; and ſome have been highly offended that one of his profeſſion ſhould follow ſuch an employment. A book entitled *De Natura Rerum*, of which he was reputed the author, gave riſe to this report. In this treatiſe there are ſeveral inſtructions for midwives, and ſo much ſkill ſhown in their art, that one would think the author could not have arrived at it without having himſelf practiſed: but the advocates for Albert ſay he was not the writer thereof, nor of that other piece *De Secretis Mulierum*; in which there are many phraſes and expreſſions unavoidable on ſuch a ſubject, which gave great offence, and raiſed a clamour againſt the ſuppoſed author. It muſt be acknowledged, however, that there are, in his Comment upon the Maſter of Sentences, ſome queſtions concerning the practice of conjugal duty, in which he has uſed ſome words rather too groſs for chaſte and delicate ears; but they allege what he himſelf uſed to ſay in his own vindication, that he came to the knowledge of ſo many monſtrous things at confeſſion, that it was impoſſible to avoid touching upon ſuch queſtions. Albert was certainly a man of a moſt curious and inquiſitive turn of mind, which gave riſe to other accuſations brought againſt him. It is ſaid, that he laboured to find out the philoſopher's ſtone; that he was a magician; and that he made a machine in the ſhape of a man, which was an oracle to him, and explained all the difficulties he propoſed. He had great knowledge in the mathematics, and by his ſkill in that ſcience might probably have formed a head with ſprings capable of articulating ſounds; like to the machines of Boetius, of which Caſſiodorus has ſaid, "Metals lowe; the birds of Diomedes trumpet in braſs; the brazen ſerpent hiſſes; counterfeited ſwallows chatter, and ſuch as have no proper note, from braſs ſend forth harmonious muſic." John Matthæus de Luna, in his treatiſe *De Rerum Inventoribus*, has attributed the invention of fire-arms to Albert; but in this he is confuted by Naude, in his *Apologie des Grandes Hommes*. Albert died at Cologne in 1280. His works were printed at Lyons, in 1651, in 21 volumes in folio.

ALBERTUS, a gold coin, worth about fourteen French livres: it was coined during the adminiſtration of Albertus archduke of Auſtria.

ALBESIA, in antiquity, a kind of ſhields otherwiſe called *Decumana*. See DECUMANA.

ALBI, a city of France, in the department of the Tarn, the capital of the Albigeois, in Upper Languedoc. The cathedral is dedicated to St Cecilia, and has one of the fineſt choirs in the kingdom. Here is a very valuable ſilver ſhrine, of exquiſite workmanſhip, of the moſaic kind: it contains the reliques of St Clair, the firſt biſhop of this city. The chapel of this pretended ſaint is magnificent, and adorned with paintings. The Lice is a fine large walk without the city: what diſtinguiſhes this from all others, is a terrace

Albigenſes. above a deep moat, which ſerves inſtead of a foſſe; it is bordered with two rows of very fine trees, which are kept in excellent order. There are four gates, through which you may view all the beauties of a delightful plain. At one end of this is the convent of the Dominicans. The archbiſhop's palace is very beautiful. The river waſhes its walls, and ſerves both for an ornament and defence. This city is ſeated on the river Tarn, 35 miles north eaſt of Toulouſe, and 250 ſouth of Paris. E. Long. 2. 9. N. Lat. 43. 56.

The Albigeois is a ſmall territory about twenty-ſeven miles in length, and twenty in breadth, abounding in corn, woad, grapes, ſaffron, plums, and ſheep; and the inhabitants have a great trade in dried prunes, grapes, a coarſe ſort of cloth, and wine of Gaillac. Theſe wines are the only ſort hereabouts that are fit for exportation: they are carried down to Bourdeaux, and generally ſold to the Britiſh. They have likewiſe ſeveral coal mines.

ALBIGENSES, in church hiſtory, a ſect or party of reformers, about Toulouſe and Albigeois in Languedoc, who ſprung up in the 12th century, and diſtinguiſhed themſelves by their oppoſition to the diſcipline and ceremonies of the Romiſh church.

This ſect had their name, it is ſuppoſed, either by reaſon there were great numbers of them in the dioceſe of Albi, or becauſe they were condemned by a council held in that city. In effect, it does not appear that they were known by this name before the holding of that council. The *Albigenſes* were alſo called *Albiani*, *Albigeſei*, *Albii*, and *Albanenſes*, though ſome diſtinguiſh theſe laſt from them. Other names given to them are *Henricians*, *Abelardiſts*, *Bulgarians*, &c.; ſome on account of the qualities they aſſumed; others on that of the country from whence it is pretended they were derived; and others on account of perſons of note who adopted their cauſe, as Peter de Brius, Arnold de Breſſe, Abelard, Henry, &c. Berengarius, if not Wickliff himſelf, is by ſome ranked in the number. The *Albigenſes* are frequently confounded with the *Waldenſes*; from whom, however, they differ in many reſpects, both as being prior to them in point of time, as having their origin in a different country, and as being charged with divers hereſies, particularly Manicheiſm, from whence the *Waldenſes* are exempt. But ſeveral Proteſtant writers have vindicated them from that imputation. Dr Allix ſhows that a great number of *Manichees* did ſpread over the weſtern countries from Bulgaria; and ſettled in Italy, Languedoc, and other places, where they were alſo *Albigenſes*; by which means, being both under the imputation of *hereſy*, they came, either by ignorance or malice, to be confounded, and called by the ſame common name, though in reality entirely different.

Other errors imputed to them by their opponents, the monks of thoſe days, were, That they admitted two Chriſts; one evil, who appeared on earth; the other good, who has not yet appeared: That they denied the reſurrection of the body; and maintained human ſouls to be demons impriſoned in our bodies, by way of puniſhment for their ſins: That they condemned all the ſacraments of the church; rejected baptiſm as uſeleſs; held the euchariſt in abhorrence; excluded the uſe of confeſſions and penance; maintained marriage unlawful; laughed at purgatory, prayers for the dead, images, crucifixes, &c. There were likewiſe ſaid to be two claſſes of them; the Perfect and the Believers. The perfect boaſted of their living in continence, of eating neither fleſh, eggs, nor cheeſe. The believers lived like other men, and were even looſe in their morals; but they were perſuaded they ſhould be ſaved by the faith of the perfect, and that none were damned who received impoſition of hands from them. But from theſe charges alſo they are generally acquitted by Proteſtants, who conſider them as the pious inventions of the Romiſh church, whoſe members deem it meritorious by any means to blacken heretics. Albigenſes.

However this be, the Albigenſes grew ſo formidable, that the Catholics agreed upon a holy league or cruſade againſt them. They were at firſt ſupported by Raimond, count of Toulouſe. Pope Innocent III. deſirous to put a ſtop to their progreſs, ſent a legate into their country; which failing, he, ſtirred up Philip Auguſtus, king of France, and the other princes and great men of the kingdom, to make war upon them. Upon this the count of Toulouſe, who had ſided with them, made his ſubmiſſion to the pope, and went over to the Catholics: but ſoon after, finding himſelf plundered by the cruſades, he declared war againſt them, and was joined by the king of Arragon. His army was defeated at the ſiege of Muret, where he himſelf was killed, and the defeat followed by the ſurrender of the city of Toulouſe, and the conqueſt of the greateſt part of Languedoc and Provence. His ſon Raymond ſucceeded him; who agreed with the king and the pope to ſet up the inquiſition in his eſtates, and to extirpate the Albigenſes. In an aſſembly held at Milan, the archbiſhop of Toulouſe drew up articles; agreeable to which the count made a moſt ample declaration againſt them, which he publiſhed at Toulouſe in 1253. From this time the Albigenſes dwindled by little and little, till the time of the Reformation; when ſuch of them as were left fell in with the Vaudois, and became conformable to the doctrine of Zuinglius and the diſcipline of Geneva.

ALBIGENSES is alſo a name ſometimes given to the followers of Peter Vaud, or Waldo; and hence ſynonymous with what we more properly call *Waldenſes*, or Poor Men of Lyons. In this ſenſe the word is applied by Camerarius, Thuanus, and ſeveral other writers. The reaſon ſeems to be, that the two parties agreed in their oppoſition to the papal innovations and encroachments, though in divers other reſpects ſaid to be different enough. The biſhop of Meaux labours hard to ſupport a diſtinction between the two ſects, alleging that the *Albigenſes* were heretics and Manichees; whereas the *Waldenſes* were only ſchimatics, not heretics; being ſound as to articles of faith, and only ſeparating from the church of Rome on account of forms and diſcipline. Dr Allix endeavours to ſet aſide the diſtinction: and ſhows, that both of them hold the ſame opinions, and were equally condemned and held for heretics; and this not for points of faith, but for declaiming againſt the papal tyranny and idolatry, and holding the pope to be the Antichriſt; which laſt, according to M. de Meaux, conſtitutes nothing leſs than Manicheiſm. In this ſenſe the Lollards and Wickliffites in England were not only Albigenſes but Manichees.

ALBINTEMELIUM,

Albintemelium Albinos

ALBINTEMELIUM, ALBINTIMILIUM (Tacitus); or at full length, ALBIUM INTEMELIUM (Pliny, Strabo); now *Vintimiglia*, situated in the south-weſt of the territory of Genoa, near the borders of the county of Nice, with a port on the Mediterranean, at the mouth of the rivulet Retta, about halfway between Monaco and St Remo. E. Long. 7. 40. N. Lat. 43. 17.

ALBIOECE, or ALBIECE (Pliny, Strabo); otherwiſe called *Reii apollinares*, from their ſuperſtitious worſhip of Apollo; alſo *Civitas Reienſium*; now *Riez*, in Provence, about 18 leagues to the north-eaſt of Toulon, on the north ſide of the rivulet Verdon; was originally a Roman colony (Inſcription). It is ſometimes written *Regium*. The people were called *Albici*, (Cæſar.) E. Long. 1. 0 N. Lat. 43. 20.

ALBINI, in *Antiquity*, the workmen employed in what was called *Opus Albarium*. They make a different profeſſion from the *dealbatores* or *whiteners*.

ALBINOS, the name by which the Portugueſe call the white Moors, who are looked upon by the negroes as menders. They at a diſtance might be taken for Europeans; but, when you come near them, their white colour appears like that of perſons affected with a leproſy.

In Sauſſure's *Voyages dans les Alpes*, is the following account of the two boys, at Chamouni, who have been called *Albinos*. "The elder, who was at the end of the year 1785 about twenty or one-and-twenty years of age, had a dull look, with lips ſomewhat thick, but nothing elſe in his features to diſtinguiſh him from other people. The other, who is two years younger, is rather a more agreeable figure; he is gay and ſprightly, and ſeems not to want wit. But their eyes are not blue; the iris is of a very diſtinct roſe colour; the pupil too, when viewed in the light, ſeems decidedly red; which ſeems to demonſtrate, that the interior membranes are deprived of the uvea, and of that black mucous matter that ſhould line them. Their hair, their eye-brows, and eye-laſhes, the down upon their ſkin, were all in their infancy, of the moſt perfect milk-white colour, and very fine; but their hair is now of a reddiſh caſt, and has grown pretty ſtrong. Their ſight, too, is ſomewhat ſtrengthened; though they exaggerate to ſtrangers their averſion for the light, and half ſhut the eyelids, to give themſelves a more extraordinary appearance. But thoſe who, like me, have ſeen them in their infancy, before they were tutored to this deceit, and when too few people came to Chamouni to make this affectation profitable to them, can atteſt that then they were not very much offended with the light of day. At that time they were ſo little deſirous of exciting the curioſity of ſtrangers, that they hid themſelves to avoid ſuch; and it was neceſſary to do a ſort of violence to them before they could be prevailed on to allow themſelves to be inſpected. It is alſo well known at Chamouni, that when they were of a proper age they were unable to tend the cattle like the other children at the ſame age; and that one of their uncles maintained them out of charity, at a time of life when others were capable of gaining a ſubſiſtence by their labour.

"I am therefore of opinion, that we may conſider theſe two lads as two albinos; for if they have not the thick lips and flat noſes of the white negroes, it is becauſe they are albinos of Europe, not of Africa. This infirmity affects the eyes, the complexion, and the colour of the hair; it even diminiſhes the ſtrength, but does not alter the conformation of the features. Beſides, there are certainly in this malady various degrees; ſome may have leſs ſtrength, and be leſs able to endure the light: but theſe circumſtances in thoſe of Chamouni are marked with characters ſufficiently ſtrong to entitle them to the unhappy advantage of being claſſed with that variety of the human ſpecies denominated albinos. Albinos.

"When nature preſents the ſame appearance often, and with circumſtances varied, we may at laſt diſcover ſome general law, or ſome relation which that appearance has with known cauſes: but when a fact is ſo ſingular and ſo rare, as that of thoſe albinos, it gives but little ſcope to a conjecture: and it is very difficult to verify thoſe by which we attempt to explain it.

"I at firſt imagined that this diſeaſe might be referred to a particular ſort of organic debility; that a relaxation of the lymphatic veſſels within the eye might ſuffer the globules of the blood to enter too abundantly into the iris, the uvea, and even into the retina, which might occaſion the redneſs of the iris and of the pupil. The ſame debility ſeemed alſo to account for the intolerance of the light, and for the whiteneſs of the hair.

"But a learned phyſiologiſt, Mr Blumenbach, profeſſor in the univerſity at Gottingen, who has made many profound obſervations on the organs of ſight, and has conſidered with great attention the albinos of Chamouni, attributes their infirmity to a different cauſe.

"The ſtudy of comparative anatomy has furniſhed him with frequent opportunities of obſerving this phenomenon; he has found it in brutes, in white dogs, and in owls; he ſays, it is generally to be ſeen in the warm-blooded animals; but that he has never met with it in thoſe with cold blood.

"From his obſervations, he is of opinion, that the redneſs of the iris, and of the other internal parts of the eye, as well as the extreme ſenſibility that accompanies this redneſs, is owing to the total privation of that brown or blackiſh mucus, which, about the fifth week after conception, covers all the interior parts of the eye in its ſound ſtate. He obſerves, that Simon Pontius, in his treatiſe *de Coloribus Oculorum*, long ago remarked, that in blue eyes the interior membranes were leſs abundantly provided with this black mucus, and were therefore more ſenſible to the action of light. This ſenſibility of blue eyes agrees very well, ſays M. Blumenbach, with northern people, during their long twilight; while, on the contrary, the deep black in the eyes of negroes enables them to ſupport the ſplendour of the ſunbeams in the torrid zone.

"As to the connection between this red colour of the eyes, and the whiteneſs of the ſkin and hair, the ſame learned phyſiologiſt ſays, that it is owing to a ſimilarity of ſtructure, *conſenſus ex ſimilitudine fabricæ*. He aſſerts, that this black mucus is formed only in the delicate cellular ſubſtance, which has numerous blood-veſſels contiguous to it, but contains no fat; like the inſide of the eye, the ſkin of negroes, the ſpotted palate of ſeveral domeſtic animals, &c. And, laſtly, he ſays,

Albinos. says, that the colour of the hair generally corresponds with that of the iris. *Gazette Litt. de Gotingue*, Oct. 1784.

" At the very time that M. Blumenbach was reading this memoir to the Royal Society of Gottingen, M. Buzzi, surgeon to the hospital at Milan, an eleve of the celebrated anatomist Moscati, published in the *Opuscoli Scelti de Milan*, 1784, tom. ii. p. 11. a very interesting memoir, in which he demonstrates by dissection what Blumenbach had only supposed.

" A peasant of about 30 years of age died in the hospital of Milan of a pulmonary disorder. His body, being exposed to view, was exceedingly remarkable by the uncommon whiteness of the skin, of the hair, of the beard, and of all the other covered parts of the body. M. Buzzi, who had long desired an opportunity of dissecting such a subject, immediately seized upon this. He found the iris of the eyes perfectly white, and the pupil of a rose colour. The eyes were dissected with the greatest possible care, and were found entirely destitute of that black membrane which anatomists call the *uvea:* it was not to be seen either behind the iris or under the retina. Within the eye there was only found the choroid coat extremely thin, and tinged of a pale red colour, by vessels covered with discoloured blood. What was more extraordinary, the skin, when detached from different parts of the body, seemed almost entirely divested of the *rete mucosum:* maceration did not discover the least vestige of this, not even in the wrinkles of the abdomen, where it is most abundant and most visible.

" M. Buzzi likewise accounts for the whiteness of the skin and of the hair, from the absence of the *rete mucosum*, which, according to him, gives the colour to the cuticle, and to the hairs that are scattered over it. Among other proofs of this opinion, he alleges a well-known fact, that if the skin of the blackest horse be accidentally destroyed in any part of the body, the hairs that afterwards grow on that part are always white, because the *rete mucosum* which tinges those hairs is never regenerated with the skin.

" The proximate cause of the whiteness of albinos, and the colour of their eyes, seems therefore pretty evidently to depend on the absence of the *rete mucosum:* But what is the remote cause?

" In the first place, it seems probable that men affected with this infirmity form no distinct species, for they are produced from parents that have dark skins and black eyes. What is it then that destroys the *rete mucosum* in such persons? M Buzzi relates a singular fact, which seems to throw some light on this subject.

" A woman of Milan, called Calcagni, had seven sons. The two eldest had brown hair, and black eyes; the three next had white skins, white hair, and red eyes; the two last resembled the two eldest. It was said that this woman, during the three pregnancies that produced the albinos, had a continual and immoderate appetite for milk, which she took in great quantities: but that when she was with child of the other four children, she had no such desire. It is not however ascertained, that this preternatural appetite was not itself the effect of a certain heat, or internal disease, which destroyed the *rete mucosum* in the children before they were born.

" The albinos of Chamouni are also the offspring of parents with dark skins and black eyes. They have three sisters by the same father and mother, who are also brunettes. One of them that I saw had the eyes of a dark brown, and the hair almost black. They are said, however, to be all afflicted with a weakness of sight. When the lads are married, it will be curious to observe how the eyes of their children will be formed. The experiment would be particularly decisive if they were married to women like themselves. But this faulty conformation seems to be more rare among women than among men; for the four of Milan, the two of Chamouni, the one described by Maupertuis, the one by Helvetius, and almost all the instances of these singular productions, have been of our sex. It is known, however, that there are races of men and women affected with this disease, and that these races perpetuate themselves in Guinea, in Java, at Panama, &c. Albinovanus Albinus.

" Upon the whole, this degeneration does not seem to be owing to the air of the mountains; for though I have traversed the greatest part of the Alps, and the other mountains of Europe, these are the only individuals of the kind that I ever met with."

ALBINOVANUS, a Latin poet, whom Ovid surnamed the *Divine*. There is now nothing of his extant, except an elegy on Drusus, and another on the death of Mecænas.

ALBINUS, Bernhard Siegfred, a celebrated physician and anatomist, was born of an illustrious family at Francfort on the Oder in 1697. His father was then professor of the practice of medicine in the university of Francfort; but in the year 1702 he repaired to Leyden, being nominated professor of anatomy and surgery in that university. Here his son had an opportunity of studying under the most eminent masters in Europe, who, from the singular abilities which he then displayed, had no difficulty in prognosticating his future eminence. But while he was distinguished in every branch of literature, his attention was particularly turned to anatomy and surgery. His peculiar attachment to these branches of knowledge gained him the intimate friendship of Ruysch and Rau, who at that time flourished in Leyden; and the latter, so justly celebrated as a lithotomist, is said to have seldom performed a capital operation without inviting him to be present. Having finished his studies at Leyden, he went to Paris, where he attended the lectures of Du Verney, Vaillant, and other celebrated professors. But he had scarce spent a year there when he was invited by the curators of the university of Leyden to be a lecturer in anatomy and surgery at that place. Though contrary to his own inclination, he complied with their request, and upon that occasion was created doctor of physic without any examination. Soon after, upon the death of his father, he was appointed to succeed him as a professor of anatomy; and upon being admitted into that office on the 9th of November 1721, he delivered an oration, *De vera via ad fabricæ humani corporis cognitionem ducente;* which was heard with universal approbation. In the capacity of a professor, he not only bestowed the greatest attention upon the instruction of the youth intrusted to his care, but in the improvement of the medical art. With this view he published many important discoveries of his own; and

Albion || Alborak.

by elegant editions, turned the attention of phyſicians to works of merit, which might otherwiſe have been neglected. By theſe means his fame was ſoon extended over Europe; and the ſocieties of London, Peterſburgh, and Haerlem, cheerfully received him as an aſſociate. In 1745, he was appointed profeſſor of the practice of medicine at Leyden, and was ſucceeded in the anatomical chair by his brother Frid. Bern. Albinus. He was twice rector of the univerſity, and as often he refuſed that high honour when it was voluntarily offered him. At length, worn out by long ſervice and intenſe ſtudy, he died on the 9th of September 1770, in the 74th year of his age.

ALBION, the ancient name of Britain.

New Albion, a name given by Sir Francis Drake to California, on the north-weſt coaſt of America, which he diſcovered and took poſſeſſion of in the year 1578. Captain Cook viſited this coaſt in 1778, and landed in a place ſituated in N. Lat. 44. 33. E. Long. 235. 20. In the year 1792, it was again viſited by Captain Vancouver, who was employed in ſurveying the weſtern coaſt of North America. The extent of New Albion, according to the latter circumnavigator, is between the 30th and 45th degrees of N. Latitude.

ALBIREO, in *Aſtronomy*, a ſtar of the third or fourth magnitude, in the conſtellation Cygnus.

ALBIS, in *Ancient Geography*, now the Elbe, which divided ancient Germany in the middle, and was the boundary of this country, ſo far as it was known to the Romans: all beyond they owned to be uncertain, no Roman except Druſus and Tiberius having penetrated ſo far as the Elbe. In the year of the building of the city 744, or about ſix years before Chriſt, Domitius Ahenobarbus, croſſing the river with a few, merited the ornaments of a triumph; ſo glorious was it reckoned at Rome to have opened this paſſage. In the following age, however, the river that before occupied the middle of ancient Germany, became its boundary to the north, from the irruptions of the Sarmatæ, who poſſeſſed themſelves of the Tranſalbin Germany. The Elbe riſes in the borders of Sileſia out of the Riſenberg, runs through Bohemia, Miſnia, Upper Saxony, Anhalt, Magdeburg, Brandenburg, Danneberg, Lauenburg, Holſtein, and after being ſwelled by many other rivers, and paſſing by Hamburg and Gluckſtadt, to both which places the river is navigable by large veſſels, falls into the German or North ſea.

ALBISOLA, a ſmall town belonging to the republic of Genoa. Here is a porcelain manufacture, and ſeveral country-houſes of the Genoeſe nobility. It was bombarded in 1745 by the Engliſh. E. Long. 8. 20. N. Lat. 44. 15

ALBOGALERUS, in Roman antiquity, a white cap worn by the *flamen Dialis*, on the top of which was an ornament of olive branches.

ALBORAK amongſt the Mahometan writers, the beaſt on which Mahomet rode in his journeys to heaven. The Arab commentators give many fables concerning this extraordinary mode of conveyance. It is repreſented as of an intermediate ſhape and ſize between an aſs and a mule. A place, it ſeems, was ſecured for it in paradiſe at the interceſſion of Mahomet; which, however, was in ſome meaſure extorted from the prophet, by Alborak's refuſing to let him mount when the angel Gabriel was come to conduct him to heaven.

Alboro || Albumen.

ALBORO, in *Zoology*, a name by which the erythrinus, a ſmall red fiſh caught in the Mediterranean, is commonly known in the markets of Rome and Venice.

ALBOURG, a town of Denmark, in North Jutland, capital of the dioceſe of the ſame name, and a biſhop's ſee. It has this name, which ſignifies *eel-town*, on account of the great number of eels taken here. It is ſeated on a canal, 10 miles from the ſea, 30 north of Wiburg, and 50 north of Arhuys. It has an exchange for merchants, and a ſafe and deep harbour. They have a conſiderable trade in herrings and corn; and a manufactory of guns, piſtols, ſaddles, and gloves. E. Long. 29. 16. N. Lat. 56. 35.

ALBRICIUS, born at London, was a great philoſopher, a learned and able phyſician, and well verſed in all the branches of polite literature. He lived in the 11th century, and wrote ſeveral works in Latin; particularly, 1. Of the Origin of the Gods. 2. The Virtues of the Ancients. 3. The Nature of Poiſon, &c.

ALBUCA, Baſtard Star-of-Bethlehem. See Botany *Index*.

ALBUGINEA tunica, in *Anatomy*, the third or innermoſt coat or covering of the teſtes; it is likewiſe the name given to one of the coats of the eye.

ALBUGINEUS, in *Anatomy*, a term ſometimes applied to the aqueous humour of the eye.

ALBUGO, or Leucoma, in *Medicine*, a diſtemper occaſioned by a white opaque ſpot growing on the *cornea* of the eye, and obſtructing viſion. See Medicine *Index*.

ALBUM, in *Antiquity*, a kind of white table or regiſter, wherein the names of certain magiſtrates, public tranſactions, &c. were entered. Of theſe there were various ſorts; as the *album decurionum*, *album ſenatorum*, *album judicum*, *album prætoris*, &c.

Album Decurionum, was the regiſter wherein the names of the decuriones were entered. This is otherwiſe called *matriculatio decurionum*.

Album Senatorum, the liſt of ſenators names, which was firſt introduced by Auguſtus, and renewed yearly.

Album Judicum, that wherein the names of the perſons of thoſe *decuriæ* who judged at certain times were entered.

Album Prætoris, that wherein the *formulæ* of all actions, and the names of ſuch judges as the prætor had choſen to decide cauſes, were written.

The high prieſt entered the chief tranſactions of each year into an *album*, or table, which was hung up in his houſe for the public uſe.

Album is alſo uſed, in later times, to denote a kind of table, or pocket-book, wherein the men of letters with whom a perſon has converſed, inſcribed their names with ſome ſentence or motto.

Album Græcum, the white dung of dogs, formerly preſcribed for inflammations of the throat, &c. but now diſuſed, and chiefly employed by leather-dreſſers to ſoften leather after the application of lime.

ALBUMAZAR, a learned Arabian aſtronomer in the tenth century, who wrote a treatiſe Of the Revolution of the Years.

ALBUMEN, a ſubſtance found both in animal and vegetable

Albuquerque ‖ Alcæus.

vegetable matters, and in great abundance in the white of eggs. See CHEMISTRY *Index*.

ALBUQUERQUE, a town of Spain, in the province of Eſtremadura, is ſeated on an eminence, nine miles from the frontiers of Portugal. It is commanded by an almoſt impregnable fortreſs, built on a high mountain, and ſerving to defend the town. It carries on a great trade in wool and woollen manufactures. It was taken by the allies of Charles king of Spain in 1705. W. Long. 7. 0. N. Lat. 38. 52.

ALBURN, the Engliſh name of a compound colour, being a mixture of white and red, or reddiſh brown. Skinner derives the word, in this ſenſe, from the Latin *albus*, and the Italian *burno*, from *bruno*, "brown."

ALBURNUM, the ſoft white ſubſtance which in trees is found between the liber or inner bark and the wood, and in proceſs of time acquiring ſolidity, becomes itſelf the wood. From its colour and comparative ſoftneſs, it has been ſtyled by ſome writers the fat of trees, *adeps arborum*.

The alburnum is found in largeſt quantities in trees that are vigorous; though in ſuch as languiſh, or are ſickly, there is a great number of beds. In an oak ſix inches in diameter, this ſubſtance is nearly equal in bulk to the wood. In a trunk of one foot diameter, it is as one to three and a half; of two and a half feet diameter, as one to four and a half, &c. but theſe proportions vary according to the health and conſtitution of the trees.—The alburnum is frequently gnawed in pieces by inſects, which lodge in the ſubſtance, and are nouriſhed from it.

ALBURNUS, in *Zoology*, a ſpecies of the *cyprinus* of Linnæus. See CYPRINUS, ICHTHYOLOGY *Index*.

ALCA, or AUK. See ORNITHOLOGY *Index*.

ALCÆUS, a famous ancient lyric poet, born at Mitylene, in the iſland of Leſbos. Horace ſeems to think him the inventor of this kind of poeſy;

> Now the Roman muſe inſpire,
> And warm the ſong with Grecian fire. FRANCIS.

He flouriſhed in the 44th Olympiad, at the ſame time with Sappho, who was likewiſe of Mitylene. Alcæus was a great enemy to tyrants, but not a very brave ſoldier. He was preſent at an engagement, wherein the Athenians gained a victory over the Leſbians; and here, as he himſelf is ſaid to have confeſſed in one of his pieces, he threw down his arms, and ſaved himſelf by flight. Horace, who, of all the Latin poets, moſt reſembled Alcæus, has made the like confeſſion:

> With thee I ſaw Philippi's plain,
> Its fatal rout, a fearful ſcene!
> And dropp'd, alas! th' inglorious ſhield,
> Where valour's ſelf was forc'd to yield;
> Where foil'd in duſt the vanquiſh'd lay,
> And breath'd th' indignant ſoul away. FRANCIS.

The poetical abilities of Alcæus are indiſputable; and though his writings were chiefly in the lyric ſtrain, yet his muſe was capable of treating the ſublimeſt ſubjects with a ſuitable dignity. Hence Horace ſays,

> Alcæus ſtrikes the golden ſtrings,
> And ſeas, and war, and exile, ſings.
> Thus while they ſtrike the various lyre,
> The ghoſts the ſacred ſounds admire:
> But when Alcæus lifts the ſtrain
> To deeds of war and tyrants ſlain,
> In thicker crowds the ſhadowy throng
> Drink deeper down the martial ſong. FRANCIS.

Alcæus ‖ Alcaic.

ALCÆUS, an Athenian tragic poet, and, as ſome think, the firſt compoſer of tragedies. He renounced his native country Mitylene, and paſſed for an Athenian. He left 10 pieces, one of which was Paſiphaë, that which he produced when he diſputed with Ariſtophanes, in the 4th year of the 97th Olympiad.

There is another ALCÆUS mentioned in Plutarch, perhaps the ſame whom Porphyrius mentions as a compoſer of ſatirical iambics and epigrams, and who wrote a poem concerning the plagiariſm of Euphorus the hiſtorian. He lived in the 145th Olympiad.

We are told likewiſe of one ALCÆUS, a Meſſenian, who lived in the reign of Veſpaſian and Titus. We know not which of theſe it was who ſuffered for his lewdneſs a very ſingular kind of death, which gave occaſion to the following epitaph:

Αλκαιω ταφος υτος, &c.

This is Alcæus's tomb; who died by a radiſh,
The daughter of the earth, and puniſher of adulterers.

This puniſhment inflicted on adulterers, was thruſting one of the largeſt radiſhes up the anus of the adulterer: or, for want of radiſhes, they made uſe of a fiſh with a very large head, which Juvenal alludes to:

> *Quoſdam mœchos et mugilis intrat.* Sat. x.
> The mullet enters ſome behind.

Hence we may underſtand the menace of Catullus,

> *Ah! tum te miſerum, malique fati,*
> *Quem attractus pedibus, patente porta,*
> *Percurrent raphanique, mugileſque.* Epig. xv.
>
> Ah! wretched thou, and born to luckleſs fate,
> Who art diſcover'd by the unſhut gate!
> If once, alas! the jealous huſband come,
> The radiſh or the ſea-fiſh is thy doom.

ALCAICS, in *Ancient Poetry*, a denomination given to ſeveral kinds of verſe, from Alcæus, their inventor.

The firſt kind conſiſts of five feet, viz. a ſpondee, or iambic; an iambic; a long ſyllable; a dactyle; another dactyle: ſuch is the following verſe of Horace:

> *Omnes | eo|dem cogimur, | omnium*
> *Verſa|tur ur|na | ſerius | ocyus |*
> *Sors exitura.*

The ſecond kind conſiſts of two dactyles and two trochees: as,

> *Exil|ium impoſi|tura | cymbæ.*

Beſides theſe two, which are called *dactylic Alcaïcs*, there is another ſimply ſtyled *Alcaïc*; conſiſting of an epitrite; a choriambus; another choriambus; and a bacchius: the following is of this ſpecies,

> *Cur timet fla|vum Tiberim tan|gere, cur | olivum?*

ALCAIC Ode, a kind of manly ode, compoſed of ſeveral ſtrophes, each conſiſting of four verſes; the two firſt of which are always alcaïcs of the firſt kind; the third verſe is a dimeter hypercatalectic, or conſiſting of four feet and a long ſyllable; and the fourth verſe is an alcaïc of the ſecond kind. The following ſtrophe

Alcaid ‖ Alcanna.

is of this ſpecies, which Horace calls *minaces Alcæi camenæ*.

Non poſſidentem multa vocaveris
Recte beatum: rectius occupat
Nomen beati, qui deorum
Muneribus ſapienter uti, &c.

ALCAID, ALCAYDE, or ALCALDE, in the polity of the Moors, Spaniards, and Portugueſe, a magiſtrate, or officer of juſtice, anſwering nearly to the French provoſt and the Britiſh juſtice of peace.—The alcaid among the Moors is veſted with ſupreme juriſdiction, both in civil and criminal caſes.

ALCALA DE GUADEIRA, a ſmall town of Spain, in Andaluſia, upon the river Guadeira. Here are abundance of ſprings, from whence they convey water to Seville by an aqueduct. W. Long. 6. 16. N. Lat. 37. 15.

ALCALA de Henares, a beautiful and large city of Spain, in New Caſtile, ſeated upon the river Henares, which waſhes its walls. It is built in a very agreeable plain, and is of an oval figure. The ſtreets are handſome and pretty ſtraight; one of them is very long, running from one end of the city to the other. The houſes are well built; and there are ſeveral ſquares, the largeſt of which is an ornament to the city; it is ſurrounded on all ſides with piazzas, where tradeſmen have their ſhops, to expoſe ſeveral ſorts of commodities to ſale, of which there is as great plenty and variety as in moſt towns of Spain. The univerſity was founded by Cardinal Ximenes, archbiſhop of Toledo, about the beginning of the 16th century. The land about Alcala is watered by the Henares, well cultivated, and very fruitful, while that at a diſtance is dry and ſterile: it yields grain in plenty, very good muſcat wine, and melons of a delicious kind. Without the walls is a ſpring, the water of which is ſo pure and ſo well taſted, that it is incloſed and ſhut up for the king of Spain's own uſe, from whence it is carried to Madrid.—This city is 10 miles ſouth-weſt of Guadalaxara, and 13 miles eaſt of Madrid. W. Long. 4. 20. N. Lat. 40. 30.

ALCALA-Real, a ſmall city of Spain, in Andaluſia, with a fine abbey. It is built on the top of a high mountain, in a mountainous country; and the road to it is incommodious, rough, and unequal; but to make amends for this, here are ſeveral kinds of exquiſite fruit and wine. W. Long. 4. 15. N. Lat. 37. 18.

ALCALY, or ALCALI, or ALKALI. See CHEMISTRY *Index*.

ALCANIS, a town of Arragon in Spain, ſeated on the river Guadalopne, 12 miles from Caſpe. It was formerly the capital of the kingdom of the Moors; but being taken from them, it was made a commandery of the order of Calatrava. Here is a very remarkable fountain, which throws up water through 42 pipes. It is ſurrounded with gardens and fruit trees, and defended by a good fortreſs. W. Long. 0. 5. N. Lat. 41. 0.

ALCANNA, or ALKANNA, in *Commerce*, a powder prepared from the leaves of the Egyptian privet, in which the people of Cairo drive a conſiderable trade. It is much uſed by the Turkiſh women to give a golden colour to their nails and hair. In dyeing, it gives a yellow colour when ſteeped with common water, and a red one when infuſed in vinegar. There is alſo an oil extracted from the berries of alcanna, which is ſometimes uſed in medicine.

Alcantara ‖ Alcaſſar.

ALCANTARA, a ſmall, but very ſtrong city of Eſtremadura, in Spain. It gives name to one of the three orders of knighthood. It is ſeated on the banks of the Tajo or Tagus, 21 miles from Coria, in a very fruitful ſoil, and is celebrated for its bridge over that river. This was built in the time of the emperor Trajan, as appears by an inſcription over one of the arches, by the people of Luſitania, who were aſſeſſed to ſupply the expence. It is raiſed 200 feet above the level of the water; and though it conſiſts but of ſix arches, is 670 feet in length, and 28 in breadth. At the entrance of the bridge, there is a ſmall antique chapel hewn in a rock by the ancient Pagans, who dedicated it to Trajan, as the Chriſtians did to St Julian. This city was built by the Moors, on account of the convenience of this bridge; which is at a place where the Tajo is very deep, running between two high ſteep rocks: for this reaſon they called it *Al-Cantara*, which in their language ſignifies *the Bridge*. It was taken from them in 1214, and given to the knights of *Calatrava*, who afterwards aſſumed the name of *Alcantara*. It was taken by the earl of Galway, in April 1706, and retaken by the French in November following. It is 45 miles from Madrid, and 125 from Seville. W. Long. 7. 12. N. Lat. 39. 30.

Knights of ALCANTARA, a military order of Spain, which took its name from the above-mentioned city. They make a very conſiderable figure in the hiſtory of the expeditions againſt the Moors. The knights of Alcantara make the ſame vows as thoſe of Calatrava, and are only diſtinguiſhed from them by this, that the croſs fleur de lys, which they bear over a large white cloak, is of a green colour. They poſſeſs 37 commanderies. By the terms of the ſurrender of Alcantara to this order, it was ſtipulated, that there ſhould be a confraternity between the two orders, with the ſame practices and obſervances in both; and that the order of Alcantara ſhould be ſubject to be viſited by the grand-maſter of Calatrava. But the former ſoon releaſed themſelves from this engagement, on pretence that their grand-maſter had not been called to the election of that of Calatrava, as had been likewiſe ſtipulated in the articles. After the expulſion of the Moors, and the taking of Granada, the ſovereignty of the order of Alcantara and that of Calatrava was ſettled in the crown of Caſtile by Ferdinand and Iſabella.—In 1540, the knights of Alcantara ſued for leave to marry, which was granted them.

ALCAREZ, a ſmall city of La Mancha in Spain, defended by a pretty ſtrong caſtle, and remarkable for an ancient aqueduct. It ſtands near the river Guadamena, and the ſoil about it is very fruitful. They have a breed of little running horſes, which are very fleet and ſtrong. It is 25 miles north of the confines of Andaluſia, 108 ſouth of Cuenza, and 138 ſouth by eaſt of Madrid. W. Long. 1. 50. N. Lat. 38. 28.

ALCASSAR DO-SAL, a town of Portugal, in Eſtremadura, which has a caſtle ſaid to be impregnable. It is indeed very ſtrong, both by art and nature, being built on the top of a rock which is exceedingly ſteep on all ſides. Here is a ſalt-work, which produces very white ſalt, from whence the town takes its name. The

Alcaſſar ‖ Alcazar.

fields produce large quantities of a ſort of ruſhes, of which they make mats, which are tranſported out of the kingdom. W. Long. 9. 10. N. Lat. 38. 18.

ALCASSAR, a city of Barbary, ſeated about two leagues from Larache, in Aſga, a province of the kingdom of Fez. It was of great note, and the ſeat of the governor of this part of the kingdom. It was built by Jacob Almanzor, king of Fez. about the year 1180, and deſigned for a magazine and place of rendezvous for the great preparations he was making to enter Granada in Spain, and to make good the footing Joſeph Almanzor had got ſome time before. It is ſaid his father firſt invaded Spain with 300,000 men, moſt of whom he was obliged to bring back to Africa to quell a rebellion that had broke out in Morocco. This done, he returned to Spain again with an army, as is ſaid, of 200,000 horſe and 300,000 foot. The city is now fallen greatly to decay, ſo that of fifteen moſques there are only two that they make uſe of. The reaſon, probably, is the bad ſituation of the town; for it ſtands ſo low, that it is exceſſively hot in ſummer, and almoſt overflowed with water in the winter. This they affirm to be owing to the curſe of one of their ſaints. Here are a great number of ſtorks, who live very familiarly with the people, walking about the town, poſſeſſing the tops of the houſes and moſques without moleſtation; for they eſteem them ſacred birds, and account it ſinful to diſturb them. At preſent, the baſhaw of Tetuan appoints a governor to this town, which is the laſt of his dominions towards Mequinez. Near this city there is a high ridge of mountans, running towards Tetuan, whoſe inhabitants were never brought entirely under ſubjection; and whenever it was attempted, they revenged themſelves by infeſting the roads, and robbing and deſtroying the travellers. When they were purſued, they retired into their woody mountains, where none could ſafely follow them. Not far from hence is the river Elmahaſſen, famous for the battle fought between Don Sebaſtian king of Portugal and the Moors; in which the Portugueſe were defeated, and their king ſlain. W. Long. 12. 35. N. Lat. 35. 15.

ALCAVALA, in the Spaniſh finances, was at firſt a tax of ten per cent. afterwards of 14 per cent. and is at preſent of only 6 per cent. upon the ſale of every ſort of property, whether moveable or immoveable; and it is repeated every time the property is ſold. The levying of this tax requires a multitude of revenue officers ſufficient to guard the tranſportation of goods, not only from one province to another, but from one ſhop to another. It ſubjects not only the dealers in ſome ſort of goods, but thoſe in all ſorts, every farmer, every manufacturer, every merchant and ſhopkeeper, to the continual viſits and examination of the taxgatherers. Through the greater part of a country in which a tax of this kind is eſtabliſhed, nothing can be produced for diſtant ſale. The produce of every part of the country muſt be proportioned to the conſumption of the neighbourhood. It is to the Alcavala, accordingly, that Uſtariz imputes the ruin of the manufactures of Spain. He might have imputed to it likewiſe the declenſion of agriculture, it being impoſed not only upon manufactures, but upon the rude produce of the land.

ALCAZAR LEGUER, a town of Africa, in the kingdom of Fez, and in the province of Habat. It was taken by Alphonſo, king of Portugal, in 1468; but ſoon after that it was abandoned to the Moors. It is ſeated on the coaſt of the ſtraits of Gibraltar. W. Long. 3. 50. N. Lat. 38. 0.

Alcazer ‖ Alciat.

ALCAZER, a town of Spain, in New Caſtile, ſeated on the river Guardamena, which has a fortreſs on a high hill for its defence, and lies in a very fruitful country. It is 100 miles north-weſt of Carthagena. W. Long. 2. 10. N. Lat. 38. 15.

ALCE, ALCES, or ELK, in *Zoology*, the trivial name of a ſpecies of the cervus, belonging to the order of mammalia pecora. See CERVUS.

ALCEA, the HOLLY-HOCK. See BOTANY *Index*.

ALCEDO, or KINGSFISHER. See ORNITHOLOGY *Index*.

ALCHEMILLA, or LADIES-MANTLE. See BOTANY *Index*.

ALCHEMIST, a practitioner in alchemy.

ALCHEMY, that branch of chemiſtry which had for its principal objects the tranſmutation of metals into gold; the panacea, or univerſal remedy; an alkaheſt, or univerſal menſtruum; an univerſal ferment; and many other things equally ridiculous.

Kircher, inſtructed in all the ſecrets of chemiſtry, has fully expoſed the artifices and impoſtures of alchemiſts. An alchemiſt puts into a crucible the matter which is to be converted into gold: this he ſets on the fire, blows it, ſtirs it with rods; and, after divers operations, gold is found at the bottom of the crucible, inſtead of the matter firſt put in. This there are a thouſand ways of effecting, without any tranſmutation. Sometimes it is done by dexterouſly dropping in a piece of gold concealed between the fingers, ſometimes by caſting in a little of the duſt of gold or ſilver diſguiſed under the appearance of ſome elixir, or other indifferent matter; ſometimes a crucible is uſed which has a double bottom, and gold put between the two; ſometimes the rod uſed to ſtir the matter is hollow, and filled with the duſt of the metal deſired; at other times there is metal mixed with the charcoal, the aſhes of the furnace, or the like. Mr Harris very properly diſtinguiſhes alchemy from chemiſtry; and defines the former to be *ars ſine arte, cujus principium eſt mentiri, medium laborare, et finis mendicare;* and the Italians have a proverb, *non ti fidiare al alchemiſta povero o medico amalato.* The ruin which has attended this deluſion has occaſioned ſeveral ſtates to make ſevere laws againſt pretences to alchemy. The Romans formerly baniſhed all ſuch as profeſſed it; and the ſacred canons likewiſe directed the thunder of their cenſure againſt them. Diocleſian and Cæſar directed all books which treated of this ſubject to be burnt. Rymer furniſhes us with a licenſe for practiſing alchemy, with all kinds of metals and minerals, granted to one Richard Carter in 1476; *Rym. Fœd.* tom. xii. Nevertheleſs, we have had ſevere laws againſt alchemy, and multiplying of metals, as much ſo as againſt coining itſelf.

ALCHORNEA. See BOTANY *Index*.

ALCIAT or ALCIATE, ANDREW, a great lawyer, who flouriſhed in the tenth century, was born at Milan. He mixed much of polite learning in the explication of the laws, and happily drove out the barbarity of language which till then had reigned in the lectures and writings of lawyers; for which Thuanus highly

praiſes

Alcibiades || Alcmaer.

praiſes him. He publiſhed a great many law-books, and ſome notes upon Tacitus. His emblems have been much admired, and tranſlated into French, Italian, and Spaniſh; and ſeveral learned men have written commentaries on them.

ALCIBIADES, an Athenian general. It was the fate of this great man to live at a time when his country was a ſcene of confuſion. The Greeks, grown inſolent from their conqueſts in Perſia, turned their armies againſt each other, and bandied together under the conduct of the two moſt opulent ſtates, Athens and Lacedæmon. Alcibiades, in the midſt of an expedition he had planned againſt the enemies of his country, was recalled home to anſwer ſome charge of a private nature; but fearing the violence of his enemy, inſtead of going to Athens, he offered his ſervices at Sparta, where they were readily accepted. By his advice the Lácedæmonians made a league with Perſia, which gave a very favourable turn to their affairs. But his credit in the republic raiſing jealouſies againſt him, he privately reconciled himſelf to his country, and took again the command of the Athenian army. Here victory, waiting as it were at his command, attended all his motions. The loſs of ſeven battles obliged the Spartans to ſue for peace. He enjoyed his triumphs, however, only a ſhort time at Athens. One unſucceſsful event made him again obnoxious to the malice of his citizens; and he found it expedient to retire from Athens. In his abſence the Spartans again took the lead, and at the fatal battle of Ægos entirely ſubdued the Athenian power. Alcibiades, though an exile, endeavoured to reſtore the power of his country; of which the Spartans having intelligence, procured him to be aſſaſſinated. He was a man of admirable accompliſhments, but indifferently principled; of great parts; and of an amazing verſatility of genius.

ALCINOUS, king of the Phæacians, in the iſland now called Corfu, was ſon of Nauſithous, and grandſon of Neptune and Peribea. It is by his gardens this king has chiefly immortalized his memory. He received Ulyſſes with much civility, when a ſtorm had caſt him on his coaſt. The people here loved pleaſure and good cheer, yet were ſkilful ſeamen; and Alcinous was a good prince.

ALCMAER, a city of the United Provinces, ſeated in North Holland, about four miles from the ſea, 15 from Haerlem, and 18 from Amſterdam. It is a handſome city, and one of the cleaneſt in Holland. The ſtreets and houſes are extremely neat and regular, and the public buildings very beautiful. It had formerly two pariſh churches, dedicated to St Matthew and St Lawrence. The latter had ſo high a tower, that it ſerved for a ſea-mark to the veſſels that were in the open ſea; but, in 1464, it tumbled down, and damaged the other church ſo much, that they were both demoliſhed in 1670, and one church was built in their ſtead, dedicated to the ſame ſaints. The Spaniards, under the command of Frederic of Toledo, ſon of the duke of Alva, came to beſiege it, after they had taken Haerlem in 1573; but were forced to raiſe the ſiege after lying three months before it, as well on account of the infection of the air as the ſtout reſiſtance of the inhabitants and ſoldiers; even the women ſignalizing themſelves bravely in its defence. It is recorded in the regiſter of this city, that, in the year 1637, 120 tulips, with the offſets, ſold for 90,000 florins. The town has a very great trade in butter and cheeſe, of which a vaſt quantity is ſold every year, and is eſteemed the beſt in Holland. E. Long. 4. 26. N. Lat. 52. 28.

Alcman || Alcohol

ALCMAN, a lyric poet, who flouriſhed in the 27th Olympiad, about 670 years before Chriſt. He was born at Sparta; and compoſed ſeveral poems, of which only ſome fragments are remaining, quoted by Athenæus and ſome other ancient writers. He was very amorous; accounted the father of gallant poeſy; and is ſaid to have been the firſt that introduced the cuſtom of ſinging love ſongs in company. He is reported to have been one of the greateſt orators of his age; upon which Mr Bayle remarks, that ſuch a quality would have been extremely inconvenient, if poetry had been at that time upon ſuch a footing as it has been often ſince, not able to procure the poet bread. He died of a ſtrange diſeaſe; for he was eaten up with lice.

ALCMANIAN, in ancient lyric poetry, a kind of verſe, conſiſting of two dactyles and two trochees: as,—

Virgini|bus pue|riſque|canto.

The word is formed from *Alcman*, the name of an ancient Greek poet, in great eſteem for his erotics or amorous compoſitions.

ALCMENA, the daughter of Electryo king of Mycenæ, and wife of Amphitryon. Jupiter putting on the ſhape of her huſband while he was abroad in the wars, begot Hercules upon her: he made that night as long as three ordinary ones.

ALCOCK, JOHN, doctor of laws, and biſhop of Ely, in the reign of King Henry VII. was born at Beverly in Yorkſhire, and educated at Cambridge. He was firſt made dean of Weſtminſter, and afterwards appointed maſter of the rolls. In 1471, he was conſecrated biſhop of Rocheſter: in 1476, he was tranſlated to the ſee of Worceſter; and in 1486, to that of Ely, in the room of Dr John Morton, preferred to the ſee of Canterbury. He was a prelate of great learning and piety, and ſo highly eſteemed by King Henry, that he appointed him lord preſident of Wales, and afterwards lord chancellor of England. Alcock founded a ſchool at Kingſton upon Hull, and built the ſpacious hall belonging to the epiſcopal palace at Ely. He was alſo the founder of Jeſus-college in Cambridge, for a maſter, ſix fellows, and as many ſcholars. This houſe was formerly a nunnery, dedicated to St Radigund: and, as Godwin tells us, the building being greatly decayed, and the revenues reduced almoſt to nothing, the nuns had all forſaken it, except two; whereupon Biſhop Alcock procured a grant from the crown, and converted it into a college. But Camden and others tell us, that the nuns of that houſe were ſo notorious for their incontinence, that King Henry VII. and Pope Julius II. conſented to its diſſolution: Bale accordingly calls this nunnery *ſpiritualium meretricum cœnobium*, "a community of ſpiritual harlots." Biſhop Alcock wrote ſeveral pieces; amongſt which are the following: 1. *Mons Perfectionis*. 2. *In Pſalmos Penitentiales*. 3. *Homiliæ Vulgares*. 4. *Meditationes Piæ*. He died October 1. 1500; and was buried in the chapel he had built at Kingſton upon Hull.

ALCOHOL, or ALKOOL, in *Chemiſtry*, ſpirit of wine highly rectified. It is alſo uſed for any highly

Alcohol || Alcoran.

rectified ſpirit.—Alcohol is extremely light and inflammable: it is a ſtrong antiſeptic, and therefore employed to preſerve animal ſubſtances. See CHEMISTRY *Index*.

ALCOHOL, is alſo uſed for any fine impalpable powder.

ALCOHOLIZATION, the proceſs of rectifying any ſpirit. It is alſo uſed for pulverization.

ALCOR, in *Aſtronomy*, a ſmall ſtar adjoining to the large bright one in the middle of the tail of *urſa major*.—The word is Arabic. It is a proverb among the Arabians, applied to one who pretends to ſee ſmall things, but overlooks much greater: *Thou canſt ſee Alcor, and yet not ſee the full moon.*

ALCORAN, or AL-KORAN, the ſcripture or bible of the Mahometans. The word is compounded of the Arabic particle *al* and *coran* or *koran*, derived from the verb *caraa* or *karaa*, to read. The word therefore properly ſignifies, *the reading*; or rather, *that which ought to be read.* By this name the Mahometans denote not only the entire book or volume of the Koran, but alſo any particular chapter or ſection of it; juſt as the Jews call either the whole Scripture, or any part of it, by the name of *Karah*, or *Mikra*, words of the ſame origin and import.

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

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

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

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

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

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

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

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

verſes

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

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

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

To the pomp and harmony of expreſſion ſome aſcribe all the force and effect of the Alcoran; which they conſider as a ſort of muſic, equally fitted with other ſpecies of that art to raviſh and amaze. In this Mahomet ſucceeded ſo well, and ſo ſtrangely captivated the minds of his audience, that ſeveral of his opponents thought it the effect of witchcraft and enchantment, as he himſelf complains.—Others have attributed the effect of the Alcoran to the frequent mention of rewards and puniſhments; heaven and hell occurring almoſt in every page. Some ſuppoſe, that the ſenſual pleaſures of paradiſe, ſo frequently ſet before the imaginations of the readers of the Alcoran, were what chiefly bewitched them. Though, with regard to theſe, there is a great diſpute whether they are to be underſtood literally or ſpiritually. Several have even allegorized the whole book. Alcoran.

The general deſign of the Koran was to unite the profeſſors of the three different religions, then followed in the populous country of Arabia (who for the moſt part lived promiſcuouſly, and wandered without guides, the far greater number being idolaters, and the reſt Jews and Chriſtians moſtly of erroneous and heterodox belief), in the knowledge and worſhip of one God, under the ſanction of certain laws, and the outward ſigns of ceremonies partly of ancient and partly of novel inſtitution, enforced by the conſideration of rewards and puniſhments both temporal and eternal; and to bring them all to the obedience of Mahomet, as the prophet and ambaſſador of God, who, after the repeated admonitions, promiſes, and threats, of former ages, was at laſt to eſtabliſh and propagate God's religion on earth, and to be acknowledged chief pontiff in ſpiritual matters, as well as ſupreme prince in temporal.

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

(A) As the compoſition and arrangement of words, however, admit of infinite varieties, it can never be abſolutely ſaid that any one is the beſt poſſible. In fact, Hamzah Benahmed wrote a book againſt the Alcoran with at leaſt equal elegance; and Moſelema another, which even ſurpaſſed it, and occaſioned a defection of a great part of the Muſſulmans. *Journ. de Sçav.* tom. viii. p. 280. *Oeuvr. de Sçav.* Nov. 1708. p. 404.

Alcoran. them much higher, as the reſt might be, were more of thoſe books extant, and was it worth while to make the inquiry.

The reſt of the Alcoran is taken up in preſcribing neceſſary laws and directions, frequent admonitions to moral and divine virtues, the worſhip and reverence of the Supreme Being, and reſignation to his will. One of their moſt learned commentators diſtinguiſhes the contents of the Alcoran into *allegorical* and *literal;* under the former are comprehended all the obſcure, parabolical, and enigmatical paſſages, with ſuch as are repealed, or abrogated; the latter, ſuch as are clear, and in full force.

The moſt excellent moral in the whole Alcoran, interpreters ſay, is that in the chapter *Al Alraf*, viz. "Shew mercy, do good to all, and diſpute not with the ignorant;" or, as Mr Sale renders it, "Uſe indulgence, command that which is juſt, and withdraw far from the ignorant." Mahomet, according to the authors of the *Keſchaf*, having begged of the angel Gabriel a more ample explication of this paſſage, received it in the following terms: "Seek him who turns thee out, give to him who takes from thee, pardon him who injures thee; for God will have you plant in your ſouls the roots of his chief perfections." It is eaſy to ſee that this commentary is copied from the goſpel. In reality, the neceſſity of forgiving enemies, though frequently inculcated in the Alcoran, is of a later date among the Mahometans than among the Chriſtians; among thoſe latter, than among the heathens; and to be traced originally among the Jews. (See EXODUS xxxiii. 4. 5.) But it matters not ſo much who had it firſt, as who obſerves it beſt. The caliph Haſſan, ſon of Hali, being at table, a ſlave unfortunately let fall a diſh of meat reeking hot, which ſcalded him ſeverely. The ſlave fell on his knees, rehearſing theſe words of the Alcoran, "Paradiſe is for thoſe who reſtrain their anger." I am not angry with thee, anſwered the caliph—"And for thoſe who forgive offences againſt them," continues the ſlave. I forgive thee thine, replies the caliph—"But above all, for thoſe who return good for evil," adds the ſlave. I ſet thee at liberty, rejoined the caliph; and I give thee ten dinars.

There are alſo a great number of occaſional paſſages in the Alcoran, relating only to particular emergencies. For this advantage Mahomet had in the piecemeal method of receiving his revelation, that whenever he happened to be perplexed and gravelled with any thing, he had a certain reſource in ſome new morſel of revelation. It was an admirable contrivance of his, to bring down the whole Alcoran at once, only to the loweſt heaven, not to earth; ſince, had the whole been publiſhed at once, innumerable objections would have been made, which it would have been impoſſible for him to ſolve; but as he received it by parcels, as God ſaw fit they ſhould be publiſhed for the converſion and inſtruction of the people, he had a ſure way to anſwer all emergencies, and to extricate himſelf with honour from any difficulty which might occur.

It is the general and orthodox belief among the Mahometans, that the Koran is of divine original; nay, that it is eternal and uncreated, remaining, as ſome expreſs it, in the very eſſence of God: that the firſt tranſcript has been from everlaſting by God's throne, written on a table of vaſt bigneſs, called the *preſerved table*, in which are alſo recorded the divine decrees paſt and future: that a copy from this table, in one volume on paper, was by the miniſtry of the angel Gabriel ſent down to the loweſt heaven, in the month of Ramadan, on the night of *power:* from whence Gabriel revealed it to Mahomet by parcels, ſome at Mecca, and ſome at Medina, at different times, during the ſpace of 23 years, as the exigency of affairs required; giving him, however, the conſolation to ſhow him the whole (which they tell us was bound in ſilk, and adorned with gold and precious ſtones of paradiſe) once a-year; but in the laſt year of his life he had the favour to ſee it twice. They ſay, that few chapters were delivered entire, the moſt part being revealed piecemeal, and written down from time to time by the prophet's amanuenſis in ſuch a part of ſuch and ſuch a chapter, till they were completed, according to the directions of the angel. The firſt parcel that was revealed is generally agreed to have been the firſt five verſes of the 46th chapter. Alcoran.

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

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

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

However, in the 30th year of the Hegira Othman being then caliph, and obſerving the great diſagreement in the copies of the Koran in the ſeveral provinces of the empire: thoſe of Irak, for example, following the reading of Abu Muſa al Aſhari, and the Syrians that of Macdad Ebn Aſwad; he, by the advice of the *companions*, ordered a great number of copies to be tranſcribed from that of Abu Becr, in Haſſa's care, under the inſpection of Zeid Ebn Thabet, Abd'allah Ebn Zobair, Said Ebn al As, and Abd'alrahman Ebn al Hareth the Makhzumite; whom he directed, that, wherever they diſagreed about any word, they ſhould write it in the dialect of the Koreiſh,

Alcoran. reiſh, in which it was at firſt delivered. Theſe copies, when made, were diſperſed in the ſeveral provinces of the empire, and the old ones burnt and ſuppreſſed. Though many things in Haffa's copy were corrected by the above-mentioned reviſers, yet ſome few various readings ſtill occur.

In fine, the book of the Alcoran is held in the higheſt eſteem and reverence among the Muſſulmans. They dare not ſo much as touch the Alcoran without being firſt waſhed, or legally purified; to prevent which, an inſcription is put on the cover or label, *Let none touch but they who are clean.* It is read with great care and reſpect; being never held below the girdle. They ſwear by it; take omens from it on all weighty occaſions; carry it with them to war; write ſentences of it in their banners; adorn it with gold and precious ſtones; and knowingly ſuffer it not to be in the poſſeſſion of any of a different religion. Some ſay that it is puniſhable even with death, in a Chriſtian, to touch it; others, that the veneration of the Muſſulmans leads them to condemn the tranſlating it into any other language as a profanation: but theſe ſeem to be aggravations. The Mahometans have taken care to have their Scripture tranſlated into the Perſian, the Javaneſe, the Malayan, and other languages; though, out of reſpect to the original, theſe verſions are generally, if not always, interlineated.

View of Chriſtianity and Mahometaniſm, p. 257.

By the advocates of Mahometaniſm, the Koran, as already obſerved, has always been held forth as the greateſt of miracles, and equally ſtupenduous with the act of raiſing the dead. The miracles of Moſes and Jeſus, they ſay, were tranſient and temporary; but that of the Koran is permanent and perpetual; and therefore far ſurpaſſes all the miraculous events of preceding ages. We will not detract from the real merit of the Koran: we allow it to be generally elegant, and often ſublime: but at the ſame time we reject with diſdain its arrogant pretence to any thing ſupernatural; all the real excellence of the work being eaſily referable to natural and viſible cauſes.

"In the language of Arabia, a language extremely loved and diligently cultivated by the people to whom it was vernacular, Mahomet found advantages which were never enjoyed by any former or ſucceeding impoſtor. It requires not the eye of a philoſopher to diſcover in every ſoil and country a principle of national pride: and if we look back for many ages on the hiſtory of the Arabians, we ſhall eaſily perceive that pride among them invariably to have conſiſted in the knowledge and improvement of their native language. The Arabic, which has been juſtly eſteemed the moſt copious of the Eaſtern tongues; which had exiſted from the remoteſt antiquity; which had been embelliſhed by numberleſs poets, and refined by the conſtant exerciſe of the natives; was the moſt ſucceſsful inſtrument which Mahomet employed in planting his new religion among them. Admirably adapted by its unrivalled harmony, and by its endleſs variety, to add painting to expreſſion, and to purſue the imagination in its unbounded flight; it became in the hands of Mahomet an irreſiſtible charm to blind the judgment, and to captivate the fancy of his followers.

"Of that deſcription of men, who firſt compoſed the adherents of Mahomet, and to whom the Koran was addreſſed, few, probably, were able to paſs a very accurate judgement on the propriety of the ſentiments, or on the beauties of the diction: but all could judge of the military abilities of their leader; and in the midſt of their admiration it is not difficult to conceive, that they would aſcribe to his compoſitions every imaginary beauty of inſpired language. Alcoran.

"The ſhepherd and the ſoldier, though awake to the charms of thoſe wild but beautiful compoſitions, in which were celebrated their favourite occupations of love or war, were yet little able to criticiſe any other works than thoſe which were addreſſed to the imagination or the heart. To abſtract reaſonings on the attributes and the diſpenſations of the Deity, to the comparative excellencies of rival religions, to the conſiſtency of any one religious ſyſtem in all its parts, and to the force of its various proofs, they were quite inattentive. In ſuch a ſituation, the appearance of a work which poſſeſſed ſomething like wiſdom and conſiſtence; which preſcribed the rules, and illuſtrated the duties of life; and which contained the principles of a new and comparatively ſublime theology, independently of its real and permanent merit, was likely to excite their aſtoniſhment, and to become the ſtandard of future compoſition.

"In the firſt periods of the literature of every country, ſomething of this kind has happened. The father of Grecian poetry very obviouſly influenced the taſte and imitation of his countrymen. The modern nations of Europe all poſſeſs ſome original author, who, riſing from the darkneſs of former ages, has begun the career of compoſition, and tinctured with the character of his own imagination the ſtream which has flowed through his poſterity.

"But the prophet of Arabia had in this reſpect advantages peculiar to himſelf. His compoſitions were not to his followers the works of man, but the genuine language of Heaven, which had ſent him. They were not confined therefore to that admiration which is ſo liberally beſtowed on the earlieſt productions of genius, or to that fond attachment with which men everywhere regard the original compoſitions of their country: but with their admiration they blended their piety. To know and to feel the beauties of the Koran, was in ſome reſpect to ſhare in the temper of heaven; and he who was moſt affected with admiration in the peruſal of its beauties, ſeemed moſt fitly the object of that mercy which had given it to ignorant man. The Koran, therefore, became naturally and neceſſarily the ſtandard of taſte. With a language thus hallowed in their imaginations, they were too well ſatisfied, either to diſpute its elegance or improve its ſtructure. In ſucceeding ages, the additional ſanction of antiquity, or preſcription, was given to theſe compoſitions which their fathers had admired: and while the belief of its divine original continues, that admiration, which has thus become the teſt and the duty of the faithful, can neither be altered nor diminiſhed.

"When therefore we conſider theſe peculiar advantages of the Koran, we have no reaſon to be ſurpriſed at the admiration in which it is held. But if, deſcending to a more minute inveſtigation of it, we conſider its perpetual inconſiſtence and abſurdity, we ſhall indeed have cauſe for aſtoniſhment at that weakneſs of humanity which could ever have received ſuch compoſitions as the work of the Deity.

"The

Alcoran. "The firſt praiſe of all the productions of genius, is invention; that quality of the mind, which, by the extent and quickneſs of its views, is capable of the largeſt conceptions, and of forming new combinations of objects the moſt diſtant and unuſual. But the Koran bears little impreſſion of this tranſcendent character. Its materials are wholly borrowed from the Jewiſh and Chriſtian Scriptures, from the Talmudical legends and apocryphal goſpels then current in the Eaſt, and from the traditions and fables which abounded in Arabia. The materials collected from theſe ſeveral ſources are here heaped together, with perpetual and needleſs repetitions, without any ſettled principle or viſible connection.

"When a great part of the life of Mahomet had been ſpent in preparatory meditation on the ſyſtem he was about to eſtabliſh, its chapters were dealt out ſlowly and ſeparately during the long period of 23 years. Yet thus defective in its ſtructure, and not leſs exceptionable in its doctrines, was the work which Mahomet delivered to his followers as the oracles of God.

"The moſt prominent feature of the Koran, that point of excellence in which the partiality of its admirers has ever delighted to view it, is the ſublime notion it generally impreſſes of the nature and attributes of God. If its author had really derived theſe juſt conceptions from the inſpiration of that Being whom they attempt to deſcribe, they would not have been ſurrounded, as they now are on every ſide, with error and abſurdity. But it might eaſily be proved, that whatever it juſtly defines of the divine attributes, was borrowed from our Holy Scripture; which even from its firſt promulgation, but eſpecially from the completion of the New Teſtament, has extended the views and enlightened the underſtandings of mankind; and thus furniſhed them with arms, which have too often, though ineffectually, been turned againſt itſelf by its ungenerous enemies.

"In this inſtance particularly, the copy is far below the great original, both in the propriety of its images, and the force of its deſcriptions. Our Holy Scriptures are the only compoſitions that can enable the dim ſight of mortality to penetrate into the inviſible world, and to behold a glimpſe of the Divine perfections. Accordingly, when they would repreſent to us the happineſs of Heaven, they deſcribe it, not by any thing minute and particular, but by ſomething general and great; ſomething that, without deſcending to any determinate object, may at once by its beauty and immenſity excite our wiſhes and elevate our affections. Though in the prophetical and evangelical writings the joys that ſhall attend us in a future ſtate are often mentioned with ardent admiration, they are expreſſed rather by alluſion than ſimilitude, rather by indefinite and figurative terms, than by any thing fixed and determinate. 'Eye hath not ſeen, nor ear heard, neither have entered into the heart of man, the things which God hath prepared for them that love him.' 1. *Cor.* ii. 9. What a reverence and aſtoniſhment does this paſſage excite in every hearer of taſte and piety! What energy, and at the ſame time what ſimplicity, in the expreſſion! How ſublime, and at the ſame time how obſcure, is the imagery!

"Different was the conduct of Mahomet in his deſcriptions of heaven and of paradiſe. Unaſſiſted by the neceſſary influence of virtuous intentions and Divine inſpiration, he was neither deſirous, nor indeed able, to exalt the minds of men to ſublime conceptions, or to rational expectations. By attempting to explain what is inconceivable, to deſcribe what is ineffable, and to materialize what in itſelf is ſpiritual; he abſurdly and impiouſly aimed to ſenſualize the purity of the Divine eſſence. Thus he fabricated a ſyſtem of incoherence, a religion of depravity, totally repugnant indeed to the nature of that Being, who, as he pretended, was its object; but therefore more likely to accord with the appetites and conceptions of a corrupt and ſenſual age. Alcoran.

"That we may not appear to exalt our Scriptures thus far above the Koran by an unreaſonable preference, we ſhall produce a part of the ſecond chapter of the latter, which is deſervedly admired by the Mahometans, who wear it engraved on their ornaments, and recite it in their prayers. 'God! there is no God but he; the living, the ſelf-ſubſiſting: neither ſlumber nor ſleep ſeizeth him: to him belongeth whatſoever is in heaven, and on earth. Who is he that can intercede with him but through his good pleaſure? He knoweth that which is paſt, and that which is to come. His throne is extended over heaven and earth, and the preſervation of both is to him no burden. He is the high, the mighty.' *Sale's Kor.* ii. p. 30. 4to edit.

"To this deſcription who can refuſe the praiſe of magnificence? Part of that magnificence, however, is to be referred to that verſe of the Pſalmiſt, whence it was borrowed, 'He that keepeth Iſrael, ſhall neither ſlumber nor ſleep.' *Pſal.* cxxi. 4.

"But if we compare it with that other paſſage of the ſame inſpired Pſalmiſt, all its boaſted grandeur is at once obſcured, and loſt in the blaze of a greater light.

"O my God, take me not away in the midſt of my days; thy years are throughout all generations. Of old haſt thou laid the foundations of the earth; and the heavens are the work of thy hands. They ſhall periſh, but thou ſhalt endure: yea all of them ſhall wax old, as doth a garment; as a veſture ſhalt thou change them, and they ſhall be changed; but thou art the ſame, and thy years ſhall not fail.'

"The Koran, therefore, upon a retroſpective view of theſe ſeveral circumſtances, far from ſupporting its arrogant claim to a ſupernatural work, ſinks below the level of many compoſitions confeſſedly of human original; and ſtill lower does it fall in our eſtimation, when compared with that pure and perfect pattern which we juſtly admire in the Scriptures of truth.

"It is therefore abundantly apparent, that no miracle either was externally performed for the ſupport, or is internally involved in the compoſition, of the Mahometan revelation."

ALCORAN, is alſo figuratively applied to certain other books full of impieties and impoſtures. In this ſenſe we meet with the Alcoran of the Cordeliers, which has made a great noiſe; wherein St Francis is extravagantly magnified, and put on a level with Jeſus Chriſt. The Alcoran of the Cordeliers is properly an extract of a very ſcarce book, entitled, The Conformity of the Life of the ſeraphic father St Francis with the Life of Chriſt, publiſhed in 1510, 4to; ſince, at Bologna, in folio. Eraſmus Albertus, being by the elector of Brandenburg appointed to viſit a monaſtery of Franciſcans,

Alcoranists || Alcuinus

Franciscans, found this book; and being struck with the extreme folly and absurdity of it, collected a number of curiosities out of it, and published them under the title of the *Alcoran* of the Franciscans, with a preface by Martin Luther.

ALCORANISTS, among Mahometans, those who adhere strictly to the letter or text of the Alcoran, from an opinion of its ultimate sufficiency and perfection. The Persians are generally *Alcoranists*, as admitting the Alcoran alone for their rule of faith. The Turks, Tartars, Arabs, &c. besides the Alcoran, admit a multitude of traditions. The Alcoranists, among Mahometans, amount to much the same with the Textuaries among the Jews. The Alcoranists can find nothing excellent out of the Alcoran; are enemies of philosophers, metaphysicians, and scholastic writers. With them the Alcoran is every thing.

ALCOVE, in *Architecture*, a recess, or part of a chamber separated by an estrade, or partition of columns, and other corresponding ornaments, in which is placed a bed of state, and sometimes seats to entertain company. These alcoves are frequent in Spain; and the bed is raised two or three ascents, with a rail at the foot.

ALCUINUS, Flaccus, an ecclesiastic of the eighth century. He was born, it is supposed, in Yorkshire. He was educated, however, at York, under the direction of Archbishop Egbert, as we learn from his own letters, in which he frequently calls that great prelate his beloved master, and the clergy of York the companions of his youthful studies. As he survived Venerable Bede about 70 years, it is hardly possible that he could have received any part of his education under him, as some writers of literary history have affirmed; and it is worthy of observation, that he never calls that great man his master, though he speaks of him with the highest veneration. It is not well known to what preferments he had attained in the church before he left England, though some say he was abbot of Canterbury. The occasion of his leaving his native country, was his being sent on an embassy by Offa king of Mercia to the emperor Charlemagne; who contracted so great an esteem and friendship for him, that he earnestly solicited, and at length prevailed upon him, to settle in his court, and become his preceptor in the sciences. Alcuinus accordingly instructed that great prince in rhetoric, logic, mathematics, and divinity; which rendered him one of his greatest favourites. "He was treated with so much kindness and familiarity (says a cotemporary writer) by the emperor, that the other courtiers called him, by way of eminence, *the emperor's delight*." Charlemagne employed his learned favourite to write several books against the heretical opinions of Felix bishop of Urgel, in Catalonia, and to defend the orthodox faith against that heresiarch, in the council of Francfort, A. D. 894; which he performed to the entire satisfaction of the emperor and council, and even to the conviction of Felix and his followers, who abandoned their errors. The emperor consulted chiefly with Alcuinus on all things relating to religion and learning; and, by his advice, did many great things for the advancement of both. An academy was established in the imperial palace, over which Alcuinus presided, and in which the princes and prime nobility were educated; and other academies were established in the chief towns of Italy and France at his instigation, and under his inspection. "France (says one of our best writers of literary history) is indebted to Alcuinus for all the polite learning it boasted of in that and the following ages. The universities of Paris, Tours, Fulden, Soissons, and many others, owe to him their origin and increase; those of whom he was not the superior and founder, being at least enlightened by his doctrine and example, and enriched by the benefits he procured for them from Charlemagne." After Alcuinus had spent many years in the most intimate familiarity with the greatest prince of his age, he at length, with great difficulty, obtained leave to retire from court to his abbey of St Martin's at Tours. Here he kept up a constant correspondence by letters with Charlemagne; from which it appears, that both the emperor and his learned friend were animated with the most ardent love to learning and religion, and constantly employed in contriving and executing the noblest designs for their advancement. He composed many treatises on a great variety of subjects, in a style much superior in purity and elegance to that of the generality of writers in the age in which he flourished. Charlemagne often solicited him, with all the warmth of a most affectionate friend, to return to court, and favour him with his company and advice; but he still excused himself; and nothing could draw him from his retirement in his abbey of St Martin in Tours, where he died A. D. 804. His works were collected and published by Andrew du Chesne in one volume folio, Paris, 1617. They consist of 1. Tracts upon Scripture. 2. Tracts upon doctrine, discipline, and morality. 3. Historical treatises, letters, and poems. Since that edition, there has been published an incredible number of tracts, poems, &c. ascribed to this author, most of which, in all probability, were not his.

Alcuinus || Alcyonius.

ALCYON, the trivial name of a species of alcedo. See Alcedo, Ornithology *Index*.

ALCYONIUM, an obsolete name of a submarine plant. It is also used for a kind of coral, or astroites, frequently found fossil in England.

Alcyonium Stagnum, in *Ancient Geography*, a lake in the territory of Corinth, whose depth was unfathomable, and in vain attempted to be discovered by Nero. Through this lake Bacchus is said to have descended to hell, to bring back Semele; (Pausanias.)

ALCYONIUS, Peter, a learned Italian, who flourished in the 16th century. He was well versed in the Greek and Latin tongues, and wrote some pieces of eloquence which met with great approbation. He was corrector of the press a considerable time for Aldus Manutius, and is entitled to a share in the praises given to the editions of that learned printer. He published a treatise concerning banishment, which contained so many fine passages intermixed with others quite the reverse, that it was thought he had tacked to somewhat of his own, several fragments of a treatise of *Cicero de Gloria*; and that afterwards, in order to save himself from being detected in this theft, he burnt the manuscript of Cicero, the only one extant. Paulus Manutius, in his commentary upon these words of Cicero, *Librum tibi celeriter mittam de gloria*, "I will speedily send you my treatise on Glory;" has the following passage relating to this affair: "He means (says

Alcyonius || Alderman.

(says he) his two books on Glory, which were handed down to the age of our fathers; for Bernard Justinian, in the index of his books, mentions *Cicero de Gloria*. This treatise, however, when Bernard had left his whole library to a nunnery, could not be found, though sought after with great care: nobody doubted but Peter Alcyonius, who, being physician to the nunnery, was entrusted with the library, had basely stolen it. And truly, in his treatise of Banishment, some things are found interspersed here and there, which seem not to favour of Alcyonius, but of some higher author." The two orations he made after the taking of Rome, wherein he represented very strongly the injustice of Charles V. and the barbarity of his soldiers, were excellent pieces. There is also an oration ascribed to him, on the knights who died at the siege of Rhodes.

ALDBOROUGH, a sea-port town of England in Suffolk. It is pleasantly situated in a dale, between a high hill to the westward, on which its large old-built church stands; the sea to the east, and its river running south-west. It is a large, long, ordinary town, made up of two or three streets of low houses, running parallel to each other. A quarter of a mile to the south lies Slaughden, where they have a commodious key, with warehouses for fish: more southerly still, they have conveniences for drying their north-sea fish. Their employment in the fishery is their chief business, which is considerable in the seasons for catching herrings and sprats; and it is the only place in England for curing red sprats. It is a town corporate, and sends two members to parliament. Towards the sea, it has some pieces of cannon planted for its defence. It is 88 miles north-east form London. E. Long. 1. 32. N. Lat. 52. 50.

ALDBOROUGH, a market-town in the west riding of Yorkshire, seated on the river Ouse, 15 miles north-west of York, and 200 miles north of London. It sends two members to parliament. W. Long. 0. 20. N. Lat. 54. 15. It was anciently a Roman city, called *Isurium Brigantum;* and several coins and monuments of the Saxons and Romans have been discovered there.

ALDEBARAN, in *Astronomy*, a star of the first magnitude, called in English the *bull's eye*, as making the eye of the constellation Taurus. Its longitude is 6 deg. 32 min. 9 sec. of Gemini, and its latitude 5 deg. 29 min. 40 sec. south.

ALDER TREE. See BETULA, BOTANY *Index*.

ALDERHOLM, an island of Sweden, formed by the three arms of a river running through Gentle, a a town of Nordland, in Sweden, 80 miles north from Stockholm. Here is a wharf, a repository for planks and deals, two packing houses, a large custom-house for taking toll of the ships, an arsenal for cannon, and a granary.

ALDERMAN, in the British policy, a magistrate subordinate to the lord-mayor of a city or town-corporate. The number of these magistrates is not limited, but is more or less according to the magnitude of the place. In London there are 26; each having one of the wards of the city committed to his care. This office is for life; so that when one of them dies, or resigns, a wardmote is called, who return two persons, one of whom the lord-mayor and aldermen choose to supply the vacancy. All the aldermen are justices of the peace, by a charter of 15 Geo. II. The aldermen of London, &c. are exempted from serving inferior offices; nor shall they be put upon assizes, or serve on juries, so long as they continue to be aldermen. Alderman || Aldhelm.

ALDERMAN, among our Saxon ancestors, was a degree of nobility answering to earl or count at present.

ALDERMAN was also used, in the time of King Edgar, for a judge or justice. Thus we meet with the titles of *aldermannus totius Angliæ*, *aldermannus regis*, *comitatis*, *civitatis*, *burgi*, *castelli*, *hundredi sive wapentachii*, *et novemdecimorum*. According to Spelman, the *aldermannus totius Angliæ* seems to have been the same officer who was afterwards styled *capitalis justiciarius Angliæ*, or chief-justice of England; the *aldermannus regis* seems to have been an occasional magistrate, answering to our justice of assize; and the *aldermannus comitatus*, a magistrate who held a middle rank between what was afterward called the *earl* and the *sheriff;* he sat at the trial of causes with the bishop: the latter proceeding according to ecclesiastical law, and the former declaring and expounding the common law of the land.

ALDERNEY, an island in the British channel, subject to the crown of Great Britain. It is about eight miles in compass, and is separated from Cape la Hogue, in Normandy, by a narrow strait, called the *Race of Alderney*, which is a very dangerous passage in stormy weather when the two currents meet; otherwise it is safe, and has depth of water for the largest ships. Through this strait the French fleet made their escape after their defeat at La Hogue, in 1692. It is a healthy island, has but one church, is fruitful both in corn and pasture, and is remarkable for a fine breed of cows. The inhabitants, for their greater safety, live together in a town of the same name. The number of houses is said to be 200, and the inhabitants 1000. It has but one harbour, called *Crabby*, which is at a good distance from the town; and is only fit for small vessels. To the west lie the range of rocks called the *Caskets*, so dangerous to mariners. W. Long. 2. 17. N. Lat. 49. 50.

ALDHELM, or ADELM, ST, bishop of Shireburn in the time of the Saxon Heptarchy. He is said to have been the son of Kenred, brother to Ina, king of the West-Saxons; but, in the opinion of William of Malmsbury, his father was no more than a distant relation to the king. Having received the first part of his education in the school which one Macdulf, a learned Scot, had set up in the place where Malmsbury now stands, he travelled into France and Italy for his improvement. At his return home, he studied some time under Adrian abbot of St Augustine's in Canterbury, the most learned professor of the sciences who had ever been in England. In these different seminaries he acquired a very uncommon stock of knowledge; and became famous for his learning, not only in England, but in foreign countries; whence several learned men sent him their writings for his perusal and correction; particularly Prince Arcivil, a son of the king of Scotland, who wrote many pieces, which he sent to Aldhelm, "entreating him to give them the last polish, by rubbing off their Scots rust." He was the first Englishman who wrote in the Latin language both in prose and verse, and composed a book for the instruction of his countrymen in the prosody of that language. Besides

Aldhelm || Aldred.

fides this, he wrote ſeveral other treatiſes on various ſubjects; ſome of which are loſt, and others publiſhed by Martin Delrio and Caniſius. Venerable Bede, who flouriſhed in the end of this and the beginning of the next century, gives the following character of Aldhelm: "He was a man of univerſal erudition, having an elegant ſtyle, and being wonderfully well acquainted with books, both on philoſophical and religious ſubjects." In fact, conſidering the cloud of ignorance by which he was ſurrounded, and the great difficulty of acquiring knowledge without proper inſtruction, Aldhelm was a very extraordinary man. From one of his letters to Hedda biſhop of Wincheſter, concerning the nature of his ſtudies whilſt at Canterbury, he appears to have been indefatigably determined to acquire every ſpecies of learning in his power. For a copy of this curious epiſtle, ſee Henry's Hiſtory, vol. ii. p. 320. King Alfred the Great declared, that Aldhelm was the beſt of all the Saxon poets; and that a favourite ſong, which was univerſally ſung in his time, near 200 years after its author's death, was of his compoſition. When he was abbot of Malmſbury, having a fine voice, and great ſkill in muſic as well as poetry, and obſerving the backwardneſs of his barbarous countrymen to liſten to grave inſtructions, he compoſed a number of little poems, which he ſung to them after maſs in the ſweeteſt manner; by which they were gradually inſtructed and civilized. After this excellent perſon had governed the monaſtery of Malmſbury, of which he was the founder, about 30 years, he was made biſhop of Shireburn, where he died A. D. 709.—He wrote, 1. *De octo vitiis principalibus.* This treatiſe is extant in *Bibliotheca Patrum* of Caniſius. 2. *Ænigmatum verſus mille.* This, with ſeveral other of his poems, was publiſhed by Martin Delrio at Mentz, 8vo, 1601. 3. A book addreſſed to a certain king of Northumberland, named Alfrid, on various ſubjects. 4. *De vita monachorum.* 5. *De laude ſanctorum.* 5. *De arithmetica.* 7. *De aſtrologia.* 8. A book againſt the miſtake of the Britons concerning the celebration of Eaſter; printed by Sonius, 1576. 9. *De laude virginitatis;* manuſcript, in Bennet-college, Cambridge; publiſhed among Bede's *Opuſcula.* Beſides many ſonnets, epiſtles, and homilies in the Saxon language.

ALDPORT, an ancient name for Mancheſter. See MANCHESTER.

ALDRED, abbot of Taviſtock, was promoted to the biſhopric of Worceſter in the year 1046. He was ſo much in favour with King Edward the Confeſſor, and had ſo much power over his mind, that he obliged him to be reconciled with the worſt of his enemies, particularly with Sweyn ſon of the earl Goodwin, who had revolted againſt him, and came with an army to invade the kingdom. Aldred alſo reſtored the union and friendſhip between King Edward and Griffith king of Wales. He took afterwards a journey to Rome, and being returned into England, in the year 1054, he was ſent ambaſſador to the emperor Henry II. He ſtaid a whole year in Germany, and was very honourably entertained by Herman archbiſhop of Cologne, from whom he learned many things relating to eccleſiaſtical diſcipline, which on his return he eſtabliſhed in his own dioceſe. In the year 1058 he went to Jeruſalem, which no archbiſhop or biſhop of England had ever done before him. Two years after he returned to England; and Kinſius archbiſhop of York dying the 22d of December 1060, Aldred was elected in his ſtead on Chriſtmas day following, and was permitted to retain the ſee of Worceſter with the archbiſhopric of York, as ſome of his predeceſſors had done. Aldred went ſoon after to Rome, in order to receive the pall from the pope: He was attended by Toſton earl of Northumberland, Giſo biſhop of Wells, and Walter biſhop of Hereford. The pope received Toſton very honourably, and made him ſit by him in the ſynod which he held againſt the ſimoniſts. He granted to Giſo and Walter their requeſt, becauſe they were tolerably well learned, and not accuſed of ſimony. But Aldred being by his anſwers found ignorant, and guilty of ſimony, the pope deprived him very ſeverely of all his honours and dignities; ſo that he was obliged to return without the pall. On the way home he and his three fellow-travellers were attacked by ſome robbers, who took from them all that they had, though they did not offer to kill them. This obliged them to return to Rome; and the pope, either out of compaſſion, or by the threatenings of the earl of Northumberland, gave Aldred the pallium; but he was obliged to reſign his biſhopric of Worceſter. However, as the archbiſhopric of York had been almoſt entirely ruined by the many invaſions of foreigners, King Edward gave the new archbiſhop leave to keep 12 villages or manors which belonged to the biſhopric of Worceſter. Edward the confeſſor dying in 1066, Aldred crowned Harold his ſucceſſor. He alſo crowned William the Conqueror, after he had made him take the following oath, viz. that he would protect the holy churches of God and their leaders; that he would eſtabliſh and obſerve righteous laws; that he would entirely prohibit and ſuppreſs all rapines and unjuſt judgements. He was ſo much in favour with the Conqueror, that this prince looked upon him as a father; and, though imperious in regard to every body elſe, he yet ſubmitted to obey this archbiſhop: John Brompton gives us an inſtance of the king's ſubmiſſion, which at the ſame time ſhows the prelate's haughtineſs.—It happened one day, as the archbiſhop was at York that the deputy-governor or lord-lieutenant going out of the city with a great number of people, met the archbiſhop's ſervants, who came to town with ſeveral carts and horſes loaded with proviſions. The governor aſked them to whom they belonged; and they having anſwered they were Aldred's ſervants, the governor ordered that all theſe proviſions ſhould be carried to the king's ſtorehouſe. The archbiſhop ſent immediately ſome of his clergy to the governor, commanding him to deliver the proviſions, and to make ſatisfaction to St Peter, and to him the ſaint's vicar, for the injury he had done them; adding, that if he refuſed to comply, the archbiſhop would make uſe of his apoſtolic authority againſt him, (intimating thereby that he would excommunicate him). The governor, offended at this proud meſſage, uſed the perſons whom the archbiſhop had ſent him very ill, and returned an anſwer as haughty as the meſſage was. Aldred thereupon went to London to make his complaint to the king; but in this very complaint he acted with his wonted inſolence; for meeting the king in the church of St Peter at Weſtminſter, he ſpoke to him in theſe words: "Hearken, O William: when thou waſt but a foreigner, and

Aldred.

Aldred, Aldrich.

God, to punish the sins of this nation, permitted thee to become master of it, after having shed a great deal of blood, I consecrated thee, and put the crown upon thy head with blessings; but now, because thou hast deserved it, I pronounce a curse over thee, instead of a blessing, since thou art become the persecutor of God's church, and of his ministers, and hast broken the promises and the oaths which thou madest to me before St Peter's altar." The king, terrified at this discourse, fell upon his knees, and humbly begged the prelate to tell him, by what crime he had deserved so severe a sentence. The noblemen, who were present, were enraged against the archbishop, and loudly cried out he deserved death, or at least banishment, for having offered such an injury to his sovereign; and they pressed him with threatenings to raise the king from the ground. But the prelate, unmoved at all this, answered calmly, "Good men, let him lie there, for he is not at Aldred's but at St Peter's feet; he must feel St Peter's power, since he dared to injure his vicegerent." Having thus reproved the nobles by his episcopal authority, he vouchsafed to take the king by the hand, and to tell him the ground of his complaint. The king humbly excused himself, by saying he had been ignorant of the whole matter; and begged of the noblemen to intreat the prelate, that he might take off the curse he had pronounced, and to change it into a blessing. Aldred was at last prevailed upon to favour the king thus far: but not without the promise of several presents and favours, and only after the king had granted him to take such a revenge on the governor as he thought fit. Since that time (adds the historian) none of the noblemen ever dared to offer the least injury. It may be questioned, which was more surprising here, whether the archbishop's haughtiness, who dared to treat his sovereign after so unbecoming a manner; or the king's stupidity, who suffered such insolence and audaciousness from a priest.—The Danes having made an invasion in the north of England in the year 1068, under the conduct of Harold and Canute the sons of King Sweyn, Aldred was so much afflicted at it, that he died of grief the 11th of September in that same year, having besought God that he might not see the desolation of his church and country.

ALDRICH, Robert, bishop of Carlisle, was born at Burnham in Buckinghamshire about the year 1493, and educated at Eaton school; from whence, in 1507, he was elected scholar of King's college, Cambridge, where he took his degree in arts, and was afterwards proctor of the university. In 1525, he was appointed master of Eaton school, then became fellow of that college, and finally provost. In 1529, he went to Oxford, where, being first incorporated bachelor of divinity, in the following year he proceeded doctor in that faculty: in 1531, he was made archdeacon of Colchester; in 1534, canon of Windsor; and the same year, registrary of the order of the garter. He was consecrated bishop of Carlisle in the year 1537, and died at Horncastle in Lincolnshire in 1556. He wrote, 1. *Epistola ad Gul. Hormanum*, in Latin verse; printed in Horman's *Antibossican*, Lond. 1521, of which book Pitts erroneously makes Aldrich the author. 2. *Epigrammata varia*. 3. *Latin verses, and another epistle to Horman*, prefixed to the *Vulgaria puerorum* of that author, Lond. 1519, 4to. 4. *Answers to certain queries concerning the abuses of the mass*; also *about receiving the sacrament*.

Aldrich.

Aldrich, *Dr Henry*, an eminent English divine and philosopher, born at London in 1647, was educated at Westminster school under the famous Dr Busby, and admitted of Christ-church college, Oxford. He had a great share in the controversy with the Papists in the reign of James II. and Bishop Burnet ranks him among those who examined all the points of Popery with a solidity of judgment, clearness of argument, depth of learning, and vivacity of writing, far beyond any who had before that time written in our language. He rendered himself so conspicuous, that at the Revolution, when Massey the Popish dean of Christ church fled, his deanery was conferred on him. In this station he behaved in an exemplary manner, and that fabric owes much of its beauty to his ingenuity: it was Aldrich who designed the beautiful square called *Peckwater Quadrangle*, which is esteemed an excellent piece of architecture. In imitation of his predecessor Dr Fell, he published, yearly, a piece of some ancient Greek author, as a present to the students of his house. He published *A System of Logic*, with some other pieces: and the revising Clarendon's History of the Rebellion was intrusted to him and Bishop Spratt; but it doth not appear that they made any additions, or considerable alterations in it, as has been asserted by Mr Oldmixon. Besides his preferments above mentioned, Dr Aldrich was also rector of Wem in Shropshire. He was chosen prolocutor of the convocation in 1702. This worthy person died at Christ-church on the 14th of December 1710. As to his character, he was a most universal scholar, and had a taste for all sorts of learning, especially architecture. Sir John Hawkins has favoured the public with several particulars relative to Dr Aldrich's skill in music; and on account of the Doctor's eminence in this respect, Sir John hath given his life, with his head prefixed. His abilities as a musician rank him, we are told, among the greatest masters of the science. He composed many services for the church, which are well known; as are also his anthems, nearly to the number of 20. He adapted, with great skill and judgment, English words to many of the notes of Palestrina, Carissimi, Victoria, and other Italian composers for the church, some of which are frequently sung in our cathedrals as anthems. By the happy talent which Dr Aldrich possessed, of naturalizing the compositions of the old Italian masters, and accommodating them to an English ear, he increased the stores of our own church. Though the Doctor chiefly applied himself to the cultivation of sacred music, yet, being a man of humour, he could divert himself by producing pieces of a lighter kind. There are two catches of his; the one, "Hark the bonny Christ-church Bells;" the other entitled, "A Smoking Catch," to be sung by four men smoking their pipes, which is not more difficult to sing than diverting to hear. His love of smoking was, it seems, so excessive as to be an entertaining topic of discourse in the university. Such was Dr Aldrich's regard for the advancement of music, and the honour of its professors, that he had formed a design of writing a history of the science; and the materials from which he proposed to compile it are yet extant in the library of his own college. It appears from these materials, that he had marked

Aldrich || Aldrovandus.

marked down every thing which he had met with concerning muſic and muſicians; but that he had brought no part of them into any kind of form.

Dr Aldrich is of ſome note as a Latin poet. In the *Muſæ Anglicanæ*, we find two elegant copies of verſes by him; one on the acceſſion of King William III. and the other on the death of the duke of Glouceſter. Sir John Hawkins has preſerved a humorous tranſlation by him of the well-known Engliſh ballad,

"A ſoldier and a ſailor,
"A tinker and a tailor," &c.

The following epigram, entitled "Cauſæ Bibendi," is likewiſe aſcribed to Dr Aldrich:

"*Si bene quid memini, Cauſæ ſunt quinque bibendi,*
"*Hoſpitis Adventus; præſens Sitis, atque futura;*
"*Aut Vini Bonitas; aut quæ libet altera Cauſa.*"

The epigram has been thus tranſlated:

"If on my theme I rightly think,
"There are five reaſons why men drink:
"Good wine, a friend, becauſe I'm dry,
"Or leaſt I ſhould be and bye,
"Or any other reaſon why."

The tranſlation is not equal to the original. It is evident, from the verſes cited and referred to, that Dr Aldrich was of a very cheerful and pleaſant turn of mind. Indeed, he is always ſpoken of as having been a man of wit; and as one who, to his great talents and virtues joined thoſe amiable qualities which rendered him the object of general affection, as well as of general eſteem and reſpect. Having never been married, he appropriated his income to works of hoſpitality and beneficence, and encouraging learning to the utmoſt of his power, of which he was a moſt munificent patron, as well as one of the greateſt men in England, if conſidered as a Chriſtian or a gentleman. He had always the intereſt of his college at heart, whereof he was an excellent governor. His modeſty and humility prevented him from prefixing his name to the learned tracts which he publiſhed during his life. At his death he wiſhed to be buried in the cathedral without any memorial; which his thrifty nephew complied with, depoſiting him on the ſouth ſide of Biſhop Fell's grave, December 22. eight days after his deceaſe; which happened in the 63d or 64th year of his age.

ALDROVANDA. See BOTANY *Index*.

ALDROVANDUS, ULYSSES, profeſſor of philoſophy and phyſic at Bologna, the place of his nativity. He was a moſt curious inquirer into natural hiſtory, and travelled into the moſt diſtant countries on purpoſe to inform himſelf of their natural productions. Minerals, metals, plants, and animals, were the objects of his curious reſearches; but he applied himſelf chiefly to birds, and was at a great expence to have figures of them drawn from the life. Aubert le Mire ſays, that he gave a certain painter, famous in that art, a yearly ſalary of 200 crowns, for 30 years and upwards; and that he employed at his own expence Lorenzo Bernini and Cornelius Swintus, as well as the famous engraver Chriſtopher Coriolanus. Theſe expences ruined his fortune, and at length reduced him to the utmoſt neceſſity; and it is ſaid that he died blind in an hoſpital at Bologna, at a great age, in 1605. Mr Bayle obſerves, that antiquity does not furniſh us with an inſtance of a deſign ſo extenſive and ſo laborious as that of Aldrovandus, with regard to natural hiſtory; that Pliny has treated of more kinds of ſubjects, but only touches lightly on them, ſaying but a little upon any thing, whereas Aldrovandus has collected all he could meet with. His compilation, or that compiled upon his plan, conſiſts of 13 volumes in folio, ſeveral of which were printed after his death. He himſelf publiſhed his Ornithology, or Hiſtory of Birds, in three folio volumes, in 1599; and his ſeven books of inſects, which make another volume of the ſame ſize. The volume Of Serpents, three Of Quadrupeds, one Of Fiſhes, that Of exanguious Animals, the Hiſtory of Monſters, with the Supplement to that of Animals, the treatiſe Of Metals, and the Dendrology or Hiſtory of Trees, were publiſhed at ſeveral times after the death of Aldrovandus, by the care of different perſons; and Aldrovandus is the ſole author only of the firſt ſix volumes of this work, the reſt having been finiſhed and compiled by others, upon the plan of Aldrovandus: a moſt extenſive plan, wherein he not only relates what he has read in naturaliſts, but remarks alſo what hiſtorians have written, legiſlators ordained, and poets feigned: he explains alſo the different uſes which may be made of the things he treats of, in common life, in medicine, architecture, and other arts; in ſhort, he ſpeaks of morality, proverbs, devices, riddles, hieroglyphics, and many other things which relate to his ſubject.

Alduabis, Ale.

ALDUABIS, in *Ancient Geography*, a river of Celtic Gaul, which riſing from Mount Jura, ſeparating the Sequani from the Helvetii, and running through the county of Burgundy, or the Franche Comté, environs almoſt on every ſide the city of Beſançon; and running by Dole, falls into the Saone near Chalons. By Cæſar it is called *Alduaſdubis*; in Ptolemy, *Dubis*: now *le Doux*.

ALE a fermented liquor obtained from an infuſion of malt, and differing from beer chiefly in having a leſs proportion of hops. (See BREWING). This liquor, the natural ſubſtitute of wine in ſuch countries as could not produce the grape, was originally made in Egypt, the firſt planted kindom, on the diſperſion from the eaſt, that was ſuppoſed unable to produce grapes. And, as the Noachian colonies pierced further into the weſt, they found, or thought they found, the ſame defect, and ſupplied it in the ſame manner. Thus the natives of Spain, the inhabitants of France, and the aborigines of Britain, all uſed an infuſion of barley for their ordinary liquor: and it was called by the various names of *Cælia* and *Ceria* in the firſt country, *Cerevifia* in the ſecond, and *Curmi* in the laſt; all literally importing only *the ſtrong water*.

"All the ſeveral nations (ſays Pliny) who inhabit the weſt of Europe, have a liquor with which they intoxicate themſelves made of corn and water. The manner of making this liquor is ſometimes different in Gaul, Spain, and other countries, and is called by many various names; but its nature and properties are everywhere the ſame. The people of Spain, in particular, brew the liquor ſo well, that it will keep good a long time. So exquiſite is the cunning of mankind, in gratifying their vicious appetites, that they have thus invented a method to make water itſelf intoxicate."

Ale. cate." The method in which the ancient Britons, and other Celtic nations, made their ale, is thus described by Isidorus and Orosius. "The grain is steeped in water and made to germinate, by which its spirits are excited and set at liberty; it is then dried and grinded; after which it is infused in a certain quantity of water; which, being fermented, becomes a pleasant, warming, strengthening, and intoxicating liquor." This ale was most commonly made of barley, but sometimes of wheat, oats, and millet. Ale.

Anciently the Welch and Scots had also two kinds of ale, called *common ale* and *spiced ale;* and their value was thus ascertained by law: "If a farmer hath no mead, he shall pay two casks of spiced ale, or four casks of common ale, for one cask of mead." By this law, a cask of spiced ale, nine palms in height, and 18 palms in diameter, was valued at a sum of money equal in efficacy to 7l. 10s. of our present money; and a cask of common ale, of the same dimensions, at a sum equal to 3l. 15s. This is a sufficient proof, that even common ale in this period was an article of luxury among the Welch, which could only be obtained by the great and opulent. Wine seems to have been quite unknown, even to the kings of Wales, in this period, as it is not so much as once mentioned in their laws; though Giraldus Cambrensis, who flourished about a century after the Conquest, acquaints us, that there was a vineyard in his time at Maenarper, near Pembroke, in South Wales.

Ale was the favourite liquor of the Anglo-Saxons and Danes, as it had been of their ancestors the ancient Germans. Before their conversion to Christianity, they believed that drinking large and frequent draughts of ale was one of the chief felicities which those heroes enjoyed who were admitted into the hall of Odin.

There are various sorts of ale known in Britain, particularly *pale* and *brown:* the former is brewed from malt slightly dried; and is esteemed more viscid than the latter, which is made from malt more highly dried or roasted.

Pale ale brewed with hard waters, as those of springs and wells, is judged the most wholesome, in regard the mineral particles tend to prevent the cohesion of those drawn from the grain, and enable them to pass the proper secretions the better; softer waters, as those of rivers, and rain, seem better suited to draw out the substance of high dried malts, which retain many igneous particles best absorbed in a smooth vehicle.

In Staffordshire, they have a secret of fining ale in a very short time. Plot conjectures it to be done by adding alum, or vinegar, in the working.

Ale is prepared various ways, and of various ingredients, as of wheat, rye, millet, oats, barley, the berries of the quickbean, &c.

Some have found that the juice which bleeds from the birch or sycamore is of great use on this occasion, applied instead of water. It makes one bushel of malt go as far as four in the common way.

Some have a method of preparing ale, so that it will keep, carried to the East or West Indies. The secret is, by mashing twice with fresh malt; boiling twice; and, after shipping it, putting to every five gallons two new-laid eggs whole, to remain therein. It is said, that in a fortnight's time the shell shall be dissolved; and the eggs become like wind-eggs; and that afterwards the white would disappear and the yolk remain untouched. Ale.

The consumption of ale in these kingdoms is incredible. It was computed twenty years ago at the value of four millions yearly, including Great Britain and Ireland.

The duties on ale and beer make a principal branch of the revenue in Britain. They were first imposed by the 12th of Car. II. and have been continued by several subsequent acts of parliament to first Geo. III. which lays an additional duty of 3d. per barrel. In the whole, the brewer of ale and beer for sale shall pay 8s. for every barrel of either above 6s. a barrel; and for every barrel of 6s. or under, the sum of 1s. 4d.

Medicated Ales, those wherein medicinal herbs have been infused, or added during the fermentation.

Gill Ale, is that in which the dried leaves of gill or ground-ivy have been infused. It is esteemed abstersive and vulnerary, and consequently good in disorders of the breast and obstructions of the viscera.

Ale Conner, an officer in London, who inspects the measures used in public houses. There are four ale conners, who are all chosen by the liverymen in common hall in Midsummer day.

Alehouses must be licensed by justices of the peace, who take recognizances of the persons licensed, and of their sureties, viz. 10l. each, that they will not suffer unlawful gaming, nor other disorderly practices in their houses. Every person, excepting those who sell ale in fairs, neglecting to procure a license, is liable to a penalty of 40s. for the first offence, 4l. for the second, and 6l. for the third, with all costs. The license granted on the first of September, or within twenty days after, at a general meeting of the justices for the division to which he belongs, upon his producing a certificate to his character, unless, by living in a city or town corporate, this last circumstance is dispensed with, and continues in force for one year only. Alehouse keepers, selling ale in short measure, are liable to a penalty not exceeding 40s. and not less than 10s. and likewise to a fine of 10s. for permitting tippling, &c.

By 29th Geo. II. c. 12. persons keeping alehouses in Scotland shall be licensed as in England, and the justices there shall meet annually to license alehouses; on each of which licenses a fee of 1s. is payable to the clerk of the peace. Magistrates of royal boroughs shall meet yearly for the like purpose; but where there shall not be a sufficient number of magistrates to act in any royal borough, justices may grant licenses, to be in force for one year only. *Ibid.*

Persons in Scotland convicted of keeping unlicensed alehouses shall forfeit for the first offence 5s. for the second 10s. for the third 20s. and to be disqualified; and for every subsequent offence 40s. to be levied by distress and sale, one moiety to the informer, the other to the poor of the parish. Conviction to be intimated to the offender, and certified to the clerk of the peace, and recorded: but persons aggrieved may appeal to the quarter-sessions. *Ibid.*

Licenses for houses on the military roads in Scotland shall be issued on payment of 1s. only to the clerk of the peace: making out licenses before the same be stamped, is a penalty of 10l. and making them contrary

Ale ‖ Alectoromantia.

trary to the intention of this act, 5l. and the same shall be vacated, unless the duty and fine be paid, and the receipt produced, and license stamped. *Ibid.*

Ale-Silver, a tax paid annually to the lord-mayor of London by all who sell ale within the city.

ALEA, in Roman antiquity, denotes in general all manner of games of chance; but, in a more restricted sense, was used for a particular game played with dice and tables, not unlike our backgammon.

ALEANDER, Jerome, cardinal and archbishop of Brindisi, was born in 1480; and distinguished himself at the beginning of the reformation, by the opposition he made to Luther: for being sent into Germany as the pope's nuncio in 1519, he acted, as occasion served, in the character of both ambassador and doctor; and declaimed three hours together against Luther's doctrine before the diet at Worms, but could not prevent that celebrated reformer from being heard in that diet. He published several works, and died at Rome in 1542.

Aleander, *Jerome*, nephew of the former, a learned man of the seventeenth century, born in the principality of Friuli, of the same family with the preceding. When he went to Rome, he was employed as secretary under Cardinal Octavius Bandini, and discharged this office with great honour for almost twenty years. He afterwards, by the persuasion of Urban VIII. who had a great esteem for him, became secretary to Cardinal Barberini, whom he accompanied to Rome when he went there in the character of legate *à latere*, and in whose service he died in 1631. He was one of the first members of the academy of Humorists, wrote a learned treatise in Italian on the device of the society, and displayed his genius on many different subjects. Barberini gave him a magnificent funeral at the academy of Humorists; the academists carried his corpse to the grave; and Gaspar Simeonibus, one of the members, made his funeral oration.

ALECTO, one of the Furies, daughter of Acheron and Night, or, as others would have it, of Pluto and Proserpine.

ALECTORIA, a stone said to be formed in the gall-bladder of old cocks, to which the ancients ascribed many fabulous virtues. This is otherwise called *Alectorius lapis*, sometimes *Alectorolithos*, in English the *cock-stone*. The more modern naturalists hold the *alectorius lapis* to be originally swallowed down, not generated in, the stomach and gizzard of cocks and capons. It is known that many of the fowl kind make a practice of swallowing pebbles, as it is supposed to be of service in the business of trituration and digestion.

ALECTOROMANTIA, in *Antiquity*, a species of divination performed by means of a cock. This is otherwise called *Alectryomancy*; of which there appear to have been different species. But that most spoken of by authors was in the following manner: A circle was described on the ground, and divided into twenty-four equal portions; in each of these spaces was written one of the letters of the alphabet, and on each of the letters was laid a grain of wheat; after which, a cock being turned loose in the circle, particular notice was taken of the grains picked up by the cock, because the letters under them, being formed into a word, made the answer desired. It was thus, according to Zonoras, that Libanius and Jamblicus sought who should succeed the emperor Valens; and the cock eating the grains answering to the spaces ΘΕΟΔ, several whose names began with those letters, as Theodotus, Theodistes, Theodulus, &c. were put to death; which did not hinder, but promote, Theodosius to the succession. But the story, however current, is but ill supported: It has been called in question by some, and refuted by others, from the silence of Marcellinus, Socrates, and other historians of that time.

Alee ‖ Alembert.

ALEE, in the sea-language, a term only used when the wind, crossing or flanking the line of a ship's course, presses upon the masts and sails so as to make her incline to one side, which is called the lee-side: hence, when the helm is moved over to this side, it is said to be *alee*, or *hard a-lee*.

ALEGAMBE, Philip, a celebrated Jesuit, born at Brussels in 1592, distinguished himself by publishing a Bibliotheque of the writers of his order, and died at Rome in 1652.

ALEGRETTE, a small town of Portugal, in Alentejo, on the confines of Port Alegre, on the river Caja, which falls into the Guadiana, a little below Badajoz, near the frontiers of Spanish Estremadura. It is a very pretty town, and finely situated; seven miles south-east of Port Alegre, and thirty north of Elvas. W. Long. 5. 20. N. Lat. 39. 6.

ALEIUS campus, in *Ancient Geography*, a plain in Cilicia, on this side the river Pyramus, near the mountain Chimera, famous for Bellerophon's wandering and perishing there, after being thrown off Pegasus; which is the reason of the appellation.

ALEMANIA, or Allemania, in *Ancient Geography*, a name of Germany, but not known before the time of the Antonines, and then used only for a part. After the Marcomanni and their allies had removed from the Rhine, a rabble, or collection of people from all parts of Gaul, as the term *Alemanni* denotes, prompted either by levity or poverty, occupied the lands, called *Decumates* by Tacitus, because they held them on a tithe; now supposed to be the duchy of *Wirtemburg*. Such appear to have been the small beginnings of Alemania, which was in after-times greatly enlarged: but still it was considered as a distinct part; for Caracalla, who conquered the Alemanni, assumed the surname both of *Alemannicus* and *Germanicus*.

ALEMBDAR, an officer in the court of the Grand Signior, who bears the green standard of Mahomet when the sultan appears in public on any solemn occasion.

ALEMBERT, John le Rond d', an eminent French philosopher, was born at Paris in 1717. He derived the name of John le Rond from that of the church near which, after his birth, he was exposed as a foundling. His father, informed of this circumstance, listened to the voice of nature and duty, took measures for the proper education of his child, and for his future subsistence in a state of ease and independence.

He received his first education in the College of the Four Nations, among the Jansenists, where he gave early marks of capacity and genius. In the first year of his philosophical studies, he composed a Commentary on the Epistle of St Paul to the Romans. The Jansenists considered this production as an omen that portended to the party of Port-Royal a restoration to some

Alembert. some part of their ancient splendour, and hoped to find one day in M. d'Alembert a second Pascal. To render this resemblance more complete, they engaged their rising pupil in the study of the mathematics: but they soon perceived that his growing attachment to this science was likely to disappoint the hopes they had formed with respect to his future destination: they therefore endeavoured to divert him from this line; but their endeavours were fruitless.

At his leaving college, he found himself alone and unconnected with the world: and sought an asylum in the house of his *nurse*. He comforted himself with the hope, that his fortune, though not ample, would better the condition and subsistence of that family, which was the only one that he could consider as his own: Here, therefore, he took up his residence, resolving to apply himself entirely to the study of geometry: And here he lived, during the space of forty years, with the greatest simplicity, discovering the augmentation of his means only by increasing displays of his beneficence, concealing his growing reputation and celebrity from these honest people, and making their plain and uncouth manners the subject of good-natured pleasantry and philosophical observation. His good nurse perceived his ardent activity: heard him mentioned as the writer of many books; but never took it into her head that he was a great man, and rather beheld him with a kind of compassion. "*You will never*," said she to him one day, "*be any thing but a philosopher—and what is a philosopher?—a fool, who toils and plagues himself during his life, that people may talk of him when* HE IS NO MORE."

As M. d'Alembert's fortune did not far exceed the demands of necessity, his friends advised him to think of a profession that might enable him to augment it. He accordingly turned his views to the law, and took his degrees in that line: but soon abandoned this plan, and applied to the study of medicine. Geometry, however, was always drawing him back to his former pursuits; and after many ineffectual efforts to resist its attractions, he renounced all views of a lucrative profession, and gave himself over entirely to mathematics and poverty.

In the year 1741 he was admitted member of the Academy of Sciences: for which distinguished literary promotion, at such an early age, he had prepared the way by correcting the errors of a celebrated work *, which was deemed *classical* in France in the line of geometry. He afterwards set himself to examine, with deep attention and assiduity, what must be the motion of a body which passes from one fluid into another more dense, in a direction not perpendicular to the surface separating the two fluids. Every one knows the phenomenon which happens in this case, and which amuses children under the denomination of *Ducks and Drakes*; but M. d'Alembert was the first who explained it in a satisfactory and philosophical manner.

* The *Analyse demontrée* of F. Reman.

Two years after his election to a place in the academy, he published his Treatise on Dynamics. The new principle developed in this treatise consisted in establishing equality, at each instant, between the changes that the motion of a body has undergone, and the forces or powers which have been employed to produce them; or, to express the thing otherwise, in separating into *two parts* the action of the moving powers, and considering the *one* as producing alone the motion of the body in the second instant, and the *other* as employed to destroy that which it had in the first. Alembert.

So early as the year 1744, M. d'Alembert had applied this principle to the theory of the equilibrium, and the motion of fluids; and all the problems before solved by geometricians became, in some measure, its corollaries. The discovery of this new principle was followed by that of a new calculus, the first trials of which were published in a *Discourse on the general Theory of the Winds*, to which the prize-medal was adjudged by the academy of Berlin in the year 1746, and which was a new and brilliant addition to the fame of M. d'Alembert.

He availed himself of the favourable circumstance of the king of Prussia having just terminated a glorious campaign by an honourable peace, and in allusion to this dedicated his work to that prince in the three following Latin verses:

Hæc ego de ventis, dum ventorum ocyor alis,
Palantes agit Austriacos Fredericus, et orbi,
Insignis lauro, ramum prætendit olivæ.

Swifter than wind, while of the winds I write,
The foes of conquering Frederick speed their flight,
While laurel o'er the hero's temple bends
To the tir'd world the olive branch he sends.

This flattering dedication procured the philosopher a polite letter from Frederick, and a place among his literary friends.

In the year 1747 d'Alembert applied his new calculus of "Partial Differences" to the problem of vibrating chords, whose solution, as well as the theory of the oscillation of the air and the propagation of sound, had been given but incompletely by the geometricians who preceded him, and these were his masters or his rivals.

In the year 1749 he furnished a method of applying his principles to the motion of any body of a given figure; and he solved the problem of the precession of the equinoxes, determined its *quantity*, and explained the phenomenon of the nutation of the terrestrial axis discovered by Dr Bradley.

In 1752, M. d'Alembert published a treatise on the *Resistance of Fluids*, to which he gave the modest title of an *Essay*; but which contains a multitude of original ideas and new observations. About the same time he published, in the Memoirs of the Academy of Berlin, *Researches concerning the Integral Calculus*, which is greatly indebted to him for the rapid progress it has made in the present century.

While the studies of M. d'Alembert were confined to geometry, he was little known or celebrated in his native country. His connexions were limited to a small society of select friends: he had never seen any man in high office except Messrs d'Argenson. Satisfied with an income which furnished him with the necessaries of life, he did not aspire after opulence or honours, nor had they been hitherto bestowed upon him, as it is easier to confer them on those who solicit them than to look out for men who deserve them. His cheerful conversation, his smart and lively sallies, a happy knack at telling a story, a singular mixture of malice of speech with goodness of heart, and of delicacy

of wit with ſimplicity of manners, rendered him a pleaſing and intereſting companion, and his company conſequently was much ſought after in the faſhionable circles. His reputation, at length, made its way to the throne, and rendered him the object of royal attention and beneficence. He received alſo a penſion from government, which he owed to the friendſhip of Count d'Argenſon.

The tranquillity of M. d'Alembert was abated when his fame grew more extenſive, and when it was known beyond the circle of his friends, that a fine and enlightened taſte for literature and philoſophy accompanied his mathematical genius. Our author's eulogiſt aſcribes to envy, detraction, and to other motives equally ungenerous, all the diſapprobation, oppoſition, and cenſure that M. d'Alembert met with on account of the publication of the famous Encyclopedical Dictionary of Arts and Sciences, in conjunction with Diderot. None ſurely will refuſe the well-deſerved tribute of applauſe to the eminent diſplays of genius, judgement, and true literary taſte, with which M. d'Alembert has enriched the great work now mentioned. Among others, the Preliminary Diſcourſe he has affixed to it, concerning the riſe, progreſs, connections, and affinities of all the branches of human knowledge, is perhaps one of the firſt productions of which the philoſophy of the preſent age can boaſt, and will be regarded as a ſtriking ſpecimen of juſt arrangement and ſound criticiſm, and alſo as a model of accurate thinking and elegant writing.

Some time after this, D'Alembert publiſhed his Philoſophical, Hiſtorical, and Philological Miſcellanies. Theſe were followed by the Memoirs of Chriſtina queen of Sweden; in which M. d'Alembert ſhowed that he was acquainted with the natural rights of mankind, and was bold enough to aſſert them. His *Eſſay on the Intercourſe of Men of Letters with Perſons high in Rank and Office*, wounded the former to the quick, as it expoſed to the eyes of the public the ignominy of thoſe ſervile chains, which they feared to ſhake off, or were proud to wear. A lady of the court hearing one day the author accuſed of having exaggerated the deſpotiſm of the great, and the ſubmiſſion they require, anſwered ſlyly, *If he had conſulted me, I would have told him ſtill more of the matter.*

M. d'Alembert gave very elegant ſpecimens of his literary abilities in his tranſlations of ſome ſelect pieces of Tacitus. But theſe occupations did not divert him from his mathematical ſtudies: for about the ſame time he enriched the Encyclopédie with a multitude of excellent articles in that line, and compoſed his *Reſearches on ſeveral important Points of the Syſtem of the World*, in which he carried to a higher degree of perfection the ſolution of the problem of the perturbations of the planets, that had ſeveral years before been preſented to the Academy.

In 1759 he publiſhed his *Elements of Philoſophy*: a work extolled as remarkable for its preciſion and perſpicuity; in which, however, are ſome tenets relative both to metaphyſics and moral ſcience, that are far from being admiſſible.

The reſentment that was kindled (and the diſputes that followed it) by the article *Geneva*, inſerted in the Encyclopédie, are well known. M. d'Alembert did not leave this field of controverſy with flying colours. Voltaire was an auxiliary in the conteſt: but, as, in point of candour and decency, he had no reputation to loſe; and as he weakened the blows of his enemies, by throwing both them and the ſpectators into fits of laughter, the iſſue of the war gave him little uneaſineſs. It fell more heavily on D'Alembert; and expoſed him, even at home, to much contradiction and oppoſition.

It was on this occaſion that the late king of Pruſſia offered him an honourable aſylum at his court, and the place of preſident of his academy; and was not offended at his refuſal of theſe diſtinctions, but cultivated an intimate friendſhip with him during the reſt of his life. He had refuſed, ſome time before this, a propoſal made by the empreſs of Ruſſia to intruſt him with the education of the grand duke;—a propoſal accompanied with all the flattering offers that could tempt a man ambitious of titles, or deſirous of making an ample fortune: but the objects of his ambition were tranquillity and ſtudy.

In the year 1765, he publiſhed his *Diſſertation on the Deſtruction of the Jeſuits*. This piece drew upon him a ſwarm of adverſaries, who confirmed the merit and credit of his work by their manner of attacking it.

Beſide the works already mentioned, he publiſhed nine volumes of memoirs and treatiſes under the title of *Opuſcules*; in which he has ſolved a multitude of problems relative to aſtronomy, mathematics, and natural philoſophy; of which our panegyriſt gives a particular account, more eſpecially of thoſe which exhibit new ſubjects, or new methods of inveſtigation.

He publiſhed alſo *Elements of Muſic*; and rendered, at length, the ſyſtem of Rameau intelligible; but he did not think the mathematical theory of the ſonorous body ſufficient to account for the rules of that art. He was always fond of muſic; which, on the one hand, is connected with the moſt ſubtile and learned reſearches of rational mechanics; while, on the other, its power over the ſenſes and the ſoul exhibits to philoſophers phenomena no leſs ſingular, and ſtill more inexplicable.

In the year 1772, he was choſen ſecretary to the French academy. He formed, ſoon after this preferment, the deſign of writing the lives of all the deceaſed academicians from 1700 to 1772; and in the ſpace of three years he executed this deſign, by compoſing 70 eulogies.

M. d'Alembert died on the 29th of October 1783. There were many amiable lines of candour, modeſty, diſintereſtedneſs, and beneficence, in his moral character: which are deſcribed, with a diffuſive detail, in his *eloge*, by M. Condorcet, *Hiſt. de l'Acad. Royale des Sciences*, 1783.

ALEMBIC, a chemical veſſel uſually made of glaſs or copper, formerly uſed for diſtillation. The bottom part, which contained the ſubject for diſtillation, is called, from its ſhape, the *cucurbit*; the upper part, which receives and condenſes the ſteam, is called the *head*, the beak of which is fitted into the neck of a receiver. Retorts, and the common *worm ſtill*, are now more generally employed.

ALEMBROTH, in the writings of the alchemiſts, a word uſed for a ſort of fixed alkaline ſalt, which had the power of the famous alkaheſt, in diſſolving bodies, opening the pores of moſt or all known ſubſtances, and

Alenio of Aleppo.

thence, as well as by deſtroying ſulphurs, promoting the ſeparation of metals from their ores.—It is alſo uſed for a compound of corroſive mercury and ſal ammoniac.

ALENIO, JULIUS, a Jeſuit, born at Breſcia in the republic of Venice. He travelled into the eaſtern countries; and arrived at Macao in 1610, where he taught mathematics. From thence he went to the empire of China, where he continued to propagate the Chriſtian religion for thirty-ſix years. He was the firſt who planted the faith in the province of Xanſi, and he built ſeveral churches in the province of Fokien. He died in Auguſt 1649, leaving behind him ſeveral works in the Chineſe language.

ALENTEJO, a province of Portugal, between the rivers Tajo and Guadiana: the ſoil is very fertile, and the inhabitants laborious and induſtrious. The principal town is Evora.

ALENZON, a town of France, the capital of the department of Orne, in Lower Normandy. It is ſurrounded with good walls, and flanked with towers. The caſtle was formerly a place of great conſequence, and has held out long ſieges. It has but one pariſh-church, which has a bold and noble front. Among the nunneries, that of St Clair is moſt remarkable. It is ſeated on the river Sarte, in a vaſt open plain, which produces all ſorts of corn and fruit. Near it there are quarries of ſtone fit for building, wherein are found a ſort like Briſtol ſtones. The trade of Alenzon is in linen, lace, ſtuffs, and leather. It is 20 miles north of Mons, 63 ſouth-by-weſt of Rouen, and 88 ſouth-weſt of Paris. Long. 0. 10. N. Lat. 48. 25.

ALEPPO, or HALAB, the capital of a pachalic, and of all Syria, and the ordinary reſidence of the pacha, is ſituated in the vaſt plain which extends from the Orontes to the Euphrates, and which towards the ſouth terminates in the deſert. It is built on eight hills or eminences, on the higheſt of which the caſtle is erected, and is ſuppoſed to be the ancient Beræa. This mount is of a conic form, and ſeems in a great meaſure to be raiſed with the earth thrown up out of a deep broad ditch which ſurrounds it. The ſuburbs to the north-north-eaſt are next in height to this, and thoſe to the weſt-ſouth-weſt are much lower than the parts adjacent, and than any other part of the city. The houſes are large and commodious, having terraces on their tops, and generally ſky-lights in form of a dome to let the light into the rooms, which from their loftineſs, the gilding on the window ſhutters, cupboard doors, &c. have at firſt entrance a very grand and agreeable effect. They are all ſo equal in height, that there are ſeldom any ſteps to aſcend or deſcend in going from one houſe to another; while ſeveral large vaulted ſtreets increaſe the facility of communication, by affording a paſſage to every part of the city free from the embarraſſment of the open ſtreets. They are carefully paved; have gutters and a foot-pavement on each ſide; and the middle of the ſtreet is laid with brick, the ſmall end upwards, for the convenience of the horſes. There is alſo a cleanlineſs obſerved here unknown to the other cities of Turkey, and which is not attended with the trouble of our ſcavengers, there being aſs-drivers who go about the city and take up the rubbiſh and duſt, which each inhabitant is obliged to ſweep together; and though the heat of the climate renders this labour more eaſy, the ſame heat obliges them to greater cleanlineſs in order to preſerve the ſalubrity of the air. Aleppo

The moſques in Aleppo are numerous, and ſome few of them magnificent. Before each of them is an area, with a fountain in the middle, deſigned for ablutions before prayers; and behind ſome of the larger there are little gardens. There are many large khans, or caravanſeras, conſiſting of a capacious ſquare, on all ſides of which are a number of rooms, built on a ground-floor, uſed occaſionally for chambers, warehouſes, or ſtables. Above ſtairs there is a colonnade or gallery on every ſide, in which are the doors of a number of ſmall rooms, wherein the merchants, as well ſtrangers as natives, tranſact moſt of their buſineſs.

The bazars or market-places are long covered narrow ſtreets, on each ſide of which are a great number of ſmall ſhops, juſt ſufficient to hold the tradeſman and his goods, the buyer being obliged to ſtand without. Each ſeparate branch of buſineſs has a particular bazar, which is locked up, as well as the ſtreets, an hour and a half after ſunſet: but the locks are of wood, though the doors are caſed with iron. The ſlaughter houſes are in the ſuburbs, open to the fields. The tanners have a khan to work in near the river. To the ſouthward in the ſuburbs they burn lime; and a little beyond that there is a village where they make ropes and catgut. On the oppoſite ſide of the river, to the weſtward, there is a glaſs-houſe, where they make a coarſe white glaſs, in the winter only; for the greateſt part of this manufacture is brought from a village 35 miles weſtward.

The ſituation of Aleppo, beſide the advantage of a rich and fruitful ſoil, poſſeſſes alſo that of a ſtream of freſh water, which never becomes dry. This rivulet, which is about as large as that of the Gobelins at Paris, or the New River near London, riſes in the mountains of Aentab, and terminates ſix leagues below Aleppo, in a moraſs full of wild boars and pelicans. Near Aleppo, its banks, inſtead of the naked rocks, which line them in the upper part of its courſe, are covered with a fertile earth, and laid out in gardens, or rather orchards, which, in a hot country, and eſpecially in Turkey, cannot but be delightful. The city is in itſelf one of the moſt agreeable in Syria, and is perhaps the cleaneſt and beſt built of any in Turkey. Or whatever ſide it is approached, its numerous minarets and domes preſent an agreeable proſpect to the eye, fatigued with the continued ſameneſs of the brown and parched plains. In the centre is an artificial mountain ſurrounded by a dry ditch, on which is a ruinous fortreſs. From hence we have a fine proſpect of the whole city, and to the north diſcover the ſnowy tops of the mountains of Bailan; and on the weſt, thoſe which ſeparate the Orontes from the ſea; while to the ſouth and eaſt, the eye can diſcern as far as the Euphrates. In the time of Omar, this caſtle ſtopped the progreſs of the Arabs for ſeveral months, and was at laſt taken by treachery, but at preſent would not be able to reſiſt the feebleſt aſſault. Its ſlight wall, low, and without a buttreſs, is in ruins; its little old towers are in no better condition; and it has not four cannon fit for ſervice, not excepting a culverine nine feet long, taken from the Perſians at the ſiege of Baſſora. Three hundred and fifty Janizaries, who

ſhould

Aleppo. should form the garriſon, are buſy in their ſhops, and the aga ſcarcely finds room in it to lodge his retinue. It is remarkable that this aga is named immediately by the Porte, which, ever ſuſpicious, divides as much as poſſible the different offices. Within the walls of the caſtle is a well, which, by means of a ſubterraneous communication, derives its water from a ſpring a league and a quarter diſtant. In the environs of the city, we find a number of large ſquare ſtones, on the top of which is a turban of ſtone, which are ſo many tombs. There are many riſing grounds round it, which, in caſe of a ſiege, would greatly facilitate the approaches of the aſſailants. Such, among others, is that on which the houſe of the Derviches ſtands, and which commands the canal and the rivulet: Aleppo, therefore, cannot be eſteemed a place of importance in war, though it be the key of Syria to the north; but, conſidered as a commercial city, it has a different appearance. It is the emporium of Armenia and Diarbekar; ſends caravans to Bagdad and into Perſia, and communicates between the Perſian gulf and India by Baſſora, with Egypt and Mecca by Damaſcus, and with Europe by Scanderoon (Alexandretta) and Latakia. Commerce is there principally carried on by barter. The chief commodities are raw or ſpun cottons, clumſy linens fabricated in the villages, ſilk ſtuffs manufactured in the city, copper, *bourres* (coarſe cloths) like thoſe of Rouen, goats hair brought from Natolia, the gall nuts of the Kourdeſtan, the merchandiſe of India, ſuch as ſhawls and muſlins, and piſtachio nuts of the growth of the neighbourhood. The articles ſupplied by Europe are the Languedoc cloths, cochineal, indigo, ſugar, and ſome other groceries. The coffee of America, though prohibited, is introduced, and ſerves to mix with that of Moka. The French have at Aleppo a conſul and ſeven counting-houſes; the Engliſh and the Venetians two, and the merchants of Leghorn and Holland one. The emperor appointed a conſul there in 1784, in the perſon of a rice Jew merchant, who ſhaved his beard to aſſume the uniform and the ſword. Ruſſia has alſo ſent one very lately. Aleppo is not exceeded in extent by any city in Turkey, except Conſtantinople and Cairo, and perhaps Smyrna. The number of inhabitants has been computed at 200,000; but in theſe calculations certainty is impoſſible. However, if we obſerve that this city is not larger than Nantes or Marſeilles, and that the houſes conſiſt only of one ſtory, we ſhall perhaps not think it probable they exceed 100,000. The people of this city, both Turks and Chriſtians, are with reaſon eſteemed the moſt civilized in all Turkey; and the European merchants nowhere enjoy ſo much liberty, or are treated with ſo much reſpect.

The air of Aleppo is very dry and piercing, but at the ſame time very ſalubrious for all who are not troubled with aſthmatic complaints. The city, however, and the environs, are ſubject to a ſingular endemial diſorder, which is called the ringworm or pimple of Aleppo: it is in fact a pimple which is at firſt inflammatory, and at length becomes an ulcer of the ſize of the nail. The uſual duration of this ulcer is one year; it commonly fixes on the face, and leaves a ſcar which diſfigures almoſt all the inhabitants. It is alleged that every ſtranger who reſides there three months is attacked with it; experience has taught that the beſt mode of treatment is to make uſe of no remedy. No reaſon is aſſigned for this malady: but M. Volney ſuſpects it proceeds from the quality of the water, as it is likewiſe frequent in the neighbouring villages, in ſome parts of Diarbekar, and even in certain diſtricts near Damaſcus, where the ſoil and the water have the ſame appearances. Of the Chriſtian inhabitants the greater number are Greeks, next to them the Armenians, then the Syrians, and laſtly the Maronites; each of whom have a church in the city called *Judida*; in which quarter, and the parts adjacent, moſt of them reſide. The common language is the vulgar Arabic, but the Turks of condition uſe the Turkiſh. Moſt of the Armenians can ſpeak the Armenian, ſome few Syrians underſtand Syriac, and many of the Jews Hebrew; but ſcarce one of the Greeks underſtands a word of Greek. The people in general are of a middle ſtature, and tolerably well proportioned; but they ſeem neither vigorous nor active. Both ſexes are handſome when young: but the beard ſoon diſfigures the men: and the women, as they come early to maturity, alſo fade very ſoon; females are generally married from 14 to 18 years of age, and many under 14. The people of rank here are polite and affable, making allowances for that ſuperiority which the Mahometan religion inſtructs its votaries to aſſume over all who hold a different faith. Their bread is generally of wheat flour made into thin cakes, but very ill prepared, and is generally eaten as ſoon as it comes out of the oven. The principal people have ſmall loaves of a finer flour, which are well fermented and baked. Beſides theſe, there is a variety of biſcuits, moſt of which are ſtrewed on the top with ſome kind of ſeeds. The Europeans have very good bread, baked and prepared in the French manner. All the inhabitants of both ſexes ſmoke tobacco to great exceſs; even the very ſervants have almoſt conſtantly a pipe in their mouths. Coaches or carriages are not uſed here; therefore perſons of quality ride on horſeback in the city, with a number of ſervants walking before them, according to their rank: ladies of the firſt diſtinction are even compelled to walk on foot in the city, or to any place at a moderate diſtance; in longer journeys they are carried by mules, in a kind of couch cloſe covered up. There are a number of public bagnios in this city, which are uſed by people of all ranks, except thoſe of the higheſt diſtinction, who commonly have baths and every other convenience in their own houſes. Aleppo is 70 miles eaſt of Scanderoon, on the ſea-coaſt, and 175 north-by-eaſt of Damaſcus. E. Long. 37. 40. N. Lat. 36. 12.

Aleppo

Aleppo, The Pachalic of, one of the five governments into which Syria is divided. It comprehends the country extending from the Euphrates to the Mediterranean, between two lines, one drawn from Scanderoon to Beer, along the mountains: the other from Beles to the ſea, by Mara and the bridge of Shoger. This ſpace principally conſiſts of two plains; that of Antioch to the weſt, and that of Aleppo to the eaſt: the north and the ſea-coaſt are occupied by conſiderably high mountains, known to the ancients by the names of Amanus and of Rhoſus. In general, the ſoil of this government is fat and loamy. The loſty and vigorous plants which ſhoot up everywhere after the winter rains prove its fertility, but its actual fruitfulneſs is but little. The greateſt part of the lands lie waſte;

Aleppo. waſte; ſcarcely can we trace any marks of cultivation in the environs of the towns and villages. Its principal produce conſiſts in wheat, barley, and cotton, which are found eſpecially in the flat country. In the mountains, they rather chooſe to cultivate the vine, mulberry, olive, and fig trees. The ſides of the hills towards the ſea-coaſt are appropriated to tobacco, and the territory of Aleppo to piſtachios. The paſturage is not to be reckoned, becauſe that is abandoned to the wandering hordes of the Turcomans and Curds.

In the greater part of the pachalics the pacha is, as his title imports, at once the viceroy and farmer-general of the country; but in that of Aleppo he does not poſſeſs the later office. This the Porte has beſtowed on a *mehaſſel* or collector, who is immediately accountable for what he receives. His leaſe is only for a year. The preſent rent of his farm is 800 purſes (above 40,000l.); but to this muſt be added the price of the *tabouches* (Turkiſh ſlippers), or a preſent of three or four thouſand pounds, to purchaſe the favour of the vizier, and men in office. For theſe two ſums the farmer receives all the duties of the government; which are, firſt, The produce of import and export duties on merchandiſe coming from Europe, India, and Conſtantinople, and on that exported in exchange. Secondly. The taxes paid by the herds of cattle brought every year by the Turcomans and Curds from Armenia and Diarbekar, to be ſold in Syria. Thirdly, The fifth of the ſalt-works of Djeboul. And laſtly, The miri, or land-tax. Theſe united may produce about 60,000l.

The pacha, deprived of this lucrative branch of the adminiſtration, receives a fixed allowance of about 8300l. This revenue has always been inadequate to the expences; for beſides the troops he is obliged to maintain, and the reparation of the highways and fortreſſes, the expences of which he is obliged to defray, he is under the neceſſity of making large preſents to the miniſters, in order to keep his place; but the Porte adds to the account the contributions he may levy on the Curds and Turcomans, and his extortions from the villages and individuals; nor do the pachas come ſhort of this calculation. Abdi Pacha, who governed 13 or 14 years ago, carried off, at the end of 15 months, upwards of 160,000l. by laying under contribution every trade, even the very cleaners of tobacco-pipes; and very lately another of the ſame name has been obliged to fly for ſimilar oppreſſions. The former was rewarded by the divan with the command of an army againſt the Ruſſians; but if the latter has not enriched himſelf, he will be ſtrangled as an extortioner. Such is the ordinary progreſs of affairs in Turkey!

In conſequence of ſuch wretched government, the greater part of the pachalics in the empire are impoveriſhed and laid waſte. This is the caſe in particular with that of Aleppo. In the ancient *defiars*, or regiſters of impoſts, upwards of 3200 villages were reckoned; but at preſent the collector can ſcarcely find 400. Such of our merchants as have reſided there 20 years, have themſelves ſeen the greater part of the environs of Aleppo become depopulated. The traveller meets with nothing but houſes in ruins, ciſterns rendered uſeleſs, and fields abandoned. Thoſe who cultivated them have fled into the towns, where the population is abſorbed, but where at leaſt the individual conceals himſelf among the crowd from the rapacious hand of deſpotiſm.

Aleria Alet.

ALERIA, ALALIA, or ALARIA, in *Ancient Geography*, a town of Corſica, ſituated near the middle of the eaſt ſide of the iſland, on an eminence, near the mouth of the river Rotanus mentioned by Ptolemy; built by the Phocæans (Diodorus Siculus). Afterwards Sylla led a colony thither. It is now in ruins, and called *Aleria Diſtructa*.

ALES, ALEXANDER, a celebrated divine of the confeſſion of Augſburg, was born at Edinburgh the 23d of April 1500. He ſoon made a conſiderable progreſs in ſchool divinity, and entered the liſts very early againſt Luther, this being then the great controverſy in faſhion, and the grand field wherein all authors, young and old, uſed to diſplay their abilities. Soon after, he had a ſhare in the diſpute which Patrick Hamilton maintained againſt the eccleſiaſtics, in favour of the new faith he had imbibed at Marpurg. He endeavoured to bring him back to the Catholic religion; but this he could not effect, and even began himſelf to doubt about his own religion, being much affected by the diſcourſe of this gentleman, and ſtill more by the conſtancy he ſhowed at the ſtake, where David Beaton, archbiſhop of St Andrew's, cauſed him to be burnt. Beginning thus to waver, he was himſelf perſecuted with ſo much violence, that he was obliged to retire into Germany, where he became at length a perfect convert to the Proteſtant religion. The change of religion which happened in England after the marriage of Henry VIII. with Anna Bullen, induced Ales to go to London in 1535. He was highly eſteemed by Cranmer archbiſhop of Canterbury, Latimer, and Thomas Cromwell, who were at that time in high favour with the king. Upon the fall of theſe favourites, he was obliged to return to Germany; where the elector of Brandenburg appointed him profeſſor of divinity at Frankfort upon the Oder, in 1540. But leaving this place upon ſome diſguſt, he returned to Leipſic, where he was choſen profeſſor of divinity, and died in March 1565. He wrote a Commentary on St John, on the Epiſtles to Timothy, and on the Pſalms. &c.

ALESA, ALÆSA, or HALESA, in *Ancient Geography*, a town of Sicily, on the Tuſcan ſea, built, according to Diodorus Siculus, by Archonides of Herbita, in the ſecond year of the 94th Olympiad, or 403 years before Chriſt; ſituated on an eminence about a mile from the ſea: now in ruins. It enjoyed immunity from taxes under the Romans (Diodorus, Cicero). The inhabitants were called *Haleſini* (Cicero, Pliny); alſo *Aleſini*, and *Alæſini*.

ALESHAM, a ſmall neat town in Norfolk. It is 15 miles north of Norwich, and 121 north-eaſt by north of London. E. Long. 0. 30. N. Lat. 52. 53. The town conſiſts of about 400 houſes.

ALESIA, in *Ancient Geography*, called *Alexia* by Livy and others; a town of the Mandubii, a people of Celtic Gaul; ſituated, according to Cæſar, on a very high hill, whoſe foot was waſhed on two ſides by two rivers. The town was of ſuch antiquity, that Diodorus Siculus relates it was built by Hercules. It is ſuppoſed to be the city of *Aliſe*, in the duchy of Burgundy, not far from Dijon.

ALET, a town of France, in the department of the Aude,

Aletris || Alexander.

Aude, and district of Limoux, at the foot of the Pyrenees. It is remarkable for its baths, and for the grains of gold and silver found in the stream which runs from the Pyrenean mountains, at the foot of which it stands. It is seated on the river Aude, 15 miles south of Carcassone, and 37 north-west of Narbonne. E. Long. 2. 5. N. Lat. 42. 59.

ALETRIS. See BOTANY *Index*.

ALETUM, or ALETA, in *Ancient Geography*, a town of Celtic Gaul, now extinct. From its ruins arose St Malo in Brittany, at the distance of a mile. Its ruins are called *Guich Aleth* in the British.

ALEURITES. See BOTANY *Index*.

ALEUROMANCY, the same with what was otherwise called *aphtomantia*, and *crithomantia*, and means an ancient kind of divination performed by means of meal or flower.

ALEUTIAN, or ALEUTSKY ISLANDS, a group or chain of islands on the north-east side of Kamtschatka, and near the continent of America, which are subject to Russia. Part of these islands were discovered by Behring in the year 1741, and the rest at different periods since that time. Captain Cook visited these islands in 1778, and directed his researches and observations to a survey of them and of the adjacent coasts of Asia and America. On the Aleutian islands and the neighbouring coast, the Russians have formed numerous establishments for the support of the fur-trade, which is one of the most advantageous commercial concerns to the Russian empire. Captain Billings, who was sent out by the late empress Catharine to make discoveries in the north-east sea, explored, in the summer 1790, the whole chain of these islands. They seem to be of volcanic origin; have no wood, but what floats from sea; and lie between the 51st and the 56th degrees N. Lat. and the 164th and the 197th degrees of E. Long.

ALEXANDER THE GREAT, king of Macedonia. His father Philip laid the plan of that extensive empire, which his son afterwards completed. Philip, having made himself master of Greece, began to cast his eyes upon Persia, with a view to retaliate upon that haughty empire the injuries of former times. It was the popular topic of the day. But this prince was cut off in the midst of his enterprise. Such, however, was the influence of Alexander in the assembly of the Grecian states, that he was created general of their combined forces in the room of his father. Having made every needful preparation, at the head of a veteran army he invaded Asia. The lieutenants of Darius, who was then king of Persia, opposed him at the river Granicus, where Alexander obtained a complete victory, after which he pursued his march through Asia. At Issus, near Scanderoon, he was met by Darius in person, at the head of a prodigious army. Here he obtained a second victory; and took the camp of Darius, together with his family, whom he treated with the utmost humanity. Contrary to all the maxims of war, instead of pursuing Darius, he made an excursion into Egypt; and, as far as appears, through no better motives than those of vanity. Here he was acknowledged to be the son of Jupiter Ammon. In the mean time Darius recruited his strength, and got together an army superior to what he brought into the plain of Issus.

Alexander having finished his Egyptian expedition, traversed Asia, and passed the Euphrates. At Arbela, a town in Assyria, he met Darius. Here a decisive battle was fought, which put all Persia into the hands of Alexander. His ambition not being satisfied with the conquest of that vast country, he projected an expedition into India. Here he met with great opposition from Porus, a gallant prince, whom in the end he reduced. Beyond the Ganges lay a country still unsubdued. He notified it to his army, that he proposed to pass the river. But these veterans, harassed with their fatigues, and seeing no end of their labour, mutinied, and refused to march further. The disappointed chief was therefore obliged to return. At Babylon he proposed to receive ambassadors, appoint governors, and settle his vast monarchy; but his excesses put an end to his life in the midst of his designs, and in the flower of his age. Alexander

The character of this hero is so familiar to every body, that it is almost needless labour to draw it. All the world knows, says Mr Bayle, that it was equally composed of very great virtues and very great vices. He had no mediocrity in any thing but his stature: in his other properties, whether good or bad, he was all extremes. His ambition rose even to madness. His father was not at all mistaken in supposing the bounds of Macedon too small for his son: for how could Macedon bound the ambition of a man, who reckoned the whole world too small a dominion? He wept at hearing the philosopher Anaxarchus say, that there was an infinite number of worlds: his tears were owing to his despair of conquering them all, since he had not yet been able to conquer one. Livy, in a short digression, has attempted to inquire into the events which might have happened, if Alexander, after the conquest of Asia, had brought his arms into Italy? Doubtless things might have taken a very different turn with him; and all the grand projects, which succeeded so well against an effeminate Persian monarch, might easily have miscarried if he had had to do with rough hardy Roman armies. And yet the vast aims of this mighty conqueror, if seen under another point of view, may appear to have been confined in a very narrow compass; since, as we are told, the utmost wish of that great heart, for which the whole earth was not big enough, was, after all, to be praised by the Athenians: for it is related, that the difficulties which he encountered in order to pass the Hydaspes, forced him to cry out, "O Athenians, could you believe to what dangers I expose myself for the sake of being celebrated by you?" But Bayle affirms, that this was quite consistent with the vast unbounded extent of his ambition, as he wanted to make all future time his own, and be an object of admiration to the latest posterity; yet did not expect this from the conquest of worlds, but from books. He was perfectly in the right, says Bayle; "for if Greece had not furnished him with good writers, he would long ago have been as much forgotten as the kings who reigned in Macedon before Amphitryon."

Alexander has been praised upon the score of continency, yet his life could not surely be quite regular in that respect. Indeed, the fire of his early youth appeared so cold towards women, that his mother suspected.

Alexander. pected him to be impotent; and, to satisfy herself in this point, did, with the consent of Philip, procure a very handsome courtezan to lie with him, whose caresses, however, were all to no purpose. His behaviour afterwards to the Persian captives shows him to have had a great command over himself in this particular. The wife of Darius was a finished beauty; her daughters likewise were all beauties; yet this young prince, who had them in his power, not only bestowed on them all the honours due to their high rank, but managed their reputation with the utmost delicacy. They were kept as in a cloister concealed from the world, and secured from the reach of every dishonourable (not only attack, but) imputation. He did not give the least handle to scandal, either by his visits, his looks, or his words: and for other Persian dames his prisoners, equally beautiful in face and shape, he contented himself with saying gayly, that they gave indeed much pain to his eyes. The amazon Thalestris could not obtain from him a compliance with her gallant request till after a delay of thirteen days. In the mean time, what are we to conclude from his causing his favourite mistress Pancaste to be drawn naked by Apelles, though it is true he gave her to the painter, who fell in love with her? What of that immoderate love of boys, which Athenæus relates of him? What of that prodigious number of wives and concubines which he kept?

His excesses with regard to wine were notorious, and beyond all imagination; and he committed, when drunk, a thousand extravagances. It was owing to wine, that he killed Clitus who saved his life, and burnt Persepolis, one of the most beautiful cities of the East: he did this last indeed at the instigation of the courtezan Thaïs; but this circumstance made it only the more heinous. It is generally believed, that he died by drinking immoderately: and even Plutarch, who affects to contradict it, owns that he did nothing but drink the whole day he was taken ill.

In short, to sum up the character of this prince, we cannot be of opinion, that his good qualities did in anywise compensate for his bad ones. Heroes make a noise: their actions glare, and strike the senses forcibly; while the infinite destruction and misery they occasion lie more in the shade, and out of sight. One good legislator is worth all the heroes that ever did or will exist. See MACEDON.

ALEXANDER AB ALEXANDRO, a Neapolitan lawyer, of great learning, who flourished toward the end of the 15th and beginning of the 16th century. He followed the profession of the law first at Naples, afterwards at Rome: but he devoted all the time he could spare to the study of polite literature; and at length he entirely left the bar, that he might lead a more easy and agreeable life with the Muses. The particulars of his life are to be gathered from his work entitled "Dies Geniales:" We are there informed, that he lodged at Rome, in a house that was haunted; and he relates many surprising particulars about the ghost. He says also, that when he was very young, he went to the lectures of Philelphus, who explained at Rome the Tusculan questions of Cicero; he was there also when Nicholas Perot and Domitius Calderinus read their lectures upon Martial. The particular time when he died is not known; but he was buried in the monastery of the Olivets. Tiraquea wrote a learned commentary upon his work, which was printed at Lyons in Alexander 1587, and reprinted at Leyden, in 1673, with the notes of Dennis Godfrey, Christopher Colerus, and Nicholas Mercerus.

ALEXANDER, *Neckham*, an eminent English writer in the 12th and 13th centuries, born at St Alban's in Hertfordshire. In 1215 he was made abbot of Exeter, and died in 1227. He wrote several works, which were never published; but they are to be found in manuscript in the libraries of England and other countries.

ALEXANDER, *Noel*, an indefatigable writer of the 17th century, born at Rouen in Normandy, 1639. After finishing his studies at Rouen, he entered into the order of Dominican friars, and was professed there in 1655. Soon after he went to Paris, to go through a course of philosophy and divinity in the great convent, where he distinguished himself so, that he was appointed to teach philosophy there, which he did for 12 years. M. Colbert showed him many marks of his esteem; and being determined to omit nothing to perfect the education of his son, afterwards archbishop of Rouen, he formed an assembly of the most learned persons, whose conferences upon ecclesiastical history might be of advantage to him. Father Alexander was invited to this assembly, where he exerted himself with so much genius and ability, that he gained the particular friendship of young Colbert, who showed him the utmost regard as long as he lived. These conferences gave rise to Alexander's design of writing an ecclesiastical history; for, being desired to reduce what was material in these conferences to writing, he did it with so much accuracy, that the learned men who composed this assembly, advised him to undertake a complete body of church history. This he executed with great assiduity, collecting and digesting the materials himself, and writing even the tables with his own hand. He at last completed his work in 1686. Towards the latter part of his life, he was afflicted with the loss of his sight; a most inexpressible misfortune to one whose whole pleasure was in study, yet he bore it with great patience and resignation. He died merely of a decay of nature, 1724, in the 86th year of his age.

ALEXANDER SEVERUS, emperor of Rome, succeeded Heliogabalus about A. D. 222, when but 16 years of age. His mother's name was Mammæa, and by her advice he in a great measure regulated his conduct. He applied himself to the reformation of abuses, the state having been greatly disordered by the vicious conduct of his predecessor; he was a most strict lover of justice, an encourager of learning and learned men, and favourable to the Christians. He made a successful expedition against the Persians; but endeavouring to reform his troops, who had grown very licentious under the late bad government, they murdered him at the instigation of Maximinus, in the 29th year of his age, together with his mother, A. D. 235.

ALEXANDER VI. *Pope*, had four bastards when he was cardinal, for one of which he had so great affection, that he stuck at nothing to raise him. Designing to poison some cardinals, he was poisoned himself, A. D. 1503. See BORGIA.

ALEXANDER VII. *Pope*. See CHIGI.

ALEXANDER bishop of Lincoln, in the reigns of Henry I. and Stephen, was a Norman by birth, and nephew

Alexander. phew of the famous Roger, biſhop of Saliſbury, who firſt made him archdeacon of Saliſbury, and afterwards, by his intereſt with the king, raiſed him to the mitre. Alexander was conſecrated at Canterbury, July 22. 1123. Having received his education under his uncle the biſhop of Saliſbury, and been accuſtomed to a ſplendid way of living, he affected ſhow and ſtate more than was ſuitable to his character, or conſiſtent with his fortunes. This failing excepted, he was a man worthy of honour, and every way qualified for his ſtation. The year after his conſecration, his cathedral church at Lincoln having been accidentally burnt down, he rebuilt it, and ſecured it againſt the like accident for the future by a ſtone roof. This prelate increaſed the number of prebends in his church, and augmented its revenues with ſeveral manors and eſtates. In imitation of the barons and ſome of the biſhops, particularly his uncle the biſhop of Saliſbury, he built three caſtles; one at Banbury, another at Sleaford, and a third at Newark. He likewiſe founded two monaſteries; one at Haverholm, for regular canons and nuns together, the other at Tame for white friars. He went twice to Rome in the years 1142 and 1144. The firſt time, he came back in quality of the pope's legate, for the calling a ſynod, in which he publiſhed ſeveral wholeſome and neceſſary canons. In Auguſt 1147, he took a third journey to the pope, who was then in France; where he fell ſick through the exceſſive heat of the weather, and returning with great difficulty to England, where he died in the 24th year of his prelacy.

ALEXANDER, *William*, earl of Stirling, an eminent Scots ſtateſman and poet in the reigns of James VI. and Charles I. who, after travelling with the duke of Argyle as his tutor or companion, wrote a poetical complaint of his unſucceſsful love of ſome beauty, under the title of *Aurora*. He then removed to the court of James VI. where he applied to the more ſolid parts of poetry, forming himſelf upon the plan of the Greek and Roman tragedians. In 1607, he publiſhed ſome dramatic performances, entitled *The Monarchic Tragedies*, dedicated to King James; who was ſo well pleaſed with them, as to call him his philoſophical poet. After this, he is ſaid to have written *A Supplement* to complete the third part of Sir Philip Sidney's Arcadia; and in 1613, he produced a poem called *Doomſday*, or *the Great Day of Judgment*. He was made gentleman uſher to Prince Charles, and maſter of the requeſts; was knighted; and obtained a grant of Nova Scotia, where he projected the ſettlement of a colony, but afterwards ſold it to the French. In 1626, he was made ſecretary of ſtate for Scotland; was created firſt viſcount, and then earl, of Stirling; and died in 1640.

ALEXANDER I. *St*, whom St Irenæus reckons the fifth biſhop of Rome, ſucceeded St Evariſtus in the year 109, and died in the year 119. There is no account of his life; and the epiſtles which are attributed to him are ſuppoſititious.

ALEXANDER II. king of Scotland, ſucceeded his father William in 1213, at 16 years of age. He made an expedition into England, to oppoſe the tyranny of King John; who returned the viſit, and was offered battle by Alexander, but refuſed it. He took the city of Carliſle from Henry III. which was afterwards exchanged for Berwick. Alexander died in 1249, in the 51ſt year of his age, and 35th of his reign; and left for his ſucceſſor, his ſon—— Alexander II. Alexandretta.

ALEXANDER III. who was crowned king of Scotland in 1249. The Cummings, a powerful family, took arms againſt him; and taking him priſoner, confined him at Stirling: but he was afterwards releaſed by his ſubjects. He married the daughter of Henry III. king of England; and was at length killed by a fall from his horſe, on the 10th of April 1290, after having reigned 42, or according to others 37, years.

ALEXANDERS, in *Botany*. See SMYRNIUM.

ALEXANDRETTA, by the Turks called *Scanderoon*; a town in Syria, at the extremity of the Mediterranean ſea. It is the port of Aleppo, from which it is diſtant 28 or 30 leagues. It is now, properly ſpeaking, nothing elſe but a village, without walls, in which the tombs are more numerous than the houſes, and which entirely owes its exiſtence to the road which it commands. This is the only road, in all Syria, where veſſels anchor on a ſolid bottom, without their cables being liable to chafe: but in other reſpects it has many inconveniences. It is infeſted, during winter, by a peculiar wind, called by the French ſailors *le Raguier*, which, ruſhing from the ſnowy ſummits of the mountains, frequently forces ſhips to drag their anchors ſeveral leagues: And when the ſnow begins to cover the mountains which ſurround the gulf, tempeſtuous winds ariſe which prevent veſſels from entering for three or four months together. The road alſo to Aleppo by the plain is inveſted by Curd robbers, who conceal themſelves in the neighbouring rocks, and frequently attack and plunder the ſtrongeſt caravans. But the worſt circumſtance is the extreme unwholeſomeneſs of the air, occaſioned here by ſtagnant waters and mephitic exhalations. It may be affirmed that this every year carries off one-third of the crews of the veſſels which remain here during the ſummer; nay, ſhips frequently loſe all their men in two months. The ſeaſon for this epidemic diſorder is principally from May to the end of September: it is an intermitting fever of the moſt malignant kind; and is accompanied with obſtructions of the liver, which terminate in dropſy. To this baneful epidemic, Alexandretta, from its ſituation, ſeems to be irremediably condemned: for the plain on which the town is built is ſo low and flat, that the rivulets, finding no declivity, can never reach the ſea. When they are ſwelled by the winter rains, the ſea, ſwelled likewiſe by tempeſts, hinders their diſcharging themſelves into it: hence their waters, forced to ſpread themſelves, form lakes in the plain. On the approach of the ſummer, the waters become corrupted by the heat, exhale vapours equally corrupt, and which cannot diſperſe, being confined by the mountains that encircle the gulf. The entrance of the bay beſides lies to the weſt, which in thoſe countries is the moſt unhealthy expoſure when it correſponds with the ſea. The labour neceſſary to remedy this would be immenſe, and after all inſufficient: and, indeed, ſuch an undertaking would be abſolutely impoſſible under a government like that of the Turks. A few years ago, Mr Volney informs us, the merchants of Aleppo, diſguſted with the numerous inconveniences of Alexandretta, wiſhed to abandon that port and carry the trade

to

Alexandretta, Alexandria.

to Latakia. They propoſed to the pacha of Tripoli to repair the harbour at their own expence, provided he would grant them an exemption from all duties for ten years. To induce him to comply with their requeſt, the agent they employed talked much of the advantage which would, *in time*, reſult to the whole country: "But what ſignifies it to me what may happen *in time*, replied the pacha? I was yeſterday at Marach; to-morrow, perhaps, I ſhall be at Djedda: Why ſhould I deprive myſelf of preſent advantages, which are certain, for future benefits I cannot hope to partake?" The European factors were obliged therefore to remain at Scanderoon. There are three of theſe factors, two for the French, and one for the Engliſh and Venetians. The only curioſity which they have to amuſe ſtrangers with conſiſts in ſix or ſeven marble monuments, ſent from England, on which you read: *Here lies ſuch a one, carried off in the flower of his age, by the fatal effects of a contagious air.* The ſight of theſe is the more diſtreſſing, as the languid air, yellow complexion, livid eyes, and dropſical bellies of thoſe who ſhow them, make it but too probable they cannot long eſcape the ſame fate. It is true, they have ſome reſource in the village of Bailan, the pure air and excellent water of which ſurpriſingly reſtore the ſick. The aga, for ſome years paſt, has applied the duties of the cuſtomhouſe of Alexandretta to this own uſe, and rendered himſelf almoſt independent of the pacha of Aleppo. The Turkiſh empire is full of rich rebels, who frequently die in peaceable poſſeſſion of their uſurpations.

ALEXANDRIA, in *Ancient Geography*, a mountain of Myſia, on the ſea coaſt, forming a part of Mount Ida, where Paris gave judgement on the three goddeſſes.

ALEXANDRIA, now *Scanderia*, by Athenæus called Χρυσή; a city of Lower Egypt, and for a long time its capital. This city was built by Alexander the Great, ſoon after the overthrow of Tyre, about 333 years before Chriſt. It is ſituated on the Mediterranean, twelve miles weſt of that mouth of the Nile anciently called *Canopicum*; and lies in E. Long. 30. 9. N. Lat. 31. 10.

Alexander is ſaid to have been induced to build this city, on account of its being conveniently ſituated for a fine port; and ſo ſudden was his reſolution, that after he had directed where every public ſtructure was to be placed, fixed the number of temples, and the deities to whom they ſhould be dedicated, &c. there were no inſtruments at hand proper for marking out the walls, according to the cuſtom of thoſe times. Upon this, a workman adviſed the king to collect what meal was among the ſoldiers, and to ſift it in lines upon the ground, whereby the circuit of the walls would be ſufficiently marked out. This advice was followed; and the new method of marking out the walls was, by Ariſtander, the king's ſouthſayer, interpreted as a preſage of the city's abounding with all the neceſſaries of life. Nor was he deceived in his predictions; for Alexandria ſoon became the ſtaple, not only for merchandiſe, but alſo for all the arts and ſciences of the Greeks.

Alexandria was a league and a half long, by one-third in breadth, which made the circumference of its walls about four leagues. Lake Mareotis bathed its walls on the ſouth, and the Mediterranean on the north. It was interſected lengthwiſe by ſtraight parallel ſtreets. This direction left a free paſſage to the northern wind, which alone conveys coolneſs and ſalubrity into Egypt. A ſtreet of 2000 feet wide began at the gate of the ſea, and terminated at the gate of Canopus. It was decorated with magnificent houſes, temples, and public buildings. In this extenſive range, the eye was never tired with admiring the marble, the porphyry and obeliſks, which were deſtined at ſome future day to embelliſh Rome and Conſtantinople. This ſtreet, the handſomeſt in the univerſe, was interſected by another of the ſame breadth, which formed a ſquare at their junction of half a league in circumference. From the middle of this great place, the two gates were to be ſeen at once, and veſſels arriving under full ſail from the north and from the ſouth. Alexandri

A mole of a mile in length ſtretched from the continent to the iſle of Pharos, and divided the great harbour into two. That which is to the northward preſerved its name. A dike drawn from the iſland to the rock whereon was built the Pharos, ſecured it from the weſterly winds. The other was called *Eunoſtos*, or the Safe Return. The former is called at preſent the new, the latter the old harbour: a bridge that joins the mole to the city, ſerved for a communication between them. It was raiſed on lofty pillars ſunk into the ſea, and left a free paſſage for ſhips. The palace, which advanced beyond the promontory of *Lochias*, extended as far as the dike, and occupied more than a quarter of the city. Each of the Ptolemies added to its magnificence. It contained within its encloſure, the muſeum, an aſylum for learned men, groves, and buildings worthy of royal majeſty, and a temple where the body of Alexander was depoſited in a golden coffin. The infamous Seleucus Cibyoſactes violated this monument, carried off the golden coffin, and put a glaſs one in its place. In the great harbour was the little iſland of Anti-Rhodes, where ſtood a theatre, and a royal place of reſidence. Within the harbour of Eunoſtos was a ſmaller one, called *Kibotos*, dug by the hand of man, which communicated with Lake Mareotis by a canal. Between this canal and the palace was the admirable temple of Serapis, and that of Neptune near the great place where the market was held. Alexandria extended likewiſe along the ſouthern banks of the lake. Its eaſtern part preſented to view the gymnaſium, with its porticoes of more than 600 feet long, ſupported by ſeveral rows of marble pillars. Without the gate of Canopus was a ſpacious circus for the chariot races. Beyond that, the ſuburb of Nicopolis ran along the ſea-ſhore, and ſeemed a ſecond Alexandria. A ſuperb amphitheatre was built there with a race-ground, for the celebration of the quinquennalia.

Such is the deſcription left us of Alexandria by the ancients, and above all by Strabo.

The architect employed by Alexander in this undertaking was the celebrated Dinocrates, who had acquired ſo much reputation by rebuilding the temple of Diana at Epheſus. The city was firſt rendered populous by Ptolemy Soter, one of Alexander's captains, who, after the death of the Macedonian monarch, being appointed governor of Egypt, ſoon aſſumed the title of king, and took up his reſidence at Alexandria, about 304 years before Chriſt.

Alexandria. In the 30th year of Ptolemy's Soter's reign, he took his ſon Ptolemy Philadelphus partner with him in the empire; and by this prince the city of Alexandria was much embelliſhed. In the firſt year of his reign the famous watch-tower of Pharos was finiſhed. It had been begun ſeveral years before by Ptolemy Soter; and, when finiſhed, was looked upon as one of the wonders of the world. The ſame year, the iſland of Pharos itſelf, originally ſeven furlongs diſtant from the continent, was joined to it by a cauſeway. This was the work of Dexiphanes, who completed it at the ſame time that his ſon put the laſt hand to the tower. The tower was a large ſquare ſtructure of white marble; on the top of which fires were kept conſtantly burning, for the direction of ſailors. The building coſt 800 talents; which, if Attic, amounted to 165,000l.; if Alexandrian, to twice that ſum.

The architect employed in this famous ſtructure fell upon the following contrivance to uſurp the whole glory to himſelf.—Being ordered to engrave upon it the following inſcription:—"King PTOLEMY to the Gods the Saviours for the benefit of Sailors;" inſtead of the king's name he ſubſtituted his own, and then filling up the hollow of the marble with mortar, wrote upon it the above-mentioned inſcription. In proceſs of time, the mortar being worn off, the following inſcription appeared: "SOSTRATUS the CNIDIAN, the ſon of DEXIPHANES, to the Gods the Saviours, for the benefit of Sailors."

This year alſo was remarkable for the bringing of the image of Serapis from Pontus to Alexandria. It was ſet up in one of the ſuburbs of the city called *Rhacotis*, where a temple was afterwards erected to his honour, ſuitable to the greatneſs of that ſtately metropolis, and called, from the god worſhipped there, *Serapeum*. This ſtructure, according to Ammianus Marcellinus, ſurpaſſed in beauty and magnificence all others in the world, except the capitol at Rome.—Within the verge of this temple was the famous Alexandrian library. It was founded by Ptolemy Soter, for the uſe of an academy he inſtituted in this city; and, by continual additions by his ſucceſſors, became at laſt the fineſt library in the world, containing no fewer than 700,000 volumes. The method followed in collecting books for this library, was, to ſeize all thoſe which were brought into Egypt by Greeks or other foreigners. The books were tranſcribed in the muſeum by perſons appointed for that purpoſe; the copies were then delivered to the proprietors, and the originals laid up in the library. Ptolemy Euergetes, having borrowed from the Athenians the works of Sophocles, Euripides, and Æſchylus, returned them only the copies, which he cauſed to be tranſcribed in as beautiful a manner as poſſible; preſenting the Athenians at the ſame time with fifteen talents (upwards of 3000l. ſterling) for the exchange.

As the muſeum was at firſt in that quarter of the city called *Bruchion*, near the royal palace, the library was placed there likewiſe; but when it came to contain 400,000 volumes, another library, within the Serapeum, was erected by way of ſupplement to it, and on that account called the *daughter* of the former. In this ſecond library 300,000 volumes, in proceſs of time, were depoſited; and the two together contained the 700,000 volumes already mentioned. In the war Alexandria. carried on by Julius Cæſar againſt the inhabitants of this city, the library in the Bruchion, with the 400,000 volumes it contained, was reduced to aſhes. The library in the Serapeum, however, ſtill remained; and here Cleopatra depoſited 200,000 volumes of the Pergamean library, which Marc Antony preſented her with. Theſe, and others added from time to time, rendered the new library at Alexandria more numerous and conſiderable than the former; and though it was often plundered during the revolutions and troubles of the Roman empire, yet it was again and again repaired, and filled with the ſame number of books.

For 293 years Alexandria was held in ſubjection by the Ptolemies. Here is a liſt of theſe princes, with the dates of their reſpective reigns.

Ptolemy the ſon of Lagus, ſurnamed *Soter*, reigned 39 years, and died in the year of the world 3720. Ptolemy Philadelphus reigned 39 years, and died in 3758. Ptolemy Euergetes reigned 25 years, and died in 3783. Ptolemy Philopater reigned 17 years, and died in 3800. Ptolemy Epiphanes reigned 24 years, and died in 3824. Ptolemy Philometor reigned 37 years, and died in 3861. Ptolemy Euergetes, or Phyſcon, reigned 53 years, part with his brother Philometor and part alone. He died in 3888. Ptolemy Lathyrus reigned 36 years ſix months. He died in 3923. Cleopatra, the daughter of Lathyrus and wife of Alexander I. reigned ſix months. Alexander I. the nephew of Lathyrus, was eſtabliſhed in 3924, and died in 3943. Alexander II. the ſon of Alexander I. was diſpoſſeſſed by the Alexandrians in 3939. Ptolemy Nothus, or Auletes, the ſon of Lathyrus, reigned 13 years, and died in 3953. Ptolemy, ſurnamed *Dionyſius* or *Bacchus*, reigned three years eight months, and died in 3957. Cleopatra reigned from 3957, and killed herſelf in 3974.

This city, as we have already obſerved, ſoon became extremely populous, and was embelliſhed both by its own princes and the Romans; but, like moſt other noted cities of antiquity, hath been the ſeat of terrible maſſacres. About 141 years before Chriſt, it was almoſt totally depopulated by Ptolemy Phyſcon. That barbarous monſter, without the leaſt provocation, gave free liberty to his guards to plunder his metropolis and murder the inhabitants at their pleaſure. The cruelties practiſed on this occaſion cannot be expreſſed; and the few who eſcaped were ſo terrified that they fled into other countries. Upon this, Phyſcon, that he might not reign over empty houſes, invited thither ſtrangers from the neighbouring countries; by whom the city was repeopled, and ſoon recovered its former ſplendour. On this occaſion many learned men having been obliged to fly, proved the means of reviving learning in Greece, Aſia Minor, the iſlands of the Archipelago, and other places, where it was almoſt totally loſt.

The new inhabitants were not treated with much more kindneſs by Phyſcon than the old ones had been; for, on their complaining of his tyrannical behaviour, he reſolved on a general maſſacre of the young men. Accordingly, when they were one day aſſembled in the gymnaſium, or place of their public exerciſes, he ordered it to be ſet on fire; ſo that they all periſh-

Alexandria ed, either in the flames, or by the ſwords of his mercenaries, whom the tyrant had placed at all the avenues.

Though Julius Cæſar was obliged to carry on a war for ſome time againſt this city, it ſeems not to have ſuffered much damage, except the burning of the library already mentioned. Before Cæſar left Alexandria, in acknowledgment of the aſſiſtance he had received from the Jews, he confirmed all their privileges there, and even engraved his decree on a pillar of braſs. This, however, did not prevent the maſſacre of 50,000 of them in this city about the year of Chriſt 67.

The city of Alexandria ſeems to have fallen into decay ſoon after this, and to have forfeited many of its ancient privileges, though for what offence is not known; but when Adrian viſited Egypt, about the year 141, it was almoſt totally ruined. He repaired both the public and private buildings, not only reſtoring the inhabitants to their ancient privileges, but heaping new favours upon them; for which they returned him their ſolemn thanks, and conferred upon him what honours they could while he was preſent; but as ſoon as he was gone, they publiſhed the moſt bitter and virulent lampoons againſt him.

The fickle and ſatirical humour of the Alexandrians was highly diſliked by Adrian, though he inflicted no puniſhment upon them for it; but when they lampooned Caracalla, he did not let them eſcape ſo eaſily. That tyrant, in the year 215, when he viſited their city, having become the ſubject of their fooliſh ſatires, ordered a general maſſacre by his numerous troops, who were diſperſed all over the city. The inhuman orders being given, all were murdered, without diſtinction of age or ſex; ſo that in one night's time the whole city floated in blood, and every houſe was filled with carcaſes. The monſter who occaſioned this had retired during the night to the temple of Serapis, to implore the protection of that deity; and, not yet ſatiated with ſlaughter, commanded the maſſacre to be continued all the next day; ſo that very few of the inhabitants remained. As if even this had not been ſufficient, he ſtripped the city of all its ancient privileges; ſuppreſſed the academy; ordered all ſtrangers who lived there to depart; and that the few who remained might not have the ſatisfaction of ſeeing one another, he cut off all communication of one ſtreet with another, by walls built for that purpoſe, and guarded by troops left there.

Notwithſtanding this terrible diſaſter, Alexandria ſoon recovered its former ſplendour, as Caracalla was murdered a ſhort time after. It was long eſteemed the firſt city in the world, next to Rome; and we may judge of its magnificence, and the multitude of people contained in it, from the account of Diodorus Siculus, who relates, that in his time (44 years before Chriſt) Alexandria had on its rolls 300,000 freemen. Towards the middle of the ſixth century, Amrou *Ebn al Aas*, Omar's general, took it by ſtorm, after a ſiege of 14 months, and with the loſs of 23,000 men. Heraclius, then emperor of Conſtantinople, did not ſend a ſingle ſhip to its aſſiſtance. This prince affords an example very rare in hiſtory; he had diſplayed ſome vigour in the firſt year of his reign, and then ſuffered himſelf to be lulled into idleneſs and effeminacy. Awakened ſuddenly from his lethargy by the noiſe of the conqueſts of Coſroes, that ſcourge of the eaſt, he Alexandr put himſelf at the head of his armies, diſtinguiſhed himſelf as a great captain from his very firſt campaign, laid waſte Perſia for ſeven years, and returned to his capital covered with laurels: he then became a theologian on the throne, loſt all his energy, and amuſed himſelf the reſt of his life with diſputing upon Monotheiſm, whilſt the Arabs were robbing him of the fineſt provinces of his empire. Deaf to the cries of the unfortunate inhabitants of Alexandria, as he had been to thoſe of the people of Jeruſalem, who defended themſelves for two years, he left them a ſacrifice to the fortunate aſcendant of the indefatigable Amrou. All their intrepid youth periſhed with their arms in their hands.

The victor, aſtoniſhed at his conqueſt, wrote to the caliph, "I have taken the city of the weſt. It is of an immenſe extent. I cannot deſcribe to you how many wonders it contains. There are 4000 palaces, 4000 baths, 12,000 dealers in freſh oil, 12,000 gardeners, 40,000 Jews who pay tribute, 400 theatres or places of amuſement."

At this time, according to the Arabian hiſtorians, Alexandria conſiſted of three cities, *viz. Menna*, or the port, which included Pharos, and the neighbouring parts; *Alexandria*, properly ſo called, where the modern Scanderia now ſtands; and *Nekita*, probably the Necropolis of Joſephus and Strabo.

At that time John, ſurnamed *the Grammarian*, a famous Peripatetic philoſopher, being in the city, and in high favour with Amrou Ebn al Aas the Saracen general, begged of him the royal library. Amrou replied, that it was not in his power to grant ſuch a requeſt; but that he would write to the caliph on that head; ſince, without knowing his pleaſure, he dared not to diſpoſe of a ſingle book. He accordingly wrote to Omar, who was then caliph, acquainting him with the requeſt of his friend: to which the ignorant tyrant replied, That if thoſe books contained the ſame doctrine with the Koran, they could be of no uſe, ſince the Koran contained all neceſſary truths; but if they contained any thing contrary to that book, they ought not to be ſuffered; and therefore, whatever their contents were, he ordered them to be deſtroyed. Purſuant to this order, they were diſtributed among the public baths; where, for the ſpace of ſix months, they ſerved to ſupply the fires of thoſe places, of which there was an incredible number in Alexandria.

After the city was taken, Amrou thought proper to purſue the Greeks who had fled farther up the country; and therefore marched out of Alexandria, leaving but a very ſlender garriſon in the place. The Greeks, who had before fled on board their ſhips, being appriſed of this, returned on a ſudden, ſurpriſed the town, and put all the Arabs they found therein to the ſword: but Amrou, receiving advice of what had happened, ſuddenly returned, and drove them out of it with great ſlaughter; after which the Greeks were ſo intimidated, that he had nothing farther to fear from them.—A few years after, however, Amrou being deprived of his government by the caliph Othman, the Egyptians were ſo much diſpleaſed with his diſmiſſion that they inclined to a revolt; and Conſtantine the Greek emperor, having received intelligence of their diſaffection, began to meditate the reduction of Alexandria. For this purpoſe, he

Alexandria. he ſent one Manuel, an eunuch, and his general, with a powerful army, to retake that place; which, by the aſſiſtance of the Grecks in the city, who kept a ſecret correſpondence with the imperial forces while at ſea, and joined them as ſoon as they had made a deſcent, he effected, without any conſiderable effuſion of Chriſtian blood. The caliph, now perceiving his miſtake, immediately reſtored Amrou to his former dignity. This ſtep was very agreeable to the natives; who having had experience of the military ſkill and bravery of this renowned general, and apprehending that they ſhould be called to an account by the Greeks for their former perfidious conduct, had petitioned Othman to ſend him again into Egypt.—Upon Amrou's arrival, therefore, at Alexandria, the Copts or natives, with the traitor Al-Mokawkas (who had formerly betrayed to Amrou the fortreſs of Meſr) at their head, not only joined him, but ſupplied him with all kinds of proviſions, exciting him to attack the Greeks without delay. This he did; and, after a moſt obſtinate diſpute which laſted ſeveral days, drove them into the town, where, for ſome time, they defended themſelves with great bravery, and repelled the utmoſt efforts of the beſiegers. This ſo exaſperated Amrou, that he ſwore, "If God enabled him to conquer the Greeks, he would throw down the walls of the city, and make it as eaſy of acceſs as the houſe of a proſtitute. Nor did he fail to execute his threat; for having taken the town by ſtorm, he quite diſmantled it, entirely demoliſhing the walls and fortifications. The lives of the citizens, however, were ſpared, at leaſt as far as lay in the general's power; but many of them were put to the ſword by the ſoldiers on their firſt entrance. In one quarter particularly, Amrou found them butchering the Alexandrians with unrelenting barbarity; to which, however, by his ſeaſonable interpoſition, he put a ſtop, and on that ſpot erected a moſque, which he called the *moſque of mercy*.

From this time Alexandria never recovered its former ſplendour. It continued under the dominion of the caliphs till the year 924, when it was taken by the Magrebians, two years after its great church had been deſtroyed by fire. This church was called by the Arabs *Al Kaiſaria*, or *Cæſarea*; and had formerly been a pagan temple, erected in honour of Saturn by the famous Queen Cleopatra.

The city was ſoon after abandoned by the Magrebians; but in 928 they again made themſelves maſters of it; their fleet being afterwards defeated by that belonging to the caliph, *Abul Kaſem* the Magrebian general retired from Alexandria, leaving there only a garriſon of 300 men; of which *Thmaâl*, the caliph's admiral, being appriſed, he in a few days appeared before the town, and carried off the remainder of the inhabitants to an iſland in the Nile called *Abukair*. This was done to prevent Abul Kâſem from meeting with any entertainment at Alexandria, in caſe he ſhould think proper to return. According to Eutychius, above 200,000 of the miſerable inhabitants periſhed this year.

What contributed to raiſe Alexandria to ſuch a prodigious height of ſplendour as it enjoyed for a long time, was its being the centre of commerce between the eaſtern and weſtern parts of the world. It was with the view of becoming maſter of this lucrative trade, that Alexander built this city, after having extirpated the Tyrians who formerly engroſſed all the Eaſt India traffic. Of the immenſe riches which that trade afforded, we may form an idea, from conſidering that the Romans accounted it a point of policy to oppreſs the Egyptians, eſpecially the Alexandrians; and after the defeat of Zenobia, there was a ſingle merchant of Alexandria who undertook to raiſe and pay an army out of the profits of his trade. The Greek emperors drew prodigious tributes from Egypt, and yet the caliphs found their ſubjects in ſo good circumſtances as to ſcrew up their revenues to three hundred millions of crowns. Alexandria.

Though the revolutions which happened in the government of Egypt, after it fell into the hands of the Mahometans, frequently affected this city to a very great degree; yet ſtill the excellence of its port, and the innumerable conveniencies reſulting from the Eaſt India trade, to whomſoever were maſters of Egypt, preſerved Alexandria from total deſtruction, even when in the hands of the moſt barbarous nations. Thus, in the 13th century, when the barbariſm introduced by the Goths, &c. began to wear off from the European nations, and they acquired a taſte for the elegancies of life, the old mart of Alexandria began to revive; and the port, though far from recovering its former magnificence, grew once more famous by becoming the centre of commerce: but having fallen under the dominion of the Turks, and the paſſage round the Cape of Good Hope being diſcovered by the Portugueſe in 1499, a fatal blow was given to the Alexandrian commerce, and the city has ſince fallen into decay.

At preſent, the city of Alexandria is reckoned to have about 14,000 or 15,000 inhabitants; a ſtrange colluvies of different nations, as well as from various parts of the Turkiſh empire. They are in general given to thieving and cheating; and (like their predeceſſors) ſeditious above all others, were they not kept in awe by the ſeverity of their government. The Britiſh and French carry on a conſiderable commerce with them, and have each a conſul reſiding here. Some Venetian ſhips alſo ſail thither yearly, but with French colours, and under the protection of France. The ſubjects of thoſe kingdoms which keep no conſul here, are ſubjected to a tax by the Grand Signior: but the Jews have found out a method of indemnifying themſelves for this diſadvantage; namely, by ſelling their commodities cheaper than other foreigners can afford. They are alſo favoured by the farmers of the revenue; who know, that if they do not pay ſome private regard to them, the Jews have it in their power to cauſe fewer merchandiſes come into their port during the two years that their farm laſts.

The preſent city is a kind of peninſula ſituated between the two ports. That to the weſtward was called by the ancients the *Portus Eunoſtus*, now the *Old Port*, and is by far the beſt: Turkiſh veſſels only are allowed to anchor there: the other called the *New Port*, is for the Chriſtians; at the extremity of one of the arms of which ſtood the famous Pharos. The New Port, the only harbour for Europeans, is clogged up with ſand, inſomuch that in ſtormy weather ſhips are liable to bilge; and the bottom being alſo rocky, the cables ſoon chafe and part; ſo that one veſſel driving againſt a ſecond, and that againſt a third, they are perhaps all loſt. Of this there was a fatal inſtance ſome years ago, when 42 veſſels were daſhed to pieces on the mole

Alexandria. in a gale of wind from the north-weſt, and numbers have been ſince loſt there at different times. If it be aſked in Europe, Why do they not repair the New Port? the anſwer is, That in Turkey they deſtroy every thing, and repair nothing. The old harbour will be deſtroyed likewiſe, as the ballaſt of veſſels has been continually thrown into it for the laſt 200 years. The ſpirit of the Turkiſh government is to ruin the labours of paſt ages, and deſtroy the hopes of future times, becauſe the barbarity of ignorant deſpotiſm never conſiders to-morrow.

In time of war, Alexandria is of no importance; no fortification is to be ſeen; even the Farillon, with its lofty towers, cannot be defended. It has not four cannon fit for ſervice, nor a gunner who knows how to point them. The 500 janizaries, who ſhould form the garriſon, reduced to half that number, know nothing but how to ſmoke a pipe. But Alexandria is a place of which the conqueſt would be of no value. A foreign power could not maintain itſelf there, as the country is without water. This muſt be brought from the Nile by the kalidj, or canal of 12 leagues, which conveys it thither every year at the time of the inundation. It fills the vaults or reſervoirs dug under the ancient city, and this proviſion muſt ſerve till the next year. It is evident, therefore, that were a foreign power to take poſſeſſion, the canal would be ſhut, and all ſupplies of water cut off. It is this canal alone which connects Alexandria with Egypt; for from its ſituation without the Delta, and the nature of the ſoil, it really belongs to the deſerts of Africa. Its environs are ſandy, flat, and ſterile, without trees and without houſes; where we meet with nothing but the plant which yields the kali, and a row of palm trees which follows the courſe of the kalidj or canal.

The city is governed like others in the ſame kingdom. (See EGYPT.) It hath a ſmall garriſon of ſoldiers, part of which are Janizaries and Aſſaffs; who are very haughty and inſolent, not only to ſtrangers, but to the mercantile and induſtrious part of the people, though ever ſo conſiderable and uſeful. The government is ſo remiſs in favour of theſe wretches, that Mr Norden informs us, one of them did not heſitate to kill a farmer of the cuſtoms, for refuſing to take leſs of him than the duty impoſed, and went off unpuniſhed; it being a common ſalvo among them, that what is done cannot be undone.

The preſent condition of Alexandria is very deſpicable, being now ſo far ruined, that the rubbiſh in many places overtops the houſes. The famous tower of Pharos has long ſince been demoliſhed, and a caſtle, called *Farillon*, built in its place. The cauſeway which joined the iſland to the continent is broken down, and its place ſupplied by a ſtone bridge of ſeveral arches.

Some parts of the old walls of the city are yet ſtanding, and preſent us with a maſterpiece of ancient maſonry. They are flanked with large towers, about 200 paces diſtant from each other, with ſmall ones in the middle. Below are magnificent caſemates, which may ſerve for galleries to walk in. In the lower part of the towers is a large ſquare hall, whoſe roof is ſupported by thick columns of Thebaic ſtone. Above this are ſeveral rooms, over which there are platforms more than 20 paces ſquare. The ancient reſervoirs, vaulted with ſo much art, which extend under the whole town, Alexandria. are almoſt entire at the end of 2000 years.

Of Cæſar's palace there remain only a few porphyry pillars, and the front, which is almoſt entire, and looks very beautiful. The palace of Cleopatra was built upon the walls facing the port, having a gallery on the outſide, ſupported by ſeveral fine columns. Not far from this palace are two obeliſks vulgarly called *Cleopatra's Needles*. They are of Thebaic ſtone, and covered with hieroglyphics. One is overturned, broken, and lying under the ſand; the other is on its pedeſtal. Theſe two obeliſks, each of them of a ſingle ſtone, are about 60 feet high, by ſeven feet ſquare at the baſe. Denon, who went to Egypt along with the French army in 1798, ſuppoſes that theſe columns decorated the entrance of the palace of the Ptolemies, the ruins of which ſtill exiſt at no great diſtance from the place of the obeliſks. Towards the gate of Roſetta, are five columns of marble on the place formerly occupied by the porticoes of the gymnaſium. The reſt of the colonnade, the deſign of which was diſcoverable 100 years ago by Maillet, has ſince been deſtroyed by the barbariſm of the Turks.

But what moſt engages the attention of travellers is the pillar of Pompey, as it is commonly called, ſituated at a quarter of a league from the ſouthern gate. It is compoſed of red granite. The capital is Corinthian, with palm leaves, and not indented. It is nine feet high. The ſhaft and the upper member of the baſe are of one piece of 90 feet long, and nine in diameter. The baſe is a ſquare of about 15 feet on each ſide. This block of marble, 60 feet in circumference, reſts on two layers of ſtone bound together with lead; which, however, has not prevented the Arabs from forcing out ſeveral of them, to ſearch for an imaginary treaſure. The whole column is 114 feet high. It is perfectly well poliſhed, and only a little ſhivered on the eaſtern ſide. Nothing can equal the majeſty of this monument; ſeen from a diſtance, it overtops the town, and ſerves as a ſignal for veſſels. Approaching it nearer, it produces an aſtoniſhment mixed with awe. One can never be tired with admiring the beauty of the capital, the length of the ſhaft, nor the extraordinary ſimplicity of the pedeſtal. This laſt has been ſomewhat damaged by the inſtruments of travellers, who are curious to poſſeſs a relick of this antiquity; and one of the volutes of the column was immaturely brought down about twelve years ago, by a prank of ſome Engliſh captains, which is thus related by Mr Irwin.

Theſe jolly ſons of Neptune had been puſhing about the can on board one of the ſhips in the harbour, until a ſtrange freak entered into one of their brains. The eccentricity of the thought occaſioned it immediately to be adopted; and its apparent impoſſibility was but a ſpur for the putting it into execution. The boat was ordered; and with proper implements for the attempt, theſe enterpriſing heroes puſhed aſhore, to drink a bowl of punch on the top of Pompey's pillar! At the ſpot they arrived; and many contrivances were propoſed to accompliſh the deſired point. But their labour was vain; and they began to deſpair of ſucceſs, when the genius who ſtruck out the frolic happily ſuggeſted the means of performing it. A man was diſ-

Voyage and Route, p. 379.

patched

Alexandria. patched to the city for a paper kite. The inhabitants were by this time apprized of what was going forward, and flocked in crowds to be witneſſes of the addreſs and boldneſs of the Engliſh. The governor of Alexandria was told that theſe ſeamen were about to pull down Pompey's pillar. But whether he gave them credit for their reſpect to the Roman warrior, or to the Turkiſh government, he left them to themſelves; and politely anſwered, that the Engliſh were too great patriots to injure the remains of Pompey. He knew little, however, of the diſpoſition of the people who were engaged in this undertaking. Had the Turkiſh empire riſen in oppoſition, it would not perhaps at that moment have deterred them. The kite was brought, and flown ſo directly over the pillar, that when it fell on the other ſide, the ſtring lodged upon the capital. The chief obſtacle was now overcome. A two-inch rope was tied to one end of the ſtring, and drawn over the pillar by the end to which the kite was affixed. By this rope one of the ſeamen aſcended to the top; and in leſs than an hour a kind of ſhroud was conſtructed, by which the whole company went up, and drank their punch amid the ſhouts of the aſtoniſhed multitude. To the eye below, the capital of the pillar does not appear capable of holding more than one man upon it; but our ſeamen found it could contain no leſs than eight perſons very conveniently. It is aſtoniſhing that no accident befel theſe madcaps, in a ſituation ſo elevated, that would have turned a landman giddy in his ſober ſenſes. The only detriment which the pillar received, was the loſs of the volute before mentioned; which came down with a thundering ſound, and was carried to England by one of the captains, as a preſent to a lady who commiſſioned him for a piece of the pillar. The diſcovery which they made amply compenſated for this miſchief; as without their evidence, the world would not have known at this hour that there was originally a ſtatue on this pillar, one foot and ancle of which are ſtill remaining. The ſtatue muſt have been of a gigantic ſize; to have appeared of a man's proportion at ſo great a height.

There are circumſtances in this ſtory which might give it an air of fiction, were it not demonſtrated beyond all doubt. Beſides the teſtimonies of many eye-witneſſes, the adventurers themſelves have left us a token of the fact, by the initials of their names, which are very legible in black paint juſt beneath the capital.

Learned men and travellers have made many fruitleſs attempts to diſcover in honour of what prince it was erected. The beſt informed have concluded, that it could not be in honour of Pompey, ſince neither Strabo nor Diodorus Siculus have ſpoken of it. The Arabian Abulfeda, in his Deſcription of Egypt, calls it *the Pillar of Severus*. And hiſtory informs us *, that this emperor "viſited the city of Alexandria: That he granted a ſenate to its inhabitants, who until that time, under the ſubjection of a ſingle Roman magiſtrate, had lived without any national council, as under the reign of the Ptolemies, when the will of the prince was their only law: That he did not confine his benefactions there; he changed ſeveral laws in their favour." This column, therefore, Mr Savary concludes to have been erected by the inhabitants as a mark of their gratitude to Severus. And in a Greek inſcription, now half effaced, but viſible on the weſt ſide when the ſun ſhines upon it, and which probably was legible in the time of Abulfeda, he ſuppoſes the name of Severus to have been preſerved. He further obſerves, that this was not the only monument erected to him by the gratitude of the Alexandrians: for there is ſtill ſeen in the midſt of the ruins of Antinoe, built by Adrian, a magnificent pillar, the inſcription on which is ſtill remaining, dedicated to Alexander Severus. Alexandria.

Denon, whom we have already quoted, ſeems to be of a different opinion. "We paſſed (ſays he) near Pompey's pillar. This monument is in the predicament of almoſt every thing famous, which loſes on a near ſcrutiny. It was named Pompey's pillar in the fifteenth century, when learning began to recover itſelf from the torpid ſtate in which it had ſo long languiſhed. At that epoch, men of ſcience, but not obſervers, beſtowed names on all the monuments; and theſe names have been handed down by tradition, and without being diſputed, from century to century. A monument had been raiſed to Pompey at Alexandria: it had diſappeared, and was thought to be recovered in this pillar or column, which has ſince been converted into a trophy erected to the memory of Septimius Severus. It is, however, placed on the ruins of the ancient city; and in the time of Septimius Severus, the city of the Ptolemies was not in a ruinous ſtate. To ſupport this column by a ſolid foundation, an obeliſk has been ſunk in the earth, on which is placed a very clumſy pedeſtal, having a fine ſhaft, and ſurmounted by a Corinthian capital of bad workmanſhip.

"If the ſhaft of this column, ſeparating it from the pedeſtal and the capital, once belonged to an ancient edifice, it is an evidence of its magnificence, and of the ſkill with which it was executed. It ought therefore to be ſaid, that what is called Pompey's pillar, is a fine column, and not a fine monument. It ſhould be ſaid, that the column of St Maria Maggiore, notwithſtanding it is one of the fineſt in exiſtence, has not the character of a monument; that it is merely a fragment; and that, if the columns of Trajan and Antoninus are not in the ſame predicament, it is becauſe they appear as coloſſal cylinders, on which the hiſtory of the glorious expeditions of theſe two emperors is pompouſly diſplayed, and which, if reduced to their ſimple form and dimenſions, would be nothing more than dull and heavy monuments.

"The earth about the foundations of Pompey's pillar having been cleared away by time, two fragments of an obeliſk of white marble, the only monument of that ſubſtance which I have ſeen in Egypt, have been added to the original baſe, to render it more ſolid.

"Excavations made round the circumference of this column, would, no doubt, afford ſome information relative to its origin. The ſhaking of the earth, and the form it takes on treading on it, ſeem to atteſt that theſe reſearches would not be fruitleſs. They would perhaps diſcover the baſe and *atrium* of the portico to which this column belonged, which has been the ſubject of diſſertations made by literati who have ſeen the drawings only, or whoſe information has been limited to the deſcriptions of travellers. Theſe travellers have neglected to apprize them, that fragments of columns of the ſame ſubſtance and diameter are found in the vicinity; and that the ſhaking of the earth indicates the deſtruction of great edifices buried beneath, the forms of which

* Vide Spartian's life of Severus, cap. 17.

Alexandria. which may be diſtinguiſhed on the ſurface, ſuch as a ſquare of a conſiderable ſize, and a large circus, the principal dimenſions of which may be meaſured, notwithſtanding it is covered with ſand and ruins.

" After having obſerved that the column, entitled *Pompey's pillar*, is very chaſte both in ſtyle and execution; that the pedeſtal and capital are not formed of the ſame granite as the ſhaft; that their workmanſhip is heavy, and appears to be merely a rough draught; and that the foundations, made up of fragments, indicate a modern conſtruction; it may be concluded, that this monument is not antique, and that it may have been erected either in the time of the Greek emperors, or of the caliphs; ſince, if the capital and pedeſtal are well enough wrought to belong to the former of theſe periods, they are not ſo perfect but that art may have reached ſo far in the latter." (*Denon's Travels.*)

On the ſouth-weſt ſide of the city, at a mile's diſtance, are ſituated the catacombs, the ancient burial-place of Alexandria; and although they cannot be compared to thoſe of the ancient Memphis, which the Arabs will not permit to be viſited, in order to make the better market of their mummies, it is probable that, the method of embalming being the ſame, the form of theſe catacombs can only differ in their proportions. The Baron de Tott, in deſcribing theſe, obſerves, " that Nature not having furniſhed this part of Egypt with a ridge of rocks, like that which runs parallel with the Nile above Delta, the ancient inhabitants of Alexandria could only have an imitation by digging into a bed of ſolid rock; and thus they formed *Necropolis*, or " City of the Dead." The excavation is from 30 to 40 feet wide, and 200 long, and 25 deep, and is terminated by gentle declivities at each end. The two ſides, cut perpendicularly, contain ſeveral openings, about 10 or 12 feet in width and height, hollowed horizontally; and which form, by their different branches, ſubterranean ſtreets. One of theſe, which curioſity has diſencumbered from the ruins and ſands that render the entrance of others difficult or impoſſible, contains no mummies, but only the places they occupied. The order in which they were ranged is ſtill to be ſeen. Niches, 20 inches ſquare, ſunk ſix feet horizontally, narrowed at the bottom, and ſeparated from each other by partitions in the rock, ſeven or eight inches thick, divided into checkers the two walls of this ſubterranean vault. It is natural to ſuppoſe, from this diſpoſition that each mummy was introduced with the feet foremoſt into the cell intended for its reception; and that new ſtreets were opened, in proportion as theſe dead inhabitants of Necropolis increaſed." This obſervation, he adds, which throws a light on the catacombs of Memphis, may perhaps likewiſe explain the vaſt ſize and multitude, as well as the different elevations, of the pyramids in the Higher and Lower Egypt.

About 70 paces from Pompey's pillar is the khalis or the canal of the Nile, which was dug by the ancient Egyptians, to convey the water of the Nile to Alexandria, and fill the ciſterns under the city. On the ſide of the khalis are gardens full of orange and lemon trees, and the fields are full of caper and palm trees. On the top of a hill is a tower, on which a ſentinel is always placed, to give notice, by means of a flag, of the ſhips that are coming into the port. From this hill may be ſeen the ſea, the whole extent of the city, and the parts round it. Alexandri

In going along the ſea coaſt, there is a large baſon cut out of the rock that lines the ſhore. On the ſides of this baſon, two beautiful ſaloons are hewn out by the chiſel, with benches that run acroſs them. A canal made zig-zag, for the purpoſe of ſtopping the ſand by its different windings, conveys into them the water of the ſea, as pure and tranſparent as cryſtal. Seated on the ſtone-bench, the water riſes a little above the waiſt; while the feet ſoftly repoſe on a fine ſand. The waves of the ſea are heard roaring againſt the rock, and foaming in the canal. The ſwell enters, raiſes you up, and leaves you; and thus alternately entering and retiring, brings a continual freſh ſupply of water, and a coolneſs which is truly delicious under a burning ſky. This place is vulgarly called the *Bath of Cleopatra*. Some ruins announce that it was formerly ornamented.

In 1798 Alexandria was taken by the French under the command of Bonaparte. It fell into the hands of the Britiſh army in the year 1801; but by an article in the treaty of peace, dictated probably by mutual jealouſy, it is to be reſtored to the Ottoman Porte, and again ſubjected to the barbarous policy of the Turkiſh government.

Alexandria is about 50 leagues north of Cairo. E. Long. 31. 15. N. Lat. 31. 12.

ALEXANDRIA, a ſtrong and conſiderable city of Italy belonging to the duchy of Milan, with a good caſtle, built in 1178 in honour of Pope Alexander III. This pope made it a biſhopric, with ſeveral privileges and exemptions. Prince Eugene of Savoy took this city in 1706, after three days ſiege. The French took it in 1745; but the king of Sardinia, to whom it belongs by the treaty of Utrecht, retook it in 1746. The fortifications of the town are trifling, but the citadel is conſiderable. It is 15 miles ſouth-eaſt of Caſſal, 35 north-by-weſt of Genoa, and 40 ſouth-by-weſt of Milan. E. Long. 8. 40. N. Lat. 44. 53. The country about this town is called the *Alexandrin*.

ALEXANDRIA, in *Ancient Geography*, a city of Arachoſia, called alſo *Alexandropolis*, on the river Arachotus (Stephanus, Iſidorus Characenus).—Another *Alexandria* in Gedroſia, built by Leonatus, by order of Alexander (Pliny).—A third *Alexandria* in Aria, ſituated at the lake Arias (Ptolemy); but, according to Pliny, built by Alexander on the river Arius.—A fourth in Bactriana (Pliny).—A fifth *Alexandria*, an inland town of Carmania (Pliny, Ptolemy, Ammian).—A ſixth *Alexandria*, or *Alexandropolis*, in Sogdiana (Iſidorus Characenus).—A ſeventh in India, at the confluence of the Aceſines and Indus (Arrian).—An eighth, called alſo *Alexandretta*, near the Sinus Iſſicus, on the confines of Syria and Cilicia, now *Scanderoon* (ſee ALEXANDRETTA), the port town to Aleppo.—A ninth *Alexandria* of Margiana, which being demoliſhed by the barbarians, was rebuilt by Antiochus the ſon of Seleucus, and called *Antiochia* of Syria (Pliny); watered by the river Margus, which is divided into ſeveral channels, for the purpoſe of watering the country which was called *Zotale*. The city was ſeventy ſtadia in circuit, according to Pliny; who adds, that, after the defeat of Craſſus, the captives were conveyed to this place by Orodes, the king of

the

Alexandrian, Alexicacus.

the Parthians.—A tenth, of the Oxiana, built on the Oxus by Alexander, on the confines of Bactria (Pliny).—An eleventh, built by Alexander at the foot of Mount Paropamiſus, which was called *Caucaſus* (Plinny, Arrian.)—A twelfth *Alexandria* in Troas, called alſo *Troas* and *Antigonia* (Pliny).—A thirteenth on the Iaxartes, the boundary of Alexander's victories towards Scythia, and the laſt that he built on that ſide.

ALEXANDRIAN, in a particular ſenſe, is applied to all thoſe who profeſſed or taught the ſciences in the ſchool of Alexandria. In this ſenſe, Clemens is denominated *Alexandrinus*, though born at Athens. The ſame may be ſaid of Apion, who was born at Oaſis; and Ariſtarchus, by birth a Samothracian. The chief Alexandrian philoſophers were, Amonius, Plotinus, Origen, Porphyry, Jamblicus, Sopater, Maximus, and Dexippus.

ALEXANDRIAN is more particularly underſtood of a college of prieſts, conſecrated to the ſervice of Alexander Severus after his deification. Lampridius relates, that, notwithſtanding Severus was killed by Maximin, the ſenate proſecuted his apotheoſis; and, for regularity of worſhip, founded an order of prieſts, or *ſodales*, under the denomination of *Alexandrini*.

ALEXANDRIAN Manuſcript, a famous copy of the Scriptures, conſiſting of four volumes, in a large quarto ſize; which contains the whole Bible in Greek, including the Old and New Teſtament, with the Apocrypha, and ſome ſmaller pieces, but not quite complete. This manuſcript is now preſerved in the Britiſh Muſeum. It was ſent as a preſent to King Charles I. from Cyrillus Lucaris, patriarch of Conſtantinople, by Sir Thomas Rowe, ambaſſador from England to the Grand Signior, about the year 1628. Cyrillus brought it with him from Alexandria, where probably it was written. In a ſchedule annexed to it, he gives this account: That it was written, as tradition informed them, by Thecla, a noble Egyptian lady, about 1300 years ago, not long after the council of Nice. But this high antiquity, and the authority of the tradition to which the patriarch refers, have been diſputed; nor are the moſt accurate Biblical writers agreed about its age. Grabe thinks that it might have been written before the end of the fourth century; others are of opinion, that it was not written till near the end of the fifth century, or ſomewhat later.

ALEXANDRIAN, or *Alexandrine*, in *Poetry*, a kind of verſe conſiſting of twelve, or of twelve and thirteen ſyllables alternately; ſo called from a poem on the life of Alexander written in this kind of verſe by ſome French poet. Alexandrines are peculiar to modern poetry, and ſeem well adapted to epic poems. They are ſometimes uſed by moſt nations of Europe; but chiefly by the French, whoſe tragedies are generally compoſed of Alexandrines.

ALEXICACUS, ſomething that preſerves the body from harm or miſchief. The word amounts to much the ſame as *alexiterial*.

ALEXICACUS, in antiquity, was an attribute of Neptune, whom the tunny-fiſhers uſed to invoke under this appellation, that their nets might be preſerved from the ξιφίας, or ſword-fiſh, which uſed to tear them; and that he might prevent the aſſiſtance which it was pretended the dolphins uſed to give the tunnies on this occaſion.

ALEXIPHARMICS, in *Medicine*, are properly remedies for expelling or preventing the ill effects of poiſon: but ſome of the moderns having imagined that the animal ſpirits in acute diſtempers were affected by a malignant poiſon, the term has been underſtood to mean medicines adapted to expel this poiſon by the cutaneous pores, in the form of ſweat. In this ſenſe, alexipharmics are the ſame as ſudorifics.

Alexipharmics || Alfet.

ALEXIS, a Piedmonteſe. There is a book of "Secrets," which for a long time has gone under his name. It was printed at Baſil 1536, in 8vo, and tranſlated from Italian into Latin by Wecher; it has alſo been tranſlated into French, and printed ſeveral times with additions. There is a preface to the piece, wherein Alexis informs us, that he was born of a noble family; that he had from his moſt early years applied himſelf to ſtudy; that he had learned the Greek, the Latin, the Hebrew, the Chaldean, the Arabian, and ſeveral other languages; that having an extreme curioſity to be acquainted with the ſecrets of nature, he had collected as much as he could during his travels for 57 years; that he picqued himſelf upon not communicating his ſecrets to any perſon; but that when he was 82 years of age, having ſeen a poor man who had died of a ſickneſs which might have been cured had he communicated his ſecret to the ſurgeon who took care of him, he was touched with ſuch a remorſe of conſcience, that he lived almoſt like a hermit: and it was in this ſolitude that he arranged his ſecrets in ſuch order as to make them fit to be publiſhed. The hawkers generally carry them, with other books, to the country fairs. Theſe, however, contain only the ſelect remedies of Seignior Alexis of Piedmont; the entire collection would make too large a volume for them.

ALEXITERIAL, among phyſicians, a term of much the ſame import with *alexipharmic;* though ſometimes uſed in a ſynonymous ſenſe with amulet.

ALEYN, CHARLES, an Engliſh poet in the reign of Charles I. In 1631, he publiſhed two poems, entitled, "The Battailes of Creſſey and Poictiers, under the fortunes and valour of King Edward of that name, and his ſonne Edward prince of Wales, named *the Black*." He ſucceeded his father as clerk of the ordnance, and was commiſſary-general of the artillery to the king at the battle of Edgehill. The next piece he wrote was a poem in honour of Henry VII. and the victory that gained him the crown of England. In 1639, the year before he died, he tranſlated the hiſtory of Eurialis and Lucretia, from the Latin epiſtles of Æneas Sylvius.

ALFANDIGA, the name of the cuſtomhouſe at Liſbon.

ALFAQUES, among the Moors, the name generally uſed for their clergy, or thoſe who teach the Mahometan religion; in oppoſition to the Morabites, who anſwer to monks among Chriſtians.

ALFATERNA, in *Ancient Geography*, the laſt town of Campania, beyond Veſuvius (Diodorus); the ſame with NOCERA, which ſee. The inhabitants *Alfaterni* (Pliny).

ALFDOUCH, a name given by the Moors to a ſort of vermicelli, which they make of flour and water, and are very fond of in their entertainments.

ALFET, in our old cuſtoms, denotes a caldron full.

Alford, Alfied.

full of boiling water, wherein an accuſed perſon, by way of trial or purgation, plunged his arm up to the elbow.

ALFORD, a town of Lincolnſhire, ſituated on a ſmall brook that runs through the town. A ſalt ſpring was diſcovered here in 1670, from the pigeons which flew thither in great numbers to drink the water; thoſe birds being known to be fond of ſalt. It contains a ſtrong purging ſalt, together with a portion of ſea-ſalt. It is recommended as cooling, cleanſing, and attenuating, as a good remedy in the ſcurvy, jaundice, and other glandular obſtructions. It alſo promotes urine and ſweat, and therefore is good in gravelly and other diſorders of the kidneys and bladder. Alford is ſix miles from the ſea, and 20 north of Boſton. E. Long. 0. 15. N. Lat. 53. 30.

ALFRED, or ÆLFRED, the Great, king of England, was the fifth and youngeſt ſon of Æthelwolf king of the Weſt Saxons, and was born at Wantage in Berkſhire in 849. He diſtinguiſhed himſelf, during the reign of his brother Ethelred, in ſeveral engagements againſt the Danes; and upon his death ſucceeded to the crown, in the year 871, and the 22d of his age. At his aſcending the throne, he found himſelf involved in a dangerous war with the Danes, and placed in ſuch circumſtances of diſtreſs as called for the greateſt valour, reſolution, and all the other virtues with which he was adorned. The Danes had already penetrated into the heart of his kingdom; and before he had been a month upon the throne, he was obliged to take the field againſt thoſe formidable enemies. After many battles gained on both ſides, he was at length reduced to the greateſt diſtreſs, and was entirely abandoned by his ſubjects. In this ſituation, Alfred, conceiving himſelf no longer a king, laid aſide all marks of royalty, and took ſhelter in the houſe of one who kept his cattle. He retired afterwards to the iſle of Æthelingey in Somerſetſhire, where he built a fort for the ſecurity of himſelf, his family, and the few faithful ſervants who repaired thither to him. When he had been about a year in this retreat, having been informed that ſome of his ſubjects had routed a great army of the Danes, killed their chief, and taken their magical ſtandard (A), he iſſued his letters, giving notice where he was, and inviting his nobility to come and conſult with him. Before they came to a final determination, Alfred, putting on the habit of a harper, went into the enemy's camp, where, without ſuſpicion, he was everywhere admitted, and had the honour to play before their princes. Having thereby acquired an exact knowledge of their ſituation, he returned in great ſecrecy to his nobility, whom he ordered to their reſpective homes, there to draw together each man as great a force as he could: and upon a day appointed there was to be a general rendezvous at the great wood called *Selwood*, in Wiltſhire. This affair was tranſacted ſo ſecretly and expeditiouſly, that, in a little time, the king, at the head of an army, approached the Danes, before they had the leaſt intelligence of his deſign. Alfred, taking advantage of the ſurpriſe and terror they were in, fell upon them, and totally defeated them at Æthendune, now Eddington. Thoſe who eſcaped fled to a neighbouring caſtle, where they were ſoon beſieged, and obliged to ſurrender at diſcretion. Alfred granted them better terms than they could expect. He agreed to give up the whole kingdom of the Eaſt-Angles to ſuch as would embrace the Chriſtian religion, on condition they would oblige the reſt of their countrymen to quit the iſland, and, as much as it was in their power, prevent the landing of any more foreigners. For the performance thereof he took hoſtages; and when, in purſuance of the treaty, Guthrum the Daniſh captain came, with 30 of his chief officers, to be baptized, Alfred anſwered for him at the font, and gave him the name of *Æthelſtane;* and certain laws were drawn up betwixt the king and Guthrum for the regulation and government of the Danes ſettled in England. In 884, a freſh number of Danes landed in Kent, and laid ſiege to Rocheſter, but the king coming to the relief of that city, they were obliged to abandon their deſign. Alfred had now great ſucceſs; which was chiefly owing to his fleet, an advantage of his own creating. Having ſecured the ſea-coaſts, he fortified the reſt of the kingdom with caſtles and walled towns; and he beſieged and recovered from the Danes the city of London, which he reſolved to repair, and to keep as a frontier (B).

Alfred.

After ſome years reſpite, Alfred was again called into the field: for a body of Danes, being worſted in the weſt of France, came with a fleet of 250 ſail on the coaſt of Kent; and having landed, fixed themſelves at Apple-tree: ſhortly after, another fleet of 80 veſſels coming up the Thames, the men landed, and built a fort at Middleton. Before Alfred marched againſt the enemy,

(A) "This (ſays Sir John Spelman) was a banner, with the image of a raven magically wrought by the three ſiſters of Hinguar and Hubba, on purpoſe for their expedition, in revenge of their father Lodebroch's murder, made, they ſay, almoſt in an inſtant, being by them at once begun and finiſhed in a noontide, and believed by the Danes to have carried great fatality with it, for which it was highly eſteemed by them. It is pretended, that, being carried in battle, towards good ſucceſs it would always ſeem to clap its wings, and make as if it would fly; but towards the approach of miſhap, it would hang down and not move." (*Life of Alfred*, p. 61.)

(B) The Danes had poſſeſſed themſelves of London in the time of his father; and had held it till now as a convenient place for them to land at, and fortify themſelves in; neither was it taken from them but by a cloſe ſiege. However, when it came into the king's hands, it was in a miſerable condition, ſcarce habitable, and all its fortifications ruined. The king, moved by the importance of the place, and the deſire of ſtrengthening his frontier againſt the Danes, reſtored it to its ancient ſplendour. And obſerving, that through the confuſion of the times, many, both Saxons and Danes, lived in a looſe diſorderly manner, without owning any government, he offered them now a comfortable eſtabliſhment, if they would ſubmit and become his ſubjects. This propoſition was better received than he expected, for multitudes growing weary of a vagabond kind of life, joyfully accepted ſuch an offer. (*Chron. Sax.* p. 88.)

Alfred. enemy, he obliged the Danes, ſettled in Northumberland and Eſſex, to give him hoſtages for their good behaviour. He then moved towards the invaders, and pitched his camp between their armies, to prevent their junction. A great body, however, moved off to Eſſex; and croſſing the river, came to Farnham in Surry, where they were defeated by the king's forces. Mean while the Danes ſettled in Northumberland, in breach of treaty, and, notwithſtanding the hoſtages given, equipped two fleets; and, after plundering the northern and ſouthern coaſts, ſailed to Exeter, and beſieged it. The king, as ſoon as he received intelligence, marched againſt them; but before he reached Exeter, they had got poſſeſſion of it. He kept them, however, blocked up on all ſides; and reduced them at laſt to ſuch extremities, that they were obliged to eat their horſes, and were even ready to devour each other. Being at length rendered deſperate, they made a general ſally on the beſiegers; but were defeated, though with great loſs on the king's ſide. The remainder of this body of Danes fled into Eſſex, to the fort they had built there, and to their ſhips. Before Alfred had time to recruit himſelf, another Daniſh leader, whoſe name was Laf, came with a great army out of Northumberland, and deſtroyed all before him, marching on to the city of Werheal in the weſt, which is ſuppoſed to be Cheſter, where they remained the reſt of that year. The year following they invaded North Wales; and after having plundered and deſtroyed every thing, they divided, one body returning to Northumberland, another into the territories of the Eaſt Angles; from whence they proceeded to Eſſex, and took poſſeſſion of a ſmall iſland called *Mereſig*. Here they did not long remain; for having ſeparated, ſome ſailed up the river Thames, and others up the Lea-road; where drawing up their ſhips, they built a fort not far from London, which proved a great check upon the citizens, who went in a body and attacked it, but were repulſed with great loſs: at harveſt time the king himſelf was obliged to encamp with a body of troops in the neighbourhood of the city, in order to cover the reapers from the excurſions of the Danes. As he was one day riding by the ſide of the river Lea, after ſome obſervations he began to think that the Daniſh ſhips might be laid quite dry: this he attempted, and ſucceeded; ſo that the Danes deſerted their fort and ſhips, and marched away to the banks of the Severn, where they built a fort, and wintered at a place called *Quatbrig* (c). Such of the Daniſh ſhips as could be got off, the Londoners carried into their own road; the reſt they burnt and deſtroyed.

Alfred enjoyed a profound peace during the three laſt years of his reign, which he chiefly employed in eſtabliſhing and regulating his government, for the ſecurity of himſelf and his ſucceſſors, as well as the eaſe and benefit of his ſubjects in general. After a troubleſome reign of 28 years, he died on the 28th of October A. D. 900; and was buried at Wincheſter, in Hyde-abbey, under a monument of porphyry. Alfred

All our hiſtorians agree in diſtinguiſhing him as one of the moſt valiant, wiſeſt, and beſt of kings that ever reigned in England; and it is alſo generally allowed, that he not only digeſted ſeveral particular laws ſtill in being, but that he laid the firſt foundation of our preſent happy conſtitution. There is great reaſon to believe that we are indebted to this prince for trials by juries; and the Doomſday book, which is preſerved in the exchequer, is thought to be no more than another edition of Alfred's book of Wincheſter, which contained a ſurvey of the kingdom. It is ſaid alſo, that he was the firſt who divided the kingdom into ſhires. What is aſcribed to him is not a bare diviſion of the country, but the ſettling a new form of judicature; for after having divided his dominions into ſhires, he ſubdivided each ſhire into three parts, called *trythings*. There are ſome remains of this ancient diviſion in the ridings of Yorkſhire, the laths of Kent, and the three parts of Lincolnſhire. Each trything was divided into hundreds or wapentakes; and theſe again into tythings or dwellings of ten houſeholders: each of theſe houſeholders ſtood engaged to the king, as a pledge for the good behaviour of his family, and all the ten were mutually pledges for each other; ſo that if any one of the tythings was ſuſpected of an offence, if the head-boroughs or chiefs of the tythings would not be ſecurity for him, he was impriſoned; and, if he made his eſcape, the tything and hundred were fined to the king. Each ſhire was under the government of an earl, under whom was the reive, his deputy; ſince, from his office, called *ſhire-reive*, or *ſheriff*. And ſo effectual were theſe regulations, that it is ſaid he cauſed bracelets of gold to be hung up in the highways, as a challenge to robbers; and they remained untouched.

In private life, Alfred was the moſt amiable man in his dominions; of ſo equal a temper, that he never ſuffered either ſadneſs or unbecoming gaiety to enter his mind; but appeared always of a calm yet cheerful diſpoſition, familiar to his friends, juſt even to his enemies, kind and tender to all. He was a remarkable economiſt of his time; and Aſſerius has given us an account of the method he took for dividing and keeping an account of it: he cauſed ſix wax-candles to be made, each of 12 inches long, and of as many ounces weight; on the candles the inches were regularly marked, and having found that one of them burnt juſt four hours, he committed them to the care of the keepers of his chapel, who from time to time gave him notice how the hours went: but as in windy weather the candles were waſted by the impreſſion of the air on the flame, to remedy this inconvenience, he invented lanthorns, there being then no glaſs in his dominions.

This prince, we are told, was 12 years of age before a maſter could be procured in the weſtern kingdom

(c) The king's contrivance is thought to have produced the meadow between Hertford and Bow: for at Hertford was the Daniſh fort, and from thence they made frequent excurſions on the inhabitants of London. Authors are not agreed as to the method the king purſued in laying dry the Daniſh ſhips: Dugdale ſuppoſes that he did it by ſtraightening the channels; but Henry of Huntingdon alleges, that he cut ſeveral canals, which exhauſted its water

Alfred. to teach him the alphabet; such was the state of learning when Alfred began to reign. He had felt the misery of ignorance; and determined even to rival his cotemporary Charlemagne in the encouragement of literature. He is supposed to have appointed persons to read lectures at Oxford, and is thence considered as the founder of that university. By other proper establishments, and by a general encouragement to men of abilities, he did every thing in his power to diffuse knowledge throughout his dominions. Nor was this end promoted more by his countenance and encouragement than by his own example and his writings. For notwithstanding the lateness of his initiation, he had acquired extraordinary erudition; and, had he not been illustrious as a king, he would have been famous as an author. His works are, 1. *Breviarium quoddam collectum ex Legibus Trojanorum*, &c. lib. i. A Breviary collected out of the laws of the Trojans, Greeks, Britons, Saxons, and Danes, in one book. Leland saw this book in the Saxon tongue, at Christ church in Hampshire. 2. *Visi-Saxonum Leges*, lib. i. The laws of the West-Saxons, in one book. Pitts tells us, that it is in Bennet College library, at Cambridge. 3. *Instituta quædam*, lib. i. Certain Institutes, in one book. This is mentioned by Pitts, and seems to be the second capitulation with Guthrum. 4. *Contra Judices iniquos*, lib. i. An invective against Unjust Judges, in one book. 5. *Acta Magistratuum suorum*, lib. i. Acts of his Magistrates, in one book. This is supposed to be the Book of Judgments mentioned by Horne; and was, in all probability, a kind of reports, intended for the use of succeeding ages. 6. *Regum fortunæ variæ*, lib. i. The various Fortunes of Kings, in one book. 7. *Dicta Sapientum*, lib. i. The sayings of Wise Men, in one book. 8. *Parabolæ et Sales*, lib. i. Parables and pleasant Sayings, in one book. 9. *Collectiones Chronicorum*, Collection of Chronicles. 10. *Epistolæ ad Wulfsigium Episcopum*, lib. i. Epistles to Bishop Wulfsig, in one book. 11. *Manuale Meditationum*. A Manual of Meditations.—Besides those original works, he translated many authors from the Latin, &c. into the Saxon language, viz. 1. Bede's History of England. 2. Paulinus Orosinus's History of the Pagans. 3. St Gregory's Pastoral, &c. The first of these, with his prefaces to the others, together with his laws, were printed at Cambridge, 1644. His laws are likewise inserted in Spelman's Councils. 4. *Boethius de Consolatione*, lib. v. Boetius's Consolations of Philosophy, in five books. Dr Plot tells us, King Alfred translated it at Woodstock, as he found in a MS. in the Cotton Library. 5. *Æsopi Fabulæ*, Æsop's Fables: which he is said to have translated from the Greek both into Latin and Saxon. 6. *Psalterium Davidicum*, lib. i. David's Psalter, in one book. This was the last work the king attempted, death surprising him before he had finished it; it was, however, completed by another hand, and published at London in 1640, in quarto, by Sir John Spelman. Several others are mentioned by Malmsbury; and the old history of Ely asserts, that he translated the Old and New Testaments.

The life of this great king was first written by Asserius Menevensis; and first published by Archbishop Parker, in the old Saxon character, at the end of his edition of Hassingham's history, printed in 1674, fol. Alga || Algarva.

ALGA, in *Botany*, the trivial name of the lichen, fucus, and several other plants of the cryptogamia class.

ALGÆ, FLAGS; one of the seven families or natural tribes into which the whole vegetable kingdom is divided by Linnæus, in his *Philosophia Botanica*. They are defined to be plants, whose root, leaf, and stem, are all one. Under this description are comprehended all the sea-weeds, and some other aquatic plants. In the sexual system, they constitute the 3d order of the 24th class, *Cryptogamia*; in Tournefort, the second genus of the second section, *Marinæ, aut Fluviatiles*, of the 17th class, *Aspermæ vulgo habitæ*; and the 57th order in Linnæus's Fragments of a Natural Method. The discoveries made in this part of the vegetable kingdom are uncertain, and imperfect; and the attempts, in particular, to arrange flags by the parts of the fructification, have not been attended with great success. Dillenius has arranged this order of plants from their general habit and structure; Michelius from the parts of fructification.

ALGAGIOLA, a small sea-port town in the island of Corsica, fortified with walls and bastions. It was almost destroyed by the malecontents in 1731, but has since been repaired. E. Long. 9. 45. N. Lat. 42. 20.

ALGAROTH, in *Chemistry*, is a white oxyde of antimony, which is obtained by washing the butter or oxymuriate with pure water. See CHEMISTRY *Index*.

ALGAROTTI, COUNT, a celebrated Italian, was born at Padua; but the year is not mentioned. Led by curiosity, as well as a desire of improvement, he travelled early into foreign countries; and was very young when he arrived in France in 1736. Here he composed his "Newtonian Philosophy for the Ladies;" as Fontenelle had done his Cartesian Astronomy, in the work entitled "The Plurality of worlds." He was noticed by the king of Prussia, who gave him marks of the esteem he had for him. He died at Pisa the 23d of May, 1674; and ordered his own mausoleum, with this inscription to be fixed upon it: "*Hic jacet Algarottus, sed non omnis.*" He is allowed to have been a very great connoisseur in painting, sculpture, and architecture. He contributed much to the reformation of the Italian opera. His works, which are numerous, and upon a variety of subjects, abound with vivacity, elegance, and wit: a collection of them has lately been made, and printed at Leghorn in 1765, in 4 vols. 8vo.

ALGARVA, a province in the kingdom of Portugal, 67 miles in length and 20 in breadth; bounded on the west and south by the sea, on the east by the river Guadiana, and on the north by Alentejo. It is very fertile in figs, almonds, dates, olives, and excellent wines; and, besides, has a very abundant and lucrative fishery. The capital town is Pharo. It contains four cities, 12 towns, 67 parishes, and it is said, above 90,000 inhabitants.

ALGEBRA.

INTRODUCTION.

History. 1. ALGEBRA is a general method of reaſoning, concerning the relations which magnitudes of every kind bear to each other in reſpect of quantity. It is ſometimes called *univerſal arithmetic*; its firſt principles and operations being ſimilar to thoſe of common arithmetic. The ſymbols which it employs to denote magnitudes are, however, more general and more extenſive in their application than thoſe employed in that ſcience; hence, and from the great facility with which the various relations of magnitudes to one another may be expreſſed, by means of a few ſigns or characters, the application of algebra to the reſolution of problems is much more extenſive than that of common arithmetic.

2. There are various opinions as to the etymology of the name *algebra*. It is pretty certain, however, that the word is Arabic, and that from the Arabians the name, as well as the art itſelf, is derived. Lucas de Burgo, the firſt European author whoſe treatiſe on algebra was printed, calls it by the Arabic name *Alghebra e Almucabala*, which is explained to denote the art of *reſtitution* and *compariſon*, or *oppoſition* and *compariſon*, or *reſolution* and *equation*, all which agree well enough with the nature of this art. Beſides this etymology of the name *algebra*, ſeveral others have been imagined; that, however, which we have juſt now given ſeems to be the moſt probable of any hitherto aſſigned.

3. The origin of algebra, as well as that of moſt other branches of mathematical ſcience, is involved in obſcurity; there are indeed traces of it to be found in the works of ſome of the earlieſt philoſophers and mathematicians, the ſubject of whoſe writings muſt neceſſarily have led them to the diſcovery, and, in ſome meaſure, to the application of this ſcience.

4. The oldeſt treatiſe of algebra, which has come down to the preſent times, was written by Diophantus of Alexandria, who flouriſhed about the year 350 after Chriſt, and who wrote 13 books on algebra or arithmetic in the Greek language: though only ſix of theſe have hitherto been printed, and one book, which is imperfect, on multangular numbers. It was not, however, from this author, but from the Moors or Arabians, that this, as well as moſt other ſciences, was received in Europe; and ſome writers are of opinion, that they again received it from the Greeks, while others ſuppoſe that they had it from the Perſians; and that theſe laſt derived algebra, as well as the arithmetical method of computing by ten characters or digits, from the Indians.

5. The Arabians themſelves ſay, that it was invented by Mahomet ben Muſa or ſon of Moſes, who it ſeems flouriſhed about the 8th or 9th century. It ſeems more probable that Mahomet was not the inventor, but only a perſon well ſkilled in the art; and that the Arabians received their knowledge of it from Diophantus, or other Greek writers, as they did that of geometry and ſome other ſciences, which they improved and tranſlated into their own language. History.

6. However this may be, it ſeems to be pretty certain, that the ſcience was firſt brought to Europe about the beginning of the 15th century, by Leonardus Piſanus, who travelled into Arabia and other eaſtern countries for the purpoſe of acquiring mathematical knowledge; and, in a ſhort time, it began to be cultivated in Italy, where it was called *l'Arte Magiore*, "the greater art," to diſtinguiſh it from common arithmetic, which was called *l'Arte Minore*, "the leſſer art." It was alſo known in that country by the name *Regola de la Coſa*, or "rule of the thing," where by *Coſa*, or *the thing*, was meant the firſt or ſimple power of the unknown quantity.

7. Between the years 1470 and 1487, Lucas Paciolus or Lucas de Burgo, a Cordelier, or Minorite friar, publiſhed ſeveral treatiſes on arithmetic, algebra, and geometry; and, in 1494, his principal work, entitled *Summa de Arithmetica Proportioni et Proportionalita* was printed. The part of this work which relates to algebra, and which he calls *l'Arte Magiore; ditta dal vulgo la Regola de la Coſa over Alghebra e Almucabala*, may be conſidered as exhibiting a pretty accurate ſtate of the ſcience, as it was then known in Europe; and probably it was much the ſame in Africa and Aſia, from whence the Europeans derived the knowledge of it. It appears from this work, that their knowledge extended no farther than quadratic equations, of which they uſed only the poſitive roots; that they uſed only one unknown quantity; that they uſed no marks nor ſigns for either quantities or operations, excepting a few abbreviations of the words or names themſelves; and that the art was only employed in the reſolution of certain numeral problems. So that either the Africans had not carried algebra beyond quadratic equations; or elſe (what indeed is not improbable) the Europeans had not learned the whole of the art, as it was then known to the former.

8. After the publication of the books of Lucas de Burgo, algebra became more generally known and improved, eſpecially in Italy; for about the year 1505, Scipio Ferreus, who was then profeſſor of mathematics at Bononia, found out a rule for reſolving one caſe of a compound cubic equation; but, as appears to have been the cuſtom of the times with reſpect to ſuch matters, he kept the rule a profound ſecret from his contemporaries. The ſame thing was afterwards diſcovered in 1535 by Nicolas Tartalea, who then reſided in Venice, and who had five years before found the reſolution of two other caſes of cubic equations.

9. The next work upon algebra which was printed after the books of Lucas de Burgo, was written by Hieronymus Cardan, of Bononia, a very learned man, who publiſhed in 1539 his arithmetical writings, in nine books, at Milan, where he practiſed phyſic, and read public lectures on mathematics. The ſame author in 1545 publiſhed a tenth book, containing the whole doctrine of cubic equations, which had been in part communicated to him under an oath of ſecrecy

History. by Tartalea, but which, notwithſtanding this circumſtance, Cardan thought proper to publiſh, alleging (not altogether without reaſon) that he had made ſo many additions to Tartalea's diſcovery as to render it in a manner his own. Accordingly we find, that even to the preſent times, the common rule for reſolving cubic equations is generally known by the name of Cardan's rule, although it would certainly be more juſt to attribute it to its firſt inventor, Tartalea.

10. Equations of the fourth order appear to have been firſt reſolved by Lewis Ferrari, a diſciple of Cardan's; and different methods of reſolution were afterwards given by Deſcartes and others. This indeed is the greateſt length that mathematicians have been able to carry the reſolution of equations; for, with reſpect to thoſe of the fifth, and all higher degrees, all attempts to reſolve them, except in particular caſes, have hitherto been found impracticable.

11. After this period, writers on algebra became more numerous; and many improvements were gradually made, both in the notation and in the theory of the ſcience. Among other writers who cultivated it with ſucceſs may be reckoned Bombelli, another Italian mathematician; Stifelius and Scheubelius, both of Germany; Robert Recorde, an Engliſh mathematician; and many others.

12. Among the mathematicians to whom algebra is particularly indebted, it is proper to mention Francis Vieta, a native of France, who wrote about the year 1600. Among various improvements in all parts of the ſcience, he firſt introduced the general uſe of the letters of the alphabet, to denote indefinite given quantities, which, before his time, had only been done in ſome particular caſes. The Engliſh mathematician, Harriot, deſerves alſo to be particularly mentioned. His algebra, which was publiſhed after his death, in 1631, ſhews that he cultivated that ſcience with great ſucceſs. For, beſides improving the notation, ſo as to render it nearly the ſame as it is at preſent, he firſt explained clearly a moſt important propoſition in the theory of equations, namely, that an equation of any degree may be conſidered as produced by the continual multiplication of as many ſimple equations as there are units in the exponent of the higheſt power of the unknown quantity in that equation: Hence he ſhewed the relation which ſubſiſts between the coefficients of the terms of an equation and its roots.

13. Without mentioning all the writers on algebra who flouriſhed about this time, and who ſeverally contributed more or leſs to its improvement, we proceed to obſerve, that nothing has contributed more to the advancement of every branch of mathematical knowledge than the happy application which the celebrated philoſopher Deſcartes made of algebra to the ſcience of geometry; for his geometry, firſt publiſhed in 1637, may be conſidered rather as the application of algebra to geometry than as either algebra or geometry taken by itſelf as a ſcience. Beſides this happy union effected between the two ſciences, Deſcartes contributed much to the improvement of both; and indeed he may be conſidered as having paved the way for all the diſcoveries which have ſince been made in mathematics.

14. After the publication of Deſcartes's Geometry, the ſcience of algebra may be conſidered as having attained ſome degree of perfection. It has, however, Notation. received many improvements from later writers, who, purſuing the paths ſtruck out by Harriot and Deſcartes, have produced many new and beautiful theories, both in algebra and geometry. The writers upon algebra from this time became too numerous, and the reſpective improvements made by each too minute, to be particularly noticed in this introduction. It is, however, neceſſary to mention another mathematician, to whom algebra lies under conſiderable obligations, namely, M. Fermat, who may be conſidered as the rival of Deſcartes; for it appears that he was in poſſeſſion of the method of applying algebra to the improvement of geometry before the publication of the celebrated work of the latter philoſopher. Beſides, Fermat appears to have been deeply verſed in the theory of indeterminate problems; and he republiſhed the oldeſt and moſt eſteemed treatiſe upon that ſubject which is known, namely, Diophantus's Arithmetic, to which he added many valuable notes of his own.

15. Having now given a brief account of the origin of algebra, and of the writers who contributed the moſt to bring it to the ſtate of perfection it had attained about the middle of the 16th century, which indeed was conſiderable, we ſhall conclude this introduction, by obſerving, that although its progreſs has ſince been very gradual, it has been upon the whole conſiderably improved; particularly by the labours of theſe foreign mathematicians, Schooten, Hudde, Van-Heuraet, De Witte, Sluſius, Huygens, &c. As to the algebraical writers of our own country, thoſe whoſe labours have been moſt conſpicuous were Wallis, and more eſpecially Sir Iſaac Newton, to whom, among other things, we owe the invention of the binomial theorem: alſo Pell, Barrow, Kerſey, Halley, Raphſon, and many others. We now proceed to explain the ſcience itſelf.

Notation and Explanation of the Signs.

16. In arithmetic there are ten characters, which being variouſly combined, according to certain rules, ſerve to denote all magnitudes whatever. But this method of expreſſing quantities, although of the greateſt utility in every branch of the mathematics (for we muſt always have recourſe to it in the different applications of that ſcience to practical purpoſes), is yet found to be inadequate, taken by itſelf, to the more difficult caſes of mathematical inveſtigation; and it is therefore neceſſary, in many inquiries concerning the relations of magnitude, to have recourſe to that more general mode of notation, and more extenſive ſyſtem of operations, which conſtitute the ſcience of algebra.

17. In algebra quantities of every kind may be denoted by any characters whatever, but thoſe commonly uſed are the letters of the alphabet: And as in every mathematical problem, there are certain magnitudes given, in order to determine other magnitudes, which are unknown, the firſt letters of the alphabet, a, b, c, &c. are uſed to denote known quantities, while thoſe to be found are repreſented by v, x, y, &c. the laſt letters of the alphabet.

18. The ſign $+$ (*plus*) denotes that the quantity before which it is placed is to be added to ſome other quantity. Thus $a+b$ denotes the ſum of a and b; $3+5$ denotes the ſum of 3 and 5, or 8.

19. The ſign $-$ (*minus*) ſignifies that the quantity before

Notation. before which it is placed is to be subtracted. Thus $a-b$ denotes the excess of a above b; $6-2$ is the excess of 6 above 2, or 4.

20. Quantities which have the sign + prefixed to them are called *positive* or *affirmative*; and such as have the sign — are called *negative*.

When quantities are considered abstractedly, the terms *positive* and *negative* can only mean that such quantities are to be added or subtracted; for as it is impossible to conceive a number less than 0, it follows, that a negative quantity by itself is unintelligible. But, in considering the affections of magnitude, it appears, that in many cases, a certain opposition may exist in the nature of quantities. Thus, a person's property may be considered as a positive quantity, and his debts as a negative quantity. Again, any portion of a line drawn to the right hand may be considered as positive, while a portion of the same line, continued in the opposite direction, may be taken as negative.

When no sign is prefixed to a quantity, + is always understood, or the quantity is to be considered as positive.

21. Quantities which have the same sign, either + or —, are said to have like signs. Thus $+a$ and $+b$ have like signs, but $+a$ and $-c$ have unlike signs.

22. A quantity which consists of one *term*, is said to be *simple*; but if it consist of several terms, connected by the signs + or —, it is then said to be compound. Thus $+a$ and $-c$ are simple quantities; and $b+c$, also $a+b-d$, are compound quantities.

23. To denote the product arising from the multiplication of quantities; if they be simple, they are either joined together, as if intended to form a word, or else the quantities are connected together, with the sign × interposed between every two of them. Thus ab, or $a \times b$, denotes the product of a and b; also abc, or $a \times b \times c$ denotes the product of a, b, and c; the latter method is used when the quantities to be multiplied are numbers. If some of the quantities to be multiplied be compound, each of them has a line drawn over it called a vinculum, and the sign × is interposed between as before. Thus $a \times \overline{c+d} \times \overline{e-f}$ denotes that a is to be considered as one quantity, the sum of c and d as a second, and the difference between e and f as a third; and that these three quantities are to be multiplied into one another. Instead of placing a line over such compound quantities as enter a product, it is now common among mathematical writers to enclose each of them between two parentheses, so that the last product may be otherwise expressed thus, $a(c+d)(e-f)$, or thus, $a \times (c+d) \times (e-f)$.

24. A number prefixed to a letter is called a *numeral coefficient*, and denotes how often that quantity is to be taken. Thus, $3a$ signifies that a is to be taken three times. When no number is prefixed, the coefficient is understood to be unity.

25. The quotient arising from the division of one quantity by another is expressed by placing the *dividend* above a line, and the *divisor* below it. Thus $\frac{12}{3}$ denotes the quotient arising from the division of 12 by 3, or 4; $\frac{b}{a}$ denotes the quotient arising from the division of b by a. This expression of a quotient is also called a fraction. Addition.

26. The equality of two quantities is expressed by putting the sign = between them. Thus $a+b=c-d$ denotes that the sum of a and b is equal to the excess of c above d.

27. Simple quantities, or the terms of compound quantities, are said to be *like*, which consist of the same letter or letters. Thus $+ab$ and $-5ab$ are like quantities; but $+ab$ and $+abb$ are unlike.

There are some other characters which will be explained when we have occasion to use them; and in what follows we shall suppose that the operations of common arithmetic are sufficiently understood; for algebra, being an extension of that science, ought not to be embarrassed by the demonstration of its elementary rules.

Sect. I. *Fundamental Operations.*

28. The primary operations in algebra are the same as in common arithmetic, namely, addition, subtraction, multiplication, and division; and from the various combinations of these four, all the others are derived.

Problem I. *To Add Quantities.*

29. In addition there may be three cases: the quantities to be added may be like, and have like signs; or, they may be like, and have unlike signs; or, lastly, they may be unlike.

Case 1. To add quantities which are like, and have like signs.

Rule. Add together the coefficients of the quantities, prefix the common sign to the sum, and annex the letter, or letters, common to each term.

Examples.

Add together	$+7a$	Add together	$-2ax$
	$+3a$		$-ax$
	$+a$		$-5ax$
	$+2a$		$-12ax$
Sum,	$+13a$	Sum,	$-20ax$

Case 2. To add quantities which are like, but have unlike signs.

Rule. Add the positive coefficients into one sum, and the negative ones into another; then subtract the least of these sums from the greatest, prefix the sign of the greatest to the remainder, and annex the common letter, or letters, as before.

Examples.

Add together	$+2ax$	Add together	$+6ab+7$
	$-ax$		$-4ab+9$
	$-3ax$		$+ab-5$
	$+9ax$		$+7ab-13$
Sum of the pos.	$+11ax$	Sum of the pos.	$+14ab+16$
Sum of the neg.	$-4ax$	Sum of the neg.	$-4ab-18$
Sum required,	$+7ax$	Sum required,	$+10ab-2$

$aa+$

Subtraction.

$ac+2ax-xx$	$-4aab$
$-2aa+3ax-4xx$	$+aab$
$6aa-5ax+11xx$	$+3aab$
Sum, $5aa \; o \; + \; 6xx$	Sum, o

Caſe 3. To add unlike quantities.

Rule. Put down the quantities, one after another, in any order, with their ſigns and coefficients prefixed.

EXAMPLES.

$2a$	$ax+2ay$
$3b$	$bb-3bz$
$-4c$	
Sum, $2a+3b-4c$	Sum, $ax+2ay+bb-3bz$

PROB. II. *To Subtract Quantities.*

30. *General Rule.* Change the ſigns of the quantities to be ſubtracted, or ſuppoſe them changed, and then add them to the other quantities, agreeably to the rules of addition.

EXAMPLES.

From $5a-12b$	From $6x-8y+3$
Subtract $2a-5b$	Subtract $2x+9y-2$
Remainder $3a-7b$	Remainder $4x-17y+5$
$5xy-2+8x-y$	$aa-ax-yy$
$3xy-8-8x-3y$	$bb-by+zz$
$2xy+6+16x+2y$	$aa-ax-yy-bb+by-zz$

31. The reaſon of the rule for ſubtraction may be explained thus. Let it be required to ſubtract $2p-3q$ from $m+n$. If we ſubtract $2p$ from $m+n$ there will remain $m+n-2p$; but if we are to ſubtract $2p-3q$, which is leſs than $2p$, it is evident that the remainder will be greater by a quantity equal to $3q$; that is, the remainder will be $m+n-2p+3q$; hence the reaſon of the rule is evident.

PROB. III. *To Multiply Quantities.*

32. *General Rule for the Signs.* If the quantities to be multiplied have like ſigns, the ſign of the product is $+$; but if they have unlike ſigns, the ſign of the product is $-$.

33. The examples of multiplication may be referred to two caſes; the firſt is when both the quantities are ſimple; and the ſecond when one or both of them are compound.

Caſe I. To multiply ſimple quantities.

Rule. Find the ſign of the product by the general rule, and annex to it the product of the numeral coefficients; then ſet down all the letters, one after another, as in one word.

EXAMPLES.

Multiply	$+a$	$+5b$	$-3ax$
By	$+c$	$-4a$	$+7ab$
Product	$+ac$	$-20aab$	$-21aabx$

Multiplication.

$$-2ab$$
$$-3cz$$
$$+6abcz$$

Caſe II. To multiply compound quantities.

Rule. Multiply every term of the multiplicand by all the terms of the multiplier, one after another, by the preceding rule, and collect their products into one ſum, which will be the product required.

EXAMPLES.

Multiply $4a-2b+c$ By $3a$

Product $12aa-6ab+3ac$

Multiply $2x+y$ By $x-2y$

$$2xx+xy$$
$$-4xy-2yy$$
$$2xx-3xy-2yy$$

Multiply $aa-ab+bb$ By $a+b$

$$aaa-aab+abb$$
$$+aab-abb+bbb$$
$$aaa \quad * \quad *+bbb$$

Multiply $a-b+c$ By $a+b-c$

$$aa-ab+ac$$
$$+ab \quad -bb+bc$$
$$-ac \quad +bc-cc$$
$$aa \quad * \quad *-bb+2bc-cc.$$

34. The reaſon of the rules for the multiplication of quantities may be explained in the following manner: Let it be required to multiply $a-b$ by $c-d$; becauſe multiplication is a repeated addition of the multiplicand as often as the multiplier contains unity, therefore, $a-b$ is to be taken as often as there are units in $c-d$, and the ſum will be the product required. Now if $a-b$ be taken as often as there are units in c, the reſult will evidently exceed the product required, and that by a quantity equal to $a-b$, taken as often as there are units in d. But, from the nature of addition $a-b$ taken as often as there are units in c, is $ca-cb$, and for the ſame reaſon, $a-b$ taken as often as there are units in d is $da-db$; therefore, to obtain the product required, we muſt ſubtract $da-db$ from $ca-cb$: but from what has been ſhewn in ſubtraction, the remainder will be $ca-cb-da+db$; therefore the product ariſing from the multiplication of $a-b$ by $c-d$ is $ca-cb-da+db$; hence the reaſon of the general rule for the ſigns, as well as the other rules, is manifeſt.

35. When ſeveral quantities are multiplied together ſo as to conſtitute a product, each of them is called a *factor* of that product; thus a, b, and c are factors of the product abc; alſo $a+x$, and $b-x$, are factors of the product $(a+x)(b-x)$.

36. The products ariſing from the continual multiplication of the ſame quantity are called *powers* of that quantity, which is called the *root*. Thus aa, aaa, $aaaa$, &c. are powers of the root a. Theſe powers are commonly expreſſed, by placing above the root, towards the right hand, a figure, denoting how often the root is repeated. This figure ſerves to denominate the power, and is called its *index* or *exponent*. Thus, the quantity a being conſidered as the root, or as the firſt power of a, we have aa or a^2 for its ſecond power,

Diviſion

power, *aaa* or a^3 for its third power, *aaaa* or a^4 for its fourth power, and ſo on.

37. The ſecond and third powers of a quantity are generally called its *ſquare* and *cube;* and the fourth, fifth, and ſixth powers are ſometimes reſpectively called its *biquadrate*, *ſurſolid*, and *cubocube*.

38. By conſidering the notation of powers, and the rules for multiplication, it appears that powers of the ſame root are multiplied by adding their exponents. Thus $a \times a^3 = a^4$, alſo $x^3 \times x^4 = x^7$; and in general $a^m \times a^n = a^{m+n}$.

Prob. IV. *To Divide Quantities.*

39. *General Rule for the Signs.*—If the ſigns of the diviſor and dividend be like, the ſign of the quotient is +; but if they be unlike, the ſign of the quotient is —.

This rule is eaſily derived from the general rule for the ſigns in multiplication, by conſidering that the quotient muſt be ſuch a quantity as when multiplied by the diviſor ſhall produce the dividend, with its proper ſign.

40. The quotient ariſing from the diviſion of one quantity by another may be expreſſed by placing the dividend above a line and the diviſor below it, (§ 25.); but it may alſo be often expreſſed in a more ſimple manner by the following rules:

Caſe 1. When the diviſor is ſimple, and a factor of every term of the dividend.

Rule. Divide the coefficient of each term of the dividend by the coefficient of the diviſor, and expunge out of each term the letter or letters in the diviſor: the reſult is the quotient.

Ex. 1. Divide $12abc$ by $3ac$.

From the method of notation, the quotient may be expreſſed thus, $\frac{12abc}{3ac}$; but the ſame quotient, by the rule juſt given, is more ſimply expreſſed thus, $4b$.

Ex. 2. Divide $16a^3xy - 28a^3x^2 + 4a^3x^3$ by $4a^3x$.

The quotient is $4ay - 7x^2 + x^3$.

If the diviſor and dividend be powers of the ſame quantity, the diviſion will evidently be performed by ſubtracting the exponent of the diviſor from that of the dividend. Thus a^5, divided by a^3, has for a quotient $a^{5-3} = a^2$.

Caſe 2. When the diviſor is ſimple, but not a factor of the dividend.

Rule. The quotient is expreſſed by a fraction, of which the numerator is the dividend, and the denominator the diviſor.

Thus the quotient of $3ab^2$, divided by $2mbc$, is the fraction $\frac{3ab^2}{2mbc}$.

It will ſometimes happen, that the quotient found thus may be reduced to a more ſimple form, as ſhall be explained when we come to treat of fractions.

Caſe 3. When the diviſor is compound.

Rule. 1. The terms of the dividend are to be arranged according to the powers of ſome one of its letters, and thoſe of the diviſor according to the powers of the ſame letter. Diviſion.

2. The firſt term of the dividend is to be divided by the firſt term of the diviſor, obſerving the general rule for the ſigns; and this quotient being ſet down for a part of the quotient wanted, is to be multiplied by the whole diviſor, and the product ſubtracted from the dividend. If nothing remain, the diviſion is finiſhed; but if there be a remainder, it is to be taken for a new dividend.

3. The firſt term of the new dividend is next to be divided by the firſt term of the dividend, as before, and the quotient joined to the part already found, with its proper ſign. The whole diviſor is alſo to be multiplied by this part of the quotient, and the product ſubtracted from the new dividend; and thus the operation is to be carried on till there be no remainder, or till it appear that there will always be a remainder.

To illuſtrate this rule, let it be required to divide $8a^2 + 2ab - 15b^2$ by $2a + 3b$, the operation will ſtand thus:

$$\begin{array}{l} 2a+3b)\,8a^2+2ab-15b^2(4a-5b \\ \quad 8a^2+12ab \\ \hline \quad -10ab-15b^2 \\ \quad -10ab-15b^2 \\ \hline \end{array}$$

Here the terms of the diviſor and dividend are arranged according to the powers of the quantity a. We now divide $8a^2$, the firſt term of the dividend, by $2a$ the firſt term of the diviſor; and thus get $4a$ for the firſt term of the quotient. We next multiply the diviſor by $4a$, and ſubtract the product $8a^2 + 12ab$ from the dividend; we thus get $-10ab - 15b^2$ for a new dividend.

By proceeding in all reſpects as before, we find $-5b$ for the ſecond term of the quotient, and no remainder; the operation is therefore finiſhed, and the whole quotient is $4a - 5b$.

The following examples will alſo ſerve to illuſtrate the manner of applying the rule.

Ex. 1.

$$\begin{array}{l} 3a-b)\,3a^3-12a^2-a^2b+10ab-2b^2(a^2-4a+2b \\ \quad 3a^3 \quad -a^2b \\ \hline \quad -12a^2 \quad +10ab \\ \quad -12a^2 \quad +4ab \\ \hline \quad +6ab-2b^2 \\ \quad +6ab-2b^2 \\ \hline \end{array}$$

Ex. 2.

$$\begin{array}{l} a+b)\,a^3+b^3(a^2-ab+b^2 \\ \quad a^3+a^2b \\ \hline \quad -a^2b+b^3 \\ \quad -a^2b-ab^2 \\ \hline \quad +ab^2+b^3 \\ \quad +ab^2+b^3 \end{array}$$

Ex. 3.

Ex. 3.

$$a^3-b^3)\,a^6-b^6\,(a^3+b^3$$
$$a^6-a^3b^3$$
$$\overline{\quad +a^3b^3-b^6}$$
$$+a^3b^3-b^6$$

Ex. 4.

$$1-x)\,1\quad(1+x+x^2+, \text{ \&c.}$$
$$1-x$$
$$\overline{+x}$$
$$+x-x^2$$
$$\overline{+x^2}$$
$$+x^2-x^3$$
$$\overline{+x^3.}$$

41. Sometimes, as in this last example, the quotient will never terminate: in such a case it may either be considered as an infinite series, the law according to which the terms are formed being in general sufficiently obvious; or the quotient may be completed as in arithmetical division, by annexing to it a fraction, the numerator of which is the remainder, and denominator the divisor. Thus the quotient in last example may stand thus $1+x+x^2+\frac{x^3}{1-x}$.

42. The reason of the rule for division is sufficiently manifest. For in the course of the operation, all the terms of the quotient obtained by it are multiplied by all the terms of the divisor, and the products successively subtracted from the dividend, till nothing remain; that therefore must evidently be the true quotient.

Sect. II. *Of Fractions.*

43. In the operation of division, the divisor may be sometimes less than the dividend, or may not be contained in it an exact number of times; in either case the quotient is expressed by means of a fraction. There can be no difficulty, however, in estimating the magnitude of such a quotient; if, for example, it were the fraction $\frac{5}{7}$, we may consider it as denoting either that some unit is divided into 7 equal parts, and that 5 of these are taken, or that 5 times the same unit is divided into seven equal parts, and one of them taken.

44. In any fraction the upper number, or the dividend, is called the *numerator*, and the lower number or the divisor is called the *denominator*. Thus in the fraction $\frac{a}{b}$, a is the numerator, and b the denominator.

45. If the numerator be less than the denominator, such a fraction is called a *proper* fraction; but if the numerator be either equal to, or greater than the denominator, it is called an *improper* fraction; and if a quantity be made up of an integer and a fraction, it is called a *mixed* quantity. Thus $\frac{a}{a+x}$ is a proper fraction; $\frac{a}{a}$, also $\frac{a+x}{a}$, are both improper fractions; and $b+\frac{x}{a}$ is a mixed quantity.

46. The *reciprocal* of a fraction is another fraction, having its numerator and denominator respectively equal to the denominator and numerator of the former.

Thus $\frac{b}{a}$ is the reciprocal of the fraction $\frac{a}{b}$.

47. The following proposition is of great importance in the operations relating to fractions.

If the numerator and denominator of a fraction be either both multiplied, or both divided, by the same quantity, the value of that fraction is the same as before.

For let any fraction $\frac{b}{a}=c$; then because c is the quotient arising from the division of b by a, it follows that $b=ac$; and multiplying both by any quantity n, we have $nb=nac$: let these equals be both divided by the same quantity na, and the quotients will be equal, that is $\frac{nb}{na}=c=\frac{b}{a}$; hence the truth of the proposition is manifest.

48. From this proposition, it is obvious that a fraction may be very differently expressed, without changing its value, and that any integer may be reduced to the form of a fraction, by placing the product arising from its multiplication by any assumed quantity as the numerator, and the assumed quantity as the denominator of the fraction. It also appears that a fraction very complex in its form may often be reduced to another of the same value, but more simple, by finding a quantity which will divide both the numerator and denominator, without leaving a remainder. Such a common measure, or common divisor, may be either simple or compound; if it be simple, it is readily found by inspection, but if it be compound, it may be found as in the following problem.

49. Prob. I. *To find the greatest common Measure of two Quantities.*

Rule 1. Range the quantities according to the power of some one of the letters, as taught in division, leaving out the simple divisors of each quantity.

2. Divide that quantity which is of most dimensions by the other one, and if there be a remainder, divide it by its greatest simple divisor; and then divide the last compound divisor by the resulting quantity, and if any thing yet remain, divide it also by its greatest simple divisor, and the last compound divisor by the resulting quantity; proceed in this way till nothing remain, and the last divisor shall be the common measure required.

Note. It will sometimes be necessary to multiply the dividends by simple quantities in order to make the divisions succeed.

Ex. 1. Required the greatest common measure of the quantities a^2x-x^3 and $a^3-2a^2x+ax^2$. The simple divisor x being taken out of the former of these quantities, and a out of the latter, they are reduced to a^2-x^2, and $a^2-2ax+x^2$, and as the quantity a rises to the same dimensions in both, we may take either of them as the first divisor; let us take that which consists of fewest terms, and the operation will stand thus:

Fractions.

$$a^2-x^2)a^2-2ax+x^2(1$$
$$a^2-x^2$$
$$-2ax+x^2 \text{ remainder}$$

which divided by $-2x$ is $a-x)a^2-x^2(a+x$

$$a^2-ax$$
$$+ax-x^2$$
$$+ax-x^2$$
$$* \quad *$$

Hence it appears that $a-x$ is the greateſt common meaſure required.

Ex. 2. Required the greateſt common meaſure of $8a^3b^2-10ab^3+2b^4$, and $9a^4b-9a^3b^2+3a^2b^3-3ab^4$.

It is evident, from inſpection, that b is a ſimple diviſor of both quantities; it will therefore be a factor of the common meaſure required. Let the ſimple diviſors be now left out of each quantity, and they are reduced to $4a^2-5ab+b^2$ and $3a^3-3a^2b+ab^2-b^3$; but as the ſecond of theſe is to be divided by the firſt, it muſt be multiplied by 4 to make the diviſion ſucceed, and the operation will ſtand thus:

$$4a^2-5ab+b^2)12a^3-12a^2b+4ab^2-4b^3(3a$$
$$12a^3-15a^2b+3ab^2$$
$$+3a^2b+ab^2-4b^3.$$

This remainder is to be divided by b, and the new dividend multiplied by 3, to make the diviſion again ſucceed, and the work will ſtand thus:

$$3a^2+ab-4b^2)12a^2-15ab+3b^2(4$$
$$12a^2+4ab-16b^2$$
$$-19ab+19b^2.$$

This remainder is to be divided by $-19b$, which being done, and the laſt diviſor taken as a dividend as before, the reſt of the operation will be as follows:

$$a-b)3a^2+ab-4b^2(3a+4b$$
$$3a^2-3ab$$
$$+4ab-4b^2$$
$$+4ab-4b^2$$
$$* \quad *$$

from which it appears that the compound diviſor ſought is $a-b$, and remarking that the quantities propoſed have alſo a ſimple diviſor b, the greateſt common meaſure which is required will be $b(a-b)$.

50. The reaſon of the rule given in this problem may be deduced from the following conſiderations.

1. If two quantities have a compound diviſor common to both, and they be either multiplied or divided by any ſimple quantities, the reſults will each have the ſame compound diviſor. Thus the quantities $p(a-x)$ and $q(a-x)$ have the common diviſor $a-x$, and the quantities $np(a-x)$, $rq(a-x)$ have each the very ſame diviſor.

2. In the operation of diviſion, whatever quantity meaſures both the diviſor and dividend, the ſame will alſo meaſure the remainder. For let x be ſuch a quantity, then the diviſor and dividend may be repreſented by ax and bx; let q be the quotient, and the remainder will evidently be $bx-qax$, which is evidently diviſible by x. Fractions.

3. Whatever quantity meaſures both the diviſor and remainder, the ſame will alſo meaſure the dividend.

For let the diviſor be ax, and the remainder rx, then, q denoting the quotient, the dividend will be $aqx+rx$, which, as well as the diviſor and dividend, is diviſible by x.

51. Let us apply theſe obſervations to the laſt example. From the firſt obſervation, the reaſon for leaving out the ſimple quantities in the courſe of the operation, as well as for multiplying by certain other quantities, to make the diviſions ſucceed, is obvious; and from the ſecond obſervation it appears, that whatever quantity meaſures $4a^2-5ab+b^2$, and $12a^3-12a^2b+4ab^2-4b^3$, the ſame muſt meaſure $3a^2b+ab^2-4b^3$, the firſt remainder, as alſo $-19ab+19ab^2$ the ſecond remainder; but the only compound diviſor which this laſt quantity can have is $a-b$, which is alſo found to be a diviſor of $3a^2+ab-4b^2$, or of $3a^2b+ab^2-4b^3$ the firſt remainder, therefore, by the third obſervation, $a-b$ muſt alſo be a diviſor of $12a^3-15ab+3b^2$, or of $4a^2-5ab+b^2$, the firſt diviſor, and therefore alſo it muſt be a diviſor of $12a^3-12a^2b+4ab^2-4b^3$ the firſt dividend, ſo that $a-b$ is the greateſt common meaſure as was required.

52. PROB. II. *To Reduce a Fraction to its loweſt Terms.*

Rule. Divide both numerator and denominator by their greateſt common meaſure, which may be found by prob. 1.

Ex. 1. Reduce $\frac{56a^2bc}{24adc^2}$ to its loweſt terms.

It appears from inſpection, that the greateſt common meaſure is $8ac$, and dividing both numerator and denominator by this quantity, we have $\frac{56a^2bc}{24adc^2}=\frac{7ab}{3dc}$.

Ex. 2. Reduce $\frac{a^2x-x^3}{a^3-2a^2x+ax^2}$ to its loweſt terms.

We have already found in the firſt example of prob. 1. that the greateſt common meaſure of the numerator and denominator is $a-x$; and dividing both by this quantity we have

$$\frac{a^2x-x^3}{a^3-2a^2x+ax^2}=\frac{ax+x^2}{a^2-ax}.$$

In like manner we find $\frac{9a^4b-9a^3b^2+3a^2b^3-3ab^4}{8a^4b^2-10ab^3+2b^4}=\frac{9a^3+3ab^2}{8ab-2b^2}$; the common meaſure being $b(a-b)$ as was ſhown in example 2. problem 1.

53. PROB. III. *To Reduce a mixed Quantity to an improper Fraction.*

Rule. Multiply the integer by the denominator of the fraction, and to the product add the numerator, and the denominator being placed under this ſum will give the improper fraction required.

Ex. 1.

Fractions.

Ex. 1. Let $x+\frac{x^2}{a}$, and $x-\frac{a^2-x^2}{x}$ be reduced to improper fractions.

First $x+\frac{x^2}{a}=\frac{ax+x^2}{a}$, the anſwer.

And $x-\frac{a^2-x^2}{x}=\frac{x^2-a^2+x^2}{x}=\frac{2x^2-a^2}{x}$, Anſ.

Ex. 2. Reduce $a-x+\frac{x^2}{a+x}$ to an improper fraction.

$a-x+\frac{x^2}{a+x}=\frac{(a+x)(a-x)+x^2}{a+x}=\frac{a^2}{a+x}$, Anſ.

54. PROB. IV. *To Reduce an improper Fraction to a whole or mixed Number.*

Rule. Divide the numerator by the denominator for the integral part, and place the remainder, if any, over the denominator, and it will be the mixed quantity required.

Ex. 1. Reduce $\frac{ax+a^2}{x}$ to a whole or mixed quantity.

$\frac{ax+a^2}{x}=a+\frac{a^2}{x}$ the anſwer required.

Ex. 2. Reduce $\frac{ax+2x^2}{a+x}$ alſo $\frac{x^2-y^2}{x-y}$ to whole or mixed quantities.

First $\frac{ax+2x^2}{a+x}=x+\frac{x^2}{a+x}$ the anſwer.

And $\frac{x^2-y^2}{x-y}=x+y$ a whole quantity which is the anſwer.

55. PROB. V. *To Reduce Fractions of different Denominators to others of the ſame value which ſhall have a common Denominator.*

Rule. Multiply each numerator ſeparately into all the denominators except its own for the new numerators, and all the denominators together for the common denominator.

Ex. 1. Reduce $\frac{a}{b}$, $\frac{c}{d}$ and $\frac{e}{f}$ to fractions of equal value which have a common denominator.

$$\left.\begin{array}{l} a\times d\times f=adf \\ c\times b\times f=cbf \\ e\times b\times d=ebd \end{array}\right\}\text{New numerators.}$$

$b\times d\times f=bdf$ Common denominator.

Hence we find $\frac{a}{b}=\frac{adf}{bdf}$, $\frac{c}{d}=\frac{cbf}{bdf}$ and $\frac{e}{f}=\frac{ebd}{bdf}$, where the new fractions have a common denominator, as was required.

Ex. 2. Reduce $\frac{ax}{a-x}$ and $\frac{a^2-x^2}{a+x}$ to fractions of equal value and having a common denominator.

$$\left.\begin{array}{l} ax(a+x)=a^2x+ax^2 \\ (a^2-x^2)(a-x)=a^3-a^2x-ax^2+x^3 \end{array}\right\}\text{new numerators.}$$

Fractions.

$a-x)(a+x)=a^2-x^2$ the common denominator.

Hence $\frac{ax}{a-x}=\frac{a^2x+ax^2}{a^2-x^2}$ and $\frac{a^2-x^2}{a+x}=\frac{a^3-a^2x-a^2x+x^3}{a^2-x^2}$.

56. PROB. VI. *To Add or Subtract Fractions.*

Rule. Reduce the fractions to a common denominator, and add or ſubtract their numerators, and the ſum or difference placed over the common denominator, is the ſum or remainder required.

Ex. 1. Add together $\frac{a}{b}$, $\frac{c}{d}$ and $\frac{e}{f}$.

$$\frac{a}{b}=\frac{adf}{bdf}$$
$$\frac{c}{d}=\frac{bcf}{bdf}$$
$$\frac{e}{f}=\frac{bde}{bdf}$$

Hence $\frac{a}{b}+\frac{c}{d}+\frac{e}{f}=\frac{adf+bcf+bde}{bdf}$ the ſum required.

Ex. 2. From $\frac{a+x}{a}$ ſubtract $\frac{a}{a+x}$.

$$\frac{a+x}{a}=\frac{a^2+2ax+x^2}{a^2+ax}$$
$$\frac{a}{a+x}=\frac{a^2}{a^2+ax}$$

Hence $\frac{a+x}{a}-\frac{a}{a+x}=\frac{2ax+x^2}{a^2+ax}$.

Ex. 3. Add together $\frac{x+2}{3}$, $\frac{x}{4}$ and $\frac{x-5}{2}$.

$\frac{x+2}{3}+\frac{x}{4}+\frac{x-5}{2}=\frac{8x+16+6x+12x-60}{24}=\frac{13x-22}{12}$. If it be required to add or ſubtract mixed quantities, they may either be reduced to the form of fractions by prob. 3. and then added, or ſubtracted, or elſe theſe operations may be performed firſt on the integer quantities, and afterwards on the fractions.

57. PROB. VII. *To Multiply Fractions.*

Rule. Multiply the numerators of the fractions for the numerator of the product, and the denominators for the denominator of the product.

Ex. 1. Multiply $\frac{b}{a}$ by $\frac{d}{c}$

$\frac{b}{a}\times\frac{d}{c}=\frac{bd}{ac}$ the product required.

Ex. 2. Multiply $\frac{a+b}{c}$ by $\frac{a-b}{d}$.

$\frac{a+b}{c}\times\frac{a-b}{d}=\frac{a^2-b^2}{cd}$, the product.

If it be required to multiply an integer by a fraction, the integer may be conſidered as having unity for a denominator. Thus $(a+x)\times\frac{3d}{c}=\frac{a+x}{1}\times\frac{3d}{c}=\frac{3ad+3dx}{c}$.

Mixed

Fractions. Mixed quantities may be multiplied after being reduced to the form of fractions by prob. 3. Thus $\left(b+\frac{bx}{a}\right)\times\frac{a}{x}=\frac{ab+bx}{a}\times\frac{a}{x}=\frac{a^2b+abx}{ax}=\frac{ab+bx}{x}$.

58. The reaſon of the rule for multiplication may be explained thus. If $\frac{a}{b}$ is to be multiplied by c, the product will evidently be $\frac{ac}{b}$; but if it is only to be multiplied by $\frac{c}{d}$, the former product muſt be divided by d, and it becomes $\frac{ac}{bd}$ which is the product required. Or let $\frac{a}{b}=m$, and $\frac{c}{d}=n$, then $a=bm$ and $c=dn$ and $ac=bdmn$; hence mn, or $\frac{a}{b}\times\frac{c}{d}=\frac{ac}{bd}$.

59. Prob. VIII. *To Divide Fractions.*

Rule. Multiply the denominator of the diviſor by the numerator of the dividend for the numerator of the quotient. Then multiply the numerator of the diviſor by the denominator of the dividend for the denominator of the quotient.

Or, multiply the dividend by the reciprocal of the diviſor, the product will be the quotient required.

Ex. 1. Divide $\frac{a}{b}$ by $\frac{c}{d}$.

$\frac{c}{d}\Big)\frac{a}{b}\Big(\frac{ad}{bc}$ the quotient required, or $\frac{a}{b}\times\frac{d}{c}=\frac{ad}{bc}$ as before.

Ex. 2. Divide $\frac{a^2+ab}{2x}$ by $\frac{3a^2}{a-b}$.

$\frac{3a^2}{a-b}\Big)\frac{a^2+ab^2}{2x}\Big(\frac{a^3-ab^2}{6a^2x}=\frac{a^2-b^2}{6ax}$ the quotient.

If either the diviſor or dividend be an integer quantity, it may be repreſented as a fraction, by placing unity for a denominator; or if it be a mixed quantity, it may be reduced to a fraction by prob. 3. and the operation of diviſion performed agreeably to the rule.

60. The reaſon of the rule for diviſion may be explained thus, let it be required to divide $\frac{c}{d}$ by $\frac{a}{b}$. If $\frac{c}{d}$ is to be divided by a, the quotient is $\frac{c}{ad}$, but if it is to be divided by $\frac{a}{b}$, then the laſt quotient muſt be multiplied by b; thus we have $\frac{cb}{ad}$ for the quotient required. Or let $\frac{a}{b}=m$, and $\frac{c}{d}=n$, then $a=bm$ and $c=dn$; alſo $ad=bdm$ and $bc=bdn$; therefore $\frac{bdn}{bdm}=\frac{n}{m}=\frac{bc}{ad}$.

Involution and Evolution.

Sect. III. *Of Involution and Evolution.*

61. In treating of multiplication, we have obſerved, that when a quantity is multiplied by itſelf any number of times, the product is called a *power* of that quantity, while the quantity itſelf, from which the powers are formed, is called the *root* (§ 36.) Thus a, a^2, and a^3 are the firſt, ſecond, and third powers of the root a; and in like manner $\frac{1}{a}$, $\frac{1}{a^2}$, and $\frac{1}{a^3}$, denote the ſame powers of the root $\frac{1}{a}$.

62. But before conſidering more particularly what relates to powers and roots, it will be proper to obſerve, that the quantities $\frac{1}{a}$, $\frac{1}{a^2}$, $\frac{1}{a^3}$, &c. admit of being expreſſed under a different form; for, like as the quantities a, a^2, a^3, &c. are expreſſed as *poſitive* powers of the root a, ſo the quantities $\frac{1}{a}$, $\frac{1}{a^2}$, $\frac{1}{a^3}$, &c. may be reſpectively expreſſed thus, a^{-1}, a^{-2}, a^{-3}, &c, and conſidered as *negative* powers of the root a.

63. This method of expreſſing the fractions $\frac{1}{a}$, $\frac{1}{a^2}$, $\frac{1}{a^3}$, as powers of the root a, but with negative indices, is a conſequence of the rule which has been given for the diviſion of powers; for we may conſider $\frac{1}{a}$ as the quotient ariſing from the diviſion of any power of a by the next higher power, for example from the diviſion of the 2d by the 3d, and ſo we have $\frac{1}{a}=\frac{a^2}{a^3}$; but ſince powers of the ſame quantity are divided by ſubtracting the exponent of the diviſor from that of the dividend (§ 40.), it follows, that $\frac{a^2}{a^3}=a^{2-3}=a^{-1}$; therefore the fraction $\frac{1}{a}$ may alſo be expreſſed thus, a^{-1}. By conſidering $\frac{1}{a^2}$ as equal to $\frac{a^2}{a^4}$, it will appear in the ſame manner that $\frac{1}{a^2}=\frac{a^2}{a^4}=a^{-2}$; and, proceeding in this way, we get $\frac{1}{a^3}=\frac{a^2}{a^5}=a^{-3}$, $\frac{1}{a^4}=\frac{a^2}{a^6}=a^{-4}$, &c. and ſo on, as far as we pleaſe. It alſo appears, that unity or 1 may be repreſented by a^0, where the exponent is a cypher, for $1=\frac{a^2}{a^2}=a^{2-2}=a^0$.

64. The rules which have been given for the multiplication and diviſion of powers with poſitive exponents will apply in every caſe, whether the exponents be poſitive or negative, and this muſt evidently take place, for the mode of notation, by which we repreſent fractional quantities as the powers of integers, but with negative exponents, has been derived from thoſe rules. Thus $\frac{1}{a^2}\times a^3$ or $a^{-2}\times a^3=a^{-2+3}=a^{-1}=\frac{1}{a}$, alſo $\frac{1}{x^2}\times\frac{1}{x^3}$

Involution. $\frac{1}{x^3}$ or $x^{-2}\times x^{-3}=x^{-2-3}=x^{-5}=\frac{1}{x^5}$ and $\frac{1}{x^3}\times x^3$ or $x^{-3}\times x^{+3}=x^{-3+3}=x^0=1$.

65. From this method of notation it appears, that any quantity may be taken from the denominator of a fraction, and placed in the numerator, by changing the ſign of its exponent; and hence it follows, that every fraction may alſo be repreſented as an integer quantity. Thus $\frac{a^2}{bc^3}$ denotes the ſame thing as $\frac{a^2b^{-1}}{c^3}$ or as $a^2b^{-1}c^{-3}$, alſo $\frac{a^2}{(x-1)^3}$ may be otherwiſe expreſſed thus, $a^2(x-1)^{-3}$.

Of Involution.

66. Involution is the method of finding any power of any aſſigned quantity, whether it be ſimple or compound; hence its rules are eaſily derived from the operation of multiplication.

Caſe 1. When the quantity is ſimple.

Rule. Multiply the exponents of the letters by the index of the power required, and raiſe the coefficient to the ſame power.

Note. If the ſign of the quantity be + all its powers will be poſitive; but if it be —, then all its powers, whoſe exponents are even numbers, are poſitive, and all its powers whoſe exponents are odd numbers are negative.

Ex. 1. Required the cube, or third power of $2a^2x$.
$(2a^2x)^3=2\times 2\times 2a^2\times 3x^1\times 3=8a^6x^3$, the anſwer.

Ex. 2. Required the fifth power of $-3a^2x^3$.
$(-3a^2x^3)^5=-243a^{10}x^{15}$, the anſwer.

Ex. 3. Required the fourth power of $-\frac{2ax^2}{3b^2y}$.
$\left(\frac{-2ax^2}{3b^2y}\right)^4=\frac{16a^4x^8}{81b^8y^4}$, the anſwer.

Caſe 2. When the quantity is compound.

Rule. The powers muſt be found by a continual multiplication of the quantity by itſelf.

Ex. Required the firſt four powers of the binomial quantity $a+x$.

$a+x$ the root, or firſt power
$a+x$

a^2+ax
$+ax+x^2$

$a^2+2ax+x^2$ the ſquare, or ſecond power
$a+x$

$a^3+2a^2x+ax^2$
$+a^2x+2ax^2+x^3$

$a^3+3a^2x+3ax^2+x^3$ the cube, or third power
$a+x$

$a^4+3a^3x+3a^2x^2+ax^3$
$+a^3x+3a^2x^2+3ax^3+x^4$

$a^4+4a^3x+6a^2x^2+4ax^3+x^4$ the fourth power.

If it be required to find the ſame powers of $a-x$, it Involution. will be found, that

$a-x$ is the root or firſt power;
$a^2-2ax+x^2$ the ſquare, or 2d power;
$a^3-3a^2x+3ax^2-x^3$ the cube, or 3d power;
$a^4-4a^3x+6a^2x^2-4ax^3+x^4$ the 4th power.

Hence it appears, that the powers of $a+x$ differ from the powers of $a-x$, only in this reſpect, that in the former the ſigns of the terms are all poſitive, but in the latter, they are poſitive and negative alternately.

67. Beſides the method of finding the powers of a compound quantity by multiplication, which we have juſt now explained, there is another, more general, as well as more expeditious, by which a quantity may be raiſed to any power whatever without the trouble of finding any of the inferior powers, namely, by means of what is commonly called the *binomial theorem*. This theorem may be expreſſed as follows. Let $a+x$ be a binomial quantity, which is to be raiſed to any power denoted by the number n, then $(a+x)^n=a^n+\frac{n}{1}a^{n-1}x+\frac{n(n-1)}{1\cdot 2}a^{n-2}x^2+\frac{n(n-1)(n-2)}{1\cdot 2\cdot 3}a^{n-3}x^3+\frac{n(n-1)(n-2)(n-3)}{1\cdot 2\cdot 3\cdot 4}a^{n-4}x^4+\frac{n(n-1)(n-2)(n-3)(n-4)}{1\cdot 2\cdot 3\cdot 4\cdot 5}a^{n-5}x^5+$, &c. This ſeries will always terminate when n is any whole poſitive number, by reaſon of ſome one of the factors $n-1$, $n-2$, &c. becoming $=0$; but if n be either a negative, or fractional number, the ſeries will conſiſt of an infinite number of terms; as, however, we mean to treat in this ſection only of the powers of quantities when their exponents are whole poſitive numbers, we ſhall make no farther remarks upon any other; we ſhall afterwards give a demonſtration of the theorem, and ſhew its application to fractional and negative powers in treating of infinite ſeries. The nth power of $a-x$ will not differ from the ſame power of $a+x$, but in the ſigns of the terms which compoſe it, for it will ſtand thus: $(a-x)^n=a^n-\frac{n}{1}a^{n-1}x+\frac{n(n-1)}{1\cdot 2}a^{n-2}x^2-\frac{n(n-1)(n-2)}{1\cdot 2\cdot 3}a^{n-3}x^3+\frac{n(n-1)(n-2)(n-3)}{1\cdot 2\cdot 3\cdot 4}a^{n-4}x^4$ —, &c. where the ſigns are + and — alternately.

Ex. 1. Let it be required to raiſe $a+x$ to the fifth power.

Here n the exponent of the power being 5, the firſt term a^n of the general theorem will be equal to a^5, the ſecond $na^{n-1}x=5a^4x$, the third $\frac{n(n-1)}{1\cdot 2}a^{n-2}x^2=\frac{5\times 4}{1\times 2}a^3x^2=10a^3x^2$, the fourth $\frac{n(n-1)(n-2)}{1\cdot 2\cdot 3}a^{n-3}x^3=\frac{5\times 4\times 3}{1\times 2\times 3}a^2x^3=10a^2x^3$, the fifth $\frac{n(n-1)(n-2)(n-3)}{1\cdot 2\cdot 3\cdot 4}a^{n-4}x^4=\frac{5\times 4\times 3\times 2}{1\times 2\times 3\times 4}ax^4=5ax^4$ and the ſixth and laſt $\frac{n(n-1)(n-2)(n-3)(n-4)}{1\cdot 2\cdot 3\cdot 4\cdot 5}a^{n-5}x^5=\frac{5\times 4\times 3\times 2\times 1}{1\times 2\times 3\times 4\times 5}a^0x^5=x^5$; the remaining terms

of

Evolution. of the general theorem all vaniſh, by reaſon of the factor $n-5=0$ by which each of them is multiplied, ſo that we get $(a+x)^5=a^5+5a^4x+10a^3x^2+10a^2x^3+5ax^4+x^5$.

Ex. 2. It is required to raiſe $2d-\frac{z}{3}$ to the third power.

In this caſe $n=3$, ſo that if we put $a=2d$ and $x=\frac{z}{3}$ we have the firſt term of the general theorem, or $a^n=8d^3$, the ſecond $\frac{n}{1}a^{n-1}x=3\times 4d^2\times\frac{z}{2}=4d^2z$, the third $\frac{n(n-1)}{1\cdot 2}a^{n-2}x^2=3\times 2d\times\frac{z^2}{9}=\frac{2dz^2}{3}$, and the fourth and laſt term $\frac{n(n-1)(n-2)}{1\cdot 2\cdot 3}a^{n-3}x^3=\frac{z^3}{27}$, and ſince the ſigns of the terms of any power of $a-x$ are $+$ and $-$ alternately we have $\left(2d-\frac{z}{3}\right)^3=8d^3-4d^2z+\frac{2dz^2}{3}-\frac{z^3}{27}$.

68. If the quantity to be involved conſiſts of more than two terms, as if $p+q-r$ were to be raiſed to the 2d power, put $p=a$ and $q-r=b$ then $(p+q-r)^2=(a+b)^2=a^2+2ab+b^2=p^2+2p(q-r)+(q-r)^2$ but $2p(q-r)=2pq-2pr$, and by the general theorem $(q-r)^2=q^2-2qr+r^2$, therefore, we get $(p+q-r)^2=p^2+2pq-2pr+q^2-2qr+r^2$; and by a ſimilar method of procedure a quantity conſiſting of four or more terms may be raiſed to any power.

Of Evolution.

69. Evolution is the reverſe of involution, or it is the method of finding the root of any quantity, whether ſimple or compound, which is conſidered as a power of that root; hence it follows that its operations, generally ſpeaking, muſt be the reverſe of thoſe of involution.

70. To denote that the root of any quantity is to be taken, the ſign $\surd$ (called the *radical ſign*) is placed before it, and a ſmall number placed over the ſign to expreſs the denomination of the root. Thus $\sqrt[2]{a}$ denotes the ſquare root of a, $\sqrt[3]{a}$ its cube root, $\sqrt[4]{a}$ its fourth root, and in general, $\sqrt[n]{a}$ its nth root. The number placed over the radical ſign is called the *index* or *exponent* of the root, and is uſually omitted in expreſſing the ſquare root, thus either $\sqrt[2]{a}$ or $\surd a$ denotes the ſquare root of a.

71. *Caſe* 1. When roots of ſimple quantities are to be found.

Rule. Divide the exponents of the letters by the index of the root required, and prefix the root of the numeral coefficient, the reſult will be the root required.

Note 1. The root of any poſitive quantity may be either poſitive or negative, if the index of the root be an even number; but if it be an odd number, the root can be poſitive only. Evolution.

2. The root of a negative quantity is alſo negative when the index of the root is an odd number.

3. But if the quantity be negative, and the index of the root even, then no root can be aſſigned.

Ex. 1. Required the ſquare root of $36a^2x^4$.

Here the index of the root is 2, and the root of the coefficient 6, therefore $\surd 36a^2x^4=+6ax^2$ or $\surd 36a^2x^4=-6ax^2$, for neither of theſe quantities, when multiplied by itſelf, produces $36a^2x^4$; ſo that the root required is $\pm 6ax^2$, where the ſign $\pm$ denotes that the quantity to which it is prefixed may be conſidered either as poſitive or negative.

Ex. 2. Required the cube root of $125a^8x^9$.

Here the index of the root is 3, and the root of the coefficient 5, therefore $\sqrt[3]{125a^6x^9}=5a^2x^3$ the root required; and in like manner the cube root of $-125a^6x^9$ is found to be $-5a^2x^3$.

72. If it be required to extract the ſquare of $-a^2$, it will immediately appear that no root can be aſſigned; for it can neither be $+a$, nor $-a$, ſeeing that each of theſe quantities when ſquared produces $+a^2$, the root required is therefore ſaid to be *impoſſible*, and may be expreſſed thus: $\surd -a^2$.

The root of a fraction is found by extracting that root out of both numerator and denominator. Thus the ſquare root of $\frac{4a^2x^4}{9b^2y^6}$ is $\frac{2xa^2}{3by^3}$.

Caſe 2. When the quantity of which the root is to be extracted is compound.

73. I. To extract the ſquare root.

Range the terms of the quantity according to the powers of the letters, as in diviſion.

Find the ſquare root of the firſt term for the firſt part of the root ſought, ſubtract its ſquare from the given quantity, and divide the remainder by double the part already found, and the quotient is the ſecond term of the root.

Add the ſecond part to double the firſt, and multiply their ſum by the ſecond part, ſubtract the product from the remainder, and if nothing remain, the ſquare root is obtained. But if there is a remainder, it muſt be divided by the double of the parts already found, and the quotient will give the third term of the root, and ſo on.

Ex. 1. Required the ſquare root of $a^2+2ax+x^2$.

$a^2+2ax+x^2(a+x$ the root required.
a^2

$2a+x)+2ax+x^2$
$\times x)+2ax+x^2$

*. *.

Ex. 2.

Evolution.

Ex. 2. Required the ſquare root of $x^4-2x^3+\frac{3}{2}x^2-\frac{x}{2}+\frac{1}{16}$.

$$x^4-2x^3-\frac{3}{2}x^2-\frac{x}{2}+\frac{1}{16}\Big(x^2-x+\frac{1}{4}$$

x^4

$2x^2-x\Big)-2x^3+\frac{3}{2}x^2$

$\times -x-2x^3+x^2$

$2x^2-2x+\frac{1}{4}\Big)\frac{x^2}{2}-\frac{x}{2}+\frac{1}{16}$

$\times\frac{1}{4}\quad\frac{x^2}{2}\quad-\frac{x}{2}+\frac{1}{16}$

* * *

74. To underſtand the reaſon of the rule for finding the ſquare root of a compound quantity, it is only neceſſary to involve any quantity, as $a+b+c$ to the ſecond power, and obſerve the compoſition of its ſquare; for we have $(a+b+c)^2=a^2+2ab+b^2+2ac+2bc+c^2$ but $2ab+b^2=(2a+b)b$ and $2ac+2bc+c^2=(2a+2b+c)c$ therefore,

$(a+b+c)^2=a^2+(2a+b)b+(2a+2b+c)c$

and from this expreſſion the manner of deriving the rule is obvious.

As an illuſtration of the common rule for extracting the ſquare root of any propoſed number, we ſhall ſuppoſe that the root of 59049 is required.

Accordingly we have $(a+b+c)^2=59049$, and from hence we are to find the values of a, b, and c.

$a^2=200\times 200=40000$ | 59049(200=a, 40=b, 3=c } Hence 243 is the root required

$2a=400$ | 19049

$b=40$

$2a+b=440$ | $17600=(2a+b)b$

$2a+2b=480$ | 1449

$c=3$

$2a+2b+c=483$ | $1449=(2a+2b+c)c$

The ſame example when wrought by the common rule (ſee ARITHMETIC) will ſtand thus:

59049(243 the root required.
4

44)190
176

483)1449
1449

and by a compariſon of the two operations, the reaſon of the common rule is obvious.

75. II. To extract the cube root.

Range the terms of the quantity according to the powers of ſome one of the letters.

Find the root of the firſt term, for the firſt part of the root ſought; ſubtract its cube from the whole quantity, and divide the remainder by 3 times the ſquare of the part already found, and the quotient is the ſecond part of the root.

Add together, 3 times the ſquare of the part of the root already found, 3 times the product of that part and the ſecond part of the root, and the ſquare of the ſecond part; multiply the ſum by the ſecond part, and ſubtract the product from the firſt remainder, and if nothing remain, the root is obtained; but if there is a remainder, it muſt be divided by 3 times the ſquare of the ſum of the parts already found, and the quotient is a third term of the root, and ſo on, till the whole root is obtained.

Ex. Required the cube root of $a^3+3a^2x+3ax^2+x^3$.

$a^3+3ax^2+3ax^2+x^1$ ($a+x$ the root required.
a^3

$3a^2+3ax+x^2)3a^2x+3ax^2+x^3$
$3a^2x+3ax^2+x^3$

* * *

76. The reaſon of the preceding rule is evident from the compoſition of a cube, for if any quantity as $a+b+c$ be raiſed to the third power, we have $(a+b+c)^3=a^3+(3a^2+3ab+b^2)b+(3(a+b)^2+3(a+b)c+c^2)c$, and by conſidering in what manner the terms a, b and c are developed from this expreſſion for the cube of their ſum, we alſo ſee the reaſon for the common rule for extracting the cube root in numbers. Let it be required to find the cube root of 13312053, where the root will evidently conſiſt of three figures; let us ſuppoſe it to be repreſented by $a+b+c$, and the operation for finding the numerical values of theſe quantities may ſtand as follows.

$=a^3=$ 13312053(200=a, 30=b, 7=c

$3a^2=120000$ | 5312053

$3ab=18000$

$b^2=900$

237 the root required.

$3a^2+3ab+b^2=138900$ | 4167000$=(3a^2+3ab+b^2)b$

$3(a+b)^2=158700$ | 1145053

$3(a+b)c=4830$

$c^2=49$

$3(a+b)^2+3(a+b)c+c^2=163579$ | $1145053=[3(a+b)^2+3(a+b)c+c^2]c$

Evolution.

The operation as performed by the common rule (see ARITHMETIC) will stand thus:

	13312053(237 the root required.
	8
12 . .	5312
18 .	
9	
1389	4167
1587 . .	1145053
383 .	
49	
163579	1145053

77. III. To extract any other root.

Rule. Range the quantity, of which the root is to be found, according to the powers of its letters, and extract the root of the first term, and that shall be the first member of the root required.

Involve the first member of the root to a power less by unity than the number that denominates the root required, and multiply the power that arises by the number itself; divide the second term of the given quantity by the product, and the quotient shall give the second member of the root required.

Find the remaining members of the root in the same manner by considering those already found as making one term.

Ex. Required the cube root of $x^6+6x^5-40x^3+96x-64$

$$x^6+6x^5-40x^3+96x-64(x^2+2x-4$$
$$(x^2)^3=x^6$$
$$3x^4)6x^5$$
$$(x^2+2x)^3=x^6+6x^5+12x^4+8x^3$$
$$3x^4+, \&c.)-12x^4$$
$$(x^2+2x-4)^3=x^6+6x^5-40x^3+96x-64$$

*

In this example, the cube root of x^6, or x^2, is the first member of the root, and to find a second member the first is raised to the power next lower, or to the second power, and also multiplied by 3, the index of the root required; thus we get $3x^4$ for a divisor, by which the second term $6x^5$ being divided, we find $2x$ for the second member of the root. We must now consider x^2+2x as forming one term; accordingly having subtracted its cube from the quantity, of which the root is sought, we have $-12x^4-$, &c. for a new dividend; and having also raised x^2+2x to the second power, and multiplied the result by 3, we find $3x^4+$, &c. for a divisor. As it is only the terms which contain the highest powers of the dividend and divisor that we have occasion for, the remaining terms are expressed by &c. Having divided $-12x^4$ by $3x^4$, we find -4 for the third term of the root; and because it appears that x^2+2x-4, when raised to the third power, gives a result the very same with the proposed power, we conclude x^2+2x-4 to be the root sought.

Surds.

78. In the preceding examples, the quantities whose roots were to be found have been all such as could have their roots expressed by a finite number of terms; but it will frequently happen, that the root cannot be otherwise assigned than by a series consisting of an infinite number of terms: the preceding rules, however, will serve to determine any number of terms of the series. Thus the square root of a^2+x^2 will be found to be $a+\frac{x^2}{2a}-\frac{x^4}{8a^3}+\frac{x^6}{16a^5}-\frac{5x^8}{128a^7}+$ &c. and the cube root of a^3+x^3 will stand thus, $a+\frac{x^3}{3a^2}-\frac{x^6}{9a^5}+\frac{5x^9}{81a^8}-\frac{10x^{12}}{243a^{11}}+$, &c.; but as the extraction of roots in the form of series can be more easily performed by other methods, we shall refer the reader to sect. 17. which treats of series, where this subject is again resumed.

SECT. IV. *Of Surds.*

79. IT has been already observed (71.), that the root of any proposed quantity is found by dividing the exponent of the quantity by the index of the root; and the rule has been illustrated by suitable examples, in all which, however, the quotient expressing the exponent of the result is a whole number; but there may be cases in which the quotient is a fraction. Thus if the cube root of a^4 were required, it might be expressed, agreeably to the method of notation already explained, either thus $\sqrt[3]{a^2}$, or thus $a^{\frac{2}{3}}$.

80. Quantities which have fractional exponents are called *surds*, or imperfect powers, and are said to be *irrational*, in opposition to others with integral exponents, which are called *rational*.

81. Surds may be denoted by means of the radical sign, but it will often be more convenient to use the notation of fractional exponents; the following examples will shew how they may be expressed either way.

$\sqrt[3]{a}=a^{\frac{1}{3}}$, $\sqrt{4ab^2}=2ba^{\frac{1}{2}}$, $\sqrt[4]{a^3b^2}=a^{\frac{3}{4}}b^{\frac{2}{4}}$, $\sqrt{a^2+b^2}=(a^2+b^2)^{\frac{1}{2}}$, $\sqrt[5]{(a-b)^2}=(a-b)^{\frac{2}{5}}$, $\frac{\sqrt{a+b}}{\sqrt{ab}}=(a+b^{\frac{1}{2}}a^{-\frac{1}{2}}b^{-\frac{1}{2}}$.

82. The operations concerning surds depend on the following principle. If the numerator and denominator of a fractional exponent be either both multiplied, or both divided by the same quantity, the value of the power is the same. Thus $a^{\frac{m}{n}}=a^{\frac{cm}{cn}}$. For let $a^{\frac{m}{n}}=b$, then, raising both to the power n, $a^m=b^n$, and farther raising both to the power c we get $a^{cm}=b^{cn}$; let the root cn be now taken and we find $a^{\frac{cm}{cn}}=b=a^{\frac{m}{n}}$.

83. PROB. I. *To Reduce a rational Quantity to the form of a Surd of any given denomination.*

Rule Reduce the exponent of the quantity to the form of a fraction of the same denomination as the given surd.

Ex. 1.

Surds. *Ex.* 1. Reduce $a^{\frac{2}{3}}$ to the form of the cube root.

Here the exponent 2 muſt be reduced to the form of a fraction having 3 for a denominator, which will be the fraction $\frac{6}{3}$; therefore $a^{\frac{2}{3}}=a^{\frac{6}{3}}=\sqrt[6]{a^3}$.

Ex. 2. Reduce 5 to the form of the cube root, and $3ab^{\frac{2}{3}}$ to the form of the ſquare root.

Firſt $5=5^{\frac{3}{3}}=\sqrt[3]{5\times5\times5}=\sqrt[3]{125}$.

And $3ab^{\frac{2}{3}}=3^{\frac{2}{2}}a^{\frac{2}{2}}b^{\frac{4}{6}}=(3^2a^2b^4)^{\frac{1}{2}}=\sqrt{9a^2b^4}$.

84. Prob. II. *To Reduce Surds of different denominations to others of the ſame value, and of the ſame denominations.*

Rule. Reduce the fractional exponents to others of the ſame value, and having the ſame common denominator.

Ex. 1. Reduce $\sqrt{a}$ and $\sqrt[3]{b^2}$, or $a^{\frac{1}{2}}$ and $b^{\frac{2}{3}}$ to other equivalent ſurds of the ſame denomination.

The exponents $\frac{1}{2}$, $\frac{2}{3}$, when reduced to a common denominator, are $\frac{3}{6}$ and $\frac{4}{6}$; therefore, the ſurds required are $a^{\frac{3}{6}}$ and $b^{\frac{4}{6}}$, or $\sqrt[6]{a^3}$ and $\sqrt[6]{b^4}$.

Ex. 2. Reduce $3^{\frac{1}{2}}$ and $2^{\frac{1}{3}}$ to ſurds of the ſame denomination.

The new exponents are $\frac{3}{6}$ and $\frac{2}{6}$, therefore we have $3^{\frac{1}{2}}=3^{\frac{3}{6}}=\sqrt[6]{3^3}=\sqrt[6]{27}$, and $2^{\frac{1}{3}}=2^{\frac{2}{6}}=\sqrt[6]{2^2}=\sqrt[6]{4}$.

And in the ſame way the ſurds $A^{\frac{1}{m}}$, $B^{\frac{1}{n}}$ are reduced to theſe two $\sqrt[mn]{A^n}$ and $\sqrt[mn]{B^m}$.

85. Prob. III. *To Reduce Surds to their moſt ſimple terms.*

Rule. Reduce the ſurd into two factors, ſo that one of them may be a complete power, having its exponent diviſible by the index of the ſurd. Extract the root of that power, and place it before the remaining quantities, with the proper radical ſign between them.

Ex. 1. Reduce $\sqrt{48}$ to its moſt ſimple terms.

The number 48 may be reſolved into the two factors 16 and 3, of which the firſt is a complete ſquare; therefore $\sqrt{48}=(4^2\times3)^{\frac{1}{2}}=4\times3^{\frac{1}{2}}=4\sqrt{3}$.

Ex. 2. Reduce $\sqrt{98a^4x}$, and $\sqrt[3]{24a^3x}+40a^3x^2$, each to its moſt ſimple terms.

Firſt $\sqrt{98a^4x}=(7^2a^4\times2x)^{\frac{1}{2}}=7a^2\times(2x)^{\frac{1}{2}}=7a^2\sqrt{2x}$.

Alſo $\sqrt[3]{24a^3x+40a^3x^2}=(2^3a^3(3x+5x^2))^{\frac{1}{3}}=2a\sqrt[3]{3x+5x^2}$.

86. Prob. IV. *To Add and Subtract Surds.*

Rule. If the ſurds are of different denominations, reduce them to others of the ſame denomination, by prob. 2.; and then reduce them to their ſimpleſt terms by laſt problem. Then, if the ſurd part be the ſame in them all, annex it to the ſum, or difference of the rational parts, with the ſign of multiplication, and it will give the ſum, or difference required. But if the ſurd part be not the ſame in all the quantities, they can only be added, or ſubtracted by placing the ſigns + or − between them. Surds.

Ex. 1. Required the ſum of $\sqrt{27}$ and $\sqrt{48}$.

By prob. 3. we find $\sqrt{27}=3\sqrt{3}$ and $\sqrt{48}=4\sqrt{3}$, therefore $\sqrt{27}+\sqrt{48}=3\sqrt{3}+4\sqrt{3}=7\sqrt{3}$.

Ex. 2. Required the ſum of $3\sqrt[3]{\frac{1}{4}}$ and $5\sqrt[3]{\frac{1}{16}}$.

$3\sqrt[3]{\frac{1}{4}}=3\sqrt[3]{\frac{2}{8}}=\frac{3}{2}\sqrt[3]{2}$ and $5\sqrt[3]{\frac{1}{16}}=5\sqrt[3]{\frac{2}{32}}=\frac{5}{4}\sqrt[3]{2}$, therefore $3\sqrt[3]{\frac{1}{4}}+5\sqrt[3]{\frac{1}{16}}=\frac{1}{2}\sqrt[3]{2}+\frac{5}{8}\sqrt[3]{2}=\frac{17}{8}\sqrt[3]{2}$.

Ex. 2. Required the difference between $\sqrt{80a^4x}$ and $\sqrt{20a^2x^3}$.

$\sqrt{80a^4x}=(4^2a^4\times5x)^{\frac{1}{2}}=4a^2\sqrt{5x}$, and $\sqrt{20a^2x^3}=(2^2a^2x^2\times5x)^{\frac{1}{2}}=2ax\sqrt{5x}$; therefore $\sqrt{80a^4x}-\sqrt{20a^2x^3}=(4a^2-2ax)\sqrt{5x}$.

86. Prob. V. *To Multiply and Divide Surds.*

Rule. If they are ſurds of the ſame rational quantity, add and ſubtract their exponents.

But if they are ſurds of different rational quantities, let them be brought to others of the ſame denomination, by prob. 2. Then, by multiplying or dividing theſe rational quantities, their product, or quotient, may be ſet under the common radical ſign.

Note. If the ſurds have any rational coefficients, their product or quotient muſt be prefixed.

Ex. 1. Required the product of $\sqrt[3]{a^2}$ and $\sqrt[5]{a^3}$.

$\sqrt[3]{a^2}\times\sqrt[5]{a^3}=a^{\frac{2}{3}}\times a^{\frac{3}{5}}=a^{\frac{2}{3}+\frac{3}{5}}=a^{\frac{19}{15}}=\sqrt[15]{a^{19}}$, Anſ.

Ex. 2. Divide $\sqrt{a^2-b^2}$ by $\sqrt[3]{a+b}$.

Theſe ſurds when reduced to the ſame denomination are $(a^2-b^2)^{\frac{3}{6}}$ and $(a+b)^{\frac{2}{6}}$. Hence $\frac{\sqrt{a^2-b^2}}{\sqrt[3]{a+b}}=\left(\frac{(a^2-b^2)^3}{(a+b)^2}\right)^{\frac{1}{6}}=\left(\frac{(a+b)^3(a-b)^3}{(a+b)^2}\right)^{\frac{1}{6}}=\left((a+b)(a-b)^3\right)^{\frac{1}{6}}=\sqrt[6]{(a+b)(a-b)^3}$.

Ex. 3. Required the product of $5\sqrt{8}$ and $3\sqrt{5}$.

$5\sqrt{8}\times3\sqrt{5}=5\times3\times\sqrt{8}\times\sqrt{5}=15\times\sqrt{40}=15\times\sqrt{4}\times10=30\sqrt{10}$.

Ex. 4. Divide $8\sqrt[3]{56}$ by $4\sqrt[3]{2}$.

$$\frac{8\sqrt[3]{56}}{4\sqrt[3]{2}}=2\frac{\sqrt[3]{56}}{2}=2\sqrt[3]{28}.$$

Ex. 5.

Proportion.

Ex. 5. Required the product of $x^{\frac{1}{m}}$ and $x^{\frac{1}{n}}$; also the quotient arising from the division of $a^{\frac{1}{m}}$ by $b^{\frac{1}{n}}$

First $x^{\frac{1}{m}} \times x^{\frac{1}{n}} = x^{\frac{1}{m}+\frac{1}{n}} = x^{\frac{m+n}{mn}} = \sqrt[mn]{x^{m+n}}$,

And $\frac{a^{\frac{1}{m}}}{b^{\frac{1}{n}}} = \left(\frac{a^n}{b^n}\right)^{\frac{1}{mn}} = \sqrt[mn]{\frac{a^n}{b^m}}$.

88. Prob. VI. *To Involve and Evolve Surds.*

Surds are involved or evolved in the same manner as any other quantities, namely, by multiplying or dividing their exponents by the index of the power, or root required. Thus the square of $3\sqrt{3}$ is $3 \times 3 \times (3)^{\frac{2}{2}} = 9\sqrt[2]{9}$. The nth power of $x^{\frac{1}{m}}$ is $x^{\frac{n}{m}}$. The cube root of $\frac{1}{8}\sqrt{2}$ is $\frac{1}{2}(2)^{\frac{1}{6}} = \sqrt[6]{\frac{2}{2}}$ and the nth root of $x^{\frac{1}{m}}$ is $x^{\frac{1}{mn}}$.

89. If a compound quantity involve one or more surds, its powers may be found by multiplication. Thus the square of $3+\sqrt{5}$ is found as follows:

$$\begin{array}{r} 3+\sqrt{5} \\ 3+\sqrt{5} \\ \hline 9+3\sqrt{5} \\ +3\sqrt{5}+5 \\ \hline \end{array}$$

$9+6\sqrt{5}+5 = 14+6\sqrt{5}$ the square required.

90. The square root of a binomial, or residual surd $A+B$, or $A-B$ may be found thus. Take $\sqrt{A^2-B^2}-D$;

then $\sqrt{A+B} = \sqrt{\frac{A+D}{2}} + \sqrt{\frac{A-D}{2}}$,

and $\sqrt{A-B} = \sqrt{\frac{A+D}{2}} - \sqrt{\frac{A-D}{2}}$.

Thus the square root of $8+2\sqrt{7}$ is $1+\sqrt{7}$; and the square root of $3-\sqrt{8}$ is $\sqrt{2}-1$. With respect to the extraction of the cube or any higher root no general rule can be given.

Sect. V. *Of Proportion.*

91. In comparing together any two quantities of the same kind in respect of magnitude, we may consider how much the one is greater than the other, or else how many times the one contains either the whole, or some part of the other; or, which is the same thing, we may consider either what is the difference between the quantities, or what is the quotient arising from the division of the one quantity by the other; the former of these is called their *arithmetical ratio*, and the latter their *geometrical ratio*. These denominations, however, have been assumed arbitrarily, and have little or no connexion with the relations they are intended to express.

I. *Of Arithmetical Proportion.*

92. When of four quantities the difference between the first and second is equal to the difference between the third and fourth, the quantities are called *arithmetical proportionals*. Such, for example, are the numbers 2, 5, 9, 12; and, in general, the quantities a, $a+d$, b, $b+d$. If the two middle terms are equal, the quantities constitute what are called *three arithmetical proportionals*. Arithmetical Proportion.

93. The most material property of four arithmetical proportionals is the following: If four quantities be arithmetically proportional, the sum of the extreme terms is equal to the sum of the means. Let the quantities be a, $a+d$, b, $b+d$, where d is the difference between the first and second, and also between the third and fourth, the sum of the extremes is $a+b+d$, and that of the means $a+d+b$; so that the truth of the proportion is evident. Hence it follows, that if any three quantities be arithmetically proportional, the sum of the two extremes is double the mean.

94. If any three terms of four arithmetical proportionals be given, the fourth may be found from the preceding proposition. Let a, b, c, be the first, second, and fourth terms, and let x the third term be required; because $a+c=b+x$; therefore $x=a+c-b$. In like manner any two of three arithmetical proportionals being supposed given, the remaining term may be readily found,

95. If a series of quantities be such, that the difference between any two adjacent terms is always the same, these terms form a *continued arithmetical proportion*. Thus the numbers 2, 4, 6, 8, 10, &c. form a series in continued arithmetical proportion, and, in general, such a series may be represented thus:

a, $a+d$, $a+2d$, $a+3d$, $a+4d$, $a+5d$, $a+6d$, &c.

where a denotes the first term and d the common difference.

By a little attention to this series, we readily discover that it has the following properties:

1. The last term of the series is equal to the first term, together with the common difference taken as often as there are terms after the first. Thus, when the number of terms is 7, the last term is $a+6d$; and so on. Hence if z denote the last term, n the number of terms, and a and d express the first term and common difference, we have $z=a+(n-1)d$.

2. The sum of the first and last term is equal to the sum of any two terms at the same distance from them. Thus suppose the number of terms to be 7, then the last term is $a+6d$, and the sum of the first and last, $2a+6d$; but the same is also the sum of the second and last but one, of the third and last but two, and so on till we come to the middle term, which, because it is equally distant from the extremes must be added to itself.

96. From this last mentioned property we derive a rule for finding the sum of all the terms of the series. For if the sum of the first and last be taken, as also the sum of the second and last but one, of the third and last but two, and so on along the series till we come to the sum of the last and first terms, it is evident that we shall have as many sums as there are terms, and each equal to the sum of the first and last terms; but the aggregate of those sums is equal to all the terms of the series taken twice, therefore the sum of the first and last term, taken as often as there are terms, is equal to twice the sum of all the terms, so that if s denote that sum, we have $2s=n(a+z)$, and $s=\frac{n}{2}(a+z)$.

Geometrical Proportion.

Hence the sum of the odd numbers 1, 3, 5, 7, 9, &c. continued to n terms, is equal to the square of the number of terms. For in this case $a=1$, $d=2$, $z=1+(n-1)d=2n-1$, therefore $s=\frac{n}{2}\times 2n=n^2$.

II. *Of Geometrical Proportion.*

97. When of four quantities, the quotient arising from the division of the first by the second is equal to that arising from the division of the third by the fourth, these quantities are said to be in *geometrical proportion*, or are called simply *proportionals*. Thus 12, 4, 15, 5, are four numbers in geometrical proportion; and, in general, na, a, nb, b may express any four proportionals, for $\frac{na}{a}=n$, and also $\frac{nb}{b}=n$.

98. To denote that any four quantities a, b, c, d, are proportional, it is common to place them thus, $a : b :: c : d$, or thus $a : b=c : d$, which notation, when expressed in words, is read thus, a is to b as c to d, or the ratio of a to b is equal to the ratio of c to d.

The first and third terms of a proportion are called the *antecedents*, and the second and fourth the *consequents*.

99. When the two middle terms of a proportion are the same, the remaining terms, and that quantity, constitute three geometrical proportionals; such are 4, 6, 9, and in general na, a, $\frac{a}{n}$. In this case the middle quantity is called a mean proportional between the other two.

100. The principal properties of four proportionals are the following:

1. If four quantities be proportionals, the product of the extremes is equal to the product of the means. Let a, b, c, d, be four quantities, such, that $a : b :: c : d$; then from the nature of proportionals $\frac{a}{b}=\frac{c}{d}$; let these equal quotients be multiplied by bd, and we have $\frac{abd}{b}=\frac{cbd}{d}$, or $ad=bc$. Hence it follows, that when three quantities are proportional, the product of the extremes is equal to the square of the middle term. It also appears, that if any three of four proportionals be given, the remaining one may be found. Thus let a, b, c, the three first be given, and let it be required to find x the fourth term; because $a : b :: c : x$, $ax=bc$, and dividing by a, $x=\frac{bc}{a}$. This conclusion may be considered as a demonstration of what is called the rule of three in arithmetic.

2. If four quantities be such that the product of two of them is equal to the product of the other two, these quantities are proportionals.

Let a, b, c, d, be the quantities, which are such that $ad=bc$, if these equals be divided by bd, we get $\frac{ad}{bd}=\frac{bc}{bd}$ or $\frac{a}{b}=\frac{c}{d}$, hence it follows, from the definition given of proportionals (§ 97.), that $a : b :: c : d$. From this property of proportionals it appears, that if three quantities be such that the square of one of them be equal to the product of the other two, these quantities are three proportionals.

Geometrical Proportion.

101. If four quantities are proportional, that is, if $a : b :: c : d$, then will each of the following combinations or arrangements of the quantities be also four proportionals.

1st, By inversion $b : a :: d : c$

2d, By alternation $a : c :: b : d$ *

3d, By composition $a+b : a :: c+d : c$
or $a+b : b :: c+d : d$

4th, By division $a-b : a :: c-d : c$
or $a-b : b :: c-d : d$

5th, By mixing $a+b : a-b :: c+d : c-d$

6th, By taking any equimultiples of the antecedents, and also any equimultiples of the consequents
$na : pb :: nc : pd$

7th, Or by taking any parts of the antecedents and consequents $\frac{a}{n} : \frac{b}{p} :: \frac{c}{n} : \frac{d}{p}$.

That the preceding combinations of the quantities a, b, c, d are proportionals, may be readily proved, by taking the products of the extremes and means; for from each of them we derive this conclusion, that $ad=bc$, which is known to be true, from the original assumption of the quantities.

102. If four quantities be proportional, and also other four, the product of the corresponding terms will be proportional.

Let $a : b :: c : d$,
and $e : f :: g : h$,
Then $ae : bf :: cg : dh$.

For $ad=bc$, and $eh=fg$ (§ 100.), therefore, multiplying together these equal quantities $adeh=bcfg$, or $ae\times dh=bf\times cg$, therefore by the second property (§ 100.), $ae : bf :: cg : dh$.

103. Hence it follows, that if there be any number of proportions whatever, the products of the corresponding terms will still be proportional.

104. If a series of quantities be so related to each other, that the quotient arising from the division of any term by that which follows it is always the same quantity, these quantities are said to be in *continued geometrical proportion*, such are the numbers 2, 4, 8, 16, 32, &c. also $\frac{1}{2}$, $\frac{1}{4}$, $\frac{1}{8}$, $\frac{1}{16}$, &c. and in general a series of such quantities may be represented thus, a, ar, ar^2, ar^3, ar^4, ar^5, &c. Here a is the first term, and r the quotient of any two adjoining terms, which is also called the *common ratio*.

105. By inspecting this series we find that it has the following properties:

1. The last term is equal to the first, multiplied by the common ratio raised to a power, the index of which is one less than the number of terms. Therefore, if z denote the last term, and n the number of terms, $z=ar^{n-1}$.

2. The

* The quantities in this case must be all of the same kind, that is, if a and b denote surfaces, then c and d must also denote surfaces, but they cannot represent lines, &c.

Reduction of Equations.

2. The product of the first and last term is equal to the product of any two terms equally distant from them: thus, supposing ar^5 the last term, it is evident that $a \times ar^5 = ar \times ar^4 = ar^2 \times ar^3$, &c.

106. The sum of all the terms may be found thus: let s represent that sum, then, supposing the number of terms to be six, $s = a + ar + ar^2 + ar^3 + ar^4 + ar^5$, and multiplying these equals by r, $sr = ar + ar^2 + ar^3 + ar^4 + ar^5 + ar^6$. If from the lower line, or $sr = ar + ar^2 + \ldots + ar^6$, we subtract the upper line, or $s = a + ar + \ldots + ar^5$, the remainders will evidently be equal; but on the one side of the sign $=$ we have $sr - s$, and on the other $ar^6 - a$: therefore, $sr - s = ar^6 - a$, and dividing by $r - 1$, $s = \frac{ar^6 - a}{r - 1}$. Let us now, instead of 6, substitute n (for the number of terms put down was 6), and we have the following general rule for finding the sum of a series of quantities in continued geometrical proportion, $s = \frac{ar^n - a}{r - 1}$, or $s = \frac{a(r^n - 1)}{r - 1}$.

Sect. VI. *Of the Reduction of Equations involving one unknown quantity.*

107. The general object of algebraic investigation is to discover certain unknown quantities, by comparing them with other quantities which are given, or supposed to be known. The relation between the known and unknown quantities is either that of equality, or else such as may be reduced to equality; and a proposition which affirms that certain combinations of quantities are equal to one another is called an *equation*. Such are the following $\frac{x}{2} + \frac{x}{3} = \frac{24}{x}$, $2x + 3y = xy$; the first of these equations expresses the relation between an unknown quantity x, and certain known numbers; and the second expresses the relation which the two indefinite quantities x and y have to each other.

108. When a quantity stands alone on one side of an equation, the terms on the other side are said to be a *value* of that quantity. Thus in the equation $x = ay + b - c$, the quantity x stands alone on one side, and $ay + b - c$ is its value.

109. The conditions of a problem may be such as to require several equations and symbols of unknown quantities for their complete expression; these, however, by rules hereafter to be explained, may be reduced to one equation, involving only one unknown quantity and its powers, besides the known quantities; and the method of expressing that quantity, by means of the known quantities, constitutes the theory of equations, one of the most important, as well as most intricate branches of algebraic analysis.

110. An equation is said to be *resolved* when the unknown quantity is made to stand alone on one side, and only known quantities on the other side; and the value of the unknown quantity is called a *root* of the equation.

111. Equations containing only one unknown quantity and its powers, are divided into different *orders*, according to the highest power of that quantity contained in any one of its terms. The equation, however, is supposed to be reduced to such a form, that the unknown quantity is found only in the numerators of the terms, and that the exponents of its powers are expressed by positive integers. Reduction of Equations.

112. If an equation contains only the first power of the unknown quantity, it is called a *simple* equation, or an equation of the first order. Such is $ax + b = c$, where x denotes an unknown, and a, b, c known quantities.

113. If the equation contains the second power of the unknown quantity, it is said to be of the second degree, or is called a *quadratic* equation; such is $4x^2 + 3x = 12$, and in general $ax^2 + bx = c$. If it contains the third power of the unknown quantity, it is of the third degree, or is a *cubic* equation. Such are $x^3 - 2x^2 + 4x = 10$, and $ax^3 + bx^2 + ca = d$, and so on, with respect to equations of the higher orders. A simple equation is sometimes said to be *linear*, or to be of one *dimension*. In like manner, quadratic equations are said to be equations of two dimensions, and cubic equations to be of three dimensions.

114. When in the course of an algebraic investigation we arrive at an equation involving only one unknown quantity, that quantity will often be so entangled in the different terms, as to render several previous reductions necessary before the equation can be expressed under its characteristic form, so as to be resolved by the rules which belong to that form.

These reductions depend upon the operations which have been explained in the former part of this treatise, and the application of a few self-evident principles, namely, that if equal quantities be added to, or subtracted from equal quantities, the sums or remainders will be equal; if equal quantities be multipled, or divided by the same quantity, the products or quotients will be equal; and, lastly, if equal quantities be raised to the same power, or have the same root extracted out of each, the results will still be equal.

From these considerations are derived the following rules, which apply alike to equations of all orders, and are alone sufficient for the resolution of simple equations.

115. *Rule* 1. Any quantity may be transposed from one side of an equation to the other, by changing its signs.

Thus, if $x - 3 = 5$
Then $x = 5 + 3$
Or $x = 8$
And if $3x - 10 = 2x + 5$
Then $3x - 2x = 5 + 10$
Or $x = 15$
Again, if $ax + b = cx - dx + e$
Then $ax - cx + dx = e - b$
Or $(a - c + d)x = e - b$

The reason of this rule is evident, for the transposing a quantity from one side of an equation to the other is nothing more than adding the same quantity to each side of the equation, if the sign of the quantity transposed was $-$; or subtracting it, if the sign was $+$.

From this rule we may infer, that if any quantity be found on each side of the equation with the same sign, it may be left out of both. Also, that the signs of all the terms of an equation may be changed into

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the contrary without affecting the truth of the equation.

Thus, if $a+x=b+a-c$
Then $x=b+c$
And if $a-x=b-d$
Then $x-a=d-b$.

116. *Rule* 2. If the unknown quantity in an equation be multiplied by any quantity, that quantity may be taken away, by dividing all the other terms of the equation by it.

If $3x=24$
Then $x=\frac{24}{3}=8$
If $ax=b-c$
Then $x=\frac{b-c}{a}=\frac{b}{a}-\frac{c}{a}$.

Here equal quantities are divided by the same quantity, and therefore the quotients are equal.

117. *Rule* 3. If any term of an equation be a fraction, its denominator may be taken away by multiplying all the other terms of the equation by that denominator.

If $\frac{x}{5}=7$
Then $x=35$
If $\frac{x}{a}=b-c+d$
Then $x=ab-ac+ad$
If $a-\frac{b}{x}=c$,
$ax-b=cx$.

In these examples, equal quantities are multiplied by the same quantity, and therefore the products are equal.

118. The denominators may be taken away from several terms of an equation by one operation, if we multiply all the terms by any number which is a multiple of each of these denominators.

Thus, if $\frac{x}{2}+\frac{x}{3}+\frac{x}{4}=26$.

Let all the terms be multiplied by 12, which is a multiple of 2, 3, and 4, and we have

$\frac{12x}{2}+\frac{12x}{3}+\frac{12x}{4}=312$
Or $6x+4x+3x=312$
Hence $13x=312$,

Universally, if $\frac{x}{a}-\frac{x}{b}+\frac{x}{c}=d-e$.

To take away the denominators a, b, c, let the whole equation be multiplied by abc, their product, and we have

$bcx-acx+abx=abc(d-e)$
Or $(bc-ac+ab)x=abc(d-e)$.

119. From the two last rules it appears that if all the terms of an equation be either multiplied or divided by the same quantity, that quantity may be left out of all the terms.

If $ax=ab-ac$
Then $x=b-c$
And if $\frac{x}{a}=\frac{b}{a}+\frac{c}{a}$
Then $x=b+c$.

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120. *Rule*. If the unknown quantity is found in any term which is a surd, let that surd be made to stand alone on one side of the equation, and the remaining terms on the opposite side; then involve each side to a power denoted by the index of the surd, and thus the unknown quantity shall be freed from the surd expression.

If $\sqrt{x}+6=10$
Then by transposition $\sqrt{x}=10-6=4$
And squaring both sides $\sqrt{x}\times\sqrt{x}=4\times4$
Or $x=16$.

Also, if $\sqrt{a^2+x^2}-b=x$
By transp. $\sqrt{a^2+x^2}=b+x$
And squaring, $a^2+x^2=(b+x)^2=b^2+2bx+x^2$
Hence $a^2=b^2+2bx$.

And if $\sqrt[1]{a^2x-b^2x}=a$
Then $a^2x-b^2x=a^1$.

121. *Rule*. If the side of the equation, which contains the unknown quantity, be a perfect power, the equation may be reduced to another of a lower order, by extracting the root of that power out of each side of the equation.

Thus if $x^1=64a^1$
Then, by extracting the cube root, $x=8a$
And if $(a+x)^2=b^2-a^2$
Then $a+x=\sqrt{b^2-a^2}$.

122. The use of the preceding rules will be farther illustrated by the following examples:

Ex. 1. Let $20-3x-8=60-7x$

By rule 1. $7x-3x=60+8-20$
Or $4x=48$
Therefore by rule 2. $x=12$.

Ex. 2. Let $ax-b=cx+d$

By rule 1. $ax-cx=b+d$
Or $(a-c)x=b+d$
And by rule 2. $x=\frac{b+d}{a-c}$.

Ex. 3. Let $\frac{x+1}{2}+\frac{x+2}{3}=16-\frac{x+3}{4}$

By rule 3.
$x+1+\frac{2x+4}{3}=32-\frac{2x+6}{4}$
$3x+3+2x+4=96-\frac{6x+18}{4}$
$12x+12+8x+16=384-6x-18$
Or $20x+28=366-6x$

Hence, by rule 1. $26x=338$
And by rule 2. $x=13$.

In this example, instead of taking away the denominators one after another, they might have been all taken away at once, by multiplying the given equation by

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by 12, which is divisible by the numbers 2, 3, and 4; thus we should have got $6x+6+4x+8=192-3x-9$, and hence, as before, $x=13$.

Ex. 4. Let $6x^3-20x^2=16x^2+2x^3$.

Then dividing by $2x^2$, $3x-10=8+x$
And transposing, $3x-x=8+10$
Or $2x=18$
And therefore $x=9$.

Ex. 5. Let $a-\frac{b^2}{x}=c$

Then $ax-b^2=cx$
And $ax-cx=b^2$
Whence $x=\frac{b^2}{a-c}$.

Ex. 6. Let $x-6=\frac{x^2}{x+24}$.

Then $(x-6)(x+24)=x^2$
That is $x^2+18x-144=x^2$
Therefore $18x=144$
And $x=8$.

Ex. 7. Let $ax+b^2=\frac{ax^2+ac^2}{a+x}$.

Then $(a+x)(ax+b^2)=ax^2+ac^2$
Or $a^2x+ab^2+ax^2+b^2x=ax^2+ac^2$
Hence $a^2x+b^2x=ac^2-ab^2$
And $x=\frac{ac^2-ab^2}{a^2+b^2}$.

Ex. 8. Let $\frac{1-x}{1+a}=a$.

Then $1-x=a+ax$
And $-x-ax=a-1$
Or changing the signs, $x+ax=1-a$
Hence, $x=\frac{1-a}{1+a}$.

Ex. 9. Let $\sqrt{12+x}=2+\sqrt{x}$.

Then by rule 4. $12+x=4+4\sqrt{x}+x$
And by transposition $8=4\sqrt{x}$
And by division $2=\sqrt{x}$
And again by rule 4. $4=x$.

Ex. 10. Let $x+\sqrt{a^2+x^2}=\frac{2a^2}{\sqrt{a^2+x^2}}$.

Then, by rule 3. $x\sqrt{a^2+x^2}+a^2+x^2=2a^2$
And by transposition, &c. $x\sqrt{a^2+x^2}=a^2-x^2$
Therefore, by rule 4. $a^2x^2+x^4=a^4-2a^2x^2+x^4$
Whence $3a^2x^2=a^4$
And $x^2=\frac{a^2}{3}$, therefore, rule 5. $x=\frac{a}{\sqrt{3}}$.

Ex. 11. Let $\frac{1-\sqrt{1-x^2}}{1+\sqrt{1-x^2}}=a$.

Then $1-\sqrt{1-x^2}=a+a\sqrt{1-x^2}$
And $1-a=a\sqrt{1-x^2}+\sqrt{1-x^2}=(1+a)\sqrt{1-x^2}$
Whence $\frac{1-a}{1+a}=\sqrt{1-x^2}$

And, taking the square of both sides, $\frac{(1-a)^2}{(1+a)^2}=1-x^2$
Therefore, by transposition, $x^2=1-\frac{(1-a)^2}{(1+a)^2}$
That is, $x^2=\frac{(1+a)^2-(1-a)^2}{(1+a)^2}=\frac{4a}{(1+a)^2}$
Therefore $x=\frac{2\sqrt{a}}{1+a}$.

Ex. 12. Let $a+x=\sqrt{a^2+x\sqrt{b^2+x^2}}$
Then $(a+x)^2=a^2+x\sqrt{b^2+x^2}$
That is, $a^2+2ax+x^2=a^2+x\sqrt{b^2+x^2}$
Therefore $2ax+x^2=x\sqrt{b^2+x^2}$
And dividing by x, $2a+x=\sqrt{b^2+x^2}$
Again taking the squares of both sides, $4a^2+4ax+x^2=b^2+x^2$
Whence $4a^2+4ax=b^2$
And $4ax=b^2-4a^2$; so that $x=\frac{b^2-4a^2}{4a}$.

123. In all these examples we have been able to determine the value of the unknown quantity by the rules already delivered, because in every case the first, or at most the second power of that quantity, has been made to stand alone on one side of the equation, while the other consisted only of known quantities; but the same methods of reduction serve to bring equations of all degrees to a proper form for solution. Thus if $\frac{1-p+q+r}{x+1}=1-p-x+\frac{r}{x}$; by proper reduction, we have $x^3+px^2+qx=r$, a cubic equation, which may be resolved by rules to be afterwards explained.

Sect. VII. *Of the Reduction of Equations involving more than one unknown quantity.*

124. Having shown in the last section in what manner an equation involving one unknown quantity may be resolved, or at least fitted for a final solution, we are next to explain the methods by which two or more equations, involving as many unknown quantities, may at last be reduced to one equation, and one unknown quantity.

As the unknown quantities may be combined together in very different ways, so as to constitute an equation, the methods most proper for their extermination must therefore be various. The three following, however, are of general application, and the last of them may be used with advantage, not only when the unknown quantity to be exterminated arises to the same power in all the equations, but also when the equations contain different powers of that quantity.

125. *Method* 1. Observe which of the unknown quantities is the least involved, and let its value be found from each equation by the rules of last section.

Let the values thus found be put equal to each other, and hence new equations will arise, from which that

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that quantity is wholly excluded. Let the same operation be now repeated with the same equations, and the unknown quantities exterminated one by one, till at last an equation be found, which contains only one unknown quantity.

Ex. Let it be required to determine x and y from these two equations.

$$2x+3y=23$$
$$5x-2y=10$$

From the first equation $2x=23-3y$

And $x=\frac{23-3y}{2}$

From the second equation $5x=10+2y$

And $x=\frac{10+2y}{5}$

Let these values of x be now put equal to each other,

And we have $\frac{10+2y}{5}=\frac{23-3y}{2}$

Or $20+4y=125-15y$

Therefore $19y=95$

And $y=5$

And since $x=\frac{23-3y}{2}$, or $x=\frac{10+2y}{5}$, from either of these values we find $x=4$.

126. *Method* 2. Let the value of the unknown quantity, which is to be exterminated, be found from that equation wherein it is least involved. Let this value, and its powers, be substituted for that quantity, and its respective powers in the other equations; and with the new equations thus arising, let the operation be repeated, till there remain only one equation, and one unknown quantity.

Ex. Let the given equations, as in last method, be

$$2x+3y=23$$
$$5x-2y=10$$

From the first equation $x=\frac{23-3y}{2}$

And this value of x being substituted in the second equation, we have $5\times\frac{23-3y}{2}-2y=10$

Or $115-15y-4y=20$

Therefore $95=19y$

And $5=y$

And hence $x=\frac{23-3y}{2}=4$, as before.

127. *Method* 3. Let the given equations be multiplied or divided by such numbers or quantities, whether known or unknown, that the term which involved the highest power of the unknown quantity may be the same in each equation.

Then by adding or subtracting the equations, as occasion may require, that term will vanish, and a new equation emerge, wherein the number of dimensions of the unknown quantity in some cases, and in others the number of unknown quantities, will be diminished; and by a repetition of the same, or similar operations, a final equation may be at last obtained, involving only one unknown quantity.

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Ex. Let the same example be taken, as in the illustration of the two former methods, namely,

$$2x+3y=23$$
$$5x-2y=10$$

and from these two equations we are to determine x and y. To exterminate x, let the first equation be multiplied by 5, and the second by 2, thus we have

$$10x+15y=115$$
$$10x-4y=20$$

Here the term involving x is the same in both equations, and it is obvious that by subtracting the one from the other, the resulting equation will contain only y, and known numbers, for by such subtraction we find $19y=95$, and therefore $y=5$.

Having got the value of y, it is easy to see how x may be found, from either of the given equations; but it may also be found in the same manner as we found y. For let the first of the given equations be multiplied by 2, and the second by 3, and we have

$$4x+6y=46$$
$$15x-6y=30$$

By adding these equations, we find

$$19x=76$$

and therefore $x=4$.

128. The following examples will serve farther to illustrate these different methods of exterminating the unknown quantities from equations.

Ex. 1. Given $\left\{\begin{matrix}\frac{x}{2}+\frac{y}{3}=16\\ \frac{x}{5}-\frac{y}{9}=2\end{matrix}\right\}$ Required x and y.

By Method 1.

From the first equation we find $x=32-\frac{2y}{3}$

And from the second $x=10+\frac{5y}{9}$

Therefore $10+\frac{5y}{9}=32-\frac{2y}{3}$

Or $90+5y=288-6y$

Hence $11y=198$

And $y=18$

The value of y being substituted in either of the values of x, namely, $32-\frac{2y}{3}$ or $10+\frac{5y}{9}$ we find $x=20$.

By Method 2.

Having found from the first given equation $x=32-\frac{2y}{3}$, let this value of x be substituted in the second, thus we have

$$\frac{1}{5}\left(32-\frac{2y}{3}\right)-\frac{y}{9}=2$$

Or $\frac{32}{5}-\frac{2y}{15}-\frac{y}{9}=2$

Hence $198=11y$

And $18=y$

The

The value of y being now ſubſtituted in either of the given equations, we thence find $x=20$ as before.

By Method 3.

The denominators of the two given equations being taken away by rule 3. of laſt ſection, we have

$$3x+2y=96$$
$$9x-5y=90$$

From three times the firſt of theſe equations, or $9x+6y=288$, let the ſecond be ſubtracted, and there remains

$$11y=198$$
And hence $y=18$

The value of y being now ſubſtituted in either of the equations $3x+2y=96$, $9x-5y=90$, we readily find $x=20$.

129. Having now ſhewn in what manner the different methods of exterminating the unknown quantities may be applied, we ſhall, in the remaining examples of this ſection, chiefly make uſe of the laſt method, becauſe it is the moſt eaſy and expeditious in practice.

Ex. 2. Given $\left\{\begin{array}{l}\frac{x}{2}-12=\frac{y}{4}+8\\ \frac{x+y}{5}+\frac{x}{3}-8=\frac{2y-x}{4}+27\end{array}\right\}$

It is required to determine x and y.

From the 1ſt equation we have $4x-96=2y+64$.
And from the ſecond, $12x+12y+20x-480=30y-15x+1620$.
Theſe two equations, when abridged, become

$$4x-2y=160$$
$$47x-18y=2100$$

To exterminate y; from this laſt equation let 9 times the one preceding it be ſubtracted.

Thus we find $11x=660$
And $x=60$
And becauſe $2y=4x-160=80$
Therefore $y=40$.

Ex. 3. Given $\left\{\begin{array}{l}ax+by=c\\ dx+fy=g\end{array}\right\}$ To determine x and y.

To exterminate y, let the firſt equation be multiplied by f, and the ſecond by b, and we have

$$afx+bfy=cf$$
$$bdx+bfy=bg$$

Taking now the difference between theſe equations we find

$$afx-bdx=cf-bg$$
Or $(af-bd)x=cf-bg$
And therefore $x=\frac{cf-bg}{af-bd}$.

In the ſame manner may y be determined, by multiplying the firſt of the given equations by d, and the ſecond by a; for we find

$$adx+bdy=cd$$
$$adx+afy=ag$$

and taking the difference as before, we get

$$bdy-afy=cd-ag$$
And therefore $y=\frac{cd-ag}{bd-af}$.

This laſt example may be conſidered as a general ſolution of the following problem. Two equations expreſſing the relation between the firſt powers of two unknown quantities being given, to determine thoſe quantities. For whatever be the number of terms in each equation, it will readily appear, as in example 2d, that by proper reduction, they may be brought to the ſame form as thoſe given in the 3d example.

130. Let us next conſider ſuch equations as involve three unknown quantities.

Ex. 4. Given $\left\{\begin{array}{l}x+y+z=29\\ x+2y+3z=62\\ \frac{x}{2}+\frac{y}{3}+\frac{z}{4}=10\end{array}\right\}$ To find x, y, and z.

We ſhall in this example proceed according to the rules of the firſt method for exterminating the unknown quantities.

From the firſt equation $x=29-y-z$
From the ſecond $x=62-2y-3z$
From the third $x=20-\frac{2y}{3}-\frac{z}{2}$.

Let theſe values of x be put equal to each other, thus we get the two following equations,

$$29-y-z=62-2y-3z$$
$$29-y-z=20-\frac{2y}{3}-\frac{z}{2}.$$

Again, from theſe two equations, by tranſpoſition, &c. we find

$$y=33-2z$$
$$y=27-\frac{3z}{2}.$$

Therefore $33-2z=27-\frac{3z}{2}$.

And hence, by reduction, $z=12$
Whence alſo $y=33-2z=9$
And $x=29-y-z=8$.

Ex. 5. Given $\left\{\begin{array}{l}\frac{x}{2}+\frac{y}{3}+\frac{z}{4}=62\\ \frac{x}{3}+\frac{y}{4}+\frac{z}{5}=47\\ \frac{x}{4}+\frac{y}{5}+\frac{z}{6}=38\end{array}\right\}$ To find x, y, and z.

Here the given equations, when cleared from fractions, become

$$12x+8y+6z=1488$$
$$20x+15y+12z=2820$$
$$30x+24y+20z=4560$$

To exterminate z by the third method, let the firſt equation be multiplied by 10, the ſecond by 5, and the third by 3, the reſults will be theſe:

$$120x+80y+60z=14880$$
$$100x+75y+60z=14100$$
$$90x+72y+60z=13680$$

Let

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Let the second equation be now subtracted from the first, and the third from the second, and we have

$$20x+5y=780$$
$$10x+3y=420$$

Next to exterminate y, let the first of these equations be multiplied by 3, and the second by 5, hence

$$60x+15y=2340$$
$$50x+15y=2100$$

Subtracting now the latter equation from the former,

$$10x=240$$

Hence $x=24$

Therefore $y=\frac{420-10x}{3}=60$

And $z=\frac{1448-12x-8y}{6}=120.$

131. From the preceding examples, it is manifest in what manner any number of unknown quantities may be determined, by an equal number of equations, which contain only the first power of those quantities, in the numerators of the terms. Such are the following

$$ax+by+cz=n$$
$$dx+ey+fz=p$$
$$gx+hy+kz=q$$

where a, b, c, &c. represent known, and x, y. z, unknown quantities; and in every case of this kind, the unknown quantities may be directly found, for they will be always expressed by whole numbers, or rational fractions, provided that the known quantities a, b, c, &c. are also rational.

132. We shall now add a few examples, in which the equations that result from the extermination of an unknown quantity arise to some of the higher degrees; and therefore their final solution must be referred to the sections which treat of those degrees.

Ex. 6. Let $x-y=2$, and $xy+5x-6y=120$; it is required to exterminate x.

From the first equation $x=y+2$; which value being substituted in the other equation according to the second general method (§ 126.) it becomes

$$(y+2)y+5(y+2)-6y=120$$
that is $y^2+2y+5y+10-6y=120$

therefore the equation required is $y^2+y=110$.

Ex. 7. There is given $x+y=a$; and $x^2+y^2=b$ to exterminate x.

From the first equation $x=a-y$, and $x^2=(a-y)^2$. And from the second $x^2=b-y^2$.

Therefore $(a-y)^2=b-y^2$
That is $a^2-2ay+y^2=b-y^2$.

Hence $2y^2-2ay=b-a^2$; an equation involving only y.

Ex. 8. Given $\left\{\begin{matrix} axy+bx+cy=d \\ fxy+gx+hy=k \end{matrix}\right\}$ To exterminate y.

From the first equation we find $y=\frac{d-bx}{ax+c}$

And from the second $y=\frac{k-gx}{fx+h}$

Therefore $\frac{d-bx}{ax+c}=\frac{k-gx}{fx+h}$, an equation in which the unknown quantity y is not found. Simple Equation

Ex. 9. Given $\left\{\begin{matrix} y^2-3xy+ay=x^2 \\ y^2+2ax-by=4x^2-b^2 \end{matrix}\right\}$ To exterminate y.

As the coefficient of y^2 is unity in both equations, if their difference be taken, the highest power of y will vanish; but to give a general solution, let the terms of the equations be brought all to one side and made equal to 0, thus,

$$y^2-(3x-a)y \quad x^2=0$$
$$y^2-by+2ax-4x^2+b^2=0$$

Let us in the first equation put $1=A$, $-(3x-a)=B$, $-x^2=C$; and in the second, $1=D$, $-b=E$, $2ax-4x^2+b^2=F$, and the two equations become

$$Ay^2+By+C=0$$
$$Dy^2+Ey+F=0$$

To exterminate y^2, let the first equation be multiplied by D, and the second by A, and we have

$$ADy^2+BDy+CD=0$$
$$ADy^2+AEy+AF=0$$

Therefore, taking the difference of these equations,

$$(BD-AE)y+CD-AF=0$$

And $y=\frac{AF-CD}{BD-AE}$

Again, to find another value of y, multiply the first equation by F, and the second by C, then

$$AFy^2+BFy+CF=0$$
$$CDy^2+CEy+CF=0$$

Therefore, subtracting as before, we get

$$(AF-CD)y^2+(BF-CE)y=0,$$

And dividing by $y(AF-CD)y+BF-CE=0$,

Therefore, $y=\frac{CE-BF}{AF-CD}$.

Let this value of y be put equal to the former value, thus we have $\frac{AF-CD}{BD-AE}=\frac{CE-BF}{AF-CD}$

And therefore $(AF-CD)^2=(BD-AE)(CE-BF)$.

Now as y does not enter this equation, if we restore the values of A, B, C, &c. we have the following equation which involves only x, and known quantities. $(b^2+2ax-3x^2)^2=(a+b-3x)(bx^2-(a-3x)(2ax-4x^3+b^2))$; this equation when properly reduced will be of the fourth order, and therefore its final resolution belongs not to this place.

Sect. VIII. *Questions producing Simple Equations.*

133. When a problem is proposed to be resolved by the algebraic method of analysis, its true meaning ought in the first place to be perfectly understood, so that, if necessary, it may be freed from all superfluous and ambiguous expressions; and its conditions exhibited in the clearest point of view possible. The several quantities concerned in the problem are next to be denoted by proper symbols, and their relation to one another expressed agreeably to the algebraic notation. Thus

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Thus we shall obtain a series of equations, which, if the question be properly limited, will enable us to determine all the unknown quantities required by the rules already delivered in the two preceding sections.

134. In reducing the conditions of a problem to equations, the following rule will be of service. Suppose that the quantities to be determined are actually found, and then consider by what operations the truth of the solution may be verified; then, let the same operations be performed upon the quantities, whether known or unknown, and thus all the conditions of the problem will be reduced to a series of equations, such as is required. For example; suppose that it is required to find two numbers, such, that their sum is 20, and the quotient arising from the division of their difference by the lesser 3; then if we denote the greater of the two numbers by x, and the lesser by y, and proceed as if to prove the truth of the solution, we shall have $x+y$ for the sum of the numbers, and $x-y$ for their difference. Now as the former must be equal to 20, and the latter divided by y equal to 3; the first condition of the problem will be expressed by this equation $x+y=20$, and the second by $\frac{x-y}{y}=3$, and from these, the values of x and y may easily be found.

135. When the conditions of a problem have been expressed by equations, or as it were translated from the common language into that of algebra, we must next consider, whether the problem be properly limited; for in some cases, the conditions may be such as to admit of innumerable solutions; and in others, they may involve an absurdity; and thus render the problem altogether impossible.

136. Now by considering the examples of last section, it will readily appear, that to determine any number of unknown quantities, there must be given as many equations as there are unknown quantities. These equations, however, must be such as cannot be derived from each other; and they must not involve any contradiction; for, in the one case, the problem would admit of an unlimited number of answers; and in the other case, it would be impossible. For example, if it were required to determine x and y from these two equations, $2x-3y=13$, $4x-6y=26$; as the latter equation is a consequence of the former (for each term of the one is the half of the corresponding term of the other) it is evident, that innumerable values of x and y might be found to satisfy both equations. Again, if x and y were to be determined from these equations, $x+2y=8$, $3x+6y=26$, it will quickly appear, that it is impossible to find such values of x and y, as will satisfy both equations; for, from the first of them, we find $3x=24-6y$; and from the second, $3x=26-6y$; and therefore $24-6y=26-6y$, or $24=26$, which is absurd; and so also must have been the conditions from which this conclusion is drawn.

137. But there is yet another case in which a problem may be impossible; and that is, when there are more equations than unknown quantities; for it appears, that in this case, by the rules of last section, we would at last find two equations, each involving the same unknown quantity. Now unless these equations happened to agree, the problem would admit of no solution. Upon the whole, therefore, it appears, that a problem is limited, when the conditions afford just as many independent equations as there are unknown quantities to be determined; if there be fewer equations the problem is indeterminate; but if there be more, the problem in general admits of no solution whatever.

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138. In expressing the conditions of a problem by equations, it will, in general, be convenient to introduce as few symbols of unknown quantities as possible. Therefore, if two quantities be sought and their sum be given, suppose it $=s$, then if the one quantity be represented by x, the other may be denoted by $s-x$. If again their difference be given $=d$, the quantities may be denoted by x, and $d+x$, or by x, and $x-d$. If their product be given $=p$, the quantities are x, and $\frac{p}{x}$; and so on.

139. We shall now apply the preceding observations to some examples, which are so chosen as to admit of being resolved by simple equations.

Ex. 1. What is that number, to which if there be added its half, its third, and its fourth part, the sum will be 50.

Let x denote the number sought. Then its half will be $\frac{x}{2}$, its third $\frac{x}{3}$, and its fourth $\frac{x}{4}$.

Therefore $x+\frac{x}{2}+\frac{x}{3}+\frac{x}{4}=50$.

Hence we find $24x+12x+8x+6x=1200$,

Or $50x=1200$.

Therefore $x=24$.

Thus it appears, that the number sought is 24, which upon trial will be found to answer the conditions of the question.

Ex. 2. A post is $\frac{1}{4}$ of its length in the mud, $\frac{1}{3}$ in the water, and 10 feet above the water, what is its whole length?

Let its length be x feet, then the part in the mud is $\frac{x}{4}$, and that in the water $\frac{x}{3}$; therefore, from the nature of the question,

$$\frac{x}{4}+\frac{x}{3}+10=x.$$

From which equation we find $7x+120=12x$, and $x=24$.

Ex. 3. Two travellers set out at the same time from London and York, whose distance is 150 miles; one of them goes 8 miles a day, and the other 7; in what time will they meet?

Suppose that they meet after x days.

Then the one traveller has gone $8x$ miles, and the other $7x$ miles; now the sum of the distances they travel is, by the question, equal to the distance from London to York.

Therefore $8x+7x=150$

That is $15x=150$, and $x=10$ days.

Ex. 4. A labourer engaged to serve for 40 days, upon these conditions; that for every day he worked he was to receive 2od. but for every day he played, or was absent, he was to forfeit 8d.; now at the end

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of the time he had to receive 1l. 11s. 8d. It is required to find how many days he worked, and how many days he was idle.

Let x be the number of days he worked.
Then will $40-x$ be the number of days he was idle.
Alſo $20\times x=20x$=the ſum he earned, in pence.
And $8\times(40-x)=320-8x$=the ſum he forfeited.
Now the difference of theſe two was 1l. 11s. 8d. or 380d.

Therefore $20x-(320-8x)=380$,
That is $28x=700$.
Hence $x=25$= the number of days he worked,
And $40-x=15$= the number of days he was idle.

Ex. 5. A market-woman bought a certain number of eggs at 2 a-penny, and as many at 3 a-penny; and ſold them all out again at 5 for 2d.: but, inſtead of getting her own money for them, as ſhe expected, ſhe loſt 4d. what number of eggs did ſhe buy?

Let x be the number of eggs of each ſort;

Then will $\frac{x}{2}$ be the price of the firſt ſort,

And $\frac{x}{3}$=the price of the ſecond ſort.

Now the whole number being $2x$, we have

$5 : 2x :: 2 : \frac{4x}{5}$= price of both ſorts at 5 for 2d.

Therefore $\frac{x}{2}+\frac{x}{3}-\frac{4x}{5}=4$, by the queſtion.
Hence $15x+10x-24x=120$,
And $x=120$, the number of each ſort.

Ex. 6. A bill of 120l. was paid in guineas and moidores: the number of pieces of both ſorts that were uſed was 100; how many were there of each?

Let the number of guineas be x.
Then the number of moidores will be $100-x$.
Alſo the value of the guineas, reckoned in ſhillings, will be $21x$; and that of the moidores $27(100-x)=2700-27x$.
Therefore, by the queſtion, $21x+2700-27x=2400$.
Hence we find $6x=300$, and $x=50$.
So that the number of pieces of each ſort was 50.

Ex. 7. A footman agreed to ſerve his maſter for 8l. a-year, and livery; but was turned away at the end of 7 months, and received only 2l. 13s. 4d. and his livery; what was its value?

Suppoſe x the value of the livery, in pence.
Then his wages for a year were to be $x+1920$ pence.
But for 7 months he received $x+640$ pence.
Now he was paid in proportion to the time he ſerved.

$m \quad m$
Therefore $12 : 7 :: x+1920 : x+640$.
And taking the product of the extremes and means,
$12x+7680=7x+13440$.
Hence $5x=5760$d. and $x=1152$d.=4l. 16s.

Ex. 8. A perſon at play loſt $\frac{1}{4}$ of his money, and then won 3s.; after which he loſt $\frac{1}{3}$ of what he then had, and then won 2s.; laſtly, he loſt $\frac{1}{7}$ of what he then had; and, this done, found he had only 12s. left; what had he at firſt?

Suppoſe he began play with x ſhillings.

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He loſt $\frac{1}{4}$ of his money, or $\frac{x}{4}$, and had left $x-\frac{x}{4}=\frac{3x}{4}$.

He won 3s. and had then $\frac{3x}{4}+3=\frac{3x+12}{4}$.

He loſt $\frac{1}{3}$ of $\frac{3x+12}{4}$, or $\frac{x+4}{4}$, and had left $\frac{3x+12}{4}-\frac{x+4}{4}=\frac{2x+8}{4}$.

He won 2s. and had then $\frac{2x+8}{4}+2=\frac{2x+16}{4}$.

He loſt $\frac{1}{7}$ of $\frac{2x+16}{4}$ or $\frac{2x+16}{28}$, and had left $\frac{2x+16}{4}-\frac{2x+16}{28}=\frac{12x+96}{28}$.

And becauſe he had now 12s. left, we have this equation $\frac{12x+96}{28}=12$.

Hence $12x=240$, and $x=20$.

Ex. 9. Two tradeſmen, A and B, are employed upon a piece of work; A can perform it alone in 15 hours, and B in 10 hours: in what time will they do it when working together.

Suppoſe that they can do it in x hours, and let the whole work be denoted by 1.

$h \quad h$
Then $15 : x :: 1 : \frac{x}{15}$= the part of the work done by A.

$h \quad h$
And $10 : x :: 1 : \frac{x}{10}$= the part done by B.

Now, by the queſtion, they are to perform the whole work between them;

Therefore, $\frac{x}{15}+\frac{x}{10}=1$.
Hence $25x=150$, and $x=6$ hours.

Ex. 10. The ſum of any two quantities being given $=s$, and their difference $=d$, it is required to find each of the quantities.

Let x denote the greater of the two quantities, and y the leſſer.
Then $x+y=s$, and $x-y=d$.
Taking the ſum of the equations we get $2x=s+d$,
And ſubtracting the ſecond from the firſt, $2y=s-d$;
Therefore $x=\frac{s+d}{2}$, and $y=\frac{s-d}{2}$.

Ex. 11. A gentleman, diſtributing money among ſome poor people, found he wanted 10s. to be able to give each 5s.; therefore he gave only 4s. to each, and had 5s. left. Required the number of ſhillings and poor people.

Let the number of ſhillings be x, and that of the poor people y, then, from the nature of the queſtion, we have theſe two equations,

$5y=x+10 \qquad 4y=x-5$.
From the firſt equation, $x=5y-10$,
And from the ſecond, $x=4y+5$;
Therefore $5y-10=4y+5$.
Hence $y=15$, and $x=4y+5=65$.

Ex. 12.

Ex. 12. A farmer kept a servant for every 40 acres of ground he rented, and on taking a lease of 104 more acres, he engaged 5 additional servants, after which he had a servant for every 36 acres. Required the number of servants and acres.

Suppose that he had at first x servants, and y acres.

From the first condition of the question $x=\frac{y}{40}$,

And from the second $x+5=\frac{y+104}{36}$.

By comparing the values of x, as found from these equations, we have $\frac{y+104}{36}-5=\frac{y}{40}$.

Hene $40y+4160-7200=36y$, so that $4y=3040$.

Therefore $y=760$, and $x=\frac{y}{40}=19$.

Ex. 13. Two persons, A and B, were talking of their ages; says A to B, seven years ago I was just three times as old as you were then, and seven years hence I shall be just twice as old as you will be. What is their present ages?

Let the ages of A and B be x and y respectively. Their ages seven years ago were $x-7$ and $y-7$, and seven years hence they will be $x+7$ and $y+7$.

Therefore by the question

$x-7=3(y-7)$ and $x+7=2(y+7)$.

From the first equation, $x=3y-14$,

And from the second $x=2y+7$.

Therefore $3y-14=2y+7$; hence $y=21$.

And because $x=2y+7$, therefore $x=49$.

Ex. 14. A hare is 50 leaps before a greyhound, and takes 4 leaps to the greyhound's 3, but 2 of the greyhound's leaps are as much as 3 of the hare's. How many leaps must the greyhound take to catch the hare?

In this example there is only one quantity required, it will, however, be convenient to make use of two letters; therefore let x denote the number of leaps of the greyhound, and y those of the hare; then, by considering the proportion between the number of leaps each takes in the same time, we have

$$3:4::x:y, \text{ hence } 3y=4x.$$

Again, by considering the proportion between the number of leaps each must take to run the same distance, we find $x:50+y::2:3$, hence $100+2y=3x$.

From the first equation we find $6y=8x$,

And from the second $6y=9x-300$.

Hence $9x-300=8x$, and $x=300$.

Ex. 15. To divide the number 90 into 4 such parts, that if the first be increased by 2, the second diminished by 2, the third multiplied by 2, and the fourth divided by 2; the sum, difference, product, and quotient, shall be all equal to each other.

In this question there are four quantities to be determined; but instead of introducing several letters, having put x to denote the first of them, we may find an expression for each of the remaining ones, as follows:

Because $x+2=$second quantity-2,

Therefore $x+4=$the second quantity.

And because $x+2=$third $\times 2$,

Therefore $\frac{x+2}{2}=$the third quantity.

And in like manner $2(x+2)=$the fourth quantity.

Now by the question, the sum of all the four$=90$,

Therefore $x+x+4+\frac{x+2}{2}+2(x+2)=90$;

Hence $9x=162$, and $x=18$.

Therefore the numbers required are 18, 22, 10, and 40.

Ex. 16. A and B together can perform a piece of work in 12 hours, A and C in 20, and B and C in 15 hours; in what time will each be able to perform it when working separately?

That we may give a general solution, let us suppose A and B can perform the work in a hours, A and C in b hours, and B and C in c hours. Let x, y, and z, denote the times in which A, B, and C, could perform it respectively, if each wrought alone; and let the whole work be represented by 1.

H H

Then $x:a::1:\frac{a}{x}=$ the part done by A
$y:a::1:\frac{a}{y}=$ the part done by B
} in a hours.

Also $x:b::1:\frac{b}{x}=$ the part done by A
$z:b::1:\frac{b}{z}=$ the part done by C
} in b hours.

And $y:c::1:\frac{c}{y}=$ the part done by B
$z:c::1:\frac{c}{z}=$ the part done by C
} in c hours.

Now by the question we have the three following equations.

$$\frac{a}{x}+\frac{a}{y}=1,\ \frac{b}{x}+\frac{b}{z}=1,\ \frac{c}{y}+\frac{c}{z}=1.$$

Let the first equation be divided by a, the second by b, and the third by c, thus we have

$$\frac{1}{x}+\frac{1}{y}=\frac{1}{a},\ \frac{1}{x}+\frac{1}{z}=\frac{1}{b},\ \frac{1}{y}+\frac{1}{z}=\frac{1}{c}.$$

If these be added together, and their sum divided by 2, we find

$$\frac{1}{x}+\frac{1}{y}+\frac{1}{z}=\frac{1}{2a}+\frac{1}{2b}+\frac{1}{2c}.$$

From this equation let each of the three last be subtracted in its turn; thus we get

$$\frac{1}{z}=-\frac{1}{2a}+\frac{1}{2b}+\frac{1}{2c}=\frac{+ab+ac-bc}{2abc}$$

$$\frac{1}{y}=\frac{1}{2a}-\frac{1}{2b}+\frac{1}{2c}=\frac{abc-ac+bc}{2abc}$$

$$\frac{1}{x}=\frac{1}{2a}+\frac{1}{2b}-\frac{1}{2c}=\frac{-ab+ac+bc}{2abc}.$$

Hence $z=\frac{2abc}{+ab+ac-bc}=\frac{7200}{120}=60$

$$y=\frac{2abc}{+ab-ac+bc}=\frac{7200}{360}=20$$

$$x=\frac{2abc}{-ab+ac+bc}=\frac{7200}{240}=30.$$

Quadratic Equations.

Sect. IX. *Of Quadratic Equations.*

140. We are next to explain the manner of resolving equations of the second degree, or quadratic equations. These involve the second power of the unknown quantity, as has been already observed (§ 113.) and may be divided into two kinds, *pure* and *affected*.

141. I. *Pure* quadratic equations are such as after proper reduction have the square of the unknown quantity in one term, while the remaining terms contain only known quantities. Thus, $x^2=64$, and $ax^2+b=c$ are examples of pure quadratics.

142. II. *Affected* quadratic equations, contain the square of the unknown quantity in one term, and its first or simple power in another, and the remaining terms consist entirely of known quantities. Such are the following, $x^2+3x=28$, $2x^2=33-5x$, $ax^2+bx-c=d$.

143. The manner of resolving a pure quadratic equation is sufficiently evident; if the unknown quantity be made to stand alone on one side, with unity as a coefficient, while the other side consists entirely of known quantities, and if the square root of each side be taken, we shall immediately obtain the value of the simple power of the unknown quantity as already directed by Rule 5th of Sect. VI.

144. In extracting the square root of any quantity, however, it is necessary to observe, that the sign of the root may be either + or —. This is an evident consequence of the rule for the signs in multiplication; for since by that rule any quantity, whether positive or negative, if multiplied by itself, will produce a positive quantity, and therefore the square of $+a$, as well as that of $-a$ is $+a^2$; so on the contrary, the square root of $+a^2$ is to be considered either as $+a$ or as $-a$, and may accordingly be expressed thus $\pm a$.

145. Having remarked that the square of any quantity, whatever be its sign, is always positive; it evidently follows, that no real quantity whatever, when multiplied by itself, can produce a negative quantity; and therefore, if the square root of a negative quantity be required, no such root can be assigned. Hence it also follows, that if a problem requires for its solution the extraction of the square root of a negative quantity, some contradiction must necessarily be involved, either in the conditions of the problem, or in the process of reasoning by which that solution has been obtained.

146. When an affected quadratic equation is to be resolved, it may always, by proper reduction, be brought to one or other of the three following forms.

1. $x^2+px=q$
2. $x^2-px=q$
3. $x^2-px=-q$

But as the manner of resolving each of the three forms is the very same, it will be sufficient if we consider any one of them.

147. Resuming therefore the first equation, or $x^2+px=q$; let us compare the side of it which involves the unknown quantity x with the square of a binomial $x+a$; that is, let us compare x^2+px with $x^2+2ax+a^2=(x+a)^2$; and it will presently appear, that if we suppose $p=2a$, or $\frac{p}{2}=a$, the quantities x^2+px and x^2+2ax will be equal; and as x^2+2ax is rendered a complete square, by adding to it a^2, so also may x^2+px be completed into a square, by adding to it $\frac{p^2}{4}$, which is equal to a^2; therefore, let $\frac{p^2}{4}$ be added to both sides of the equation $x^2+px=q$, and we have

$$x^2+px+\frac{p^2}{4}=\frac{p^2}{4}+q, \text{ or } \left(x+\frac{p}{2}\right)^2=\frac{p^2}{4}+q;$$

and extracting the square root of each side, $x+\frac{p}{2}=\pm\sqrt{\frac{p^2}{4}+q}$; hence $x=-\frac{p}{2}\pm\sqrt{\frac{p^2}{4}+q}$.

148. From these observations we derive the following general rule for resolving adfective quadratic equations.

1. Transpose all the terms involving the unknown quantity to one side, and the known quantities to the other side, and so that the term involving the square of the unknown quantity may be positive.

2. If the square of the unknown quantity be multiplied by a coefficient, let the other terms be divided by it, so that the coefficient of the square of the unknown quantity may be 1.

3. Add to both sides the square of half the coefficient of the unknown quantity itself, and the side of the equation involving the unknown quantity will now be a complete square.

4. Extract the square root of both sides of the equation, by which it becomes simple with respect to the unknown quantity; and by transposition, that quantity may be made to stand alone on one side of the equation, while the other side consists of known quantities; and therefore the equation is resolved.

Note. The square root of the first side of the equation is always equal to the sum, or difference of the unknown quantity, and half the coefficient of the second term. If the sine of that term be +, it is equal to the sum, but if it be —, then it is equal to the difference.

Ex. 1. Given $x^2+2x=35$, to determine x.

Here the coefficient of the second term is 2, therefore, adding the square of its half to each side, we have

$$x^2+2x+1=35+1=36$$

And extracting the square root $x+1=\sqrt{36}=\pm 6$.

Hence $x=\pm 6-1$, that is $x=+5$, or $x=-7$, and either of these numbers will be found to satisfy the equation for $5\times 5+2\times 5=35$, also $-7\times -7+2\times -7=35$.

Ex. 2. Given $\frac{x^2}{6}-12=x$ to find x.

This equation, when reduced, becomes $x^2-6x=72$.

And by completing the square, $x^2-6x+9=72+9=81$.

Hence, by extracting the square root, $x-3=\pm 9$.

And $x=\pm 9+3$, therefore $x=+12$, or $x=-6$, and upon trial we find that each of these values satisfies

Quadratic Equations.

fies the original equation, for $\frac{12\times12}{6}-12=12$, alſo $-\frac{6\times-6}{6}-12=-6$.

Ex. 3. Given $x^2+28=11x$, to find x.

Then $x^2-11x=-28$.

And, completing the ſquare, $x^2-11x+\frac{121}{4}=\frac{121}{4}-28=\frac{9}{4}$.

Therefore, by extracting the root, $x-\frac{11}{2}=\pm\frac{3}{2}$.

Hence $x=\frac{11}{2}\pm\frac{3}{2}$, that is, $x=+7$, or $x=+4$.

In the firſt two examples, we found one poſitive value for x in each, and alſo one negative value; but in this example both the values of x are poſitive, and, upon trial, each of them is found to ſatisfy the equation; for $7\times7+28=11\times7$, alſo $4\times4+28=11\times4$.

149. As at firſt ſight it appears remarkable, that in every quadratic equation the unknown quantity admits always of two diſtinct values, or roots, it will be proper to conſider a little farther the circumſtances upon which this peculiarity depends. This is the more neceſſary, as the property of the unknown quantity admitting of ſeveral values is not peculiar to quadratics, but takes place alſo in equations of the higher degrees, where the cauſe of the ambiguity requires an explanation ſomewhat different from that which we have already given in the preſent caſe.

150. Let us again conſider the equation $x^2+2x=35$, which forms the firſt of the three preceding examples; by tranſpoſing all the terms to one ſide, the ſame equation may be alſo expreſſed thus, $x^2+2x-35=0$; ſo that we ſhall have determined x, when we have found ſuch a number, as when ſubſtituted for it in the quantity $x^2+2x-35$, will render the reſult equal to 0. But $x^2+2x-35$ is the product of theſe two factors $x-5$, and $x+7$, as may be proved by actual multiplication; therefore, to find x, we have $(x-5)(x+7)=0$; and as a product can only become $=0$, when one of its factors is reduced to 0, it follows, that either of the two factors $x-5$ and $x+7$ may be aſſumed $=0$; if $x-5=0$, then $x=5$; but if $x+7=0$, then $x=-7$, ſo that the two values of x, or two roots of the equation $x^2+2x=35$ are $+5$ and -7, as we have already found in a different manner.

151. What has been juſt now ſhewn in a particular caſe is true of any quadratic equation whatever, that is, if $x^2+px=q$, or by bringing all the terms to one ſide, $x^2+px-q=0$, it is always poſſible to find two factors $x+a$, and $x-b$, ſuch, that $x^2+px-q=(x+a)(x-b)$, where a and b are known quantities, which depend only upon p and q the given numbers in the equation, and ſince that to have $(x-a)(x+b)=0$, we may either aſſume $x-a=0$, or $x+b=0$, it evidently follows, that the conditions of the equation $x^2+px-q=0$, or $x^2+px=q$ are alike ſatisfied, by taking $x=+a$ or $x=-b$.

From theſe conſiderations, it follows, that x can have only two values in a quadratic equation; for if it could be ſuppoſed to have three or more values, then it would be poſſible to reſolve x^2+px-q into as many factors; $x-c$, $x-d$, &c.; but the product of more than two factors muſt neceſſarily contain the third or higher powers of x; and as x^2+px-q contains no higher power than the ſecond; therefore no ſuch reſolution can take place. Quadratic Equations.

152. Since it appears that x^2+px-q may be conſidered as the product of two factors $x-a$, and $x+b$, let us examine the nature of theſe factors; accordingly, taking their product by actual multiplication, we find it $x^2+(b-a)x-ab$; and ſince this quantity muſt be equal to x^2+px-q, it follows, that $b-a=p$ and $ab=q$, or, changing the ſigns of the terms of both equations, $a-b=-p$, $-ab=-q$. Now if we conſider that $+a$, and $-b$, are the roots of the equation $x^2+px=q$; it is evident that $a-b$ is the ſum of the roots, and $-ab$ their product. So that from the equations $a-b=-p$, and $-ab=q$, we derive the following propoſition relating to the roots of any quadratic equation. The ſum of the roots of any quadratic equation $x^2+px=q$ is equal to $-p$, that is, to the coefficient of the ſecond term, having its ſign changed; and their product is equal to $-q$, or to the latter ſide of the equation, having its ſign alſo changed.

153. This propoſition enables us to reſolve ſeveral important queſtions concerning the roots of a quadratic equation, without actually reſolving that equation. Thus we learn from it, that if q, the term which does not involve the unknown quantity, (called ſometimes the abſolute number) be poſitive, the equation has one of its roots poſitive, and the other negative; but if that term be negative, the roots are either both poſitive or both negative. It alſo follows, that in the former caſe the root which is denoted by the leaſt number will have the ſame ſign with the ſecond term, and in the latter caſe, the common ſign of the roots will be the contrary to that of the ſecond term.

154. From this property of the roots we may alſo derive a general ſolution to any quadratic equation $x^2+px=q$; for we have only to determine two quantities whoſe ſum is $-p$, and product $-q$, and theſe quantities ſhall be the two values of x, or the two roots of the equation.

Without conſidering the ſigns of the roots, let us call them v and z, then

$$v+z=-p, \text{ and } vz=-q.$$

From the ſquare of each ſide of the firſt equation let four times the ſecond be ſubtracted, and we have

$$v^2-2vz+z^2=p^2+4q, \text{ or } (v-z)^2=p^2+4q,$$

therefore, by extracting the ſquare root, $v-z=\pm\sqrt{p^2+4q}$; from this equation, and from the equation $v+z=p$, we readily obtain $v=\frac{-p\pm\sqrt{p^2+4q}}{2}$ $z=\frac{-p\mp\sqrt{p^2+4q}}{2}$, that is, if $v=\frac{-p+\sqrt{p^2+4q}}{2}$, then $z=-\frac{p-\sqrt{p^2+4q}}{2}$, and if $v=-\frac{p-\sqrt{p^2+4q}}{2}$, then $z=\frac{-p+\sqrt{p^2+4q}}{2}$.

But the value of v, upon the one ſuppoſition, is the ſame as the value of z upon the other ſuppoſition, and *vice verſa*; therefore, in reality, the only two diſtinct values

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values of the roots v and z are $\frac{-p+\sqrt{p^2+4q}}{2}$ and $\frac{-p-\sqrt{p^2+4q}}{2}$, which agrees with the concluſion we have already found, (§ 148).

155. It appears from what has been already ſhewn, that the roots of a quadratic equation $x^2+px=q$ always involve the quantity $\sqrt{p^2+4q}$; hence it follows, that p^2+4q muſt be a poſitive quantity; for if it were negative, as the ſquare root of ſuch a quantity could not be found, the value of x could not poſſibly be obtained. If for example the value of x were required from this equation $x^2+13=4x$, or $x^2-4x=-13$, we ſhould find $x=2\pm\sqrt{-9}$; and as this expreſſion for the roots requires us to extract the ſquare root of -9, the equation from which it is derived muſt neceſſarily have involved ſome contradiction. It is not difficult to ſee wherein the abſurdity conſiſts, for ſince in this caſe $p=-4$, and $q=-13$, the roots of the equation ought to be both poſitive (§ 154), and ſuch that their ſum $=4$, while their product $=13$, (§ 153), which is impoſſible.

156. Although imaginary quantities ſerve no other purpoſe in the reſolution of quadratic equations, than to ſhew that a particular problem cannot be reſolved, by reaſon of ſome want of conſiſtency in its data; yet they are not upon that account to be altogether rejected. By introducing them into mathematical inveſtigations, many curious theories may be explained, and problems reſolved in a more conciſe way, than can be done without the uſe of ſuch quantities. This is particularly the caſe with reſpect to the higher parts of the mathematics.

157. The method which has been applied to the reſolution of quadratic equations, properly ſo called, namely, ſuch as are of this form $x^2+px=q$, will alſo apply to all equations of this form,

$$x^{2n}+px^n=q.$$

Where the unknown quantity x is found only in two terms, and ſuch, that its exponent in the one term is double that in the other; for let us aſſume $x^n=y$, then $x^{2n}=y^2$, and therefore the equation

$$+x^{2n}+px^n=q \text{ becomes}$$
$$y^2+py=q,$$

a quadratic equation, from which y may be found, and thence x, by conſidering that $x=\sqrt[n]{y}$.

158. Before proceeding to give examples of queſtions producing quadratic equations, it is proper to obſerve, that although every ſuch equation admits of two roots; yet it will frequently happen, that only one of them can be of uſe, the other being excluded by the conditions of the queſtion. This will often be the caſe with reſpect to the negative root; as for example, when the unknown quantity denotes a number of men, a number of days, &c. And hence, in reckoning the caſes of quadratic equations, it is common to neglect this one $x^2+px=-q$, where the roots are both negative; for an equation of this form can only be derived from a queſtion which has ſome fault in its enunciation, and which, by a proper change in its form, will produce another equation having both its roots poſitive.

159. The remainder of this ſection ſhall be employed in ſolving ſome queſtions which produce quadratic equations.

Quadratic Equation

Ex. 1. It is required to divide the number 10 into two ſuch parts, that the ſum of their ſquares may be 58.

Let x be the one number.

Then, ſince their ſum is 10, we have $10-x$ for the other.

And by the queſtion $x^2+(10-x)^2=58$.

That is $x^2+100-20x+x^2=58$

Or $2x^2-20x=58-100=-42$

Hence $x^2-10x=-21$

And completing the ſquare $x^2-10x+25=25-21=4$

Hence, by extracting the root, $x-5=\pm\sqrt{4}=\pm 2$.

And $x=5\pm 2=7$

That is $x=7$ or $x=3$.

If we take the greateſt value of x, viz. 7, then the other number $10-x$ will be 3; and if we take the leaſt value of x, viz. 3, then the other number is 7. Thus it appears, that the greateſt value of the one number correſponds to the leaſt value of the other; and indeed this muſt neceſſarily be the caſe, ſeeing that both numbers are alike concerned in the queſtion. Hence upon the whole, the only numbers that will anſwer the conditions of the queſtion are 7 and 3.

Ex. 2. What two numbers are thoſe whoſe product is 28; and ſuch, that twice the greater, together with thrice the leſſer is equal to 26.

Let x be the greateſt and y the leaſt number, then, from the nature of the queſtion, we have theſe two equations

$$xy=28,\ 2x+3y=26.$$

From the firſt equation we have $y=\frac{28}{x}$.

And from the ſecond $y=\frac{26-2x}{3}$.

Hence, $\frac{26-2x}{3}=\frac{28}{x}$.

And, reducing, $26x-2x^2=84$

Or $2x^2-26x=-84$

Hence $x^2-13x=-42$

And comp. the ſq. $x^2-13x+\frac{169}{4}=\frac{169}{4}-42=\frac{9}{4}$

Hence, by extracting the root $x-\frac{13}{2}=\pm\sqrt{\frac{9}{4}}=\pm\frac{3}{2}$

Therefore $x=\frac{13}{2}\pm\frac{3}{2}$

That is $x=7$, or $x=6$.

And ſince $y=\frac{28}{x}$, we have $y=4$, or $y=\frac{14}{3}$.

Thus we have obtained two ſets of numbers, which fulfil the conditions required, viz.

$$x=7,\ y=4 \ :\ \text{Or } x=6,\ y=\tfrac{14}{3}.$$

And beſides theſe, there can be no other numbers.

Ex. 3. A company dining together at an inn, find their bill amount to 175 ſhillings; two of them were not allowed to pay, and the reſt found, that their ſhares amounted to 10 ſhillings a-man more than if they had all paid. How many were in company?

Suppoſe their number to be x.

Then, if all had paid, the ſhare of each would have been $\frac{175}{x}$.

But,

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But, because only $x-2$ paid, the share of each was $\frac{175}{x-2}$.

Therefore, by the question, $\frac{175}{x-2}-\frac{175}{x}=10$.

And by proper reduction $175x-175x+350=10x^2-20$.

That is $10x^2-20x=350$

Or $x^2-2x=35$

And comp. the sq. $x^2-2x+1=35+1=36$

Hence, by extracting the root, $x^2+1=\pm 6$.

Therefore, $x=+5$, or $x=-7$. But from the nature of the question, the negative root can be of no use; therefore $x=6$.

Ex. 4. A mercer sold a piece of cloth for 24l. and gained as much per cent. as the cloth cost him; what was the price of the cloth?

Suppose that it cost x pounds,

Then the gain was $24-x$,

And by the question $100 : x :: x : 24-x$,

Therefore, taking the product of the extremes and means, $2400-100x=x^2$,

Or $x^2+100x=2400$,

And comp. the sq. $x^2+100x+2500=4900$,

Hence, taking the root, $x+50=\pm 70$,

And $x=+20$ or -120.

Here, as in the last question, the negative root cannot apply; therefore $x=20$ pounds, the price required.

Ex. 5. A grazier bought as many sheep as cost him 60l. out of which he reserved 15, and sold the remainder for 54l. and gained 2s. each upon them. How many sheep did he buy, and what did each cost him?

Suppose that he bought x sheep,

Then each would cost him $\frac{1200}{x}$. shillings.

Therefore, after reserving 15, he sold each of the remaining $x-15$ for $\frac{1200}{x}+2$ shillings.

Hence, he would receive for them $(x-15)(\frac{1200}{x}+2)$ shillings. And, because 54l.$=1080$ shillings, we have by the question $(x-15)(\frac{1200}{x}+2)=1080$.

Which by proper reduction becomes $x^2+45x=9000$.

Or, completing the square, $x^2+45x+\frac{2025}{4}=\frac{38025}{4}$.

Therefore, extracting the root, &c. $x=\pm\frac{195}{2}-\frac{45}{2}$.

And taking the positive root, $x=75$, the number of sheep; and consequently $\frac{1200}{75}=16$ shillings the price of each.

Ex. 6. What number is that, which, when divided by the product of its two digits, the quotient is 3; and if 18 be added to it, the digits are inverted. Let x and y denote the digits; then the number itself will be expressed by $10x+y$; and that number, in which the digits are inverted, by $10y+x$. Thus the conditions of the problem will be expressed by these two equations,

$$\frac{10x+y}{xy}=3,\quad 10x+y+18=10y+x.$$

From the first equation we have $y=\frac{10x}{3x-1}$

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And from the second $y=x+2$

Therefore $x+2=\frac{10x}{3x-1}$

And $3x^2+5x-2=10x$

Hence $x^2-\frac{5}{3}x=\frac{2}{3}$

And comp. sq. $x^2-\frac{5}{3}x+\frac{25}{36}=\frac{24}{36}+\frac{25}{36}=\frac{49}{36}$

Therefore, taking the root $x-\frac{5}{6}=\pm\frac{7}{6}$

So that $x=2$, or $x=-\frac{1}{3}$

Here it is evident that the negative root is useless; hence we have $y=x+2=4$, and 24 for the number required.

Ex. 7. It is required to find two numbers whose product is 100; and the difference of their square roots 3.

Let x be the one number; then $\frac{100}{x}$ must denote the other.

Now by the question $\frac{10}{\sqrt{x}}-\sqrt{x}=3$

Hence we have $10-x=3\sqrt{x}=3x^{\frac{1}{2}}$

Or $x+3x^{\frac{1}{2}}=10$

And comp. the sq. $x+3x^{\frac{1}{2}}+\frac{9}{4}=10+\frac{9}{4}=\frac{49}{4}$

and taking the root $x^{\frac{1}{2}}+\frac{3}{2}=\pm\frac{7}{2}$

So that $x^{\frac{1}{2}}=+5$ or $x^{\frac{1}{2}}=-2$

and therefore $x=25$ or $x=4$.

If $x=4$, the other number is $\frac{100}{4}=25$, and if $x=25$, then the other number is 4; so that, in either case, the two numbers which answer the conditions of the question are 4 and 25.

Ex. 8. It is required to find two numbers, of which the product shall be 6, and the sum of their cubes 35.

Let v be the one number, then $\frac{6}{x}$ will be the other.

Therefore, by the question, $x^3+\frac{216}{x^3}=35$

Hence $x^6+216=35x^3$

Or $x^6-35x^3=-216$

This equation, by putting $x^3=y$, becomes

$y^2-35y=-216$

Hence we find $y=27$, or $y=8$.

And since $x^3=y$; therefore $x=3$, or $x=2$.

If $x=3$, then the other number is 2, and if $x=2$, the other number is 3; so that 2 and 3 are the numbers required.

In general, if it be required to find two numbers, which are exactly alike concerned in a question that produces a quadratic equation; the two numbers sought will be the roots of that equation. A similar observation applies to any number of quantities which require for the determination the resolution of an equation of any degree whatever.

Sect. X. *Of Equations in General.*

165. Before we proceed to the resolution of cubic, and the higher orders of equations, it will be proper to

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to explain ſome general properties, which belong to equations of every degree; and alſo certain operations, which muſt frequently be performed upon equations, before they be fitted for a final ſolution.

161. In treating of equations in general, we ſhall ſuppoſe all the terms tranſpoſed to one ſide, and put equal to 0; this we have already done in explaining the nature of quadratics, and in like manner an equation of the fourth degree will ſtand thus:

$$x^4+px^3+qx^2+rx+s=0,$$

where x denotes an unknown quantity, and p, q, r, s, known quantities, either poſitive or negative. In this equation the coefficient of the higheſt power of x is unity, but if it had been any other quantity, that quantity might have been taken away, and the equation reduced to the above form, by rules already explained, Sect. VI.

162. The terms of an equation being thus arranged, if ſuch a quantity be found, as when ſubſtituted for x, will render both ſides $=0$, and therefore ſatisfy the equation, that quantity whether it be poſitive or negative, or even imaginary, is to be conſidered as a root of the equation. But we have ſeen that every quadratic equation has always two roots, real or imaginary, we may therefore ſuppoſe that a ſimilar diverſity of roots will take place in all equations of a higher degree; and this ſuppoſition we ſhall preſently find to be well founded, by means of the following propoſition which is of great importance in the theory of equations.

If a root of any equation, as $x^4+px^3+qx+r=0$, be repreſented by a, the firſt ſide of that equation is diviſible by $x-a$.

For ſince $x^4+px^3+qx^2+rx+s=0$

And alſo $a^4+pa^3+qa+ra+s=0$

Therefore, by ſubtraction, $x^4-a^4+p(x^3-a^3)+q(x^2-a^2)+r(x-a)=0$.

163. But any quantity of this form x^n-a^n, where n denotes a whole poſitive number, is equal to

$$(x-a)(x^{n-1}+ax^{n-2}+a^2x^{n-3}+\ldots+a^{n-2}x+a^{n-1}),$$

as may be eaſily proved by multiplication; therefore, putting $n=4$, 3 and 2 ſucceſſively, we have

$$\begin{aligned} x^4-a^4&=(x-a)(x^3+ax^2+a^2x+a^3)\\ x^3-a^3&=(x-a)(x^2+ax+a^2)\\ x^2-a^2&=(x-a)(x+a)\\ x-a&=x-a \end{aligned}$$

and by ſubſtitution, and collecting into one term the coefficients of the like powers of x, the equation

$x^4-a^4+p(x^3-a^3)+q(x^2-a^2)+r(x-a)=0$ becomes $(x-a)[x^3+(a+p)x^2+(a^2+pa+q)x+a^3+pa^2+qa+r]=0$, ſo that putting $p'=a+p$, $q'=a^2+pa+q$, $r'=a^3+pa+qa+r$, we have

$$x^4+px^3+qx^2+rx+s=(x-a)(x^3+p'x^2+q'x+r')$$

Hence, if the propoſed equation $x^4+px^3+qx^2+rx-s$ be divided by $x-a$, the quotient will be $x^3+p'x^2+q'x+r'$, an integer quantity, and ſince the ſame mode of reaſoning will apply to any equation whatever; the truth of the propoſition is evident.

164. We have found that $(x-a)(x^3+p'x^2+q'x+r')=0$, and as a product becomes $=0$, when any one of its factors $=0$, therefore, the equation will have its conditions fulfilled, not only when $x-a=0$, but alſo when $x^3+p'x^2+q'x+r'=0$.

Equation in genera

Let us now ſuppoſe that b is a root of this equation, then by reaſoning exactly as in laſt article, and putting $p''=b+p'$, $q''=b^2+p'b+q'$, we ſhall have

$$x^3+p'x^2+q'x+r'=(x-b)(x^2+p''x+q'')=0$$

and therefore

$$x^4+px^3+qx^2+rx+s=(x-a)(x-b)(x^2+p''x+q'').$$

165. By proceeding in the ſame manner with the quadratic equation $x^2+p''x+q''=0$, we ſhall find that if c denote one of its roots, then

$$x^2+p''x+q''=(x-c)(x+c+p'')$$

So that if we put $d'=-(c+p'')$, we at laſt find $x^4+px^3+qx^2+rx+s=(x-a)(x-b)(x-c)(x-d)$; and ſince each of the factors $x-a$, $x-b$, $x-c$, $x-d$ may be aſſumed $=0$; it follows, that there are four different values of x, which will render the equation $x^4+px^3+qx^2+rx+s=0$, namely, $x=a$, $x=b$, $x=c$, $x=d$.

166. The mode of reaſoning which has been juſt now employed in a particular caſe, may be applied to an equation of any order whatever; we may therefore conclude, that every equation may be conſidered as the product of as many ſimple factors, as the number denoting its order contains unity; and therefore, that the number of roots in any equation is preciſely equal to the exponent of the higheſt power of the unknown quantity contained in that equation.

167. By conſidering equations of all degrees as formed from the product of factors $x-a$, $x-b$, $x-c$, &c. we diſcover a number of curious relations, which ſubſiſt between the roots of any equation whatever, and its coefficients. Thus, if we limit the number of factors to four, and ſuppoſe that a, b, c, d, are the roots of this equation of the fourth degree

$$x^4+px^3+qx^2+rx+s=0$$

we ſhall alſo have $(x-a)(x-b)(x-c)(x-d)=0$; and therefore, by actual multiplication

$$\left.\begin{matrix} x^4 \\ -a \\ -b \\ -c \\ -d \end{matrix}\right\} \left.\begin{matrix} x^3 \\ +ab \\ +ac \\ +ad \\ +bc \\ +bd \\ +cd \end{matrix}\right\} \left.\begin{matrix} x^2 \\ -abc \\ -abd \\ -acd \\ -bcd \end{matrix}\right\} x+abcd=0.$$

168. If we compare together the coefficients of the ſame powers of x, we find the following ſeries of equations:

$$\begin{aligned} a+b+c+d&=-p\\ ab+ac+ad+bc+bd+cd&=+q\\ abc+abd+acd+bcd&=-r\\ abcd&=+s \end{aligned}$$

and as a ſimilar ſeries of equations will be obtained for every equation whatever, we hence derive the following propoſitions, which are of the greateſt importance in the theory of equations.

1. The coefficient of the ſecond term of any equation taken with a contrary ſign, is equal to the ſum of all the roots.

2. The coefficient of the third term is equal to the ſum of the products of the roots multiplied together two and two.

3. The coefficient of the fourth term, taken with a contrary

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contrary ſign, is equal to the ſum of the roots multiplied together three and three, and ſo on for the remaining coefficients, till we come to the laſt term of the equation, which is equal to the product of all the roots, having their ſigns changed.

169. Inſtead of ſuppoſing an equation to be produced by multiplying together ſimple equations, we may conſider it as formed by the product of equations of any degree, provided that the ſum of their dimenſions is equal to that of the propoſed equation. Thus, an equation of the fourth degree may be formed either from a ſimple and cubic equation, or from two quadratic equations.

170. If n denote the degree of an equation, we have ſhewn, that by conſidering it as the product of ſimple factors, that equation will have n diviſors of the firſt degree; but if we ſuppoſe the ſimple factors to be combined two and two, they will form quantities of the ſecond degree, which are alſo factors of the equation; and ſince there may be formed $\frac{n(n-1)}{1.2}$ ſuch combinations, any equation will admit of $\frac{n(n-1)}{1.2}$ diviſors of the ſecond degree.

171. For example, the equation $x^4+px^3+qx^2+rx+s=0$, which we have conſidered as equal to

$$(x-a)(x-b)(x-c)(x-d)=0,$$

may be formed by the product of two factors of the ſecond degree, in theſe ſix different ways.

By the product of	$(x-a)(x-b)$ and	$(x-c)(x-d)$
	$(x-a)(x-c)$	$(x-b)(x-d)$
	$(x-a)(x-d)$	$(x-b)(x-c)$
	$(x-b)(x-c)$	$(x-a)(x-d)$
	$(x-b)(x-d)$	$(x-a)(x-c)$
	$(x-c)(x-d)$	$(x-a)(x-b)$

Thus an equation of the fourth degree may have $\frac{4\times 3}{1\times 2}=6$ quadratic diviſors.

172. By combining the ſimple factors three and three, we ſhall have diviſors of the third degree, of which the number for an equation of the nth order will be $\frac{n(n-1)(n-2)}{1.2.3}$; and ſo on.

173. When the roots of an equation are all poſitive, its ſimple factors will have this form $x-a$, $x-b$, $x-c$, &c. and if for the ſake of brevity we take only theſe three, the cubic equation which reſults from their product will have this form

$$x^3-px^2+qx-r=0$$
$$\text{where } p=a+b+c,\ q=ab+ac+bc,\ r=abc,$$

and here it appears that the ſigns of the terms are $+$ and $-$ alternately.

Hence we infer, that when the roots of an equation are all poſitive, the ſigns of its terms are poſitive and negative alternately.

174. If again the roots of the equation be all negative, and therefore its factors $x+a$, $x+b$, $x+c$, then p, q, and r being as before, the reſulting equation will ſtand thus:

$$x^3+px^2+qx+r=0.$$

And hence we conclude, that when the roots are all negative, there is no change whatever in the ſigns.

175. In general, if the roots of an equation be all real, that equation will have as many poſitive roots as there are changes of the ſigns from $+$ to $-$, or from $-$ to $+$; and the remaining roots are negative. This rule, however, does not apply when the equation has imaginary roots, unleſs ſuch roots be conſidered as either poſitive or negative.

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176. That the rule is true when applied to quadratic equations will be evident from Sect. IX. With reſpect to cubic equations, the rule alſo applies when the roots are either all poſitive, or all negative, as we have juſt now ſhewn.

When a cubic equation has one poſitive root, and the other two negative, its factors will be $x-a$, $x+b$, $x+c$, and the equation itſelf

$$\left.\begin{matrix}x^3-a\\+b\\+c\end{matrix}\right\}\left.\begin{matrix}-ab\\-ac\\+bc\end{matrix}\right\}x-abc=0.$$

Here there muſt always be one change of the ſigns, ſince the firſt term is poſitive, and the laſt negative; and there can be no more than one; for if the ſecond term is negative, or $b+c$ leſs than a, then $(b+c)^2$ will be leſs than $(b+c)a$; but $(b+c)^2$ is always greater than bc, therefore bc will be much leſs than $(b+c)a$ or $ab+ac$, ſo that the third term muſt alſo be negative, and therefore in this caſe only one change of the ſigns. If again the ſecond term be poſitive, then becauſe the ſign of the laſt term is negative, whatever be the ſign of the third term, there can ſtill be no more than one change of the ſigns.

When the equation has two poſitive roots and one negative, its factors are $x-a$, $x-b$, $x-c$, and the equation

$$\left.\begin{matrix}x^3-a\\-b\\+c\end{matrix}\right\}\left.\begin{matrix}+ab\\-ac\\-bc\end{matrix}\right\}x+abc=0.$$

Here there muſt always be two changes of the ſigns; for if $a+b$ be greater than c, the ſecond term is negative, and the laſt term being always poſitive, there muſt be two changes, whether the ſign of the third term be poſitive or negative. If again $a+b$ be leſs than c, and therefore the ſecond term poſitive; it may be ſhewn as before, that ab is much leſs than $ac+bc$; and hence the third term will be negative; ſo that in either caſe there muſt be two changes of the ſigns. We may conclude therefore, upon the whole, that in cubic equations there are always as many poſitive roots, as changes of the ſigns from $+$ to $-$, or from $-$ to $+$; and by the ſame method of reaſoning, the rule will be found to extend to all equations whatever.

177. It appears from the manner in which the coefficients of an equation are formed from its roots, that when the roots are all real, the coefficients muſt conſiſt entirely of real quantities. But it does not follow, on the contrary, that when the coefficients are real, the roots are alſo real; for we have already found, that in a quadratic equation, $x^2+px+q=0$ where p and q denote real quantities, the roots are ſometimes both imaginary.

178. When the roots of a quadratic equation are imaginary, they have always this form $a+\sqrt{-b^2}$, $a-\sqrt{-b^2}$, which quantities may alſo be expreſſed thus,

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$a+b\sqrt{-1}$, $a-b\sqrt{-1}$, so that we have these two factors $x-a-b\sqrt{-1}$, $x-a+b\sqrt{-1}$, and taking their product,

$$x^2-2ax+a^2-b^2=0.$$

Thus we see that two imaginary factors may be of such a form as to admit of their product being expressed by a real quantity; and hence the origin of imaginary roots in quadratic equations.

179. It appears by induction, that no real equation can be formed from imaginary factors, unless those factors be taken in pairs, and each pair have the form $x\pm a-b\sqrt{-1}$, $x\pm a+b\sqrt{-1}$; for the product of three, or any odd number of imaginary factors, whatever be their form, is still an imaginary quantity. Thus, if we take the product of any three of these four imaginary expressions $x+a+b\sqrt{-1}$, $x+a-b\sqrt{-1}$, $x+c+d\sqrt{-1}$, $x+c-d\sqrt{-1}$, we may form four different equations, each of which will involve imaginary quantities. If, however, each equation be multiplied by the remaining factor, which had not previously entered into its composition, the product will be found to be rational, and the same for all the four.

180. Hence we may deduce the three following inferences respecting the roots of equations:

1. If an equation have imaginary roots, it must have two, or four, or some even number of such roots.

2. If the degree of an equation be denoted by an odd number, that equation must have at least one real root.

3. If the degree of an equation be denoted by an even number, and that equation have one real root, it will also have another real root.

181. We shall now explain some transformations which are frequently necessary to prepare the higher orders of equations for a solution.

Any equation may have its positive roots changed into negative roots of the same value, and its negative roots into such as are positive, by changing the signs of the terms alternately, beginning with the second. The truth of this remark will be evident, if we take two equations,

$$(x-a)(x-b)(x+c)=0,$$
$$(x+a)(x+b)(x-c)=0,$$

(which are such, that the positive roots of the one have the same values as the negative roots of the other) and multiply together their respective factors, for these equations will stand thus:

$$\left.\begin{matrix}x^3\\-a\\-b\\+c\end{matrix}\right\}\left.\begin{matrix}\\+ab\\-ac\\-bc\end{matrix}\right\}x^2\left.\begin{matrix}\\-ac\\-bc\end{matrix}\right\}x+abc=0$$

$$\left.\begin{matrix}x^3\\+a\\+b\\-c\end{matrix}\right\}\left.\begin{matrix}\\+ab\\-ac\\-bc\end{matrix}\right\}x^2\left.\begin{matrix}\\-ac\\-bc\end{matrix}\right\}x-abc=0$$

where it appears that the signs of the first and third terms are the same in each, but the signs of the second and fourth are just the opposite of each other. And this will be found to hold true, not only of cubic equations, but of all equations to whatever order they belong.

182. It will sometimes be useful to transform an equation into another, that shall have each of its roots greater or less than the corresponding roots of the other equation, by some given quantity.

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Let $(x-a)(x-b)(x+c)=0$ be any proposed equation which is to be transformed into another, having its roots greater or less than those of the proposed equation by the given quantity n; then, because the roots of the transformed equation are to be $+a\pm n$, $+b\pm n$ and $-c\pm n$, the equation itself will be

$$(y\mp n-a)(y\mp n-b)(y\mp n+c)=0.$$

Hence the reason of the following rule is evident.

If the new equation is to have its roots greater than those of the proposed equation, instead of x and its powers, substitute $y-n$ and its powers; but if the roots are to be less, then instead of x substitute $y+n$; and in either case, a new equation will be produced, the roots of which shall have the property required.

183. By means of the preceding rule, an equation may be changed into another, which has its roots either all positive, or all negative; but it is chiefly used in preparing cubic and biquadratic equations for a solution, by transforming them into others of the same degrees, but which want their second term.

Let $x^3+px^2+qx+r=0$ be any cubic equation; if we substitute $y+n$ for x, the equation is changed into the following:

$$\left.\begin{matrix}y^3\\+3n\\+p\end{matrix}\right\}\ y^2\left.\begin{matrix}+3n^2\\+2pn\\+q\end{matrix}\right\}y\left.\begin{matrix}+n^3\\+pn^2\\+qn\\+r\end{matrix}\right\}=0.$$

Now, that this equation may want its second term, it is evident, that we have only to suppose $3n+p=0$, or $n=-\frac{p}{3}$, for this assumption being made, and the value of n substituted in the remaining terms, the equation becomes

$$y^3+(q-\frac{p^2}{3})y+\frac{2p^3}{27}-\frac{pq}{3}+r=0,$$

or, putting $-\frac{p^2}{3}+q=q'$, and $+\frac{2p^3}{27}-\frac{pq}{3}+r=r'$ the same equation may also stand thus,

$$y^3+q'y+r'=0.$$

184. In general, any equation whatever may be transformed into another, which shall want its second term by the following rule.

Divide the coefficient of the second term of the proposed equation by the exponent of the first term, and add the quotient, with its sign changed, to a new unknown quantity; this sum being substituted for the unknown quantity in the proposed equation, a new equation will be produced, which will want the second term, as required.

185. By this rule, any adfected quadratic equation may be readily resolved; for by transforming it into another equation, which wants the second term, we thus reduce its solution to that of a pure quadratic. Thus if the quadratic equation $x^2-5x+6=0$ be proposed; by substituting $y+\frac{5}{2}$ for x, we find

$$\left.\begin{matrix}y^2\\-5y\\+6\end{matrix}\right\}\left.\begin{matrix}+\frac{25}{4}\\-\frac{25}{2}\end{matrix}\right\}=0 \text{ or } y^2-\frac{1}{4}=0.$$

Hence $y=\pm\frac{1}{2}$, and since $x=y+\frac{5}{2}$, therefore $x=\pm\frac{1}{2}+\frac{5}{2}=+3$ or $+2$.

186. It has been shewn (§ 169.) that in any equation, the coefficient of the second term, having its sign changed, is equal to the sum of all the roots, or abstracting

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ſtracting from their ſigns, it is equal to the difference between the ſum of the poſitive, and the ſum of the negative roots. Therefore, if the ſecond term be wanting, the ſum of the poſitive roots in that equation muſt neceſſarily be equal to that of the negative roots.

187. Inſtead of taking away the ſecond term from an equation, any other term may be made to vaniſh, by an aſſumption ſimilar to that which has been employed to take away the ſecond term. Thus if in § 183. we aſſume $3n^2+2pn+q=0$, by reſolving this quadratic equation, a value of n will be found, which, when ſubſtituted in the equation, will cauſe the third term to vaniſh; and by the reſolution of a cubic equation the third term might be taken away; and ſo on.

188. Another ſpecies of transformation, of uſe in the reſolution of equations, is that by which an equation, having the coefficients of ſome of its terms expreſſed by fractional quantities, is changed into another, the coefficients of which are all integers.

Let $x^3+\frac{p}{a}x^2+\frac{q}{b}x+\frac{r}{c}=0$ denote an equation to be ſo transformed; and let us aſſume $y=abcx$; and therefore $x=\frac{y}{abc}$, then, by ſubſtitution, our equation becomes

$$\frac{y^3}{a^3b^3c^3}+\frac{p}{a^3b^2c^2}y^2+\frac{q}{ab^2c}y+\frac{r}{c}=0,$$

and multiplying the whole equation by $a^3b^3c^3$, we have

$$y^3+bcpy^2+a^2bc^2qy+a^3b^3c^3r=0.$$

Thus we have an equation free from fractions, while at the ſame time the coefficient of the higheſt power of the unknown quantity is unity, as before.

189. This transformation may always be performed by the following rule. Inſtead of the unknown quantity ſubſtitute a new unknown quantity divided by the product of all the denominators; then, by proper reduction, the equation will be found to have the form required.

190. If, however, the equation have this form,

$$x^3+\frac{p}{a}x^2+\frac{q}{a}x+\frac{r}{a}=0,$$

it will be ſufficient to aſſume $y=ax$, and therefore $x=\frac{y}{a}$; for then we have

$$\frac{y^3}{a^3}+\frac{p}{a^3}y^2+\frac{q}{a^2}y+\frac{r}{a}=0,$$

And $y^3+py^2+aqy+a^2r=0$,

which laſt equation has the form required.

Sect. XI. *Of Cubic Equations.*

191. Cubic equations, as well as equations of every higher degree, are, like quadratics, divided into two claſſes; they are ſaid to be *pure*, when they contain only one power of the unknown quantity; and *adfected*, when they contain two or more powers of that quantity.

192. Pure cubic equations are therefore of this form $x^3=125$, or $x^3=-27$, or, in general, $x^3=r$; and hence it appears, that the value of the ſimple power of the unknown quantity may always be found, without difficulty, by extracting the cube root of each ſide of the equation; thus from the firſt of the three preceding examples we find $x=+5$, from the ſecond $x=-3$, and from the third $x=\sqrt[3]{r}$.

193. It would ſeem at firſt ſight, that the only value which x can have in the cubic equation $x^3=r$, or putting $r=c^3$, $x^3-c^3=0$, is this one, $x=c$; but ſince x^3-c^3 may be reſolved into theſe two factors $x-c$ and x^2+cx+c^2, it follows, that beſides the value of x already found, which reſults from making the factor $x-c=0$, it has yet other two values, which may be found by making the other factor $x^2+cx+c^2=0$; and accordingly by reſolving the quadratic equation $x^2+cx=-c^2$, we find theſe values to be $\frac{-c+\sqrt{-3c^2}}{2}$ and $\frac{-c-\sqrt{-3c^2}}{2}$, or $\frac{-1+\sqrt{-3}}{2}c$ and $\frac{-1-\sqrt{-3}}{2}c$. Thus it appears, that any cubic equation of this form $x^3=c^3$, or $x^3-c^3=0$, has theſe three roots

$$x=c,\quad x=\frac{-1+\sqrt{-3}}{2}c,\quad x=\frac{-1-\sqrt{-3}}{2}c,$$

the firſt of which is real, but the two laſt are imaginary. If, however, each of the imaginary values of x be raiſed to the third power, the ſame reſults will be obtained as from the real value of x; the original equation $x^3-c^3=0$ may alſo be reproduced, by multiplying together the three factors $x-c$, $x-\frac{-1+\sqrt{-3}}{2}c$, and $x-\frac{-1-\sqrt{-3}}{2}c$.

194. Let us now conſider ſuch cubic equations as have all their terms, and which are therefore of this form

$$x^3+Ax^2+Bx+C=0,$$

where A, B, and C denote known quantities, either poſitive or negative.

It has been ſhewn (§ 184. how an equation having all its terms may be transformed into another, which wants the ſecond term; let us therefore aſſume $x=y-\frac{A}{3}$, as directed in that article; then, by proper ſubſtitution, the above equation will be changed into another of this form

$$y^3+qy+r=0,$$

where q and r denote known quantities, whether poſitive or negative; now the roots of this equation being once found, it is evident that thoſe of the former may alſo be readily obtained by means of the aſſumed equation $x=y-\frac{A}{3}$.

195. Reſuming, therefore, the equation $y^3+qy+r=0$, let us ſuppoſe $y=v+z$, and it becomes

$$\left.\begin{matrix} v^3+3v^2z+3vz^2+z^3 \\ +qv+qz \\ +r \end{matrix}\right\}=0.$$

Thus we have got a new equation, which, as it involves two unknown quantities, v and z, may be reſolved into any two other equations, which will ſimplify the determination of thoſe quantities.

Now it appears, that the only way in which we can

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divide that equation into two others, ſo as to ſimplify the queſtion, is the following

$$3v^2z+3vz^2+qv+qz=0$$
$$v^3+z^3+r=0$$

The firſt of theſe equations may alſo be expreſſed thus

$$(3vz+q)(v+z)=0.$$

Hence we muſt either ſuppoſe that $v+z=0$, or that $3vz+q=0$; but the former ſuppoſition cannot be admitted, without ſuppoſing alſo that $y=0$, which does not agree with the hypotheſis of the equation $y^3+qy+r=0$; therefore we muſt adopt the latter. So that to determine v and z we have theſe two equations

$$3vz+q=0,\ v^3+z^3+r=0.$$

From the firſt, we find $vz=-\frac{q}{3}$, and $v^3z^3=-\frac{q^3}{27}$; and from the ſecond $v^3+z^3=-r$, ſo that to determine the quantities v^3 and z^3, we have given their ſum, and product: now this is a problem which we have already reſolved when treating of quadratic equations, § 155; and by proceeding in the ſame manner, in the preſent caſe, we ſhall find

$$v^3=-\tfrac{1}{2}r+\sqrt{\tfrac{1}{27}q^3+\tfrac{1}{4}r^2}\quad z^3=-\tfrac{1}{2}r-\sqrt{\tfrac{1}{27}q^3+\tfrac{1}{4}r^2}$$

$$v=\sqrt[3]{-\tfrac{1}{2}r+\sqrt{\tfrac{1}{27}q^3+\tfrac{1}{4}r^2}}\quad z=\sqrt[3]{-\tfrac{1}{2}r-\sqrt{\tfrac{1}{27}q^3+\tfrac{1}{4}r^2}}$$

and $$y=v+z=\sqrt[3]{-\tfrac{1}{2}r+\sqrt{\tfrac{1}{27}q^3+\tfrac{1}{4}r^2}}$$

$$+\sqrt[3]{-\tfrac{1}{2}r-\sqrt{\tfrac{1}{27}q^3+\tfrac{1}{4}r^2}}.$$

Thus we have at laſt obtained a value of the unknown quantity y, in terms of the known quantities q and r; therefore the equation is reſolved.

196. But this is only one of three values which y may have; let us, for the ſake of brevity, put

$$A=-\tfrac{1}{2}r+\sqrt{\tfrac{1}{27}q^3+\tfrac{1}{4}r^2},\ B=-\tfrac{1}{2}r-\sqrt{\tfrac{1}{27}q^3+\tfrac{1}{4}r^2},$$

and denote the imaginary expreſſions

$$\frac{-1+\sqrt{-3}}{2},\ \frac{-1-\sqrt{-3}}{2}$$

by α and β. Then, from what has been ſhewn (§ 193), it is evident that v and z have each theſe three values

$$v=\sqrt[3]{A},\ v=\alpha\sqrt[3]{A},\ v=\beta\sqrt[3]{A}$$
$$z=\sqrt[3]{B},\ z=\alpha\sqrt[3]{B},\ z=\beta\sqrt[3]{B}$$

To determine the correſponding values of v and z, we muſt conſider that $vz=-\frac{q}{3}=\sqrt[3]{AB}$; now if we obſerve that $\alpha\beta=1$, it will immediately appear that $v+z$ has theſe three values

$$v+z=\sqrt[3]{A}+\sqrt[3]{B}$$
$$v+z=\alpha\sqrt[3]{A}+\beta\sqrt[3]{B}$$
$$v+z=\beta\sqrt[3]{A}+\alpha\sqrt[3]{B}$$

Hence the three values of y are alſo theſe

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$$y=\sqrt[3]{A}+\sqrt[3]{B}$$
$$y=\alpha\sqrt[3]{A}+\beta\sqrt[3]{B}$$
$$y=\beta\sqrt[3]{A}+\alpha\sqrt[3]{B}$$

The firſt of 'theſe formulæ is commonly known by the name of Cardan's rule; but it is well known that Cardan was not the inventor, and that it ought to be attributed to Nicholas Tartalea, and Scipio Ferreus, who diſcovered it much about the ſame time, and independently of each other (ſee the *Introduction*.)

197. The formulæ given in laſt article for the roots of a cubic equation may be put under a different form, and perhaps better adapted to the purpoſes of arithmetical calculation as follows. Becauſe $vz=-\frac{q}{3}$, therefore $z=-\frac{q}{3}\times\frac{1}{v}=-\frac{q}{3}\times\frac{1}{\sqrt[3]{A}}$, hence $v+z=\sqrt[3]{A}-\frac{\frac{1}{3}q}{\sqrt[3]{A}}$; thus it appears that the three values of y may alſo be expreſſed thus

$$y=\sqrt[3]{A}-\frac{\frac{1}{3}q}{\sqrt[3]{A}}$$
$$y=\alpha\sqrt[3]{A}-\frac{\frac{1}{3}q\beta}{\sqrt[3]{A}}$$
$$y=\beta\sqrt[3]{A}-\frac{\frac{1}{3}q\alpha}{\sqrt[3]{A}}$$

198. To ſhow the manner of applying theſe formulæ, let it be required to determine x from the cubic equation

$$x^3+3x^2+9x-13=0$$

And as this equation has all its terms, the firſt ſtep towards its reſolution is to transform it into another which ſhall want the ſecond term, by ſubſtituting $y-1$ for x as directed (§ 184). The operation will ſtand thus

$$\begin{array}{rrr} x^3=y^3 & -3y^2+3y & -1 \\ +3x^2= & +3y^2-6y & +3 \\ +9x= & +9y & -9 \\ -13= & & -13 \\ \hline \end{array}$$

The transformed equation is $y^3+6y-20=0$

which being compared with the general equation

$$y^3+qy+r=0$$

gives $q=6$, $r=-20$; hence

$$A=\sqrt[3]{-\tfrac{1}{2}r+\sqrt{\tfrac{1}{27}q^3+\tfrac{1}{4}r^2}}=\sqrt[3]{10+\sqrt{108}}$$

Therefore, the firſt formula of laſt article gives $y=\sqrt[3]{10+\sqrt{108}}-\frac{2}{\sqrt[3]{10+\sqrt{108}}}$; but as this expreſſion involves a radical quantity, let the ſquare root of 108 be taken and added to 10, and the cube root of the ſum found; thus we have $\sqrt[3]{10+\sqrt{108}}=2.732$, nearly, and

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and therefore $\frac{2}{\sqrt[3]{10+\sqrt{108}}}=\frac{2}{2.732}=.732$; hence we at last find one of the values of y to be $2.732-.732=2$.

In finding the cube root of the radical quantity $\sqrt[3]{10+\sqrt{108}}$ we have taken only its approximate value, so as to have the expression for the root under a rational form, and in this way we can always find, as near as we please, the cube root of any surd of the form $a+\sqrt{b}$ where b is a positive number. But it will sometimes happen that the cube root of such a surd can be expressed exactly by another surd of the same form; and accordingly, in the present case, it appears that the cube root of $10+\sqrt{108}$ is $1+\sqrt{3}$, as may be proved by actually raising $1+\sqrt{3}$ to the third power. Hence we find $\frac{2}{\sqrt[3]{10+\sqrt{108}}}=\frac{2}{1+\sqrt{3}}=\frac{2(1-\sqrt{3})}{(1-\sqrt{3})(1+\sqrt{3})}=-(1-\sqrt{3})$; so that we have $y=1+\sqrt{3}+1-\sqrt{3}=2$, as before.

The other two values of y will be had by substituting $1+\sqrt{3}$ and $1-\sqrt{3}$ for $\sqrt{A}$ and $\frac{\frac{1}{2}q}{\sqrt[3]{A}}$ in the second and third formulæ of last article, also restoring the values of α and β. We thus have

$$y=\frac{-1+\sqrt{-3}}{2}\times(1+\sqrt{3})+\frac{-1-\sqrt{-3}}{2}\times(1-\sqrt{3})=-1+\sqrt{-9}$$

$$y=\frac{-1-\sqrt{-3}}{2}\times(1+\sqrt{3})+\frac{-1+\sqrt{-3}}{2}\times(1-\sqrt{3})=-1-\sqrt{-9}$$

So that the three values of y are

$$+2,\ -1+\sqrt{-9},\ -1-\sqrt{9}$$

and since $x=y+1$, the corresponding values of x are

$$+1,\ -2+\sqrt{-9},\ -2-\sqrt{-9}.$$

Thus it appears that one of the roots of the proposed equation is real and the other two imaginary.

The two imaginary roots might have been found otherwise, by considering that since one root of the equation is 1, the equation must be divisible by $x-1$ (§ 163). Accordingly the division being actually performed, and the quotient put $=0$, we have this quadratic equation

$$x^2+4x+13=0$$

which, when resolved by the rule for quadratics, gives $x=-2\pm\sqrt{-9}$, the same imaginary values as before.

199. In the application of the preceding formulæ (§ 196 and 197) to the resolution of the equation $y^3+qy+r=0$, it is necessary to find the square root of $\frac{1}{27}q^3+\frac{1}{4}r^2$, now when that quantity is positive, as in the equation $y^3+6y-20=0$, which was resolved in last article, no difficulty occurs, for its root may be found, either exactly, or to as great a degree of accuracy as we please.

As, however, the coefficients q and r are independent of each other, it is evident that q may be negative, and such that $\frac{1}{27}q^3$ is greater than $\frac{1}{4}r^2$, in this case the expression $\frac{1}{27}q^3+\frac{1}{4}r^2$ will be negative, and therefore its square root an imaginary quantity. Let us take as an example this equation $y^3-6y+4=0$; here $q=-6$, $r=+4$, $\frac{1}{2}r=2$, $\frac{1}{27}q^3=-8$, $\frac{1}{4}r^2=+4$, $\sqrt{\frac{1}{27}q^3+\frac{1}{4}r^2}=\sqrt{-4}=2\sqrt{-1}$, hence, by recurring to the formulæ (§ 196), we have $A=2+2\sqrt{-1}$, $B=2-\sqrt{-1}$, and therefore the three roots of the equation expressed thus

$$y=\sqrt[3]{2+2\sqrt{-1}}+\sqrt[3]{2-2\sqrt{-1}}$$

$$y=\alpha\sqrt[3]{2+2\sqrt{-1}}+\beta\sqrt[3]{2-2\sqrt{-1}}$$

$$y=\beta\sqrt[3]{2+2\sqrt{-1}}+\alpha\sqrt[3]{2-2\sqrt{-1}}$$

Here all the roots appear under an imaginary form; but we are certain from the theory of equations, as explained in Sect. X. that every cubic equation must have at least one real root. The truth is, as we shall shew immediately, that in this case, so far from any of the roots being imaginary (as in the former example), they are all real; for it appears by actual involution that the imaginary expression $2+2\sqrt{-1}$ is the cube of this other imaginary expression $-1+\sqrt{-1}$, and in like manner, that $2-2\sqrt{-1}$ is the cube of $-1-\sqrt{-1}$, so that we have

$$y=\sqrt[3]{2+2\sqrt{-1}}+\sqrt[3]{2-2\sqrt{-1}}=-1+\sqrt{-1}-1-\sqrt{-1}=-2$$

$$y=\frac{-1+\sqrt{-3}}{2}\times(-1+\sqrt{-1})+\frac{-1-\sqrt{-3}}{2}\times(-1-\sqrt{-1})=1+\sqrt{3}$$

$$y=\frac{-1-\sqrt{-3}}{2}\times(-1+\sqrt{-1})+\frac{-1+\sqrt{-3}}{2}\times(-1-\sqrt{-1})=1-\sqrt{3}.$$

200. We now proceed to prove in general, that as often as the roots of the equation $x^3+qx+r=0$ are real, q is negative, and $\frac{1}{27}q^3$ greater than $\frac{1}{4}r^2$; and, on the contrary, that if $\frac{1}{27}q^3$ be greater than $\frac{1}{4}r^2$ the roots are all real.

Let us suppose a to be a real root of the proposed equation,

Then $x^3+qx+r=0$

And $a^3+qa+r=0$

And therefore by subtraction $x^3-a^3+q(x-a)=0$; hence, dividing x^3-a^3, also $q(x-a)$ by $x-a$, we have

$$x^2+ax+a^2+q=0$$

This quadratic equation is formed from the two remaining roots of the proposed equation, and by resolving it we find

$$x=-\tfrac{1}{2}a\pm\sqrt{-\tfrac{3}{4}a^2-q}$$

And as, by hypothesis, all the roots are real, it is evident that q must necessarily be negative, and greater than $\frac{1}{4}a^2$; for otherwise the expression $\sqrt{-\frac{3}{4}a^2-q}$, would be imaginary. Let us change the sign of q, and put

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put $q=\frac{3}{4}a^2+d$; thus the roots of the equation $x^3+qx+r=0$ will be

$$a,\ -\tfrac{1}{2}a+\sqrt{d},\ -\tfrac{1}{2}a-\sqrt{d},$$

and here d is a positive quantity.

To find an expression for r in terms of a and d, let $\frac{3}{4}a^2+d$ be substituted for q in the equation $a^3-qa+r=0$; we thence find $r=-\frac{1}{4}a^3+ad$; so that to compare together the quantities q and r we have these equations,

$$q=\tfrac{3}{4}a^2+d$$
$$r=-\tfrac{1}{4}a^3+ad.$$

In order to make this comparison, let the cube of $\frac{1}{3}q$ be taken, also the square of $\frac{1}{2}r$, the results are

$$\tfrac{1}{27}q^3=\tfrac{1}{64}a^6+\tfrac{1}{16}a^4d+\tfrac{1}{12}a^2d^2+\tfrac{1}{27}d^3$$
$$\tfrac{1}{4}r^2=\tfrac{1}{64}a^6-\tfrac{1}{8}a^4d+\tfrac{1}{4}a^2d^2;$$

and therefore, by subtraction,

$$\tfrac{1}{27}q^3-\tfrac{1}{4}r^2=\tfrac{1}{16}a^4d-\tfrac{1}{6}a^2d^2+\tfrac{1}{27}d^3$$
$$=3d(\tfrac{1}{16}a^4-\tfrac{1}{18}a^2d+\tfrac{1}{108}d^2)$$
$$=3d(\tfrac{1}{4}a^2-\tfrac{1}{9}d)^2.$$

Now the square of any real quantity being always positive, it follows, that $3d(\frac{1}{4}a^2-\frac{1}{9}d)^2$ will be positive when d is positive; hence it is evident that in this case $\frac{1}{27}q^3$ must be greater than $\frac{1}{4}r^2$; and that the contrary cannot be true, unless d be negative, that is, unless that $-\frac{1}{2}a+\sqrt{d}$, $-\frac{1}{2}a-\sqrt{d}$, the two other roots of the equation, are imaginary. If we suppose $d=o$, then $\frac{1}{27}q^3=\frac{1}{4}r^2$; and the roots of the equations, which in this case are also real, are a, $-\frac{1}{2}a$, $-\frac{1}{2}a$.

Upon the whole, therefore, we infer, that since a cubic equation has always one real root, its roots will be all real as often as q is negative, and $\frac{1}{27}q^3$ greater than $\frac{1}{4}r^2$; and consequently, that in this case the formulæ for the roots must express real quantities notwithstanding their imaginary form.

201. Let $y^3-qy+r=0$ denote any equation of the form which has been considered in last article, namely, that which has its roots all real; then, if we put $a=-\frac{1}{2}r$, $b^2=\frac{1}{27}q^3-\frac{1}{4}r^2$, one of the roots, as expressed by the first formula, § 196. will be

$$y=\sqrt[3]{a+b\sqrt{-1}}+\sqrt[3]{a-b\sqrt{-1}}.$$

This expression, although under an imaginary form, must (as we have shewn in last article) represent a real quantity. It will sometimes happen, as in last example, § 199. that the two surds which compose the root are perfect cubes of the form $(A+B\sqrt{-1})^3$ and $(A-B\sqrt{-1})^3$, and then the value of y becomes

$$A+B\sqrt{-1}+A-B\sqrt{-1}=2A.$$

But the rules for determining when this is the case depend upon trials, and are, besides, troublesome in the application; and if we attempt by a direct process to investigate the numerical values of A and B, we are brought to a cubic equation, of the very same form as that whose root is required.

202. This imaginary expression for a real quantity has greatly perplexed mathematicians; and much pains has been taken to obtain the root under another form, but without success. Accordingly, the case of cubic equations, in which the roots are all real, is now called the *irreducible case*.

203. It is remarkable that the expression

$$\sqrt{a+b\sqrt{-1}}+\sqrt{a-b\sqrt{-1}},$$

and in general,

$$\sqrt[n]{a+b\sqrt{-1}}+\sqrt[n]{a-b\sqrt{-1}},$$

where n is any power of 2, admits of being reduced to another form in which no impossible quantity is found. Thus

$$\sqrt{a+b\sqrt{-1}}+\sqrt{a-b\sqrt{-1}}=\sqrt{2a+2\sqrt{a^2+b^2}}$$
$$\sqrt[4]{a+b\sqrt{-1}}+\sqrt[4]{a-b\sqrt{-1}}=$$
$$\sqrt{\left(\sqrt{2a+2\sqrt{a^2+b^2}}+2\sqrt[4]{a^2+b^2}\right)},$$

as is easily proved by first squaring the imaginary formulæ, and then taking the square root of each. But when n is 3, it does not seem that such reduction can possibly take place.

204. If each of the surds be expanded into an infinite series and their sum be taken, the imaginary quantity $\sqrt{-1}$ will vanish; and thus the root may be found by a direct process. There are, however, other methods which seem preferable; and the following, which is derived from the application of algebra to geometry, seems to be the best.

205. It will be demonstrated in Sect. XXV. that if a denote an arch of a circle, the relation between the cosine of the arch and the cosine of $\frac{a}{3}$, one-third of that arch is expressed by the following cubic equation.

$$\text{Cos.}^3\frac{a}{3}-\tfrac{3}{4}\text{ cos.}\frac{a}{3}=\tfrac{1}{4}\text{ cos. }a.$$

Let us assume $\text{cos.}\frac{a}{3}=\frac{y}{n}$, then, by substitution, the equation is transformed into the following:

$$\frac{y^3}{n^3}-\frac{3y}{4n}=\tfrac{1}{4}\text{cos. }a.$$

$$\text{Or}\qquad y^3-\frac{3n^2}{4}y=n^3\times\tfrac{1}{4}\text{cos. }a,$$

and in this cubic equation one of the roots is evidently $y=n\times\text{cos.}\frac{a}{3}$. Now from the arithmetic of sines it appears that cos. a, cos. $(360^\circ-a)$, and cos. $(360^\circ+a)$, are all expressed by the same quantity; therefore the equation must have for a root not only $n\times\text{cos.}\frac{a}{3}$, but also $n\times\text{cos.}\frac{360^\circ-a}{3}$, and $n\times\text{cos.}\frac{360^\circ+a}{3}$. But, from the arithmetic of sines, $\text{cos.}\frac{360^\circ-a}{3}=-\text{sin.}\frac{90^\circ-a}{3}$, and $\text{cos.}\frac{360^\circ+a}{3}=-\text{sin.}\frac{90^\circ+a}{3}$. Therefore the three roots of the equation are

$$n\times\text{cos.}\frac{a}{3},\ -n\times\text{sin.}\frac{90^\circ-a}{3},\ -n\times\text{sin.}\frac{90^\circ+a}{3}.$$

Let us next suppose that $y^3-qy=r$ is a cubic equation

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tion whose roots are required, and let us compare it with the former equation $y^3-\frac{3n^2}{4}y=n^3\times\text{cos.}\frac{1}{3}a$; then it is evident that if we assume the quantities n and cos. a, such, that

$$\frac{3n^2}{4}=q,\ n^3\times\text{cos.}\tfrac{1}{3}a=r$$

the two equations will become identical, and thus their roots will be expressed by the very same quantities. But from these two assumed equations we find

$$n=\sqrt{\frac{4q}{3}}=\frac{2\sqrt{q}}{\sqrt{3}},\ \text{cos. } a=\frac{4r}{n^3}=\sqrt{\frac{27r^2}{4q^3}}=\frac{3r\sqrt{3}}{2q\sqrt{q}}$$

and since the cosine of an arch cannot exceed unity, therefore, $\frac{27r^2}{4q^3}$ must be a proper fraction, that is, $4q^3$ must exceed $27r^2$, or $\frac{1}{27}q^3$ must exceed $\frac{1}{4}r^2$; if we now recollect that q is a negative quantity, it will immediately appear that the proposed equation must necessarily belong to the irreducible case.

206. The rule, therefore, which we derive from the preceding analysis for resolving that case is as follows.

Let $y^3-qy=r$ be the proposed equation.

Find in the trigonometrical tables an arch a, whose natural cosine $=\frac{3r\sqrt{3}}{2q\sqrt{q}}$.

The roots of the equation are

$$y=2\sqrt{\frac{q}{3}}\times\text{cos.}\frac{a}{3}$$
$$y=-2\sqrt{\frac{q}{3}}\times\text{sin.}\frac{90^\circ-a}{3}$$
$$y=-2\sqrt{\frac{q}{3}}\times\text{sin.}\frac{90^\circ+a}{3}.$$

These formulæ will apply, whether r be positive or negative, by proper attention to the signs: If, however, r be negative, or the equation have this form, $y^3-qy=-r$, the following will be more convenient:

Find in the tables an arch a, whose sine $=\frac{3r\sqrt{3}}{2q\sqrt{q}}$

Then the roots of the equation are

$$y=2\sqrt{\frac{q}{3}}\times\text{sin.}\frac{a}{3}$$
$$y=2\sqrt{\frac{q}{3}}\times\text{cos.}\frac{90^\circ+a}{3}$$
$$y=-2\sqrt{\frac{q}{3}}\times\text{cos.}\frac{90^\circ-a}{3}.$$

The last formulæ are derived from the equation

$$\text{Sin.}\frac{a}{3}-\frac{3}{4}\text{sin.}\frac{a}{3}=-\text{sin. }a$$

in the same manner as the former were found from the first equation of last article.

Ex. 1. It is required to find the roots of the equation $x^3-3x=1$.

$$\text{Here }\frac{3r\sqrt{3}}{2q\sqrt{q}}=\frac{3\times\sqrt{3}}{6\times\sqrt{3}}=\tfrac{1}{2}=\text{cos. }60^\circ=\text{cos. }a.$$

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$$\text{Hence}\begin{cases} x=2\text{ cos.}\frac{60^\circ}{3}=2\text{ cos. }20^\circ=1.8793852\\ x=-2\text{sin.}\frac{150^\circ}{3}=-2\text{sin.}50^\circ=-1.5320888\\ x=-2\text{ sin.}\frac{30^\circ}{3}=-2\text{ sin. }10^\circ=.3472964.\end{cases}$$

Ex. 2. It is required to find the roots of the equation x^3-3x-1.

$$\text{Here }\frac{3r\sqrt{3}}{2q\sqrt{q}}=\frac{3\sqrt{3}}{6\sqrt{3}}=\tfrac{1}{2}=\text{sin. }30^\circ=\text{sin. }a.$$
$$x=2\text{ sin.}\frac{30^\circ}{3}=2\text{ sin. }10^\circ=\ .3472964$$
$$x=2\text{ cos.}\frac{120^\circ}{3}=2\text{ cos. }40^\circ=\ 1.5320888$$
$$x=-2\text{cos.}\frac{60^\circ}{3}=-2\text{ cos. }20^\circ=-1.8793852.$$

Sect. XII. *Of Biquadratic Equations.*

207. When a biquadratic equation contains all its terms, it has this form,

$$x^4+Ax^3+Bx^2+Cx+D=0$$

where A, B, C, D, denote any known quantities whatever.

208. We shall first consider pure biquadratics, or such as contain only the first and last terms, and therefore are of this form $x^4=b^4$. In this case it is evident that x may be readily had by two extractions of the square root; by the first we find $x^2=b^2$ and by the second $x=b$. This, however, is only one of the values which x may have; for since $x^4=b^4$, therefore $x^4-b^4=0$; but x^4-b^4 may be resolved into two factors x^2-b^2 and x^2+b^2, each of which admit of a similar resolution; for $x^2-b^2=(x-b)(x+b)$ and $x^2+b^2=(x-b\sqrt{-1})(x+b\sqrt{-1})$. Hence it appears that the equation $x^4-b^4=0$ may also be expressed thus:

$$(x-b)(x+b)(x-b\sqrt{-1})(x+b\sqrt{-1})=0,$$

so that x may have these four values,

$$+b,-b,+b\sqrt{-1},-b\sqrt{-1},$$

two of which are real and the others imaginary.

209. Next to pure biquadratic equations, in respect of easiness of resolution, are such as want the second and fourth terms, and therefore have this form,

$$x^4+qx^2+s=0.$$

These may be resolved in the manner of quadratic equations; for if we put $y^2=x^2$ we have

$$y^2+qy+s=0$$

from which we find $y=\frac{-q\pm\sqrt{q^2-4s}}{2}$, and therefore

$$x=\pm\sqrt{\frac{-q\pm\sqrt{q^2-4s}}{2}}.$$

210. When a biquadratic equation has all its terms, the manner of resolving it is not so obvious as in the two former cases, but its resolution may be always reduced to that of a cubic equation. There are various methods by which such a reduction may be effected; the following, which we select as one of the most ingenious, was first given by Euler in the Petersburg Commentaries, and

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and afterwards explained more fully in his Elements of Algebra.

We have already explained § 184, in what manner an equation which is complete in its terms may be transformed into another equation of the same degree, but which wants the second term; therefore, any proposed biquadratic equation may be reduced to this form,

$$y^4+py^2+qy+r=0$$

where the second term is wanting, and where p, q, r, denote any known quantities whatever.

211. That we may form any equation similar to the above, let us assume $y=\sqrt{a}+\sqrt{b}+\sqrt{c}$, and let us also suppose that the letters a, b, c, denote the roots of the cubic equation

$$z^3+Pz^2+Qz-R=0$$

then from the theory of equations we have

$$a+b+c=-P,\ ab+ac+bc=Q\ abc=R.$$

Let us now square the assumed formula $y=\sqrt{a}+\sqrt{b}+\sqrt{c}$, and we obtain

$y^2=a+b+c+2(\sqrt{ab}+\sqrt{ac}+\sqrt{bc})$

or substituting $-P$ for $a+b+c$, and transposing,

$y^2+P=2(\sqrt{ab}+\sqrt{ac}+\sqrt{bc})$.

Let this equation be also squared and we have

$y^4+2Py^2+P^2=4(ab+ac+bc)+8(\sqrt{a^2bc}+\sqrt{ab^2c}+\sqrt{abc^2})$, and since $ab+ac+bc=Q$

and $\sqrt{a^2bc}+\sqrt{ab^2c}+\sqrt{abc^2}=\sqrt{abc}(\sqrt{a}+\sqrt{b}+\sqrt{c})=\sqrt{R}y$; the same equation may be expressed thus:

$$y^4+2Py^2+P^2=4Q+8\sqrt{R}y.$$

Thus we have obtained the biquadratic equation

$$y^4+2Py^2-8\sqrt{R}y+P^2-4Q=0,$$

one of the roots of which $y=\sqrt{a}+\sqrt{b}+\sqrt{c}$, and in which a, b, c are the roots of the cubic equation $z^3+Pz^2+Qz-R=0$.

212. That we may apply this resolution to the proposed equation $y^4+py^2+qy+r=0$, we must express the assumed coefficients P, Q, R by means of p, q, r the coefficients of that equation. For this purpose let us compare together the equations

$$y^4+py^2+qy+r=0$$
$$y^4+2Py^2-8\sqrt{R}y+P^2-4Q=0,$$

and it immediately appears that $2P=p$, $-8\sqrt{R}=q$, $P^2-4Q=r$; and from these three equations we find $P=\frac{p}{2}$, $Q=\frac{p^2-4r}{16}$, $R=\frac{q^2}{64}$. Hence it follows, that the roots of the proposed equation are generally expressed by the formula $y=\sqrt{a}+\sqrt{b}+\sqrt{c}$; where a, b, c denote the roots of this cubic equation

$$z^3+\frac{p}{2}z^2+\frac{p^2-4r}{16}z-\frac{q^2}{64}=0.$$

213. But to find each particular root, we must consider, that as the square root of a number may be either positive or negative, so each of the quantities $\sqrt{a}$, $\sqrt{b}$, $\sqrt{c}$ may have either the sign $+$ or $-$ prefixed to it; and hence our formula will give eight different expressions for the root. It is, however, to be observed, that as the product of the three quantities $\sqrt{a}$, $\sqrt{b}$, $\sqrt{c}$, must be equal to $\sqrt{R}$ or to $-\frac{q}{8}$, therefore when q is positive, their product must be a negative quantity; and this can only be effected by making either one or three of them negative; again, when q is negative, their product must be a positive quantity, so that in this case they must either be all positive, or two of them must be negative. These considerations enable us to determine, that four of the eight expressions for the root belong to the case in which q is positive, and the other four to that in which it is negative.

Biquadratic Equation

214. We shall now give the result of the preceding investigation, in the form of a practical rule, for resolving biquadratic equations; and as the coefficients of the cubic equation which has been found, § 212, involve fractions, we shall transform it into another, in which the coefficients are integers, by supposing $z=\frac{v}{4}$. Thus the equation $z^3+\frac{p}{2}z^2+\frac{p^2-4r}{16}z-\frac{q^2}{64}=0$ becomes, after reduction, $v^3+2pv^2+(p^2-4r)v-q^2=0$; it also follows, that since the roots of the former equation are a, b, c, the roots of the latter are $\frac{a}{4}, \frac{b}{4}, \frac{c}{4}$, so that our rule may now be expressed thus:

Let $y^4+py^2+qy+r=0$ be any biquadratic equation wanting its second term. Form this cubic equation

$$v^3+2pv^2+(p^2-4r)v-q^2=0,$$

and find its roots, which let us denote by a, b, c.

Then the roots of the proposed biquadratic equation are

when q is negative	when q is positive
$y=\frac{1}{2}(\sqrt{a}+\sqrt{b}+\sqrt{c})$	$y=\frac{1}{2}(-\sqrt{a}-\sqrt{b}-\sqrt{c})$
$y=\frac{1}{2}(\sqrt{a}-\sqrt{b}-\sqrt{c})$	$y=\frac{1}{2}(-\sqrt{a}+\sqrt{b}+\sqrt{c})$
$y=\frac{1}{2}(-\sqrt{a}+\sqrt{b}-\sqrt{c})$	$y=\frac{1}{2}(\sqrt{a}-\sqrt{b}+\sqrt{c})$
$y=\frac{1}{2}(-\sqrt{a}-\sqrt{b}+\sqrt{c})$	$y=\frac{1}{2}(\sqrt{a}+\sqrt{b}-\sqrt{c})$.

215. This resolution of biquadratic equations suggests the following general remarks upon the nature of their roots.

1. It is evident from the form of the roots, that if the cubic equation

$$v^3+2pv^2+(p^2-4r)v-q^2=0$$

have all its roots real, and positive, those of the biquadratic equation shall be all real.

2. Since the last term of the cubic equation is negative, when its three roots are real, they must either be all positive, or two of them must be negative and one positive; for the last term is equal to the product of all the roots taken with contrary signs, § 169; so that in this last case two of the three quantities a, b, c, must be negative, and therefore all the four roots of the biquadratic equation imaginary. If, however, the two negative roots be equal, they will destroy each other in two of the roots of the biquadratic equation, which will then become real and equal. Let us suppose for example that b and c are negative, and equal; the two first values of y in each column become then imaginary,

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nary, and the remaining values of y are in the first set of roots $y=-\frac{1}{2}\sqrt{a}$, $y=-\frac{1}{2}\sqrt{a}$, and in the second $y=+\frac{1}{2}\sqrt{a}$, $y=\frac{1}{2}\sqrt{a}$.

3. When the cubic equation has only one real and two imaginary roots, its real root must necessarily be positive. For the imaginary roots can only come from a quadratic equation, having its last term positive, Sect. IX. and therefore of this form $v^2+Av+B=0$, hence, the simple factor which contains the remaining root must have this form $v-\gamma$, otherwise the last term of the cubic equation could not be negative.

By resolving the equation $v^2+Av+B=0$, we find

$$v=-\frac{A}{2}\pm\sqrt{\frac{A^2}{4}-B};$$

here, the roots being supposed imaginary, $\frac{A^2}{4}-B$ must be a negative quantity. That we may simplify the form of the roots, let us put $-\frac{A}{2}=\alpha$ and $\frac{A^2}{4}-B=-\beta^2$, then

$$v=-\alpha\pm\sqrt{-\beta^2}=-\alpha\pm\beta\sqrt{-1}$$

and $v=-\alpha+\beta\sqrt{-1}$, $v=-\alpha-\beta\sqrt{-1}$.

Hence we have

$$a=\alpha+\beta\sqrt{-1},\ b=\alpha-\beta\sqrt{-1},\ c=\gamma;$$

so that in two of the four values of y, we have a quantity of this form

$$\sqrt{\alpha+\beta\sqrt{-1}}+\sqrt{\alpha-\beta\sqrt{-1}}$$

but this quantity, although it appears to be imaginary, is indeed real; for if we first square it, and then take its square root, it becomes

$$\sqrt{2\alpha+2\sqrt{\alpha^2+\beta^2}},$$

which is a real quantity. The two other roots involve this other expression

$$\sqrt{\alpha+\beta\sqrt{-1}}-\sqrt{\alpha-\beta\sqrt{-1}}$$

which, being treated in the same manner as the former, becomes

$$\sqrt{2\alpha-2\sqrt{\alpha^2+\beta^2}}$$

an imaginary quantity, and therefore the roots, into which it enters, are imaginary.

4. We may discover from the coefficients of the proposed biquadratic equation in what case the roots of the cubic equation are all real; for this purpose the latter is to be transformed into another which shall want the second term by assuming $v=u-\frac{2p}{3}$; thus it becomes

$$u^3-\left(\frac{p^2}{3}+4r\right)u-\frac{2p^3}{27}+\frac{8rp}{3}-q^2=0;$$

and in this equation the three roots will be real when $\frac{1}{27}\left(\frac{p^2}{3}+4r\right)^3$ is greater than $\frac{1}{4}\left(\frac{2p^3}{27}-\frac{8rp}{3}+q^2\right)^2$.

216. As an example of the method of resolving a biquadratic equation, let it be required to determine the roots of the following,

$$x^4-25x^2+60x-36=0.$$

By comparing this equation with the general formula, we have $p=-25$, $q=+60$, $r=-36$, hence Reciprocal Equations.

$$2p=-50,\ p^2-4r=769,\ q^2=3600,$$

and the cubic equation to be resolved is

$$v^3-50v^2+769v-3600=0;$$

the roots of which are found, by the rules for cubics, to be 9, 16, and 25, so that we have $\sqrt{a}=3$, $\sqrt{b}=4$, $\sqrt{c}=5$. Now in this case q is positive, therefore

$$x=\tfrac{1}{2}(-3-4-5)=-6$$
$$x=\tfrac{1}{2}(-3+4+5)=+3$$
$$x=\tfrac{1}{2}(+3-4+5)=+2$$
$$x=\tfrac{1}{2}(+3+4-5)=+1.$$

217. We have now explained the particular rules by which the roots of equations belonging to each of the first four orders may be determined; and this is the greatest length mathematicians have been able to go in the direct resolution of equations; for as to those of the fifth, and all higher degrees, no general method has hitherto been found, either for resolving them directly, or for reducing them to others of an inferior degree.

It even appears that the formulæ which express the roots of cubic equations are by no means of universal application; for in one case, that is, when the roots are all real, they become illusory, so that no conclusion can be drawn from them. The same observation will also apply to the formulæ for the roots of biquadratic equations, because, before they can be applied, it is always necessary to find the roots of a cubic equation. But in either cubics or biquadratic equations, even when the formulæ involve no imaginary quantities, and therefore can be always applied, it is more convenient in practice to employ some other methods which we are hereafter to explain.

Sect. XIII. *Of Reciprocal Equations.*

218. Although no general resolution has hitherto been given of equations belonging to the fifth, or any higher degree; yet there are particular equations of all orders, which, by reason of certain peculiarities in the nature of their roots, admit of being reduced to others of a lower degree, and thus, in some cases, equations of the higher orders may be resolved by the rules which have been already explained for the resolution of equations belonging to the first four orders.

219. When the coefficients of the terms of an equation form the same numerical series, whether taken in a direct or an inverted order, as in this example

$$x^4+px^3+qx^2+px+1=0$$

that equation may always be transformed into another of a degree denoted by half the exponent of the highest power of the unknown quantity, if that exponent be an even number, or by half the exponent diminished by unity, if it be an odd number.

The same observation will also apply to any equation of this form

$$x^4+pax^3+qa^2x^2+pa^3x+a^4=0$$

where the given quantity a and the unknown quantity

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x are precisely alike concerned; for by substituting ay for x, it becomes

$$a^4y^4+pa^4y^3+qa^4y^2+pa^4y+a^4=0;$$

and dividing by a^4,

$$y^4+py^3+qy^2+py+1=0,$$

an equation of the same kind as the former.

220. That we may effect the proposed transformation upon the equation

$$x^4+px^3+qx^2+px+1=0$$

let every two terms which are equally distant from the extremes be collected into one, and the whole be divided by x^2, thus we have

$$x^2+\frac{1}{x^2}+p\left(x+\frac{1}{x}\right)+q=0.$$

Let us assume $x+\frac{1}{x}=z$

Then $x^2+2+\frac{1}{x^2}=z^2$ and $x^2+\frac{1}{x^2}=z^2-2$

Thus the equation $x^2+\frac{1}{x^2}+p\left(x+\frac{1}{x}\right)+q=0$

becomes $z^2+pz+q-2=0$.

And since $z+\frac{1}{x}=z$, therefore $x^2-zx+1=0$.

221. Hence, upon the whole, to determine the roots of the biquadratic equation

$$x^4+px^3+qx^2+px+1=0$$

we have the following rule.

Form this quadratic equation

$$z^2+pz+q-2=0$$

and find its roots, which let us suppose denoted by z' and z''. Then the four roots of the proposed equation will be found by resolving two quadratic equations

$$x^2-z'x+1=0,\ x^2-z''x+1=0.$$

222. It may be observed respecting these two quadratic equations, that since the last term of each is unity, if we put a, a' to denote the roots of the one, and b, b' those of the other, we have from the theory of equations $aa'=1$, and therefore $a'=\frac{1}{a}$, also $bb'=1$, and $b'=\frac{1}{b}$; now a, a', b, b' are also the roots of the equation

$$x^4+px^3+qx^2+px+1=0.$$

Hence it appears that the proposed equation has this peculiar property, that the one half of its roots are the reciprocals of the other half; and to that circumstance we are indebted for the simplicity of its resolution.

223. The following equation

$$x^6+px^5+qx^4+rx^3+qx^2+px+1=0,$$

which is of the sixth order, admits of a resolution in all respects similar to the former; for by putting it under this form

$$x^3+\frac{1}{x^3}+p\left(x^2+\frac{1}{x^2}\right)+q\left(x+\frac{1}{x}\right)+r=0,$$

and putting also $x+\frac{1}{x}=z$, so that $x^2-zx+1=0$, we have $x^2+\frac{1}{x^2}=z^2-2$

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$$x^3+\frac{1}{x^3}=z^3-3\left(x+\frac{1}{x}\right)=z^3-3z.$$

Hence, by substitution, the proposed equation is transformed into the following cubic equation

$$z^3+pz^2+(q-3)z+r-2p=0.$$

Therefore, putting z', z'', z''' to denote its roots, the six roots of the proposed equation will be had by resolving these three quadratics

$$x^2-z'x+1=0,\ x^2-z''x+1=0,\ x^2-z'''x+1=0,$$

and here it is evident, as in the former case, that the roots of each quadratic equation are the reciprocals of each other, so that the one half of the roots of the proposed equation are the reciprocals of the other half.

224. The method of resolution we have employed in the two preceding examples is general for all equations whatever, in which the terms placed at equal distances from the first and last have the same coefficients, and which are called *reciprocal equations*, because any such equation has the same form when you substitute for x its reciprocal $\frac{1}{x}$.

225. If the greatest exponent of the unknown quantity in a reciprocal equation is an odd number, as in this example

$$x^5+px^4+qx^3+qx^2+px+1=0$$

the equation will always be satisfied by substituting -1 for x; hence -1 must be a root of the equation, and therefore the equation must be divisible by $x+1$. Accordingly, if the division be actually performed, we shall have in the present case

$$x^4+(p-1)x^3-(p-q-1)x^2+(p-1)x+1=0$$

another reciprocal equation, in which the greatest exponent of x is an even number, and therefore resolvable in the manner we have already explained.

SECT. XIV. *Of Equations which have Equal Roots.*

226. WHEN an equation has two or more of its roots equal to one another, those roots may always be discovered, and the equation reduced to another of an inferior degree, by a method of resolution which is peculiar to this class of equations; and which we now proceed to explain.

227. Although the method of resolution we are to employ will apply alike to equations having equal roots, of every degree, yet, for the sake of brevity, we shall take a biquadratic equation

$$x^4+px^3+qx^2+rx+s=0$$

the roots of which may be generally denoted by a, b, c, and d. Thus we have, from the theory of equations,

$$(x-a)(x-b)(x-c)(x-d)=x^4+px^3+qx^2+rx+s$$

Let us put

$A=(x-a)(x-b)(x-c)$ $A''=(x-a)(x-c)(x-d)$
$A'=(x-a)(x-b)(x-d)$ $A'''=(x-b)(x-c)(x-d)$

Then,

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Then, by actual multiplication, we have

$$A=x^3\left\{\begin{matrix}-a\\-b\\-c\end{matrix}\right\}x^2\left\{\begin{matrix}+ab\\+ac\\+bc\end{matrix}\right\}x-abc$$

$$A'=x^3\left\{\begin{matrix}-a\\-b\\-d\end{matrix}\right\}x^2\left\{\begin{matrix}+ab\\+ad\\+bd\end{matrix}\right\}x-abd$$

$$A''=x^3\left\{\begin{matrix}-a\\-c\\-d\end{matrix}\right\}x^2\left\{\begin{matrix}+ac\\+ad\\+bd\end{matrix}\right\}x-acd$$

$$A'''=x^3\left\{\begin{matrix}-b\\-c\\-d\end{matrix}\right\}x^2\left\{\begin{matrix}+bc\\+bd\\+cd\end{matrix}\right\}x-bcd$$

and taking the sum of these four equations

$$A+A'+A''+A'''=4x^3\left\{\begin{matrix}-3a\\-3b\\-3c\\-3d\end{matrix}\right\}x^2\left\{\begin{matrix}+2ab\\+2ac\\+2ad\\+2bc\\+2bd\\+2cd\end{matrix}\right\}x\left\{\begin{matrix}-abc\\-abd\\-acd\\-bcd\end{matrix}\right.$$

But since a, b, c, d are the roots of the equation

$$x^4+px^3+qx^2+rx+s=0,$$

we have $-3(a+b+c+d)=3p$

$2(ab+ac+ad+bc+bd+cd)=2q$

$-(abc+abd+acd+bcd)=r$

Therefore, by substitution,

$$A+A'+A''+A'''=4x^3+3px^2+2qx+r.$$

228. Let us now suppose that the proposed biquadratic equation has two equal roots, or $a=b$, then $x-a=x-b$, and since one or other of these equal factors enters each of the four products A, A', A'', A''', it is evident that $A+A'+A''+A'''$, or $4x^3+3px^2+2qx+r$ must be divisible by $x-a$, or $x-b$. Thus it appears that if the proposed equation

$$x^4+px^3+qx^2+rx+s=0$$

has two equal roots, each of them must also be a root of this equation

$$4x^3+3px^2+2qx+r=0;$$

for when the first of these equations is divisible by $(x-a)^2$, the latter is necessarily divisible by $x-a$.

229. Let us next suppose that the proposed equation has three equal roots or $a=b=c$, then two at least of the three equal factors $x-a$, $x-b$, $x-c$, must enter each of the four products A', A'', A''', A'''; so that in this case $A+A'+A''+A'''$, or $4x^3+3x^2+2qx+r$ must be twice divisible by $x-a$. Hence it follows, that as often as the proposed equation has three equal roots, two of them must also be equal roots of the equation

$$4x^3+3px^2+2qx+r=0.$$

230. Proceeding in the same manner, it may be shewn that whatever number of equal roots are in the proposed equation

$$x^4+px^3+qx^2+rx+s=0$$

they will all remain except one, in this equation

$$4x^3+3px^2+2qx+r=0,$$

which is evidently derived from the former, by multiplying each of its terms by the exponent of x in that term, and then diminishing the exponent by unity. Equations with equal Roots.

231. If we suppose that the proposed equation has two equal roots or $a=b$, and also two other equal roots, or $c=d$, then, by reasoning as before, it will appear that the equation derived from it must have one root equal to a or b, and another equal to c or d; so that when the former is divisible both by $(x-a)^3$ and $(x-c)^3$, the latter will be divisible by $(x-a)(x-c)$.

232. The same mode of reasoning may be extended to all equations whatever; so that if we suppose

$$x^m+Px^{m-1}+Qx^{m-2}\ldots+Sx^2+Tx+U=0$$

an equation of the mth degree to have a divisor of this form

$$(x-a)^n(x-d)^p(x-f)^q\ldots\text{ \&c.}$$

The equation

$$mx^{m-1}+(m-1)Px^{m-2}+(m-2)Qx^{m-3}\ldots+2Sx+T=0,$$

which is of the next lower degree, will have for a divisor

$$(x-a)^{n-1}(x-d)^{p-1}(x-f)^{q-1}\ldots\text{ \&c.}$$

and as this last product must be a divisor of both equations, it may always be discovered by the rule which has been given (§ 49.) for finding the greatest common divisor of two algebraic quantities.

233. Again, as this last equation must, in the case of equal roots, have the same properties as the original equation; therefore, if we multiply each of its terms by the exponent of x, and diminish that exponent by unity, as before, we have

$$m(m-1)x^{m-2}+(m-1)(m-2)Px^{m-3}+(m-2)(m-3)Qx^{m-4}\ldots+2S=0,$$

a new equation, which will have for a divisor

$$(x-a)^{n-2}(x-d)^{p-2}(x-f)^{q-2},$$

where the exponent of the factors are one less than those of the equation from which it was derived; and as this last divisor is also a divisor of the original equation, it may be discovered in the same manner as the former, namely, by finding the greatest common measure of both equations; and so on we may proceed as far as we please.

234. As a particular example, let us take this equation

$$x^5-13x^4+67x^3-171x^2+216x-108=0,$$

and apply to it the method we have explained, in order to discover whether it has equal roots, and if so, what they are. We must therefore seek the greatest common measure of the proposed equation and this other equation, which is formed agreeably to what has been shewn § 228,

$$5x^4-52x^3+201x^2-342x+216=0,$$

and the operation being performed, we find that they have a common divisor $x^3-8x^2+21x-18$, which is of the third degree, and consequently may have several factors. Let us therefore try whether the last equation and the following,

$$20x^3-156x^2+402x-342=0,$$

which is derived from it, as directed in § 228. have any common divisor; and, by proceeding as before, we

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find that they admit of this divisor $x-3$, which is also a factor of the last divisor $x^3-8x^2+21x-18$, and therefore the product of remaining factors is immediately found by division to be x^2-5x+6, which is evidently resolvable into $x-2$ and $x-3$.

Thus, it appears upon the whole, that the common divisor of the original equation, and that which is immediately derived from it, is $(x-2)(x-3)^2$; and that the common divisor of the second and third equations is $x-3$. Hence it follows that the proposed equation has $(x-2)^2$ for one factor, and $(x-3)^3$ for another factor; so that the equation itself may be expressed thus, $(x-2)^2(x-3)^3=0$, and the truth of this conclusion may be easily verified by multiplication.

Sect. XV. *Resolution of Equations whose Roots are rational.*

235. It has been shewn in § 169 that the last term of any equation is always the product of its roots taken with contrary signs: Hence it follows that when the roots are rational they may be discovered by the following rule.

Bring all the terms of the equation to one side; find all the divisors of the last term, and substitute them successively for the unknown quantity in the equation. Then each divisor, which produces a result equal to 0, is a root of the proposed equation.

Ex. 1. Let $x^3-4x^2-7x+10=0$ be the proposed equation.

Then, the divisors of 10 the last term are 1, 2, 5, 10, each of which may be taken either positively, or negatively, and these being substituted successively for x, we obtain the following results.

By putting $+1$ for x,	$1-$	$4-$	$7+10=$	0
-1	$-1-$	$4+$	$7+10=$	12
$+2$	$8-$	$16-$	$14+10=$	-12
-2	$-8-$	$16+$	$14+10=$	0
$+5$	$125-$	$100-$	$35+10=$	0

Here the divisors which produce results equal to 0 are $+1$, -2, and $+5$, and therefore these numbers are the three roots of the proposed equation.

236. When the number of divisors to be tried happens to be considerable, it will be convenient to transform the proposed equation into another, in which the last term has fewer divisors. This may, in general, be done by forming an equation, the roots of which are greater or less than those of the proposed equation by some determinate quantity, as in the following example:

Ex. 2. Let $y^4-4y^3-8y+32=0$ be proposed.

Here the divisors to be tried are 1, 2, 4, 8, 16, 32, each taken either positively or negatively; but to prevent the trouble of so many substitutions, let us transform the equation, by putting $x+1$ for y.

Then	$y^4=x^4+$	$4x^3+$	$6x^2+$	$4x+$	1
	$-4y^3=$	$-4x^3-$	$12x^2-$	$12x-$	4
	$-8y=$			$-8x-$	8
	$+32=$				$+32$
Therefore	x^4		$-6x^2-$	$16x+$	$21=0$

is the transformed equation, and the divisors of the last term are $+1$, -1, $+3$, -3, $+7$, -7. These being put successively for x, we get $+1$ and $+3$ for two roots of the equation; and as to the two remaining roots, it is easy to see that they must be imaginary. They may, however, be readily exhibited by considering that the equation $x^4-6x^2-16x+21=0$ is divisible by the product of the two factors $x-1$ and $x-3$, and therefore may be reduced to a quadratic. Accordingly, by performing the division, and putting the quotient equal 0, we have this equation,

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$$x^2+4x+7+=0,$$

the roots of which are the imaginary quantities $-2+\sqrt{-3}$ and $-2-\sqrt{-3}$; so that since $y=x+1$, the roots of the equation $y^4-4y^3-8y+32=0$ are these, $y=+2$, $y=+4$, $y=-1+\sqrt{-3}$, $y=-1-\sqrt{-3}$.

If this literal equation were proposed

$$x^3-(3a+b)x^2+(2a^2+3ab)x-2a^2b=0,$$

by proceeding as before, we should find $x=a$, $x=2a$, $x=b$ for the roots.

237. To avoid the trouble of trying all the divisors of the last term, a rule may be investigated for restricting the number to very narrow limits as follows:

Suppose that the cubic equation $x^3+px^2+qx+r=0$ is to be resolved. Let it be transformed into another, the roots of which are less than those of the proposed equation by unity: this may be done by assuming $y=x-1$, and the last term of the transformed equation will be $1+p+q+r$. Again, by assuming $y=x+1$ another equation will be formed whose roots exceed those of the proposed equation by unity, and the last term of this other transformed equation will be $-1+p-q+r$. And here it is to be observed, that these two quantities $1+p+q+r$ and $-1+p-q+r$ are formed from the proposed equation x^3+px^2+qx+r by substituting in it successively $+1$ and -1 for x.

Now the values of x are some of the divisors of r, which is the term left in the proposed equation, when x is supposed $=0$; and the values of the y's are some of the divisors of $1+p+q+r$ and $-1+p-q+r$ respectively; and these values are in arithmetical progression, increasing by the common difference unity; because $x-1$, x, $x+1$ are in that progression; and it is obvious, that the same reasoning will apply to an equation of any degree whatever. Hence the following rule.

Substitute in place of the unknown quantity, successively, three or more terms of the progression 1, 0, -1, &c. and find all the divisors of the sums that result, then take out all the arithmetical progressions that can be found among these divisors, whose common difference is 1, and the values of x will be among these terms of the progressions, which are the divisors of the result arising from the substitution of $x=0$. When the series increases, the roots will be positive; and, when it decreases, they will be negative.

Ex. 1. Let it be required to find a root of the equation $x^3-x^2-10x+6=0$.

The

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The operation.

Subſtit.	*Reſult.*	*Diviſors.*	*Ar. Pro.*
$x=+1$	-4	1. 2. 4.	4
$x=0$	$+6$	1. 2. 3. 6.	3
$x=-1$	$+14$	1. 2. 7. 14.	2

$x^3-x^2-10x+6=$

In this example there is only one progreſſion, 4, 3, 2, the term of which oppoſite to the ſuppoſition of $x=0$ being 3, and the ſeries decreaſing, we try if -3 ſubſtituted for x makes the equation vaniſh, and as it ſucceeds, it follows that -3 is one of its roots. To find the remaining roots, if $x^3-x^2-10x+6$ be divided by $x+3$, and the quotient x^2-4x+2 put $=0$, they will appear to be $2+\sqrt{2}$, and $2-\sqrt{2}$.

Ex. 2. Let the propoſed equation be

$$x^4+x^3-29x^2-9x+180=0.$$

To find its roots.

Sub.	*Ref.*	*Diviſors.*	*Progreſſions.*			
2	70	1. 2. 5. 7. 10. 14. 35. 70.	1	2	5	7
1	144	1. 2. 3. 4. 6. 8. 9. 12, &c.	2	3	4	6
0	180	1. 2. 3. 4. 5. 6. 9. 10, &c.	3	4	3	5
-1	160	1. 2. 4. 5. 8. 10. 16. 20, &c.	4	5	2	4
-2	90	1. 2. 3. 5. 6. 9. 10. 15, &c.	5	6	1	3

Here there are four progreſſions, two increaſing and two decreaſing; hence, by taking their terms, which are oppoſite to the ſuppoſition of $x=0$, we have theſe four numbers to be tried as roots of the equation $+3$, $+4$, -3, -5, all of which are found to ſucceed.

238. If any of the coefficients of the propoſed equation be a fraction, the equation may be transformed into another, having the coefficient of the higheſt power unity, and thoſe of the remaining terms integers by § 189. and the roots of the transformed equation being found, thoſe of the propoſed equation may be eaſily derived from them.

For example, if the propoſed equation be $x^3-\frac{5}{4}x^2+\frac{35}{4}x-6=0$. Let us aſſume $x=\frac{y}{4}$, thus the equation is transformed to

$$\frac{y^3}{64}-\frac{7y^2}{64}+\frac{35y}{16}-6=0,$$

Or $y^3-7y^2+140y-384=0$,

one root of which is $y=3$; hence $x=\frac{y}{4}=\frac{3}{4}$.

The propoſed equation being now divided by $x-\frac{3}{4}$ is reduced to this quadratic $x^2-x+8=0$, the roots of which are both impoſſible.

239. When the coefficients of an equation are integers, and that of the higheſt power of the unknown quantity unity, if its roots are not found among the diviſors of the laſt term, we may be certain that, whether the equation be pure or adfected, its roots cannot be exactly expreſſed either by whole numbers or rational fractions. This may be demonſtrated by means of the following propoſition. If a prime number P be a diviſor of the product of two numbers A and B, it will alſo be a diviſor of at leaſt one of the numbers.

240. Let us ſuppoſe that it does not divide B, and that B is greater than P; then, putting q for the greateſt number of times that P can be had in B, and B′ for the remainder, we have $\frac{B}{P}=q+\frac{B'}{P}$, and therefore

$$\frac{AB}{P}=qA+\frac{AB'}{P}.$$

Hence it appears, that if P be a diviſor of AB, it is alſo a diviſor of AB′. Now B′ is leſs than P, for it is the remainder which is found in dividing B by P; therefore, ſeeing we cannot divide B′ by P, let P be divided by B′, and q' put for the quotient, alſo B″ for the remainder; again, let P be divided by B″, and q'' put for the quotient, and B‴ for the remainder, and ſo on; and as P is ſuppoſed to be a prime number, it is evident that this ſeries of operations may be continued till a remainder be found equal to unity, which will at laſt be the caſe; for the diviſors are the ſucceſſive remainders of the diviſions, and therefore each is leſs than the diviſor which preceded it. By performing theſe operations we obtain the following ſeries of equations,

$$\left.\begin{array}{l} P=q'B'+B'' \\ P=q''B''+B''', \\ \text{\&c.} \end{array}\right\} \text{ and therefore } \left\{\begin{array}{l} B'=\dfrac{P-B''}{q'} \\ B''=\dfrac{P-B'''}{q''}, \\ \text{\&c.} \end{array}\right.$$

Hence we have $AB'=\frac{AP-AB''}{q'}$, and

$$\frac{q'AB'}{P}=\frac{AP-AB''}{P}=A-\frac{AB''}{P}.$$

Now, if AB be diviſible by P, we have ſhewn that AB′, and conſequently $q'AB'$ is diviſible by P; therefore, from the laſt equation, it appears that AB″ muſt alſo be diviſible by P.

Again, from the preceding ſeries of equations, we have $AB''=\frac{AP-AB'''}{q''}$, and therefore

$$\frac{q''AB''}{P}=\frac{AP-AB'''}{P}=A-\frac{AB'''}{P};$$

hence we conclude that AB‴ is alſo diviſible by P.

Proceeding in this manner, and obſerving that the ſeries of quantities B′, B″, B‴, &c. continually decreaſe till one of them $=1$, it is evident that we ſhall at laſt come to a product of this form $A\times 1$, which muſt

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must be divisible by P, and hence the truth of the proposition is manifest.

241. It follows from this proposition, that if the prime number P, which we have supposed not to be a divisor of B, is at the same time not a divisor of A, it cannot be a divisor of AB the product of A and B.

242. Let $\frac{b}{a}$ be a fraction in its lowest terms, then the numbers a and b have no common divisor; but from what has been just now shewn, it appears, that if a prime number be not a divisor of a it cannot be a divisor of $a \times a$ or a^2, and in like manner, that if a prime number is not a divisor of b, it cannot be a divisor of $b \times b$, or b^2; therefore, it is evident that a^2 and b^2 have no common divisor, and thus the fraction $\frac{b^2}{a^2}$ is also in its lowest terms.

Hence it follows that the square of any fractional quantity is still a fraction, and cannot possibly be a whole number; and, on the contrary, that the square root of a whole number cannot possibly be a fraction; so that all such whole numbers as are not perfect squares can neither have their roots expressed by integers nor by fractions.

243. Since that if a prime number is not a divisor of a, it is also not a divisor of a^2, therefore if it is not a divisor of a, it cannot be a divisor of $a \times a^2$ or a^3, § 241, and by reasoning in this way, it is obvious that if a prime number is not a divisor of a, it cannot be a divisor of a^n; also, that if it is not a divisor of b, it cannot be a divisor of b^n, therefore if $\frac{b}{a}$ is a fraction in its lowest terms $\frac{b^n}{a^n}$ is also a fraction in its lowest terms; so that any power whatever of a fraction is also a fraction, and on the contrary, any root of a whole number is also a whole number. Hence it follows that if the root of a whole number is not expressible by an integer, such root cannot be expressed by a fraction, but is therefore irrational or incommensurable.

244. Let us next suppose that

$$x^n + Px^{n-1} + Qx^{n-2} \ldots + Tx + U = 0$$

is any equation whatever, in which P, Q, &c. denote integer numbers; then if its roots are not integers they cannot possibly be rational fractions. For, if possible, let us suppose $x = \frac{b}{a}$, a fraction reduced to its lowest terms, then, by substitution

$$\frac{a^n}{b^n} + P\frac{a^{n-1}}{b^{n-1}} + Q\frac{a^{n-2}}{b^{n-2}} \ldots + T\frac{a}{b} + U = 0,$$

and, reducing all the terms to a common denominator,

$$a^n + Pa^{n-1}b + Qa^{n-2}b^2 \ldots + Tab^{n-1} + Ub^n = 0,$$

which equation may also be expressed thus

$$a^n + b(Pa^{n-1} + Qa^{n-2}b \ldots + Tab^{n-2} + Ub^{n-1}) = 0,$$

where the equation consists of two parts, one of which is divisible by b. But by hypothesis a and b have no common measure, therefore a^n is not divisible by b, § 243; hence it is evident that the two parts of the equation cannot destroy each other as they ought to do; therefore x cannot possibly be a fraction.

Approximation.

Sect. XVI. *Resolution of Equations by Approximation.*

245. When the roots of an equation cannot be accurately expressed by rational numbers, it is necessary to have recourse to the methods of approximation, and by these we can always determine the numerical values of the roots to as great a degree of accuracy as we please.

246. The application of the methods of approximation is rendered easy by means of the following principles:

If two numbers, either whole or fractional, be found, which, when substituted for the unknown quantity in any equation, produce results with contrary signs; we may conclude that at least one root of the proposed equation is between those numbers, and is consequently real.

Let the proposed equation be

$$x^3 - 5x^2 + 10x - 15 = 0$$

which, by collecting the positive terms into one sum, and the negative into another, may also be expressed thus

$$x^3 + 10x - (5x^2 + 15) = 0$$

then, to determine a root of the equation, we must find such a number as when substituted for x will render

$$x^3 + 10x = 5x^2 + 15.$$

Let us suppose x to have every degree of magnitude from 0 upwards in the scale of number, then $x^3 + 10x$ and $5x^2 + 15$ will both continually increase, but with different degrees of quickness, as appears from the following table.

Successive values of x. 0, 1, 2, 3, 4, 5, 6, &c.
——— of $x^3 + 10x$. 0, 11, 28, 57, 104, 175, 276, &c.
——— of $5x^2 + 15$. 15, 20, 35, 60, 95, 140, 195, &c.

By inspecting this table, it appears that while x increases from 0 to a certain numerical value, which exceeds 3, the positive part of the equation, or $x^3 + 10x$, is always less than the negative part, or $5x^2 + 15$; so that the expression

$$x^3 + 10x - (5x^2 + 15), \text{ or } x^3 - 5x^2 + 10x - 15$$

must necessarily be negative.

It also appears that when x has increased beyond that numerical value, and which is evidently less than 4, the positive part of the equation, instead of being less than the negative part, is now greater, and therefore the expression

$$x^3 - 5x^2 + 10x - 15$$

is changed from a negative to a positive quantity.

247. Hence we may conclude that there is some real and determinate value of x, which is greater than 3, but less than 4, and which will render the positive and negative parts of the equation equal to one another; therefore that value of x must be a root of the proposed equation; and as what has been just now shewn in a particular case will readily apply to any equation whatever, the truth of what has been asserted at § 246 is obvious.

248. Two

Approximation.

248. Two limits, between which all the roots of any equation are contained, may be determined by the following propoſition.

Let N be the greateſt negative coefficient in any equation. Change the ſigns of the terms taken alternately, beginning with the ſecond, and let N′ be the greateſt negative coefficient after the ſigns are ſo changed. The poſitive roots of the equation are contained between 0 and N+1, and the negative roots between 0 and −N′−1.

Suppoſe the equation to be

$$x^4-px^3+qx^2-rx-s=0,$$

which may be alſo expreſſed thus:

$$x^4\left(1-\frac{p}{x}+\frac{q}{x^2}-\frac{r}{x^3}-\frac{s}{x^4}\right)=0.$$

Then, whatever be the values of the coefficients p, q, r, &c. it is evident that x may be taken ſo great as to render each of the quantities $\frac{p}{x}$, $\frac{q}{x^2}$, $\frac{r}{x^3}$, $\frac{s}{x^4}$ as ſmall as we pleaſe, and therefore their ſum, or $-\frac{p}{x}+\frac{q}{x^2}-\frac{r}{x^3}-\frac{s}{x^4}$ leſs than 1; but in that caſe the quantity

$$x^4\left(1-\frac{p}{x}+\frac{q}{x^2}-\frac{r}{x^3}+\frac{s}{x^4}\right),$$

or $x^4-px^3+qx^2-rx+s$

will be poſitive, and ſuch, that the firſt term x^4 is greater than the ſum of all the remaining terms; therefore alſo x^4+qx^2 the ſum of the poſitive terms will be much greater than px^3+rx+s the ſum of the negative terms alone.

Hence it follows, that if a number be found, which when ſubſtituted for x, renders the expreſſion $x^4-px^3+qx^2-rx-s$ poſitive, and which is alſo ſuch that every greater number has the ſame property, that number will exceed the greateſt poſitive root of the equation.

Now, if we ſuppoſe N to be the greateſt negative coefficient, it is evident that the poſitive part of the equation, or x^4+qx^2, is greater than px^3+rx+s, provided that x^4 is greater than Nx^3+Nx^3+Nx+N, or $N(x^3+x^2+x+1)$; but $x^3+x^2+x+1=\frac{x^4-1}{x-1}$, therefore a poſitive reſult will be obtained, if for x there be ſubſtituted a number ſuch that $x^4>\frac{N(x^4-1)}{x-1}$ *, or $x^5-x^4>Nx^4-N$. Now this laſt condition will evidently be fulfilled if we take $x^5-x^4=Nx^4$, and from this equation we find $x=N+1$; but it farther appears that the ſame condition will alſo be fulfilled as often as $x^5-x^4>Nx^4$, or $x-1>N$, that is, $x>N+1$, therefore N+1 muſt be a limit to the greateſt poſitive root of the propoſed equation, as was to be ſhewn.

249. If $-y$ be ſubſtituted for $+x$, the equation $x^4-px^3+qx^2-rx-s=0$ will be transformed into $y^4+py^3+qy^2+ry-s=0$; which equation differs from the former only in the ſigns of the ſecond, fourth, &c. terms; and as the poſitive roots of this laſt equation are the ſame as the negative roots of the propoſed equation, it is evident that their limit muſt be ſuch as has been aſſigned.

Approximation.

250. From the two preceding propoſitions it will not be difficult to diſcover, by means of a few trials, the neareſt integers to the roots of any propoſed numeral equation, and thoſe being found, we may approximate to the roots continually, as in the following example:

$$x^4-4x^3*-3x+27=0.$$

Here the greateſt negative coefficient being 4, it follows, § 248. that the greateſt poſitive root is leſs than 5. If $-y$ be ſubſtituted for x, the equation is tranſformed to

$$y^4+4y^3*+3y+27=0,$$

an equation having all its terms poſitive; therefore, it can have no poſitive roots, and conſequently the propoſed equation can have no negative roots; its real roots muſt therefore be contained between 0 and +5.

251. To determine the limits of each root in particular, let 0, 1, 2, 3, 4, be ſubſtituted ſucceſſively for x; thus we obtain the following correſponding reſults.

Subſtitutions for x	0,	1,	2,	3,	4
Reſults	+27,	+21,	+5,	−9,	+15.

Hence it appears that the equation has two real roots, one between 2 and 3, and another between 3 and 4.

252. That we may approximate to the firſt root, let us ſuppoſe $x=2+y$, where y is a fraction leſs than unity, and therefore its ſecond and higher powers but ſmall in compariſon to its firſt power; hence, in finding an approximate value of y, they may be rejected. Thus we have

$$\begin{aligned} x^4 &= +16+32y, \text{ \&c.}\\ -4x^3 &= -32-48y, \text{ \&c.}\\ -3x &= -6-3y\\ +27 &= +27\end{aligned}$$

Hence $0 = 5-19y$ nearly,

and $y=\frac{5}{19}=.26$; therefore, for a firſt approximation, we have $x=2.26$.

Let us next ſuppoſe $x=2.26+y'$, then, rejecting as before the ſecond and higher powers of y' on account of their ſmallneſs, we have

$$\begin{aligned} x^4 &= +26.087+46.172y', \text{ \&c.}\\ -4x^3 &= -46.172-61.291y', \text{ \&c.}\\ -3x &= -6.780-3y'\\ +27 &= +27\end{aligned}$$

$$0 = .135 - 18.119y' \text{ nearly.}$$

Hence $y'=\frac{.135}{18.119}=.0075$, and $x=2.26+y'=2.2675$.

This value of x is true to the laſt figure, but a more accurate value may be obtained by ſuppoſing $x=2.675+y''$, and finding the value of y'' in the ſame manner as we have already found thoſe of y' and y; and thus the

* The ſign $>$ denotes that the quantities between which it is placed are unequal. Thus $a>b$, ſignifies that a is greater than b, and $a<c$, that a is leſs than c.

Approxima tion.

the approximation may be continued till any required degree of accuracy be obtained.

The ſecond root of the equation, which we have already found to be between 3 and 4, may be inveſtigated in the ſame manner as the firſt, and will appear to be 3.6797, the approximation being carried on to the fourth figure of the decimal, in determining each root.

253. In the preceding example we have ſhewn how to approximate to the roots of an adfected equation, but the ſame method will alſo apply to pure equations.

For example, let it be required to determine x from this equation $x^3=2$.

Becauſe x is greater than 1, and leſs than 2, but nearer to the former number than to the latter, let us aſſume $x=1+y$, then, rejecting the powers of y which exceed the firſt, we have $x^3=1+3y$, and therefore $2=1+3y$, and $y=\frac{1}{3}=.3$ nearly, hence $x=1.3$ nearly.

Let us next aſſume $x=1.3+y'$, then, proceeding as before, we find $2=2.197+5.07y'$, hence $y'=-\frac{.197}{5.07}$ $=-.039$, and $x=1.3-.039=1.26$ nearly.

To find a ſtill nearer approximation let us ſuppoſe $x=1.26+y'$, then from this aſſumption we find $y=$ $-.000079$, and therefore $x=12.59921$, which value is true to the laſt figure.

254. By aſſuming an equation of any order with literal coefficients, a general formula may be inveſtigated, for approximating to the roots of equations belonging to that particular order.

Let us take for an example the cubic equation

$$x^3+px^2+qx+r=0,$$

and ſuppoſe that $x=a+y$, where a is nearly equal to x, and y is a ſmall fraction. Then, by ſubſtituting $a+y$ for x in the propoſed equation, and rejecting the powers of y which exceed the firſt, on account of their ſmallneſs, we have

$$a^3+pa^2+qa+r+(3a^2+2pa+q)y=0.$$

Hence $y=-\frac{a^3+pa^2+qa+r}{3a^2+2pa+q}$

and $x=a-\frac{a^3+pa^2+qa+r}{3a^2+2pa+q}=\frac{2a^3+pa^2-r}{3a^2+2pa+q}$.

255. Let it be required to approximate to a root of the cubic equation $x^3+2x^2+3x-50=0$. Here $p=2$ $q=3$ and $r=-50$; and by trials it appears that x is between 2 and 3, but neareſt the latter number; therefore for the firſt approximation a may be ſuppoſed $=3$, hence we find

$$x=\frac{2a^3+pa^2-r}{3a^2+2pa+q}=\frac{122}{34}=\frac{61}{17}.$$

By ſubſtituting $\frac{61}{17}$ for a in the formula, and proceeding as before, a value of x would be found more exact than the former, and ſo on we may go as far as we pleaſe.

256. The method we have hitherto employed for approximating to the roots of equations is known by the name of *the method of ſucceſſive ſubſtitutions*, and was firſt propoſed by Newton. It has been ſince improved by Lagrange, who has given it a form which has the advantage of ſhewing the progreſs made in the approximation by each operation. This improved form we now proceed to explain.

Approxima tion.

Let a denote the whole number, next leſs to the root ſought, and $\frac{1}{y}$ a fraction, which, when added to a, completes the root, then $x=a+\frac{1}{y}$. If this value of x be ſubſtituted in the propoſed equation, a new equation involving y will be had, which, when cleared of fractions, will neceſſarily have a root greater than unity.

Let b be the whole number which is next leſs than that root, then, for a firſt approximation, we have $x=$ $a+\frac{1}{b}$. But b being only an approximate value of y, in the ſame manner as a is an approximate value of x, we may ſuppoſe $y=b+\frac{1}{y'}$, then, by ſubſtituting $b+\frac{1}{y'}$, for y, we ſhall have a new equation, involving only y', which muſt be greater than unity; putting therefore b' to denote the next whole number leſs than the root of the equation involving y', we have $y=b+\frac{1}{b'}=\frac{bb'+1}{b'}$, and ſubſtituting this value in that of x the reſult is

$$x=a+\frac{b'}{bb'+1}$$

for a ſecond approximate value of x.

To find a third value we may take $y'=b'+\frac{1}{y''}$, then if b'' denote the next whole number leſs than y', we have $y'=b'+\frac{1}{b''}=\frac{b'b''+1}{b''}$, whence

$$y=b+\frac{b''}{b'b''+1}=\frac{bb'b''+b''+b}{b'b''+1} \text{ and}$$

$$x=a+\frac{b'b''+1}{bb'b''+b''+b}$$

and ſo on to obtain more accurate approximations.

257. We ſhall apply this method to the following example.

$$x^3-7x+7=0.$$

Here the poſitive roots muſt be between 0 and 8, let us therefore ſubſtitute ſucceſſively, 0, 1, 2, . . . to 8 and we obtain reſults as follow:

Subſtitutions.

0, 1, 2, 3, 4, 5, 6, 7, 8,

Reſults.

$+7, +1, +1, +13, +43, +97, +181, +301, +463$;

but as theſe reſults have all the ſame ſign, nothing can be concluded reſpecting the magnitude of the roots from that circumſtance alone. It is, however, obſervable, that while x increaſes from 0 to 1 the reſults decreaſe; but that whatever ſucceſſive magnitudes x has greater than 2, the reſults increaſe; we may therefore reaſonably conclude that if the equation have any poſitive roots they muſt be between 1 and 2. Accordingly by ſubſtituting 1.2, 1.4, 1.6, and 1.8 ſucceſſively for x we find theſe reſults $+.328$, $-.056$, $-.104$, $+.232$, and

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and as there are here two changes of the signs, it follows that the equation has two positive roots, one between 1.2 and 1.4, and another between 1.6 and 1.8.

Hence it appears, that to find either value of x, we may assume $x=1+\frac{1}{y}$; thus, by substitution, we have

$$y^3-4y^2+3y+1=0.$$

The limit of the positive roots of this last equation is 5, and by substituting 0, 1, 2, 3, 4, successively for y, it will be found to have two, one of which is between 1 and 2, and the other between 2 and 3. Therefore, for a first approximation, we have

$$x=1+\tfrac{1}{1},\ x=1+\tfrac{1}{2},\ \text{that is, } x=2,\ x=\tfrac{3}{2}.$$

To approach nearer to the first value of y, let us take $y=1+\frac{1}{y'}$, and therefore

$$y'^3-2y'^2-y'+1=0.$$

This last equation will be found to have only one real root between 2 and 3, from which it appears, that $y=1+\frac{1}{2}=\frac{3}{2}$, and $x=1+\frac{2}{3}=\frac{5}{3}$.

Let us next suppose $y'=2+\frac{1}{y''}$; hence we find

$$y''^3-3y''^2-4y''-1=0,$$

and from this equation y'' is found to be between 4 and 5. Taking the least limit, we have

$$y'=2+\tfrac{1}{4}=\tfrac{9}{4},\ y=1+\tfrac{4}{9}=\tfrac{13}{9},\ x=1+\tfrac{9}{13}=\tfrac{22}{13}.$$

It is easy to continue this process by assuming $y''=4+\frac{1}{y'''}$, and so on, as far as may be judged necessary.

We return to the second value of x, which was found $=\frac{3}{2}$ by the first approximation, and which corresponds to $y=2$. Putting $y=2+\frac{1}{y'}$, and substituting this value in the equation $y^3-4y^2+3y+1=0$, which was formerly found, we get

$$y'^3+y'^2-2y'-1=0,$$

this equation, as well as the corresponding equation employed in determining the other value of x, has only one root greater than unity, which root being between 1 and 2, let us take $y'=1$, we thence find

$$y=3,\ \text{and } x=1+\tfrac{1}{3}=\tfrac{4}{3}.$$

Put $y'=1+\frac{1}{y''}$, and we thence find by substitution

$$y''^3-3y''^2-4y''-1=0,$$

an equation which gives y'' between 4 and 5; hence, as before,

$$y'=\tfrac{5}{4},\ y=\tfrac{13}{5},\ x=\tfrac{18}{13}.$$

That we may proceed in the approximation, we have only to suppose $y''=4+\frac{1}{y'''}$, and so on. The equation x^3-7x+7 has also a negative root between -3 and -4, and to find a nearer value we may put $x=-3-\frac{1}{y}$; hence we have $y^3-20y^2-9y-1=0$, and $y>20$, $y<21$; and therefore, for the first approximation, $x=-3-\frac{1}{20}=-\frac{61}{20}$. By putting $y=20+\frac{1}{y'}$, &c. we may obtain successive values of x, each of which will be more exact than that which preceded it.

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258. The successive equations which involve y, y', y'', &c. have never more than one root greater than unity, unless that two or more roots of the proposed equation are contained between the limits a, and $a+1$; but when that circumstance has place, as in the preceding example, some one of the equations involving y, y', &c. will have more than one root greater than unity, and from each root a series of equations may be derived, by which we may approximate to the particular roots of the proposed equation contained between the limits a and $a+1$.

Sect. XVII. *Of Infinite Series.*

259. The resolving of any proposed quantity into a series, is a problem of considerable importance in the application of algebra to the higher branches of the mathematics; and there are various methods by which it may be performed, suited to the particular forms of the quantities which may become the subject of consideration.

260. Any rational fraction may be resolved into a series, by the common operation of algebraic division, as in the following examples:

Ex. 1. To change $\frac{ax}{a-x}$ into an infinite series.

Operation.

$$\begin{array}{l|l} a-x)ax & (x+\frac{x^2}{a}+\frac{x^3}{a^2}+\frac{x^4}{a^3}+, \text{ \&c.} \\ \quad ax-x^2 & \\ \hline \quad +x^2 & \\ \quad +x^2-\frac{x^3}{a} & \\ \hline \quad +\frac{x^3}{a} & \\ \quad +\frac{x^3}{a}-\frac{x^4}{a^2} & \\ \hline \quad +\frac{x^4}{a^2} & \end{array}$$

Thus it appears, that

$$\frac{ax}{a-x}=x+\frac{x^2}{a}+\frac{x^3}{a^2}+\frac{x^4}{a^3}+, \text{ \&c.}$$

Here the law of the series being evident, the terms may be continued at pleasure.

Ex. 2. It is required to convert $\frac{a^2}{(a+x)^2}$ into an infinite series

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$$a^2+2ax+x^2)a^2\quad(1-\frac{2x}{a}+\frac{3x^2}{a^2}-\frac{4x^3}{a^3}+,\ \&c.$$

$$\begin{array}{r}a^2+2ax+x^2\\ \hline -2ax-x^2\\ -2ax-4x^2-\frac{2x^3}{a}\\ \hline +3x^2+\frac{2x^3}{a}\\ +3x^2+\frac{6x^3}{a}+\frac{3x^4}{a^2}\\ \hline -\frac{4x^3}{a}-\frac{3x^4}{a^2}\end{array}$$

Therefore $\frac{a^2}{(a+x)^2}=1-\frac{2x}{a}+\frac{3x^2}{a^2}-\frac{4x^3}{a^3}+\frac{5x^4}{a^4}-$, &c. the law of continuation being evident.

261. A ſecond method by which algebraic quantities, whether rational or irrational, may be converted into ſeries, and which is alſo of very extenſive uſe in the higher parts of the mathematics, conſiſts in aſſuming a ſeries with indeterminate coefficients, and having its terms proceeding according to the powers of ſome quantity contained in the propoſed expreſſion. Infinite Series.

That we may explain this method, let us ſuppoſe that the fraction $\frac{a^2}{a^2+ax+x^2}$ is to be converted into a ſeries proceeding by the powers of x; we are therefore to aſſume

$$\frac{a^2}{a^2+ax+x^2}=A+Bx+Cx^2+Dx^3+Ex^4+,\ \&c.$$

where A denotes theſe terms of the ſeries into which x does not at all enter; Bx the terms which contain only the firſt power of x; Cx^2 the terms which contain only the ſecond power, and ſo on. Let both ſides of the equation be multiplied by a^2+ax+x^2 ſo as to take away the denominator of the fraction, and let the numerator a^2 be tranſpoſed to the other ſide, ſo that the whole expreſſion may be $=0$, then

$$\left.\begin{array}{l}a^2A+a^2B\\ -a^2+aA\end{array}\right\}\ x\left\{\begin{array}{l}+a^2C\\ +aB\\ +A\end{array}\right\}x^2\left\{\begin{array}{l}+a^2D\\ +aC\\ +B\end{array}\right\}x^3\left\{\begin{array}{l}+a^2E\\ +aD\\ +C\end{array}\right\}x^4+,\ \&c.\Big\}=0.$$

Now the quantities A, B, C, D, &c. being ſuppoſed to be entirely indepeendent of any particular value of x, it follows that the whole expreſſion can only be $=0$, upon the ſuppoſition that the terms which multiply the ſame powers of x are ſeparately $=0$; for if that were not the caſe, it would follow that x had a certain determinate relation to the quantities A, B, C, &c. which is contrary to what we have all along ſuppoſed. To determine the quantities A, B, C, D, &c. therefore, we have this ſeries of equations

$a^2A-a^2=0$	Hence $A=1$
$a^2B+aA=0$	$B=-\frac{A}{a}=-\frac{1}{a}$
$a^2C+aB+A=0$	$C=-\frac{B}{a}-\frac{A}{a^2}=0$
$a^2D+aC+B=0$	$D=-\frac{C}{a}-\frac{B}{a^2}=\frac{1}{a^3}$
$a^2E+aD+C=0$	$E=-\frac{D}{a}-\frac{C}{a^2}=-\frac{1}{a^4}$
&c.	&c.

Here the law of relation which takes place among the quantities A, B, C, D, &c. is evident, viz. that if P, Q, R, denote any three coefficients which immediately follow each other

$$a^2R+aQ+P=0$$

and from this equation, by means of the coefficients already determined, we find $F=0$, $G=\frac{1}{a^6}$, $H=-\frac{1}{a^7}$, $K=0$, &c.

Therefore, reſuming the aſſumed equation, and ſubſtituting for A, B, C, &c. their reſpective values, we have

$$\frac{a^2}{a^2+ax+x^2}=1-\frac{x}{a}*+\frac{x^3}{a^3}-\frac{x^4}{a^4}*+\frac{x^6}{a^6}-\frac{x^7}{a^7}*+,\ \&c.$$

262. As a ſecond example of the method of indeterminate coefficients, let it be required to expreſs the ſquare root a^2-x^2 by means of a ſeries. For this purpoſe we might aſſume

$$\sqrt{a^2-x^2}=A+Bx+Cx^2+Dx^3+Ex^4+,\ \&c.$$

but as we would find the coefficients of the odd powers of x, each $=0$, let us rather aſſume

$$\sqrt{a^2-x^2}=A+Bx^2+Cx^4+Dx^6+,\ \&c.$$

then, ſquaring both ſides, and tranſpoſing, we have

$$0=\left\{\begin{array}{l}A^2+2AB\\ +\ 1\\ -a^2\end{array}\right\}x^2\left\{\begin{array}{l}+2AC\\ +\ B^2\end{array}\right\}x^4\left\{\begin{array}{l}+2AD\\ +2BC\end{array}\right\}x^6+,\ \&c.$$

Hence $A^2-a^2=0$ and $A=a$

$2AB+1=0$	$B=-\frac{1}{2A}=-\frac{1}{2a}$
$2AC+B^2=0$	$C=-\frac{B^2}{2A}=-\frac{1}{8a^3}$
$AD+BC=0$	$D=-\frac{BC}{A}=-\frac{1}{16a^5}$
&c.	&c.

and ſubſtituting for A, B, C, &c. their values

$$\sqrt{a^2-x^2}=a-\frac{x^2}{2a}-\frac{x^4}{8a^3}-\frac{x^6}{16a^5}-,\ \&c.$$

This method of reſolving a quantity into an infinite ſeries will be found more expeditious than any other, as often as the operations of diviſion and evolution are to be performed at the ſame time, as in theſe expreſſions $\frac{1}{\sqrt{a^2+x^2}}$, or $\frac{\sqrt{a^2-x^2}}{\sqrt[3]{a^3+x^3}}$.

263. The binomial theorem affords a third method of reſolving quantities into ſeries, but before we explain this method it will be proper to ſhew how the theorem itſelf may be inveſtigated.

Let $a+x$ be any binomial quantity, which is to be raiſed

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raiſed to a power denoted by $\frac{m}{n}$, where m and n denote any numbers either poſitive or negative. Or becauſe $a+x=a\left(1+\frac{x}{a}\right)$, if we put $\frac{x}{a}=y$, then $(a+x)^{\frac{m}{n}}$ $=a^{\frac{m}{n}}\times(1+y)^{\frac{m}{n}}$; therefore inſtead of $a+x$ we may conſider $1+y$, which is ſomewhat more ſimple in its form.

264. By conſidering ſome of the firſt powers of $1+x$, viz.

$(1+x)=1+x$
$(1+x)^2=1+2x+x^2$
$(1+x)^3=1+3x+3x^2+x^3$
$(1+x)^4=1+4x+6x^2+4x^3+x^4$
&c.

it appears that the powers of $1+x$ have this form

$$1+Ax+Bx^2+Cx^3=Dx^4+, \&c.$$

where the coefficients A, B, C, D, &c. are numbers which are altogether independent of any particular value of x. It alſo appears that the ſeries cannot contain any negative power of x; for if any of its terms had this form $\frac{Q}{x^r}$, then, the ſuppoſition of $x=0$ would render that term indefinitely great, whereas the whole ſeries ought in that caſe to be reduced to unity.

265. Let us therefore aſſume

$(1+y)^{\frac{m}{n}}=1+Ay+By^2+Cy^3+Dy^4+$, &c.

Then we have alſo

$(1+z)^{\frac{m}{n}}=1+Az+Bz^2+Cz^3+Dz^4+$, &c.

Let us put $(1+y)^{\frac{1}{n}}=u$, $(1+z)^{\frac{1}{n}}=v$, and therefore $(1+y)^{\frac{m}{n}}=u^m$, $(1+z)^{\frac{m}{n}}=v^m$, then, taking the difference between the two ſeries, we have

$u^m-v^m=A(y-z)+B(y^2-z^2)+C(y^3-z^3)+D(y^4-z^4)+$, &c.

Becauſe $u^n=1+y$ and $v^n=1+z$, by ſubtracting the latter equation from the former, $u^n-v^n=y-z$, hence, and from the laſt ſeries, we have

$$\frac{u^m-v^m}{u^n-v^n}=\frac{A(y-z)}{y-z}+\frac{B(y^2-z^2)}{y-z}+\frac{C(y^3-z^3)}{y-z}+\frac{D(y^4-z^4)}{y-z}+, \&c.$$

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266. But every expreſſion of the form u^m-v^m is diviſible by $u-v$, when m is a whole number, thus we have

$u^m-v^m=(u-v)(u^{m-1}+u^{m-1}v\ldots+uv^{m-2}+v^{m-1})$
$u^n-v^n=(u-v)(u^{n-1}+u^{n-2}v\ldots+uv^{n-2}+v^{n-1})$

ſo that if we ſubſtitute for $\frac{u^m-v^m}{u^n-v^n}$ its value as found from theſe equations, and divide each term of the ſeries by the denominator $y-z$, we have

$$\frac{u^{m-1}+u^{m-2}v\ldots+uv^{m-2}+v^{m-1}}{u^{n-1}+u^{n-2}v\ldots+uv^{n-2}+v^{n-1}}=$$

$A+B(y+z)+C(y^2+yz+z^2)+D(y^3+y^2z+yz^2+z^3)+E(y^4+y^3z+y^2z^2+yz^3+z^4)+$, &c.

Now as this laſt equation muſt be true, whatever be the values of y and z, we may ſuppoſe $y=z$, but in that caſe $1+y=1+z$ or $u^n=v^n$, and therefore $u=v$. Thus the equation is reduced to

$$\frac{mu^{m-1}}{nu^{n-1}}=A+2By+3Cy^2+4Dy^3+5Ey^4+, \&c.$$

or to the following:

$$\frac{m}{n}u^m=u^n(A+2By+3Cy^2+4Dy^3+5Ey^4+, \&c.),$$

ſo that, putting for u^m and u^n their values $(1+y)^{\frac{m}{n}}$ and $1+y$ we have

$$\frac{m}{n}(1+y)^{\frac{m}{n}}=(1+y)(A+2By+3Cy^2+4Dy^3+5Ey^4+, \&c.$$
$$=\begin{cases}A+2By+3Cy^2+4Dy^3+5Ey^4+, \&c.\\ \quad +Ay+2By^2+3Cy^3+4Dy^4+, \&c.\end{cases}$$

But from the equation originally aſſumed we have

$$\frac{m}{n}(1+y)^{\frac{m}{n}}=\frac{m}{n}+\frac{m}{n}Ay+\frac{m}{n}By^2+\frac{m}{n}Cy^3+\frac{m}{n}y^4+, \&c.$$

therefore

$$\frac{m}{n}+\frac{m}{n}Ay+\frac{m}{n}By^2+\frac{m}{n}Cy^3+\frac{m}{n}Dy^4+, \&c.$$
$$=\begin{cases}A+2By+3Cy^2+4Dy^3+5Ey^4+, \&c.\\ \quad +Ay+2By^2+3Cy^3+4Dy^4+, \&c.\end{cases}$$

And as the coefficients of the terms have no connexion with any particular value of y, it follows, that the coefficient of any power of y on the one ſide of the equation muſt be equal to the coefficient of the ſame power of y on the other ſide. Therefore, to determine A, B, C, &c. we have the following ſeries of equations:

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$A=\frac{m}{n}$. Hence $A=\frac{m}{n}$

$$2B+A=\frac{m}{n}A \qquad B=\frac{A\left(\frac{m}{n}-1\right)}{2}=\frac{A(m-n)}{2n}$$

$$3C+2B=\frac{m}{n}B \qquad C=\frac{B\left(\frac{m}{n}-2\right)}{3}=\frac{B(m-2n)}{3n}$$

$$4D+3C=\frac{m}{n}C \qquad D=\frac{C\left(\frac{m}{n}-3\right)}{4}=\frac{C(m-3n)}{4n}$$

$$5E+4D=\frac{m}{n}D \qquad E=\frac{D\left(\frac{m}{n}-4\right)}{5}=\frac{D(m-4n)}{5n}$$

&c. &c.

Or, fubſtituting for A, B, C, &c. their values as determined from the preceding equations:

$$A=\frac{m}{n}$$

$$B=\frac{m(m-n)}{1\cdot 2\,n^2}$$

$$C=\frac{m(m-n)(m-2n)}{1\cdot 2\cdot 3\,n^3}$$

$$D=\frac{m(m-n)(m-2n)(m-3n)}{1\cdot 2\cdot 3\cdot 4\,n^4}$$

$$E=\frac{m(m-n)(m-2n)(m-3n)(m-4n)}{1\cdot 2\cdot 3\cdot 4\cdot 5\,n^5}$$

&c.

267. Reſuming now the aſſumed equation

$$(1+y)^{\frac{m}{n}}=1+Ay+By^2+Cy^3+,\ \&c.$$

and obſerving that $\frac{x}{y}=y$ and $(a+x)^{\frac{m}{n}}=a^{\frac{m}{n}}(1+y)^{\frac{m}{n}}$ we have

$$(a+x)^{\frac{m}{n}}=a^{\frac{m}{n}}\left(1+\frac{mx}{na}+\frac{A(m-n)x^2}{2n\ a^2}+\frac{B(m-2n)}{3n}\right.$$

$$\left.\frac{x^3}{a^3}+\frac{C(m-3n)x^4}{4n\ a^4}+,\ \&c.\right)$$

where A, B, C, &c. denote the coefficients of the preceding terms, or

$$(a+x)^{\frac{m}{n}}=a^{\frac{m}{n}}+\frac{m}{n}a^{\frac{m-n}{n}}x+\frac{m(m-n)}{1\cdot 2\ n^2}a^{\frac{m-2n}{n}}x^2+$$

$$\frac{m(m-n)(m-2n)}{1\cdot 2\cdot 3\ n^3}a^{\frac{m-3n}{n}}x^3$$

$$+\frac{m(m-n)(m-2n)(m-3n)}{1\cdot 2\cdot 3\cdot 4\ n^4}a^{\frac{m-4n}{n}}x^4+,\ \&c.$$

and either of theſe formulæ may be conſidered as a general theorem for raiſing a binomial quantity $a+x$ to any power whatever.

268. In determining the value of the expreſſion $\frac{u^m-v^m}{u^n-v^n}$ when $u=v$ it has been taken for granted that $\frac{m}{n}$ is poſitive, but the ſame concluſion will be obtained when $\frac{m}{n}$ is negative. For, changing $+m$ into $-m$, and obſerving that

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$$u^{-m}-v^{-m}=\frac{1}{u^m}-\frac{1}{v^m}=\frac{v^m-u^m}{u^mv^m}$$

we have

$$\frac{u^{-m}-v^{-m}}{u^n-v^n}=\frac{1}{u^mv^m}\left(\frac{v^m-u^m}{u^n-v^n}\right)=-\frac{1}{u^mv^m}\left(\frac{u^m-v^m}{u^n-v^n}\right).$$

Now we have already found, that when $u=v$, the fraction $\frac{u^m-v^m}{u^n-v^n}$ becomes $\frac{mu^{m-1}}{nu^{n-1}}$; therefore, in the ſame caſe,

$$\frac{u^{-m}-v^{-m}}{u^n-v^n}=\frac{-1}{u^{2m}}\times\frac{mu^{m-1}}{nu^{n-1}}=\frac{-u^{-m-1}}{nu^{n-1}}$$

and from this laſt expreſſion we derive the ſame value for u^{-m} or $(1+y)^{-\frac{m}{n}}$ as before, regard being had to the change of the ſign of the exponent.

269. If we ſuppoſe m to be a poſitive integer, and $n=1$, the ſeries given in laſt article for the powers of $a+x$ will always terminate, as appears alſo from the operation of involution; but if m be negative, or $\frac{m}{n}$ a fraction, the ſeries will conſiſt of an indefinite number of terms. Examples of the application of the theorem have been already given upon the firſt ſuppoſition, when treating of involution; we now proceed to ſhew how it is to be applied to the expanſion of algebraic quantities into ſeries upon either of the two laſt hypotheſes.

270. *Ex.* 1. It is required to expreſs $\frac{r^3}{(r+z)^3}$ by means of a ſeries.

Becauſe $\frac{r}{r+z}=\frac{1}{1+\frac{z}{r}}$,

Therefore $\frac{r^3}{(r+z)^3}=\frac{1}{\left(1+\frac{z}{r}\right)^3}=\left(1+\frac{z}{r}\right)^{-3}$

Let $\left(1+\frac{z}{r}\right)^{-3}$ be compared with $(a+x)^{\frac{m}{n}}$ and we have

$$a=1,\ x=\frac{z}{r},\ m=-3,\ n=1.$$

Hence, by ſubſtituting theſe values of a, x, m, n in the firſt general formula of § 267, we have

$$\frac{r^3}{(r+z)^3}\begin{cases}=1-\frac{3z}{r}+\frac{3\cdot 4z^2}{1.2r^2}-\frac{3\cdot 4\cdot 5z^3}{1.2.3r^3}+,\ \&c.\\ =1-\frac{3z}{r}+\frac{6z^2}{r^2}-\frac{10z^3}{r^3}-\frac{15z^4}{r^4}+,\ \&c.\end{cases}$$

Ex. 2.

Reversion of Series.

Ex. 2. It is required to express $\sqrt[3]{a+b}$ by the form of a series.

Because $a+b=a\left(1+\frac{b}{a}\right)$

Therefore $\sqrt[3]{a+b}=\sqrt[3]{a}\times\sqrt[3]{1+\frac{b}{a}}=a^{\frac{1}{3}}\left(1+\frac{b}{a}\right)^{\frac{1}{3}}$

By comparing $\left(1+\frac{b}{a}\right)^{\frac{1}{3}}$ with $(a+x)^{\frac{m}{n}}$ we have $a=1$, $x=\frac{b}{a}$, $m=1$, $n=3$,

and substituting as in last example

$$\sqrt[3]{a+b}\begin{cases}=a^{\frac{1}{3}}\left(1+\frac{1.b}{3a}-\frac{1.2b^2}{3.6a^3}+\frac{1.2.5b^3}{3.6.9a^3}-\frac{1.2.5.8b^4}{3.6.9.12a^4}+, \&c.\right)\\ =a^{\frac{1}{3}}\left(1+\frac{b}{3a}-\frac{b^2}{9a^2}+\frac{5b^3}{81a^3}-\frac{10b^4}{243a^4}+, \&c.\right)\end{cases}$$

Ex. 3. It is required to resolve $\frac{r^3}{(r^3+z^3)^{\frac{2}{3}}}$ into a series.

Because $\frac{r^3}{(r^3+z^3)^{\frac{2}{3}}}=r^3\times(r^3+z^3)^{-\frac{2}{3}}$ if we raise r^3+z^3 to the $-\frac{2}{3}$ power, and multiply the resulting series by r^3, we shall have the series required. Or the given quantity may be reduced to a more simple form thus; because $r^3+z^3=r^3\times\left(1+\frac{z^3}{r^3}\right)$

Therefore $(r^3+z^3)^{\frac{2}{3}}=r^2\left(1+\frac{z^3}{r^3}\right)^{\frac{2}{3}}$, and

$\frac{r^3}{(r^3+z^3)^{\frac{2}{3}}}=\frac{1}{\left(1+\frac{z^3}{r^3}\right)^{\frac{2}{3}}}=\left(1+\frac{z^3}{r^3}\right)^{-\frac{2}{3}}$. Hence

$$\frac{r^3}{(r^3+z^3)^{\frac{2}{3}}}\begin{cases}=\left(1+\frac{z^3}{r^3}\right)^{-\frac{2}{3}}\\ =1-\frac{2z^3}{3r^3}+\frac{2.5z^6}{3.6r^6}-\frac{2.5.8z^9}{3.6.9r^9}+\frac{2.5.8.11z^{12}}{3.6.9.12r^{12}}-, \&c.\\ =1-\frac{2z^3}{3r^3}+\frac{5z^6}{9}-\frac{40z^9}{81r^9}+\frac{110z^{12}}{243r^{12}}-, \&c.\end{cases}$$

Ex. 4. It is required to find a series equal to $\frac{\sqrt{a^2+x^2}}{\sqrt{a^2-x^2}}$.

First by the binomial theorem we have

$$\sqrt{a^2+x^2}=(a^2+x^2)^{\frac{1}{2}}=a+\frac{x^2}{2a}-\frac{x^4}{8a^3}+\frac{x^6}{16a^5}-, \&c.$$

$$\frac{1}{\sqrt{a^2-x^2}}=(a^2-x^2)^{-\frac{1}{2}}=\frac{1}{a}+\frac{x^2}{2a^3}+\frac{3x^4}{8a^5}+\frac{5x^6}{16a^7}+, \&c.$$

Therefore, by taking the product of the two series, and proceeding in the operation only to such terms as involve the 6th power of x, we find

$$\frac{\sqrt{a^2+x^2}}{\sqrt{a^2-x^2}}=1+\frac{x^2}{a^2}-\frac{x^4}{2a^4}+\frac{x^6}{2a^6}, \&c.$$

Sect. XVIII. *Of the Reversion of Series.*

271. The method of indeterminate coefficients, which we have already employed when treating of infinite series, may also be applied to what is called the reverting of series; that is, having any quantity expressed by an infinite series composed of the powers of another quantity, to express, on the contrary, the latter quantity by means of an infinite series composed of the powers of the former.

272. Let $y=n+ax+bx^2+cx^3+dx^4+, \&c.$

Then to revert the series we must find the value of x in terms of y. For this purpose we shall transpose n, and put $z=y-n$, then

$$z=ax+bx^2+cx^3+dx^4+, \&c.$$

Now when $x=0$, it is evident that $z=0$, therefore we may assume for x a series of this form

$$x=Az+Bz^2+Cz^3+Dz^4+, \&c.$$

where the coefficients A, B, C, D, &c. denote quantities as yet unknown, but which are entirely independent of the quantity x. To determine those quantities let the first, second, third, &c. powers of the series

$$Az+Bz^2+Cz^3+Dz^4+, \&c.$$

be

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be found by multiplication, and substituted for x, x^2, x^3, &c. respectively, in the equation

$$0 = -z + ax + bx^2 + cx^3 +, \text{ &c.}$$

thus we have

$$\begin{aligned}
-z &= -z \\
+ax &= aAz + aBz^2 + aCz^3 + aDz^4 + \text{&c.} \\
+bx^2 &= bA^2z^2 + 2bABz^3 + 2bACz^4 + \text{&c.} \\
&\quad + bB^2z^4 \\
+cz^3 &= cA^3z^3 + 3cA^2Bz^4 + \text{&c.} \\
+dz^4 &= dA^4z^4 + \text{&c.} \\
&\text{&c.}
\end{aligned} \Bigg\} = 0$$

and, putting the coefficients of z, z^2, z^3, &c. each $=0$,

$$aA - 1 = 0,\ aB + bA^2 = 0,\ aC + 2bAB + cA^3 = 0$$
$$aD + 2bAC + bB^2 + 3cA^2B + dA^4 = 0, \text{ &c.}$$

these equations give

$$A = \frac{1}{a}$$

$$B = -\frac{b}{a^3}$$

$$C = \frac{2b^2 - ac}{a^5}$$

$$D = -\frac{5b^3 - 5abc + a^2d}{a^7}$$

&c.

Therefore $x = \frac{1}{a}z - \frac{b}{a^3}z^2 + \frac{2b^2 - ac}{a^5}z^3 - \frac{5b^3 - 5abc + a^2d}{a^7}z^4 +$, &c.

273. As an example of the application of this formula, let it be required to determine x from the equation

$$y = x - \frac{x^2}{2} + \frac{x^3}{3} - \frac{x^4}{4} +, \text{ &c.}$$

In this case we have

$$z = y,\ a = 1,\ b = -\tfrac{1}{2},\ c = \tfrac{1}{3},\ d = -\tfrac{1}{4}, \text{ &c.}$$

Therefore, substituting these values, we have

$$x = y + \frac{y^2}{2} + \frac{y^3}{6} + \frac{y^4}{24} +, \text{ &c.}$$

274. In the equation

$$ay + by^2 + cy^3 +, \text{ &c.} = a'x + b'x^2 + c'x^3 +, \text{ &c.}$$

in which both sides are expressed by series, and it is required to find y in terms of x, we must assume, as before,

$$y = Ax + Bx^2 + Cx^3 + Dx^4 +, \text{ &c.}$$

and substitute this series and its powers for y and its powers in the proposed equation; afterwards, by bringing all the terms to one side, and making the coefficients of each power of y, $=0$, a series of equations will be had by which the quantities A, B, C, D, &c. may be determined.

Sect. XIX. *Of Logarithms and Exponential Quantities.*

275. All positive numbers may be considered as powers of any one given affirmative number. The powers of 2, for instance, may become equal, either exactly, or nearer than by any assignable difference, to all numbers whatever, from 0 upwards. If the exponents be integers, we shall have only the numbers which form the geometrical progression 1, 2, 4, 8, 16, &c.; but the intermediate numbers may be expressed, at least nearly, by means of fractional exponents. Thus the numbers from 0 to 10 may be expressed by the powers of 2 as follows:

2^0	$=1$	$2^{2.585}$	$=6$
2^1	$=2$	$2^{2.807}$	$=7$
$2^{1.585}$	$=3$	2^3	$=8$
2^2	$=4$	$2^{3.170}$	$=9$
$2^{2.322}$	$=5$	$2^{3.322}$	$=10$

In like manner may fractions be expressed by the powers of 2. Thus

$$\cdot 1 = \frac{1}{2^{3.322}} = 2^{-3.322},\ \cdot 2 = \frac{1}{2^{2.322}} = 2^{-2.322},$$

$$\cdot 3 = \frac{1}{2^{1.737}} = 2^{-1.737}, \text{ &c.}$$

where it is observable that the exponents are now negative.

In the same manner may all numbers be expressed by the powers of 10. Thus

10^0	$=1$	10^{-1}	$=\cdot 1$
$10^{.301}$	$=2$	$10^{-.699}$	$=\cdot 2$
$10^{.477}$	$=3$	$10^{-.523}$	$=\cdot 3$
&c.		&c.	

276. Even a fraction might be taken in place of 2, or 10, in the preceding examples; and such exponents might be found as would give its powers equal to all numbers, from 0 upwards. There are therefore no limitations with respect to the magnitude of the number, by the powers of which all other numbers are to be expressed, except that it must neither be equal to unity, nor negative. If it were $=1$, then all its powers would also be $=1$, and if it were negative, there are numbers to which none of its powers could possibly be equal.

277. If therefore y denote any number whatever, and r a given number, a number x may be found, such, that $r^x = y$, and x, that is, the exponent of r which gives a number equal to y, is called the *logarithm* of y.

278. The given number r, by the powers of which all other numbers are expressed, is called the *radical number* of the logarithms, which are the indices of those powers.

279. From the preceding definition of logarithms their properties are easily deduced, as follows:

1. The sum of two logarithms is equal to the logarithm of their product. Let y and y' be two numbers, and x and x' their logarithms, so that $r^x = y$, and $r^{x'} = y'$, then $r^x \times r^{x'} = yy'$, or $r^{x+x'} = yy'$; hence, from the definition, $x + x'$ is the logarithm of yy', that is, the sum of the logarithms of y and y' is the logarithm of yy'.

2. The difference of the logarithms of two numbers is equal to the logarithm of their quotient; for

if $r^x = y$ and $r^{x'} = y'$, then $\frac{r^x}{r^{x'}} = \frac{y}{y'}$ or $r^{x-x'} = \frac{y}{y'}$,

therefore, by the definition, $x-x'$ is the logarithm of $\frac{y}{y'}$; that is, the difference of the logarithms of y and y' is the logarithm of $\frac{y}{y'}$.

3. Let n be any number whatever, then, log. $N^n = n \times$ log. N. For N^n is N multiplied into itself n times, therefore the logarithm of N^n is equal the logarithm of N added to itself n times, or to $n \times$ log. N.

280. From these properties of logarithms it follows, that if we possess tables by which we can assign the logarithm corresponding to any given number, and also the number corresponding to any given logarithm, the operations of multiplication and division of numbers may be reduced to the addition and subtraction of their logarithms, and the operations of involution and evolution to the more simple operations of multiplication and division. Thus, if two numbers x and y are to be multiplied together, by taking the sum of their logarithms we obtain the logarithm of their product, and, by inspecting the table, the product itself. A similar observation applies to the quotient of two numbers, and also to any power or to any root of a number.

281. The general properties of logarithms are independent of any particular value of the radical number, and hence there may be various systems of logarithms, according to the radical number employed in their construction. Thus if the radical number be 10, we shall have the *common* system of logarithms, but if it were 2·7182818 we should have the logarithms first constructed by Lord Napier, which are called *hyperbolic logarithms*.

282. We have already observed (§ 277), that the relation between any number and its logarithm is expressed by the equation $r^x = y$, where y denotes a number, x its logarithm, and r the radical number of the system, and any two of these three quantities being given, the remaining one may be found. If either y or r were the quantity required, the question would involve no difficulty; if, however, the exponent x were considered as the unknown quantity while r and y were supposed given, the equation to be resolved would be of a different form than any that we have hitherto considered. Equations of this form are called *exponential* equations, to resolve such an equation is evidently the same thing as to determine the logarithm of a given number, and this problem we shall now proceed to investigate.

283. We therefore resume the equation $r^x = y$, where r, x, and y denote as before, we are to find a value of x in terms of r and y. Let us suppose $r = 1 + a$ and $y = 1 + v$, then our equation will stand thus

$$(1+a)^x = 1 + v.$$

So that, by raising both sides to the power n, where n denotes an indefinite number, which is to disappear in the course of the investigation, we have $(1+a)^{nx} = (1+v)^n$, and resolving both sides of the equation into series by means of the binomial theorem,

$$1 + nxa + \frac{nx(nx-1)}{1\cdot 2}a^2 + \frac{nx(nx-1)(nx-2)}{1\cdot 2\cdot 3}a^3 + \frac{nx(nx-1)(nx-2)(nx-3)}{1\cdot 2\cdot 3\cdot 4}a^4 +, \text{ &c.}$$

$$= 1 + nv + \frac{n(n-1)}{1\cdot 2}v^2 + \frac{n(n-1)(n-2)}{1\cdot 2\cdot 3}v^3 + \frac{n(n-1)(n-2)(n-3)}{1\cdot 2\cdot 3\cdot 4}v^4 +, \text{ &c.}$$

Therefore, subtracting unity from both sides, and dividing by n, we have

$$xa + \frac{x(nx-1)}{1\cdot 2}a^2 + \frac{x(nx-1)(nx-2)}{1\cdot 2\cdot 3}a^3 + \frac{x(nx-1)(nx-2)(nx-3)}{1\cdot 2\cdot 3\cdot 4}a^4 +, \text{ &c.}$$

$$= v + \frac{n-1}{1\cdot 2}v^2 + \frac{(n-1)(n-2)}{1\cdot 2\cdot 3}v^3 + \frac{(n-1)(n-2)(n-3)}{1\cdot 2\cdot 3\cdot 4}v^4 +, \text{ &c.}$$

and by supposing the factors which constitute the terms of each series to be actually multiplied, and the products arranged according to the powers of n, the last equation will have this form

$$xa + \left(Pn - \frac{x}{2}\right)a^2 + \left(P'n + Qn^2 + \frac{x}{3}\right)a^3 + \left(P''n + Q'n^2 + Rn^3 - \frac{x}{4}\right)a^4 +, \text{ &c.}$$

$$= v + (pn - \tfrac{1}{2})v^2 + (p'n + qn^2 + \tfrac{1}{3})v^3 + (p''n + q'n^2 + rn^3 - \tfrac{1}{4})v^4 +, \text{ &c.}$$

Here the coefficients of the powers of n, viz. P, P′, P″, &c. Q, Q′, &c. R, &c. also p, p', p'', &c. q, q'. &c. r, &c. are expressions which denote certain combinations of the powers of x in the first series, and certain numbers in the second; but as they are all to vanish in the course of the investigation, it is not necessary that they should be expressed in any other way than by a single letter.

284. Now each side of this last equation may evidently be resolved into two parts, one of which is entirely free from the quantity n, and the other involves that quantity, hence the same equation may also stand thus,

$$\left.\begin{array}{l} xa - \frac{x}{2}a^2 + \frac{x}{3}a^3 - \frac{x}{4}a^4 +, \text{ &c.} \\ +Pna^2 + (P'n + Qn^2)a^3 + (P''n + Q'n^2 + Rn^3)a^4 +, \text{ &c.} \end{array}\right\}$$

$$= \left\{\begin{array}{l} +v - \frac{1}{2}v^2 + \frac{1}{3}v^3 - \frac{1}{4}v^4 +, \text{ &c.} \\ +pnv^2 + (p'n + qn^2)v^3 + (p''n^2 + q'n^2 + rn^4)v^4 + \text{&c.} \end{array}\right.$$

This equation must hold true, whatever be the value of n, which is a quantity entirely arbitrary, and therefore ought to vanish from the equation expressing the relation between x and v; hence it follows that the terms on each side of the equation, which involve n, ought to destroy each other, and thus there will remain

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main only the part of each ſide, which does not involve n, that is,

$$xa-\frac{xa^2}{2}+\frac{xa^3}{3}-\frac{xa^4}{4}+,\&c.=v-\frac{v^2}{2}+\frac{v^3}{3}-\frac{v^4}{4}+,\&c.$$

$$\text{or } (a-\frac{a^2}{2}+\frac{a^3}{3}-\frac{a^4}{4}+,\&c.)\,x=v-\frac{v^2}{2}+\frac{v^3}{3}-\frac{v^4}{4}+\frac{v^5}{5}-,\&c.$$

Let us now put A to denote the conſtant multiplier

$$a-\frac{a^2}{2}+\frac{a^3}{3}-\frac{a^4}{4}+,\&c.=(r-1)-\frac{(r-1)^2}{2}+\frac{(r-1)^3}{3}-\frac{(r-1)^4}{4}+,\&c.$$

and ſubſtitute for v, its value $y-$, thus we at laſt find

$$x=\log.\,y=\frac{1}{A}(y-1-\frac{(y-1)^2}{2}+\frac{(y-1)^3}{3}-\frac{(y-1)^4}{4}+,\&c.$$

and by this formula the logarithm of any number a little greater than unity may be readily found.

285. If y be nearly $=2$ the ſeries will, however, converge too ſlowly to be of uſe, and if it exceed 2, the ſeries will diverge, and therefore cannot be directly applied to the finding of its logarithm. But a ſeries which ſhall converge faſter and be applicable to every caſe may be inveſtigated as follows:

Becauſe $\log.(1+v)=\frac{1}{A}(v-\frac{v^2}{2}+\frac{v^3}{3}-\frac{v^4}{4}+,\&c.)$ Of Logarithms, &c.

By ſubſtituting $-v$ for $+v$ we have

$$\log.(1-v)=\frac{1}{A}\left(-v-\frac{v^2}{2}-\frac{v^3}{3}-\frac{v^4}{4}-,\&c.\right)$$

Now, $\log.(1+v)-\log.(1-v)=\log.\frac{1+v}{1-v}$ therefore, ſubtracting the latter ſeries from the former we have $\log.\frac{1+v}{1-v}=\frac{1}{A}\left(2v+\frac{2v^3}{3}+\frac{2v^5}{5}+\frac{2v^7}{7}+\&c.\right.$

Put $\frac{1+v}{1-v}=y$, then $v=\frac{y-1}{y+1}$ and the laſt ſeries becomes

$$\log.\,y=\frac{1}{A}\left(2\frac{y-1}{y+1}+\frac{2}{3}\left(\frac{y-1}{y+1}\right)^3+\frac{2}{5}\left(\frac{y-1}{y+1}\right)^5+\&c.\right)$$

This ſeries will always converge whatever be the value of y, and by means of it the logarithms of ſmall numbers may be found with great facility.

286. When a number is compoſite, its logarithm will moſt eaſily be found, by adding together the logarithms of its factors; but if it be a prime number, its logarithm may be derived from that of ſome convenient compoſite number, either greater or leſs, and an infinite ſeries. Let n be a number of which the logarithm is already found; then ſubſtituting $\frac{n+z}{n}$ for y in the laſt formula, we have

$$\log.\frac{n+z}{n}=\frac{1}{A}\left(\frac{2z}{2n+z}+\frac{1}{3}\frac{2z^3}{(2n+z)^3}+\frac{1}{5}\frac{2z^5}{(2n+z)^5}+,\&c.\right.$$

But $\log.\frac{n+z}{n}=\log.(n+z)-\log.n$, therefore

$$\log.(n+z)=\log.n+\frac{1}{A}\left(\frac{2z}{2n+z}+\frac{1}{3}\frac{2z^3}{(2n+z)^3}+\frac{2z^5}{(2n+z)^5}+,\&c.\right)$$

This ſeries gives the logarithm of $n+z$ by means of the logarithm of n, and converges very faſt when n is conſiderable.

287. It appears from the ſeries which have been found for $\log.y$ in § 284 and 285, that the logarithm of a number is always the product of two quantities; one of theſe is variable, and depends upon the number itſelf, but the other, viz. $\frac{1}{A}$ is conſtant, and depends entirely on the radical number of the ſyſtem. This quantity has been called by writers on logarithms the *modulus* of the ſyſtem.

288. The moſt ſimple ſyſtem of logarithms in reſpect to facility of computation is that in which $\frac{1}{A}=1$ or $A=1$. The logarithms of this ſyſtem are the ſame as thoſe firſt invented by Napier, and are alſo called *hyperbolic logarithms*.

The hyperbolic logarithm of any numbers y, is therefore (§ 284)

$$y-1-\frac{(y-1)^2}{2}+\frac{(y-1)^3}{3}-,\&c.$$

and that of r, the radical number of any ſyſtem is

$$r-1-\frac{(r-1)^2}{2}+\frac{(r-1)^3}{3}-,\&c.$$

but this laſt ſeries is the ſame as we have denoted by A; hence it follows, that the *modulus* of any ſyſtem is the reciprocal of the hyperbolic logarithm of the radical number of that ſyſtem. Thus it appears, that the logarithms of numbers, according to any propoſed ſyſtem, may be readily found from the hyperbolic logarithm of the ſame numbers, and the hyperbolic logarithm of the radical number of that ſyſtem.

289. Let L denote the hyp. log. of any number, and l, l' the logarithms of the ſame number according to two other ſyſtems whoſe *moduli* are m and m'; then

$$l=m\mathrm{L},\ l'=m'\mathrm{L}$$

therefore $\frac{l}{m}=\frac{l'}{m'}$ and $m:m'::l:l'$

That is, the logarithms of the ſame number, according to different ſyſtems, are directly proportional to the *moduli* of thoſe ſyſtems, and therefore have a given ratio to one another.

290. We ſhall now apply the ſeries here inveſtigated to the calculation of the hyperbolic logarithm of 10, the reciprocal of which is the *modulus* of the common ſyſtem

Of Logarithms, &c.

system of logarithms; and also to the calculation of the common logarithm of 2. The hyp. log. of 10 may be obtained by substituting 10 for y in the formula

$$\text{hyp. log. } y=\frac{2(y-1)}{y+1}+\frac{2}{3}\left(\frac{y-1}{y+1}\right)^3+\frac{2}{5}\left(\frac{y-1}{y+1}\right)^5+\&c.$$

but the resulting series $\frac{2\cdot 9}{11}+\frac{2\cdot 9^3}{3\cdot 11^3}+\frac{2\cdot 9^5}{5\cdot 11^5}+$, &c. converges too slowly to be of any practical utility, it will therefore be better to derive the logarithm of 10 from those of 2 and 5. By substituting 2 in the formula we have

$$\text{hyp. log. } 2=2\left(\frac{1}{3}+\frac{1}{3\cdot 3^3}+\frac{1}{5\cdot 3^5}+\frac{1}{7\cdot 3^7}+\&c.\right)$$

this series converges very fast, so that by reducing its terms to decimal fractions, and taking the sum of the first seven terms, we find the hyp. log. of 2 to be ·6931472.

The hyp. log. of 5 may be found in the same manner, but more easily from the formula given in § 286. For the log. of 2 being given, that of $4=2^2$ is also given § 279. Therefore, substituting log. $4=2$ log. 2 for log. n, and 1 for z, in the series

$$\text{hyp. log. } (n+z)=\text{hyp. log. } n+2\left(\frac{z}{2n+z}+\tfrac{1}{3}\frac{z^3}{(2n+z)^3}+\tfrac{1}{5}\frac{z^5}{(2n+z)^5}+\&c.\right)$$

we have

$$\text{hyp. log. } 5=2\text{ hyp. log. } 2+2\left(\frac{1}{9}+\frac{1}{3\cdot 9^3}+\frac{1}{5\cdot 9^5}+\&c.\right)$$

The first three terms of this series are sufficient to give the result true to the seventh decimal, so that we have hyp. log. 5=1.6094379, and
hyp. log. 10=hyp. log. 2+hyp. log. 5=2.3025851.
Hence the *modulus* of the common system of logarithms, or $\frac{1}{\text{hyp. log. } 10}$, is found $=.4342945$. The same number, because of its great utility in the construction of tables of logarithms, has been calculated to a much greater number of decimals. A celebrated calculator of the last century, Mr A. Sharp, found it to be

0.434294481903251827651128918916605082294397005803666566114454.

Having found the hyp. log. of 2 to be ·6931472 the common logarithm of 2 is had immediately, by multiplying the hyp. log. of 2 by the modulus of the system, thus we find

com. log. $2=4\cdot 342945\times\cdot 6931472=\cdot 3010300$.

291. We have already observed, § 282, that to determine the logarithm of a given number, is the same problem as to determine the value of x in an equation of this form $a^x=b$, where the unknown quantity is an exponent. But in order to resolve such an equation, it is not necessary to have recourse to series; for a table of logarithms being once supposed constructed, the value of x may be determined thus. It appears, from § 279, that $x\times\text{log. } a=\text{log. } b$. Hence it follows, that $x=\frac{\text{log. } b}{\text{log. } a}$. The use of this formula will appear in next section, which treats of computations relative to annuities.

Of Logarithms, &c.

292. The theory of logarithms requires the solution of this other problem. Having given the radical number of a system, and a logarithm, to determine the corresponding number. Or having given the equation $r^x=y$, where r, x, and y denote, as in § 282, to find a a series which shall express y in terms of r and x.

293. For this purpose, let us suppose $r=1+a$, then our equation becomes $y=(1+a)^x$, which may also be expressed thus:

$$y=[(1+a)^n]^{\frac{x}{n}}$$

where n is an indefinite quantity, which is to disappear in the course of the investigation.

By the binomial theorem we have

$$(1+a)^n=1+na+\frac{n(n-1)}{1\cdot 2}a^2+\frac{n(n-1)(n-2)}{1\cdot 2\cdot 3}a^3+\&c.$$

this equation, by multiplying together the factors which compose the terms of the series, and arranging the results according to the powers of n, may also be expressed thus:

$$(1+a)^n=1+An+Bn^2+Cn^3+\&c.$$

where it will readily appear that

$$A=a-\frac{a^2}{2}+\frac{a^3}{3}-\frac{a^4}{4}+\&c.$$

as to the values of B, C, &c. it is of no importance to know them, for they will all disappear in the course of the investigation. Hence, by substituting for $(1+a)^n$ its value, as expressed by this last series, we have

$$y=(1+An+Bn^2+Cn^3+\&c.)^{\frac{x}{n}}$$

and expanding the latter part of this equation by means of the binominal theorem it becomes

$$y=1+\frac{x}{n}(An+Bn^2+\&c.)+\frac{x(x-n)}{1\cdot 2\,n^2}(An+Bn^2+\&c.)^2+\frac{x(x-n)(x-2n)}{1\cdot 2\cdot 3n^3}(An+Bn^2+\&c.)^3+\&c.$$

But $An+Bn^2+$, &c. $=n(A+Bn+$, &c.) also $(An+Bn^2+$, &c.$)^2=n^2(A+Bn+$, &c.$)^2$, and $(An+Bn^2+$, &c.$)^3=n^3(A+Bn+$, &c.$)^3$, &c. therefore, by leaving out of each term of the series the powers of n, which are common to the numerator and denominator, the equation will stand thus:

$$y=1+x(A+Bn+,\&c.)+\frac{x(x-n)}{1\cdot 2}(A+Bn+,\&c.)^2+\frac{x(x-n)(x-2n)}{1\cdot 2\cdot 3}(A+Bn+,\&c.)^3+\&c.$$

Now n is here an arbitrary quantity, and ought, from the nature of the original equation, to disappear from the value of y; the terms of the equation which are multiplied

Intereſt and Annuities.

multiplied by n ought therefore to deſtroy each other; and this being the caſe, the equation is reduced to

$$r^x=y=1+\frac{xA}{1}+\frac{x^2A^2}{1\cdot 2}+\frac{x^3A^3}{1\cdot 2\cdot 3}+\frac{x^4A^4}{1\cdot 2\cdot 3\cdot 4}+, \text{ \&c.}$$

and ſince we have found

$$A=a-\frac{a^2}{2}+\frac{a^3}{3}-\frac{a^4}{4}+, \text{ \&c.}$$
$$=(r-1)-\frac{(r-1)^2}{2}+\frac{(r-1)^3}{3}-\frac{(r-1)^4}{4}.$$

It is evident from § 288, that A is the hyperbolic logarithm of the radical number of the ſyſtem.

294. If, in the equation $r^x=y$, we ſuppoſe $x=1$, the value of y becomes

$$r=1+\frac{A}{1}+\frac{A^2}{1\cdot 2}+\frac{A^3}{1\cdot 2\cdot 3}+, \text{ \&c.}$$

Here the radical number is expreſſed by means of its hyperbolic logarithm. Again, if we ſuppoſe $x=\frac{1}{A}$, then

$$r^{\frac{1}{A}}=1+\frac{1}{1}+\frac{1}{1\cdot 2}+\frac{1}{1\cdot 2\cdot 3}+\frac{1}{1\cdot 2\cdot 3}+, \text{ \&c.}$$

Thus it appears that the quantity $r^{\frac{1}{A}}$ is equal to a conſtant number, which, by taking the ſum of a ſufficient number of terms of the ſeries, will be found $=2.71828182845904\ldots$ Let us denote this number by e, then $r^{\frac{1}{A}}=e$, and hence $r=e^A$. Now, if we remark that A is the hyp. log. of r, it muſt be evident (§ 277. and 278.), that e is the radical number of the hyperbolic ſyſtem of logarithms.

Again, ſince $r^{\frac{1}{A}}=e$, therefore $\frac{1}{A}\times\log. r=\log. e$ and $A=\frac{\log. r}{\log. e}$, here log. r and log. e denote logarithms, taken according to any ſyſtem whatever.

295. If we now reſume the equation

$$r^x=y=1+\frac{xA}{1}+\frac{x^2A^2}{1\cdot 2}+\frac{x^3A^3}{1\cdot 2\cdot 3}+, \text{ \&c.}$$

and ſubſtitute for A its value $\frac{\log. r}{\log. e}$, we ſhall have the following general expreſſion for any exponential quantity whatever,

$$r^x=1+\frac{x}{1}\left(\frac{\log. r}{\log. e}\right)+\frac{x^2}{1.2}\left(\frac{\log. r}{\log. e}\right)^2+\frac{x^3}{1\cdot 2\cdot 3}\left(\frac{\log. r}{\log. e}\right)^3+, \text{ \&c.}$$

which, by ſuppoſing $r=e$, becomes

$$e^x=1+\frac{x}{1}+\frac{x^2}{1\cdot 2}+\frac{x^3}{1\cdot 2\cdot 3}+, \text{ \&c.}$$

SECT. XX. *Of Intereſt and Annuities.*

296. THE theory of logarithms finds its application in ſome meaſure to calculations relating to intereſt and annuities: theſe we now proceed to explain. There are two hypotheſes, according to either of which money put out at intereſt may be ſuppoſed to be improved. We may ſuppoſe that the intereſt, which is always proportional to the ſum lent, or principal, is alſo proportional to the time during which the principal is employed; and on this hypotheſis the money is ſaid to be improved at *ſimple* intereſt. Or we may ſuppoſe that the intereſt, which ought to be paid to the lender at ſucceſſive ſtated periods, is added to the principal inſtead of being actually paid, and thus their amount converted into a new principal. When money is laid out according to this ſecond hypotheſis, it is ſaid to be improved at *compound* intereſt. Compound Intereſt

297. In calculations relating to intereſt, the things to be conſidered are the *principal*, or ſum lent; the *rate of intereſt*, or ſum paid for the uſe of 100l. for one year; the *time* during which the principal is lent; and the *amount*, or ſum of the principal and intereſt at the end of that time.

Let p denote the principal, 1l. being the unit.
r the intereſt of 1l. for one year, at the given rate.
t the time, one year being the unit.
a the amount.

We ſhall now examine the relations which ſubſiſt between thoſe quantities, according to each of the two hypotheſes of ſimple and compound intereſt

I. *Simple Intereſt.*

298. Becauſe the intereſt of 1l. for one year is r, the intereſt of 1l. for t years muſt be rt, and the intereſt of p pounds for the ſame time prt, hence we have this formula

$$p+prt=a,$$

from which we find

$$p=\frac{a}{1+rt} \qquad r=\frac{a-p}{pt} \qquad t=\frac{a-p}{pr}.$$

As the manner of applying theſe formulæ to queſtions relating to ſimple intereſt is ſufficiently obvious, we proceed to conſider compound intereſt.

II. *Compound Intereſt.*

299. In addition to the ſymbols already aſſumed, let $R=1+r=$ amount of 1l. in one year; then, from the nature of compound intereſt, R is alſo the principal at the beginning of the ſecond year. Now, intereſt being always proportional to the principal, we have

$1 : r :: R : rR=$ the intereſt of R for a year,

and $R+rR=(1+r)R=R^2=$ amount of R in a year,

therefore R^2 is the amount of 1l. in two years, which ſum being aſſumed as a new principal, we find, as before, its intereſt for a year to be rR^2, and its amount $R^2+rR^2=(1+r)R^2=R^3$; ſo that R^3 is the amount of 1l. in three years. Proceeding in this manner, we find, in general, that the amount of 1l. in t years is R^t, and of p pounds pR^t; hence we have this formula

$$pR^t=a,$$

which

Annuities. which from the nature of logarithms may alſo be expreſſed thus:

$$\log. p + t \times \log. R = \log. a.$$

Hence we find

$$p = \frac{a}{R^t} \qquad R = \sqrt[t]{\frac{a}{p}}$$

or, by logarithms,

$$\log. p = \log. a - t \times \log. R. \qquad \log. R = \frac{\log. a - \log. p}{t}$$

$$t = \frac{\log. a - \log. p}{\log. R}.$$

300. As an example of the uſe of theſe formulæ, let it be required to determine what ſum improved at 5 per cent. compound intereſt will amount to 500l. in 42 years. In this caſe we have given $a = 500$ $r = .05$, $R = 1.05$, $t = 42$, to find p.

From	$\log. a = \log. 500 =$	2.6989700
ſubtract	$t \times \log. R = 42 \times \log. 1.05 =$	0.8899506
remains	$\log. p$	1.8090194

therefore $p = 64.42l. = 64l.\ 8s.\ 5d.$ the ſum required.

Ex. 2. In what time will a ſum laid out at 4 per cent. compound intereſt be doubled.

Let any ſum be expreſſed by unity, then we have given $p = 1$, $r = .04$, $R = 1.04$, $a = 2$, to find t.

From the formula $t = \frac{\log. a - \log. p}{\log. R} = \frac{\log. 2}{\log. 1.04}$

we find $t = \frac{.3010300}{.0170333} = 17.7$ years nearly.

301. In treating of compound intereſt, we have ſuppoſed the intereſt to be joined to the principal at the end of every year. But we might have ſuppoſed it to be added at the end of every half year or every quarter, or even every inſtant; and ſuitable rules might have been found for performing calculations according to each hypotheſis. As ſuch ſuppoſitions are, however, never made in actual buſineſs, we ſhall not at preſent ſay any thing more of them.

III. *Annuities.*

302. An annuity is a payment made annually for a term of years; and the chief problem relating to it is to determine its preſent worth, that is, the ſum a perſon ought to pay immediately to another, upon condition of receiving from the latter a certain ſum annually for a given time. In reſolving this problem, it is ſuppoſed that the buyer improves his annuity from the time he receives it, and the ſeller the purchaſe money, in a certain manner, during the continuance of the annuity, ſo that at the end of the time the amount of each may be the ſame. There may be various ſuppoſitions as to the way in which the annuity and its purchaſe money may be improved; but the only one commonly applied to practice is the higheſt improvement poſſible of both, viz. by compound intereſt. As the taking compound intereſt is, however, prohibited by law, the realiſing of this ſuppoſed improvement requires punctual payment of intereſt; and therefore the intereſt in ſuch calculations is uſually made low. Continued Fractions.

303. Let A denote the annuity;
P the preſent worth, or purchaſe money;
t the time of its continuance;

let r and R denote as before.

The ſeller, by improving the price P at compound intereſt during the time t, has PR^t.

The purchaſer is ſuppoſed to receive the firſt annuity A at the end of one year, which, being improved for $t-1$ years, amounts to AR^{t-1}. He receives the ſecond years annuity at the end of the ſecond year, which, being improved for $t-2$ years, amounts to AR^{t-2}. In like manner the third year's annuity becomes AR^{t-3}, and ſo on to the laſt year's annuity, which is ſimply A. Therefore, the whole amount of the improved annuities is the geometrical ſeries

$$A + AR + AR^2 + AR^3 \ldots + AR^{t-1},$$

the ſum of which, by § 106, is $A\frac{R^t - 1}{R - 1} = A\frac{R^t - 1}{r}$;

and ſince this ſum muſt be equal to the amount of the purchaſe money, or PR^t, we have

$$PR^t = A\frac{R^t - 1}{r};$$

and, from this equation, we find

$$P = \frac{A}{r}\left(1 - \frac{1}{R^t}\right). \quad A = \frac{rPR^t}{R^t - 1}. \quad t = \frac{\log. A - \log.(A - rP)}{\log. R}.$$

As to r, it can only be found by the reſolution of an equation of the t order.

304. To find the preſent value of an annuity in *reverſion*, that is, an annuity which is to commence at the end of n years, and continue during t years; firſt find its value for $n+t$ years, and then for n years; and ſubtract the latter from the former, we thus obtain the following formula:

$$P = \frac{A}{rR^n}\left(1 - \frac{1}{R^t}\right).$$

305. If the annuity is to commence immediately, and to continue for ever, then, becauſe in this caſe R^t is infinitely great, and therefore $\frac{1}{R^t} = 0$, the formula $P = \frac{A}{r}\left(1 + \frac{1}{R^t}\right)$ becomes ſimply $P = \frac{A}{r}$.

And if the annuity is to commence after n years, and continue for ever, the formula $P = \frac{A}{rR^n}\left(1 - \frac{1}{R^t}\right)$ becomes $P = \frac{A}{rR^n}$.

Sect. XXI. *Of Continued Fractions.*

306. Every quantity which admits of being expreſſed by a common fraction may alſo be expreſſed in

Continued Fractions.

the form of what is called a *continued fraction*. The nature of such fractions will be easily understood by the following example.

Let the common fraction be $\frac{314159}{100000}$, or, which is the same, $3+\frac{14159}{100000}$. Since $100000=7\times14159+887$, therefore $\frac{14159}{100000}=\frac{14159}{7\times14159+887}=\frac{1}{7+\frac{887}{14159}}$, and

$$\frac{314159}{100000}=3+\frac{1}{7+\frac{887}{14159}}.$$

Now $\frac{887}{14159}=\frac{887}{15\times887+854}=\frac{1}{15+\frac{854}{887}}$, and substituting this for $\frac{887}{15159}$, in the value of $\frac{314159}{100000}$, already found, we have $\frac{314159}{100000}=3+\frac{1}{7+\frac{1}{15+\frac{854}{887}}}$.

Again, $\frac{854}{887}=\frac{854}{854+33}=\frac{1}{1+\frac{33}{854}}$, which being substituted as before, gives $\frac{314159}{100000}=3+\frac{1}{7+\frac{1}{15+\frac{1}{1+\frac{33}{854}}}}$

By operations similar to the preceding, we find $\frac{33}{854}=\frac{1}{25+\frac{29}{33}}$, $\frac{29}{33}=\frac{1}{1+\frac{4}{29}}$, $\frac{4}{29}=\frac{1}{7+\frac{1}{4}}$; therefore, by substitution,

$$\frac{314159}{100000}=3+\frac{1}{7+\frac{1}{15+\frac{1}{1+\frac{1}{25+\frac{1}{1+\frac{1}{7+\frac{1}{4}}}}}}}$$

By an operation, in all respects the same as has been just now performed, may any fraction whatever be reduced to the form

$$a+\frac{1}{b+\frac{1}{c+\frac{1}{d+}}},\ \&c.$$

and it is then called a *continued fraction*.

307. It is easy to see in what manner the inverse of the preceding operation is to be performed, or a continued fraction reduced to a common fraction.

Thus if the continued fraction be

$$a+\frac{1}{b+\frac{1}{c+\frac{1}{d}}}$$

it will evidently be reduced to a common fraction by adding the reciprocal of d to b, and the reciprocal of that sum to b, and again the reciprocal of this last sum to a; now the reciprocal of d, or $\frac{1}{d}$, added to c is $c+\frac{1}{d}=\frac{cd+1}{d}$; again, the reciprocal of this sum, or $\frac{d}{cd+1}$, added to b, is $b+\frac{d}{cd+1}=\frac{bcd+b+d}{cd+1}$, and the reciprocal of this last quantity, viz. $\frac{cd+1}{bcd+b+a}$, when added to a, gives

$$\frac{abcd+ab+ad+cd+1}{bcd+b+d}=a+\frac{1}{b+\frac{1}{c+\frac{1}{d}}}.$$

Continued Fraction

308. This manner of expressing a fraction enables us to find a series of other fractions, that approach in value to any given one, and each of them expressed in the smallest numbers possible. Thus, in the example $\frac{314159}{100000}$, which has been resolved into a continued fraction, § 306, and which is known to express nearly the proportion of the diameter of a circle to its circumference, if we take only the first two terms of the continued fraction, and put π for $\frac{314159}{100000}$, we shall have $\pi=3+\frac{1}{7}=\frac{22}{7}$ nearly; and this is the proportion which was found by Archimedes.

Again, by taking the three first terms, we have

$$\pi=3+\frac{1}{7+\frac{1}{15}}=3+\frac{15}{106}=\frac{333}{106},$$

which is nearer the truth than the former.

And, by taking the first four terms, we have

$$\pi=3+\frac{1}{7+\frac{1}{15+\frac{1}{1}}}=\frac{355}{113},$$

which is the proportion assigned by Metius, and is more exact than either of the preceding. These results are alternately greater and less than the truth.

309. Among continued fractions, those have been particularly distinguished in which the denominators, after a certain number of changes, are continually repeated in the same order. Such, for example, is the fraction

$$1+\frac{1}{2+\frac{1}{3+\frac{1}{2+\frac{1}{3+}}}},\ \&c.$$

The amount of this fraction, though continued, *ad infinitum*, may be easily found; for leaving out the first term, which is an integer, let us suppose

$$x=\frac{1}{2+\frac{1}{3+\frac{1}{2+\frac{1}{3+}}}},\ \&c.$$

Then, since after the second, all the terms return in the

Continued Fractions.

the same order, it follows that their amount is also $=x$, thus we have

$$x=\frac{1}{2}+\frac{1}{3+x}$$

Hence $x=\frac{3+x}{6+2x+1}$ and $x^2+3x=\frac{3}{2}$ and $x=\frac{-3+\sqrt{15}}{2}$

Therefore $x+1$, or the sum of the series, $=\frac{-1+\sqrt{15}}{2}$

In general if $x=\frac{1}{a}+\frac{1}{b}+\frac{1}{a}+$, &c.

we find $x=-\frac{b}{2}\pm\sqrt{\frac{b^2}{4}+\frac{b}{a}}$. Though the denominators did not return in the same order till after a greater interval, the value of the fraction would still be expressed by the root of a quadratic equation. And conversely, the roots of all quadratic equations may be expressed by periodical continued fractions, and may often by that means be very readily approximated in numbers, without the trouble of extracting the square root.

310. The reduction of a decimal into the form of a continued fraction sometimes renders the law of its continuation evident. Thus we know that $\sqrt{2}=1.41421356\cdots$ but from the bare inspection of this decimal we discover no rule for its further continuation. If, however, it be reduced into a continued fraction, it becomes

$$=1+\frac{1}{2}+\frac{1}{2}+\frac{1}{2}+, \&c.$$

and hence we see in what way it may be continued to any degree of accuracy.

311. When the root of any equation is found by the method explained in § 256, the value of the unknown quantity is evidently expressed by a continued fraction.

For if x be the root sought, we have $x=a+\frac{1}{y}$, $y=b+\frac{1}{y'}$, $y'=b'+\frac{1}{y''}$, $y''=b''+\frac{1}{y'''}$, &c. where a, b', b'', b''', &c. denote the whole numbers, which are next less than the true values of x, y, y', y'', &c. If therefore in the value of x we substitute $b+\frac{1}{y'}$ for y, it becomes

$$x=a+\frac{1}{b+\frac{1}{y'}}.$$

Again, if in this second value of x we substitute $b'+\frac{1}{y''}$ for y it becomes

$$x=a+\frac{1}{b+\frac{1}{b'+\frac{1}{y''}}}$$

The next value of x is in like manner found to be

$$x=a+\frac{1}{b+\frac{1}{b'+\frac{1}{b''+\frac{1}{y'''}}}}$$

and so on continually.

Indeterminate Problems.

Sect. XXII. *Of Indeterminate Problems.*

312. When the conditions of a question are such that the number of equations exceeds the number of unknown quantities, that question will admit of innumerable solutions, and is therefore said to be indeterminate. Thus, if it be required to find two numbers subject to no other limitation than that their sum be 10, we have two unknown quantities x and y, and only one equation, viz. $x+y=10$, which may evidently be satisfied by innumerable different values of x and y, if fractional solutions be admitted. It is, however, usual in such questions as this, to restrict the values of the numbers sought to positive integers, and therefore, in this case, we can have only these nine solutions;

$$x=1, 2, 3, 4, 5, 6, 7, 8, 9.$$
$$y=9, 8, 7, 6, 5, 4, 3, 2, 1.$$

which indeed may be reduced to five, for the first four become the same as the last four, by simply changing x into y, and the contrary.

313. Indeterminate problems are of different orders according to the dimensions of the equation which is obtained after all the unknown quantities, but two, have been exterminated by means of the given equations. Those of the first order lead always to equations of this form,

$$ax+by=c,$$

where a, b, c denote given whole numbers, and x, y two numbers to be found, so that both may be integers. That this condition may be fulfilled, it is necessary that the coefficients a, b have no common divisor which is not also a divisor of c, for if $a=md$ and $b=me$, then $ax+by=mdx+mey=c$, and $dx+ey=\frac{c}{m}$; but d, e, x, y are supposed to be whole numbers, therefore $\frac{c}{m}$ is a whole number, hence m must be a divisor of c.

314. We proceed to illustrate the manner of resolving indeterminate equations of the first order by some numerical examples.

Ex. 1. Given $2x+3y=25$, to determine x and y in whole positive numbers.

From the given equation we have $x=\frac{25-3y}{2}=12-y+\frac{1-y}{2}$; now since x must be a whole number it follows that $\frac{1-y}{2}$ must be a whole number. Let us assume $\frac{1-y}{2}=z$, then $1-y=2z$ and $y=1-2z$, and since $x=12-y+\frac{1-y}{2}=12-y+z$, therefore $x=12-1+2z+z$; hence we have

$$x=11+3z, \qquad y=1-2z$$

where

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where z might be any whole number whatever, if there were no limitation as to the signs of x and y; but since these quantities are required to be positive, it is evident from the value of y, that z must either be 0 or negative, and from the value of x that, abstracting from the sign, it must be less than 4; hence z may have these three values 0, —1, —2, —3.

$$\text{If } z=0,\ z=-1,\ z=-2,\ z=-3.$$
$$\text{Then } \begin{cases} x=11, & x=8, & x=5, & x=2. \\ y=1, & y=3, & y=5, & y=7. \end{cases}$$

Ex. 2. It is required to divide 100 into such parts that the one may be divisible by 7 and the other by 11.

Let $7x$ be the first part, and $11y$ the second, then by the question $7x+11y=100$, and

$$x=\frac{100-11y}{7}=14-y+\frac{2-4y}{7};$$

hence it appears that $\frac{2-4y}{7}$ must be a whole number. Let us assume $\frac{2-4y}{7}=z$, then $x=14-y+z$ and $4y=2-7z$ or $y=\frac{2-7z}{4}=\frac{2-3z}{4}-z$, therefore $\frac{2-3z}{4}$ must be a whole number. Assume $\frac{2-3z}{4}=t$, then $y=t-z$, and $3z=2-4t$, or $z=\frac{2-4t}{3}=\frac{2-t}{3}-t$, therefore $\frac{2-t}{3}$ must be a whole number.

Assume now $\frac{2-t}{3}=v$, then $z=v-t$ and $t=2-3v$, here it is evident v may be any whole number taken at pleasure, so that to determine x and y we have the following series of equations:

$$\begin{aligned} t&=2-3v \\ z&=v-t=4v-2 \\ y&=t-z=4-7v \\ x&=14-y+z=11v+8. \end{aligned}$$

Now from the value of y it appears, that v must either be $=0$, or negative; but from the value of x we find that v cannot be a negative whole number, therefore v can only be $=0$; hence the only values which x and y can have in whole numbers are $x=8$, $y=4$.

Ex. 3. It is required to find all the possible ways in which 60l. can be paid in guineas and moidores only.

Let x be the number of guineas and y the number of moidores. Then the value of the guineas, expressed in shillings, is $21x$, and that of the moidores $27y$, therefore from the nature of the question $21x+27y=1200$, or, dividing the equation by 3, $7x+9=400$, hence $x=\frac{400-9y}{7}=57-y+\frac{1-2y}{7}$, so that $\frac{1-2y}{7}$ must be a whole number.

Assume $\frac{1-2y}{7}=z$, then $x=57-y+z$ and $2y=1-7z$ or $y=\frac{1-7z}{2}=\frac{1-z}{2}-3z$ therefore $\frac{1-z}{2}$ must be a whole number.

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Assume $\frac{1-z}{2}=v$, then $y=v-3z$ and $z=1-2v$ therefore v may be taken any whole number at pleasure, and x and y may be determined by the following equations

$$\begin{aligned} z&=1-2v \\ y&=v-3z=7v-3 \\ x&=57-y+z=61-9v. \end{aligned}$$

From the value of x, it appears that v cannot exceed 6, and from the value of y, that it cannot be less than 1.

$$\begin{aligned} &\text{Hence if } v=1,\ 2,\ 3,\ 4,\ 5,\ 6, \\ &\text{we have } x=52,\ 43,\ 34,\ 25,\ 16,\ 7, \\ &\qquad\quad y=4,\ 11,\ 18,\ 25,\ 32,\ 39. \end{aligned}$$

315. In the foregoing examples the unknown quantities x and y have each a determinate number of positive values, and this will evidently be the case as often as the proposed equation is of this form $ax+by=c$. If, however, b be negative, that is, if the equation be of this form $ax-by=c$, or $ax=by+c$, we shall have questions of a different kind, admitting each of an infinite number of solutions; these, however, are to be resolved in the same manner as the preceding, as will appear from the following example.

Ex. 4. A person buys some horses and oxen, he pays 31 crowns for each horse, and 20 crowns for each ox, and he finds that the oxen cost him seven crowns more than the horses. How many did he buy of each?

Let x be the number of horses, and y that of the oxen; then by the question

$$20x=31y+7, \text{ and } x=\frac{31y+7}{20}=y+\frac{11y+7}{20}.$$

Therefore $\frac{11y+7}{20}$ must be a whole number.

Let $\frac{11y+7}{20}=v$, then $x=y+v$ and $y=\frac{20v-7}{11}=v+\frac{9v-7}{11}$; hence $\frac{9v-7}{11}$ must be a whole number.

Let $\frac{9v-7}{11}=t$, then $y=v+t$ and $v=\frac{11t+7}{9}=t+\frac{2t+7}{9}$; therefore $\frac{2t+7}{9}$ is a whole number.

Let $\frac{2t+7}{9}=s$, then $v=t+s$ and $t=\frac{9s-7}{2}=4s+\frac{s-7}{2}$; therefore $\frac{s-7}{2}$ is a whole number.

Put $\frac{s-7}{2}=r$, then $t=4s+r$ and $s=2r+7$.

Having now no longer any fractions, we return to the values of x and y by the following series of equations

$$s=$$

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$s=2r+7$
$t=4s+r=9r+28$
$v=t+s=11r+35$
$y=v+t=20r+63=$ number of oxen,
$x=y+v=31r+98=$ number of horſes.

The leaſt poſitive values of x and y will evidently be obtained by making $r=-3$, and innumerable other values will be had by putting $r=-2$, $r=-1$, $r=0$, $r=+1$, &c. Thus we have

$x=5$, 36, 67, 98, 129, 160, 191, 222, &c.
$y=3$, 23, 43, 63, 83, 103, 123, 143, &c.

each ſeries forming an arithmetical progreſſion, the common difference in the firſt being 31 and in the ſecond 20.

316. If we conſider the manner in which the numbers x, y, in this example, are determined, from the ſucceeding quantities v, t, &c. we ſhall immediately perceive that the coefficients of thoſe quantities are the ſame as the ſucceſſive quotients which ariſe in the arithmetical operation for finding the greateſt common meaſure of 20 and 31, the coefficients of the given equation $20x=31y+7$. The operation performed at length will ſtand thus:

```
20)31(1
   20
   --
   11)20(1
      11
      --
       9)11(1
          9
          --
           2)9(4
              8
              --
               1)2(2
                  2
                  --
                  0
```

Hence we may form a ſeries of numeral equations which, when compared with the ſeries of literal equations expreſſing the relations between x, y, v, &c. as put down in the following table, will render the method of determining the latter from the former ſufficiently obvious.

$31=1\times20+11$	$x=1\times y+v$
$20=1\times11+9$	$y=1\times v+t$
$11=1\times9+2$	$v=1\times t+s$
$9=4\times2+1$	$t=4\times s+r$
$2=2\times2+0$	$s=2\times r+7$

And as every queſtion of this kind may be analyzed in the ſame manner, we may hence form the following general rule for reſolving indeterminate problems of the firſt order.

317. Let $bx=ay+n$ be the propoſed equation, in which a, b, n, are given integers, and x, y numbers to be found. Let a be the greateſt of the two numbers a, b, and let A denote the greateſt multiple of b which is contained in a, and c the remainder; alſo let B denote the greateſt multiple of c contained in b, and d the remainder; and C the greateſt multiple of d contained in c, and e the remainder; and ſo on, till one of the remainders be found equal to 0. The numbers A, B, C afford a ſeries of equations from which another ſeries may be derived as in the following table.

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$a=Ab+c$ hence we derive	$x=Ay+v$
$b=Bc+d$	$y=Bv+t$
$c=Cd+e$	$v=Ct+s$
$d=De+f$	$t=Ds+r$
$e=Ef+g$	$s=Er+q$
$f=Fg+0$	$r=Fq\pm n$

and in the laſt equation of the ſecond ſeries any number whatever may be put for q: it is alſo to be obſerved that the given number n is to have the ſign + prefixed to it, if the number of equations be odd, but − if that number be even. Having formed the ſecond ſeries of equations, the values of x and y may be thence found as in the foregoing examples. We proceed to ſhew the application of the rule.

Ex. 5. Required a number which being divided by 11 leaves the remainder 3, but being divided by 19 leaves the remainder 5.

Let N be the number, and x, y the quotients which ariſe from the reſpective diviſions, then we have $N=11x+3$, alſo $N=19y+5$, hence $11x+3=19y+5$ and $11x=19y+2$, an equation which furniſhes the following table.

$19=1\times11+8$	$x=y+v$
$11=1\times8+3$	$y=v+t$
$8=2\times3+2$	$v=2t+s$
$3=1\times2+1$	$t=s+r$
$2=2\times1+0$	$s=2r+2$

Here r may be aſſumed of any value whatever.

Hence we have

$s=2r+2$
$t=s+r=3r+2$
$v=2t+s=8r+6$
$y=v+t=11r+8$
$x=y+v=19r+14$

and the number required $N=209u+157$ where it is evident that the leaſt number which can expreſs N is 157.

Ex. 6. Given $\left\{\begin{matrix}3x+5y+7z=560\\9x+25y+49z=2920\end{matrix}\right\}$ To determine x, y, z in whole numbers.

From 7 times the firſt equation ſubtract the ſecond; thus we have $12x+10y=1000$, or $6x+5y=500$; and from this laſt equation by proceeding as in the foregoing example we find

$$x=500-5v, \qquad y=6v-500.$$

Let theſe values of x and y be ſubſtituted in either of the original equations; in the firſt, for example, as being the moſt ſimple, and we find $7z+15v=1560$. This laſt equation being reſolved in the ſame manner we find

$v=$

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$v=1560-7t$
$x=15t-3120$
$y=8860-42t$
$z=35t-7300$

and hence it appears that the only values which t can have so as to give whole positive numbers for x, y, z are 209 and 210: thus we have

$x=15 \quad y=82 \quad z=15$
or $x=50 \quad y=40 \quad z=30$.

318. If an equation was proposed involving three unknown quantities, as $ax+by+cz=d$, by transposition we have $ax+by=d-cz$, and, putting $d-cz=d'$, $ax+by=d'$. From this last equation we may find values of x and y of this form

$$x=mr+nc', \quad y=m'r+n'c'$$

or $x=mr+n(d-cz)$, $y=m'r+n'(d-cz)$

where z and r may be taken at pleasure, except in so far as the values of x, y, z may be required to be all positive, for from such restriction the values of z and r may be confined within certain limits to be determined from the given equation.

319. We proceed to indeterminate problems of the second degree. These produce equations of the three following forms,

I. $y=\frac{a}{b+cx}$, II. $y=\frac{a+bx}{c+dx}$, III. $y=\sqrt{a+bx+cx^2}$.

In all these equations a, b, c denote given numbers; in the two first x is to be determined so that y may be an integer, and in the third x is to be determined so that y may be a rational quantity.

320. In the equation $y=\frac{a}{b+cx}$ it is evident $b+cx$ must be a divisor of a; let d be one of its divisors, then $b+cx=d$, and $x=\frac{d-b}{c}$: hence, to find x we must search among the divisors of a for one such that if b be subtracted from it the remainder may be divisible by c, and the quotient will be such a value of x as is required.

321. When $y=\frac{a+bx}{c+dx}$, if d be a divisor of b, x will be taken out of the numerator if we divide it by $c+dx$, and this form is then reduced to the preceding. But if d is not a divisor of b, multiply both sides by d, then $dy=\frac{da+dbx}{c+dx}$ or $dy=b+\frac{ad-bc}{c+dx}$, and so x is found by making $c+dx$ equal to a divisor of $ad-bc$.

Example. Given $x+y+2xy=195$, to determine x and y in whole numbers.

From the given equation $y=\frac{195-x}{1+2x}$, therefore

$2y=\frac{390-2x}{1+2x}=-1+\frac{391}{1+2x}$. Now $391=17\times 23$ hence we must assume $1+2x=17$, or $1+2x=23$: the first supposition gives us $x=8$, $y=11$; and the second $x=11$, $y=8$, the same result in effect as the former.

322. It remains to consider the formula $y=\sqrt{a+bx+cx^2}$ where x is to be found so that y may be a rational quantity, but as the condition of having x and y also integers would add greatly to the difficulty of the problem and produce researches of a very intricate nature, we must be satisfied for the most part with fractional values. The possibility of rendering the proposed formula a square depends altogether upon the coefficients a, b, c; and there are four cases of the problem, the solution of each of which is connected with some peculiarity in their nature.

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323. *Case* 1. Let a be a square number, then, putting g^2 for a, we have $y=\sqrt{g^2+bx+cx^2}$. Suppose $\sqrt{g^2+bx+cx^2}=g+mx$; then $g^2+bx+cx^2=g^2+2gmx+m^2x^2$, or $bx+cx^2=2gmx+m^2x^2$, that is $b+cx=2gm+m^2x$, hence

$$x=\frac{2gm-b}{c-m^2}, \quad y=\sqrt{g^2+bx+cx^2}=\frac{cg-bm+gm^2}{c-m^2}.$$

Here m may be any rational quantity either whole or fractional.

324. *Case* 2. Let c be a square number $=g^2$, then putting $\sqrt{a+bx+g^2x^2}=m+gx$, we find $a+bx+g^2x^2=m^2+2mgx+g^2x^2$, or $a+bx=m^2+2mgx$, hence we find

$$x=\frac{m^2-a}{b-2mg}, \quad y=\sqrt{a+bx+g^2x^2}=\frac{bm-gm^2-ag}{b-2mg}.$$

Here m, as before, may be taken at pleasure.

325. *Case* 3. When neither a nor c are square numbers, yet, if the expression $a+bx+cx^2$ can be resolved into two simple factors as $f+gx$ and $h+kx$ the irrationality may be taken away as follows.

Assume $\sqrt{a+bx+cx^2}=\sqrt{(f+gx)(h+kx)}=m(f+gx)$, then $(f+gx)(h+kx)=m^2(f+gx)^2$, or $h+kx=m^2(f+gx)$, hence we find

$$x=\frac{fm^2-h}{k-gm^2}, \quad y=\sqrt{(f+gx)(h+kx)}=\frac{(fk-gh)m}{k-gm^2}$$

and in these formulæ m may be taken at pleasure.

326. *Case* 4. The expression $a+bx+cx^2$ may be transformed into a square as often as it can be resolved into two parts, one of which is a complete square, and the other a product of two simple factors; for then it has this form p^2+qr, where p, q, and r are quantities which contain no power of x higher than the first. Let us assume $\sqrt{p^2+qr}=p+mq$; thus we have $p^2+qr=p^2+2mpq+m^2q^2$ and $r=2mp+m^2q$, and as this equation involves only the first power of x we may by proper reduction obtain from it rational values of x and y as in the three foregoing cases.

327. If we can by trials discover any one value of x which renders the expression $\sqrt{a+bx+cx^2}$ rational we may immediately reduce the quantity under the radical sign to the above-mentioned form, and thence find a general expression from which as many more values of x may be determined as we please. Thus let us suppose that p is a value of x which satisfies the condition

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dition required, and that q is the corresponding value of y, then

$$y^2 = a + bx + cx^2$$
$$q^2 = a + bp + cp^2.$$

Therefore, by subtraction,

$$y^2 - q^2 = b(x-p) + c(x^2-p^2) = (b+cp+cx)(x-p)$$

and $y = \sqrt{q^2 + (b+cp+cx)(x-p)}$. The quantity under the radical sign being now reduced to the prescribed form, it may be rendered rational by the substitution pointed out in last article.

328. The application of the preceding general methods of resolution to any particular case is very easy; we shall therefore conclude with a very few examples.

Ex. 1. It is required to find two square numbers whose sum is a given square number.

Let a^2 be the given square number, and x^2, y^2, the numbers required. Then by the question $x^2 + y^2 = a^2$, and $y = \sqrt{a^2 - x^2}$. This equation is evidently of such a form as to be resolvable by the method employed in case 1. Accordingly, by comparing $\sqrt{a^2 - x^2}$ with the general expression $\sqrt{g^2 + bx + cx^2}$, we have $g = a$, $b = 0$, $c = -1$, and substituting these values in the formulæ of § 323. also $-n$ for $+m$, we find

$$x = \frac{2an}{n^2+1}, \quad y = \frac{a(n^2-1)}{n^2+1},$$ hence the numbers required are

$$x^2 = \frac{4a^2n^2}{(n^2+1)^2} \qquad y^2 = \frac{a^2(n^2-1)^2}{(n^2+1)^2}$$

If $a = n^2 + 1$, where n is any number whatever, the square numbers x^2 and y^2 will both be integers, viz. $x^2 = 4n^2$ and $y^2 = (n^2-1)^2$. Let us suppose $n = 2$, then $a = n^2 + 1 = 5$, and $a^2 = 25$. hence $x^2 = 4n^2 = 16$, $y = (n^2-1)^2 = 9$. Thus it appears that the square number 25 may be resolved into two other square numbers 9 and 16.

Ex. 2. It is required to find two square numbers whose difference shall be equal to a given square number b^2.

This question may be resolved in the same manner as the last. Or, without referring to any former investigation, let $(x+n)^2$ and x^2 be the numbers sought, then $(x+n)^2 - x^2 = b^2$, that is, $2nx + n^2 = b^2$, hence $x = \frac{b^2 - n^2}{2n}$ and $x + n = \frac{b^2 + n^2}{2n}$. So that the numbers sought are

$$\frac{(b^2+n^2)^2}{4n^2}, \qquad \frac{(b^2-n^2)^2}{4n^2}$$

where n may be any number whatever. If, for example, $b^2 = 25$ and $n = 1$, then $x = 12$ and $x + n = 13$; so that the numbers required are 144 and 169.

Ex. 3. It is required to determine x, so that $\frac{x^2+x}{2}$ may be a rational square.

Let y be the side of the square required, then $\frac{x^2+x}{2} = y^2$ and $4x^2 + 4x = 8y^2$. Let the first part of this equation be completed into a square by adding 1 to each side, then $4x^2 + 4x + 1 = 1 + 8y^2$, and taking the root $2x + 1 = \sqrt{1 + 8y^2}$, so that we have to make $1 + 8y^2$ a square. Assume

$$1 + 8y^2 = \left(1 + \frac{p}{q}y\right)^2 = 1 + \frac{2p}{q}y + \frac{p^2}{q^2}y^2,$$ then $8y = \frac{2p}{q} + \frac{p^2}{q^2}y$. Hence by proper reduction $y = \frac{2pq}{8q^2 - p^2}$ and since $2x + 1 = \sqrt{1 + 8y^2} = \frac{8q^2 + p^2}{8q^2 - p^2}$, therefore $x = \frac{p^2}{8q^2 - p^2}$ and $\frac{x^2+x}{2} = \frac{4p^2q^2}{(8q^2-p^2)^2}$, a rational square as was required.

Resolution of Geometrical Problems

Sect. XXIII. *Of the Resolution of Geometrical Problems.*

329. When a geometrical problem is to be resolved by algebra, the figure which is to be the subject of investigation must be drawn, so as to exhibit as well the known quantities, connected with the problem, as the unknown quantities, which are to be found. The conditions of the problem are next to be attentively considered, and such lines drawn, or produced, as may be judged necessary to its resolution. This done, the known quantities are to be denoted by symbols in the usual manner, and also such unknown quantities as can most easily be determined; which may be either those directly required, or others from which they can be readily found. We must next proceed to deduce from the known geometrical properties of the figure a series of equations, expressing the relations between the known and unknown quantities; these equations must be independent of each other, and as many in number as there are unknown quantities. Having obtained a suitable number of equations, the unknown quantities are to be determined in the same manner as in the resolution of numerical problems.

330. No general rule can be given for drawing the lines, and selecting the quantities most proper to be represented by symbols, so as to bring out the simplest conclusion; because different problems require different methods of solution. The best way to gain experience in this matter is to try the solution of the same problem in different ways, and then apply that which succeeds best to other cases of the same kind, when they afterwards occur. The following particular directions however may be of some use.

1. In preparing the figure by drawing lines, let them be either parallel or perpendicular to other lines in the figure, or so as to form similar triangles. And if an angle be given, it will be proper to let the perpendicular be opposite to that angle, and to fall from one end of a given line, if possible.

2. In selecting the quantities for which symbols are to be substituted, those are to be chosen, whether required or not, which lie nearest the known or given parts of the figure, and by means of which the next adjacent parts may be expressed by addition and subtraction only, without the intervention of surds.

3. When two lines, or quantities, are alike related to other parts of the figure, or problem, the best way is to substitute for neither of them separately, but to substitute for their sum, or difference, or rectangle, or the sum of their alternate quotients, or some line or lines in the figure, to which they have both the same relation.

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4. When the area or the perimeter of a figure is given, or ſuch like parts of it as have only a remote relation to the parts required, it is ſometimes of uſe to aſſume another figure ſimilar to the propoſed one, having one ſide equal to unity, or ſome other known quantity. For, from hence, the other parts of the figure may be found by the known proportions of like ſides or parts, and ſo an equation will be obtained.

351. We ſhall now give the algebraical ſolutions of ſome geometrical problems.

PROB. 1. In a right-angled triangle, having given the baſe, and the ſum of the hypothenuſe and perpendicula, to find both theſe two ſides.

Let ABC (Plate XIV. fig. 1.) repreſent the propoſed triangle, right-angled at B. Let AB, the given baſe, be denoted by b, and AC+BC, the ſum of the hypothenuſe and perpendicular by s; then if x be put for BC the perpendicular, the hypothenuſe AC will be $=s-x$. But from the nature of a right-angled triangle $AC^2=AB^2+BC^2$, that is,

$$b^2+x^2=(s-x)^2=s^2-2sx+x^2.$$

Hence $b^2=s^2-2sx$, and $x=\frac{s^2-b^2}{2s}=$ BC. Alſo $s-x=s-\frac{s^2-b^2}{2s}=\frac{s^2+b^2}{2s}=$AC. Thus the perpendicular and hypothenuſe are expreſſed by means of the known quantities b and s, as required.

If a ſolution in numbers be required, we may ſuppoſe AB$=b=3$, and AC+CB$=s=9$, then

$$\text{BC}=\frac{s^2-b^2}{2s}=4, \text{ and } \text{AC}=\frac{s^2+b^2}{2s}=5.$$

PROB. 2. In a right-angled triangle, having given the hypothenuſe, alſo the ſum of the baſe and perpendicular, it is required to determine both theſe two ſides.

Let ABC (fig. 1.) repreſent the propoſed triangle, right-angled at B. Put $a=$AC the given hypothenuſe, and $s=$AB+BC the given ſum of the ſides, then if x be put for AB, the baſe, $s-x$ will denote BC the perpendicular.

Now, from the nature of right-angled triangles, $AC^2=AB^2+BC^2$; therefore, $x^2+(s-x)^2=a^2$, or $x^2+s^2-2sx+x^2=a^2$; hence we have this quadratic equation $x^2-sx=\frac{a^2-s^2}{2}$, which being reſolved, by completing the ſquare, we find $x=\frac{s\pm\sqrt{2a^2-s^2}}{2}=$ AB, and $s-x=\frac{s\mp\sqrt{2a^2-s^2}}{2}=$BC. Thus it appears, that either of the two quantities $\frac{s+\sqrt{2a^2-s^2}}{2}$, $\frac{s-\sqrt{2a^2-s^2}}{2}$ may be taken for AB; but whichever of the two be taken, the remaining one is neceſſarily equal to BC.

PROB. 3. It is required to inſcribe a ſquare in a given triangle.

Let ABC (fig. 2.) be the given triangle, and EFGH the inſcribed ſquare. Draw the perpendicular AD cutting EF the ſide of the ſquare in K; then, becauſe the triangle is given, the perpendicular AD may be conſidered as given. Let BC$=b$, AD$=p$, and, conſidering AK as the unknown quantity, (becauſe from it the ſquare may be readily determined), let AK$=x$; then KD$=$EF$=p-x$.

The triangles ABC, AEF, are ſimilar; therefore AD : BC :: AK : EF, that is, $p:b::x:p-x$. Hence, by taking the product of the extremes and means, $p^2-px=bx$, and $x=\frac{p^2}{p+b}=$AK. If the ſide of the ſquare be required, it may be immediately found by ſubtracting AK from AD the perpendicular. Thus we have $p-\frac{p^2}{p+b}=\frac{pb}{p+b}=KD=$EF. Hence it appears, that we may either take AK, a third proportional to AD+BC and AD, or take DK, a fourth proportional to AD+BC, AD and BC, and the point K being found, the manner of conſtructing the ſquare is ſufficiently obvious.

PROB. 4. Having given the area of a rectangle inſcribed in a given triangle, it is required to determine the ſides of the rectangle.

Let ABC (fig. 3.) be the given triangle, and EDGF the rectangle whoſe ſides are required. Draw the perpendicular CI cutting DG in H. Put AB$=b$, CI$=p$, DG$=$EF$=x$, DE$=$HI$=y$, then CH$=p-y$. Let a^2 denote the given area.

The triangles CDG, CAB are ſimilar; hence

$$\text{CH} : \text{DG} :: \text{CI} : \text{AB}, \text{ or } p-y : x :: p : b.$$

So that to determine x and y, we have theſe two equations

$$xy=a^2,\ bp-by=px.$$

From the firſt equation we find $y=\frac{a^2}{x}$, and from the ſecond $y=\frac{bp-px}{b}$, therefore $\frac{bp-px}{b}=\frac{a^2}{x}$; hence $x^2-bx=-\frac{a^2b}{p}$, and, from this quadratic equation, by completing the ſquare, &c. we find

$$x=\frac{b}{2}\pm\sqrt{\frac{b^2}{4}-\frac{a^2b}{p}}, \text{ and } y=\frac{a^2}{x}=\frac{p}{2}\mp\sqrt{\frac{p^2}{2}-\frac{pa^2}{b}}.$$

Hence it appears, that if $\frac{a^2b}{p}$ be leſs than $\frac{b^2}{4}$, that is, if a^2 be leſs than $\frac{pb}{4}$, there are two different rectangles, having the ſame area, which may be inſcribed in the given triangle. It alſo appears that, to render the problem poſſible, the given ſpace a^2 muſt not be greater than $\frac{pb}{4}$, that is, than half the area of the given triangle.

PROB. 5. In a triangle, there are given the baſe, the vertical angle, and the ſum of the ſides about that angle, to determine each of theſe ſides.

Let us ſuppoſe that ABC (fig. 4.) is the triangle, of which there is given the baſe AC, the vertical angle ABC,

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ABC, and the sum of the sides AB, BC. Put $AC=a$, $AB+BC=b$, cosine of $\angle ABC=c$, and let AB, BC, the sides required, be denoted by x and y.

Let CD be drawn from either of the angles at the base perpendicular to the opposite side AB; then, rad. : cos. B :: CB : BD; therefore $BD=\cos.B\times CB=cy$.

Now, from the principles of geometry, $AC^2=AB^2+BC^2-2AB\times BD$. Hence, and from the question, we have these two equations,

$$x+y=b,\ x^2-2cxy+y^2=a^2.$$

From the square of the first of these equations, viz. $x^2+2xy+y^2=b^2$, let the second be subtracted, thus we have $2(1+c)xy=b^2-a^2$, and $2xy=\frac{b^2-a^2}{1+c}$. Again, from the square of the first equation let the double of this last equation, viz. $4xy=\frac{2(b^2-a^2)}{1+c}$, be subtracted, and the result is $x^2-2xy+y^2=\frac{2a^2-(1+c)b^2}{1+c}$, so that by taking the square root of this last equation we obtain

$$x-y=\sqrt{\frac{2a^2-(1+c)b^2}{1+c}}.$$

Thus we have found the difference between the sides, now their sum is given $=b$, hence, by adding $\frac{1}{2}$ the difference to $\frac{1}{2}$ the sum we find

$$x=\frac{b}{2}+\tfrac{1}{2}\sqrt{\frac{2a^2-(1+c)b^2}{1+c}};$$

and subtracting $\frac{1}{2}$ the difference from $\frac{1}{2}$ the sum

$$y=\frac{b}{2}-\tfrac{1}{2}\sqrt{\frac{2a^2-(1+c)b^2}{1+c}}.$$

If the angle at B be a right angle this problem becomes the same as prob. 2.

332. By a method of investigation, in all respects similar to that which has been employed in these examples, any proposed geometrical problem may be reduced to an algebraic equation, the roots of which will exhibit arithmetical values of that geometrical magnitude which constitutes the unknown quantity in the equation. But the roots of algebraic equations may also be expressed by geometrical magnitudes, and hence a geometrical construction of a problem may be derived from its algebraic solution. For example, quadratic equations, which all belong to one or other of these three forms,

$$x^2+ax=bc,\ x^2-ax=bc,\ x^2-ax=-bc,$$

or $x(x+a)=bc$, $x(x-a)=bc$, $x(a-x)=bc$

may be constructed as follow.

333. *Construction of the first and second forms.* Let a circle EABD (fig. 5.) be described with a radius $=\frac{1}{2}a$, in which, from any point A in the circumference apply a chord $AB=b-c$ (b being supposed greater than c) and produce AB so that $BC=c$; then $AC=b$.

Let H be the centre of the circle, join CH cutting the circumference in D and E, then, in the first case, the positive value of x shall be represented by CD, and in the second by CE. For, by construction $DE=a$, therefore, if CD be called x, then $CE=x+a$, but if CE $=x$, then $CD=x-a$. Now by the elements of geometry $EC\times CD=AC\times CB$, that is, $x(x\pm a)=bc$ or $x^2\pm ax=bc$, which equation comprehends the first and second cases.

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If the negative roots be required, that of the first case will be CE and that of the second CD.

When b and c are equal the construction will be rather more simple, for then AB vanishing, AC will coincide with the tangent CF. Therefore if a right-angled triangle HFC be constructed whose legs HF and FC are equal respectively to $\frac{1}{2}a$ and b, then will CD, the value of x in the first case, be equal to CH—HF, and CE, the value of x in the latter, $=$CH+HF.

334. *Construction of the third form.*—Let a circle EADB (fig. 6.) be described with a radius $=\frac{1}{2}a$ as before, in which apply a chord $AB=b+c$, and take $AC=b$. Through C draw the diameter DCE, then either DC or EC will be positive roots of the equation. For since $ED=a$, if either EC or $CD=x$, the remaining part of the diameter shall be $a-x$; now by the nature of the circle $EC\times CD=AC\times CB$, that is $x(a-x)=bc$, or $ax-x^2=-bc$, hence it is evident that the roots are rightly determined.

If b and c are equal, the construction will be the same, only it will then not be necessary to describe the whole circle; for since AC will be perpendicular to the diameter, if a right-angled triangle HCA be constructed, having its hypothenuse $HA=\frac{1}{2}a$ and base $AC=b$, the roots of the equation will be expressed by AH+HC and AH—HC.

335. If b and c be so unequal, that $b-c$ in the first two cases, or $b+c$ in the third, is greater than a, then, instead of these quantities, $\frac{1}{2}b$ and $\frac{1}{2}c$, or in general $\frac{b}{n}$ and nc (where n is any number whatever) may be used. Or a mean proportional may be found between b and c, and the construction performed as directed in each case when b and c are equal.

336. It appears from § 333 and 334, that every geometrical problem which produces a quadratic equation may be constructed by means of a straight line and a circle, or is a *plane* problem, hence on the contrary, if a problem can be constructed by straight lines and circles, its algebraic resolution will not produce an equation higher than a quadratic. Cubic and biquadratic equations may be constructed geometrically by means of any two conic sections, hence it follows that every geometrical problem which requires for its construction two conic sections, will, when resolved by algebra, produce a cubic or biquadratic equation.

Sect. XXIV. *Of the Loci of Equations.*

337. When an equation contains two indeterminate quantities x and y, then for each particular value of x there may be as many values of y as it has dimensions in that equation. So that if in an indefinite line AE (fig. 7.) there be taken a part AP to represent x, and a perpendicular PM be drawn to represent y, there will be as many points M, M', &c. the extremities of these perpendiculars, as there are dimensions of y in the proposed equation. And the values of PM, PM', &c. will be the roots of the equation which are found by substituting for x its value in any particular

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case. Hence it appears that in any particular equation we may determine as many points M, as we please, and a line which passes through all these points is called the *locus* of the equation. The line AP which expresses any value of x is called an *abscis*; and PM which expresses the corresponding value of y is called an *ordinate*. Any two corresponding values of x and y are also called *co-ordinates*.

338. When the equation that arises by substituting for x any particular value AP has all its roots positive, the points M, M', &c. will lie all on one side of AE, but if any of them be negative, these must be set off on the other side of AE towards m.

If x be supposed to become negative, then the line Ap which represents it is to be taken in a direction the opposite to that which represents the positive values of x; the points M, m, are to be taken as before, and the *locus* is only complete when it passes through all the points M, m, so as to exhibit a value of y corresponding to every possible value of x.

If in any case one of the values of y vanish, then the point M coincides with P, and the *locus* meets AE in that point. If one of the values of y becomes infinite, then it shews that the curve has an infinite arc, and in that case the line PM becomes an *asymptote* to the curve, or touches it at an infinite distance, if AP itself is finite.

If when x is supposed infinitely great, a value of y vanish, then the curve approaches to AE as an asymptote.

If any values of y become impossible, then so many points M vanish.

339. From these observations and the theory of equations, it appears that when an equation is proposed involving two indeterminate quantities x and y, there may be as many intersections of the curve that is the *locus* of the equation and of the line PM, as there are dimensions of y in the equation; and as many intersections of the curve and the line AE as there are dimensions of x in the equation.

340. A curve line is called *geometrical* or *algebraic*, when the equation which expresses the relation between x and y, any abscis and its corresponding ordinate, consists of a finite number of terms, and contains besides these quantities only known quantities. Algebraic curves are divided into *orders* according to the dimensions of the equations which express the relations between their abscisses and ordinates, or according to the number of points in which they can intersect a straight line.

341. *Straight lines* themselves constitute the first order of lines, and when the equation expressing the relation between x and y is only of one dimension, the points M must be all found in a straight line which contains with AE a given angle. Suppose for example that the given equation is $ay-bx-cd=0$, and that its *locus* is required.

Since $y=\frac{bx+cd}{a}$, it follows that APM (fig. 8.) being a right angle, if AN be drawn making the angle NAP such that its cosine is to its sine as a to b, and drawing AD parallel to the ordinates PM, and equal to $\frac{cd}{a}$, if DF be drawn parallel to AN, then will DF be the *locus* required; where it is to be observed that AD and PN are to be taken on the same side of AE if bx and cd have the same sign, but on opposite sides of AE if they have contrary signs.

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342. These curves whose equations are of two dimensions constitute the *second* order of lines, and the *first* kind of curves. Their intersections with a straight line can never exceed two (§ 339.)

The curves whose equations are of three dimensions form the *third* order of lines, and the *second* kind of curves; and their intersections with a straight line can never exceed three, and after the same manner curves of the higher orders are denominated.

Some curves, if they were completely described, would cut a straight line in an infinite number of points, but these belong to none of the orders we have mentioned, for the relation between their ordinates and abscisses cannot be expressed by a finite equation, involving only ordinates and abscisses with determinate quantities. Curves of this kind are called *mechanical* or *transcendental*.

343. As the roots of an equation become impossible always in pairs, so the intersections of a curve and its ordinate PM must vanish in pairs if any of them vanish. Let PM (fig. 9.) cut the curve in the points M and m, and by moving parallel to itself come to touch it in the point N, then the two points of intersection M and m go to form one point of contact N. If PM still move on parallel to itself, the points of intersection will beyond N become imaginary, as the two roots of an equation first become equal, and then imaginary.

344. The curves of the 3d, 5th, 7th orders, and all whose dimensions are odd numbers, have always one real root at least, and consequently for every value of x the equation by which y is determined must have at least one real root; so that as x, or AP, may be increased *in infinitum* on both sides, it follows that M must go off *in infinitum* on both sides without limit.

In curves whose dimensions are even numbers, as the roots of their equations may become all impossible, it follows that the figure of the curve may be like a circle or oval that is limited within certain bounds, beyond which it cannot extend.

345. When two roots of the equation by which y is determined become equal, either the ordinate PM touches the curve, two points of intersection in that case going into a point of contact, or the point M is a *punctum duplex* in the curve, two of its arcs intersecting each other there; or some oval that belongs to that kind of curve becoming infinitely little in M, it vanishes into what is called a *punctum conjugatum*.

If in the equation y be supposed $=0$, then the roots of the equation by which x is determined, will give the distances of the points where the curve meets AE from A, and if two of those roots be found equal, then either the curve touches the line AE, or AE passes through a *punctum duplex* in the curve. When y is supposed $=0$, if one of the values of x vanish, the curve in that case passes through A. If two vanish, then either AE touches the curve in A, or A is a *punctum duplex*.

As a *punctum duplex* is determined from the equality of two roots, so is a *punctum triplex* from the equality of three roots,

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346. To illuſtrate theſe obſervations we ſhall take a few examples.

Ex. 1. It is required to deſcribe the line that is the *locus* of this equation $y^2=ax+ab$, or $y^2-ax-ab=0$, where a and b denote given quantities. Since $y=\pm\sqrt{ax+ab}$, if AP$=x$ (fig. 10). be aſſumed of a known value and PM, Pm ſet off on each ſide equal to $\sqrt{ax+ab}$ the points M, m, will belong to the locus required; and for every poſitive value of AP there may thus be found a point of the locus on each ſide. The greater AP, or x, is taken, the greater does $\sqrt{ax+ab}$ become, and conſequently PM and Pm the greater, and if AP be ſuppoſed infinitely great, PM and Pm will alſo become infinitely great, therefore the locus has two infinite arcs that go off to an infinite diſtance from AE and from AD. If x be ſuppoſed to vaniſh, then $y=\pm\sqrt{ab}$, ſo that y does not vaniſh in that caſe, but paſſes through D and d, taking AD and Ad each $=\sqrt{ab}$.

If P be ſuppoſed to move to the other ſide of A, then x becomes negative, and $y=\pm\sqrt{ab-ax}$, ſo that y will have two values as before, while x is leſs than b; but if AB$=b$, and the point P be ſuppoſed to come to B, then $ab=ax$, and $y=\pm\sqrt{ab-ax}=0$; that is PM and Pm vaniſh, and the curve there meets the line AE. If P be ſuppoſed to move from A beyond B, then x becomes greater than b, and ax greater than ab, ſo that $ab-ax$ being negative, $\sqrt{ab-ax}$ becomes imaginary; that is, beyond B there are no ordinates which meet the curve, and conſequently on that ſide the curve is limited in B.

All this agrees very well with what is known by other methods, that the curve whoſe equation is $y^2=ax+ab$ is a parabola whoſe vertex is B, axis BE, and parameter equal to a. For ſince $b\pm x=$ BP and $y=$PM, from the equation $ab\pm ax=y^2$, or $a(b\pm x)=y^2$, we have $a\times$BP$=$PM^2, which is the well-known property of the parabola.

Ex. 2. It is required to deſcribe the line that is the *locus* of the equation $xy+ay+cy=bc+bx$,

$$\text{or } y=\frac{bc+bx}{a+c+x}.$$

Here it is evident (fig. 11.) that the ordinate PM can meet the curve in one point only, there being but one value of y correſponding to each value of x. When $x=0$, then $y=\frac{bc}{a+c}$ ſo that the curve does not paſs through A. If x be ſuppoſed to increaſe, then y will increaſe, but will never become equal to b, ſince $y=b\times\frac{c+x}{a+c+x}$, and $a+c+x$ is always greater than $c+x$: If x be ſuppoſed infinite, then the terms a and c vaniſh compared with x, and conſequently $y=b\times\frac{x}{x}=b$; from which it appears, that taking AD$=b$, and drawing GD parallel to AE, it will be an *aſymptote*, and touch the curve at an infinite diſtance. If x be now ſuppoſed negative, and AP be taken on the other ſide of A; then $y=b\times\frac{c-x}{a+c-x}$, and if x be taken on that ſide $=c$, then $y=b\times\frac{c-c}{a}=0$, ſo that the curve muſt paſs through B if AB$=c$. If x be ſuppoſed greater than c, then will $c-x$ become negative, and the ordinate will become negative, and lie on the other ſide of AE, till x become equal to $a+c$, and then $y=b\times\frac{-a}{0}$, that is, becauſe the denominator is 0, x becomes *infinite*, ſo that if AK be taken$=a+c$, the ordinate K4 will be an aſſymptote to the curve.

If x be taken greater than $a+c$ or AP greater than AK, then both $c-x$ and $a+c-x$ become negative, and conſequently $y=b\times\frac{x-c}{x-a-c}$ becomes a poſitive quantity; and ſince $x-c$ is always greater than $x-a-c$, it follows that y will be always greater than b or KG, and conſequently the reſt of the curve lies in the angle FGH. And as x increaſes, ſince the ratio of $x-c$ to $x-a-c$ approaches ſtill nearer to a ratio of equality, it follows that PM approaches to an equality with PN, therefore the curve approaches to its aſymptote GH on that ſide alſo.

This curve is the common hyperbola, for ſince $b(c+x)=y(a+c+x)$, by adding ab to both ſides, $b(a+c+x)=y(a+c+x)+ab$, and $(b-y)(a+c+x)=ab$, that is NM$\times$GN$=$GC$\times$BC which is the property of the common hyperbola.

Ex. 3. It is required to deſcribe the *locus* of the equation $ay^2-xy^2=x^3+bx^2$.

Here $y^2=\frac{x^3+bx^2}{a-x}$, and therefore $y=\pm\sqrt{\frac{x^3+bx^2}{a-x}}$, hence PM and PM (fig. 12.) are to be taken on each ſide, and equal to $\sqrt{\frac{x^3+bx^2}{a-x}}$; this expreſſion, by ſuppoſing $x=a$, becomes infinite becauſe its denominator is then $=0$, therefore if AB be taken $=a$ and BK be drawn perpendicular to AB, the line BK ſhall be an aſymptote to the curve. If x be ſuppoſed greater than a, or AP greater than AB, then $a-x$ being negative, the fraction $\frac{x^3+bx^2}{a-x}$ will become negative, and its ſquare root impoſſible; ſo that no part of the locus can lie beyond B. If x be ſuppoſed negative, or P taken on the other ſide of A, then $y=\pm\sqrt{\frac{-x^3+bx^2}{c+x}}$, hence the values of y will be real and equal as long as x is leſs than b, but if $x=b$, then $y=\sqrt{\frac{-x^3+bx^2}{a-x}}=\sqrt{\frac{-b^3+b^3}{a-b}}=0$, and conſequently if AD be taken $=b$, the curve will paſs through D, and there touch the

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the ordinate. If x be taken greater than b, then $\pm\sqrt{\frac{-x^3-ax^2}{c+x}}$ becomes imaginary, so that no part of the curve is found beyond D. The portion between A and D is called a *nodus*. If y be supposed $=0$, then will $x^3+bx^2=0$ be an equation whose roots are $-b$, 0, 0, from which it appears that the curve passes twice through A, and has in A a *punctum duplex*. This locus is a line of the 3d order.

If b is supposed to vanish in the proposed equation, so that $ay^2-xy^2=x^3$, then will A and D coincide (fig. 13.) and the *nodus* vanish, and the curve will have in the point A a *cuspis*, the two arcs AM and Am, in this case, touching one another in that point. This is the same curve which the ancients called the *Cissoid of Diocles*.

If instead of supposing b positive, or equal to 0, we suppose it negative, the equation will be $ay^2-xy^2=x^3-bx^2$, the curve will in this case pass through D as before, (fig. 14.) and taking AB$=a$, BK will be its asymptote. It will have a *punctum conjugatum* in A, because when y vanishes two values of x vanish, and the third becomes $=b$ or AD. The whole curve, besides this point, lies between DQ and BK. These remarks are demonstrated after the same manner as in the first case.

347. If an equation have this form,

$$y=ax^n+bx^{n-1}+cx^{n-2}+, \text{ \&c.}$$

and n is an even number, then will the *locus* of the equation have two infinite arcs lying on the same side of AE, (fig. 13.) for if x become infinite, whether positive or negative, x^n will be positive and ax^n have the same sign in either case, and as ax^n becomes infinitely greater than the other terms bx^{n-1}, &c. it follows that the infinite values of y will have the same sign in these cases, and consequently the two infinite arcs of the curve will lie on the same side of AE.

But if n be an odd number, then when x is negative x^n will be negative, and ax^n will have the contrary sign to what it had when x is positive, and therefore the two infinite arcs will in this case lie on different sides of AE, as in fig. 16. and tend towards parts directly opposite.

384. If an equation have this form $yx^n=a^{n+1}$, and n be an odd number, then when x is positive $y=\frac{a^{n+1}}{x^n}$, but when x is negative $y=-\frac{a^{n+1}}{x^n}$, so that this curve must all lie in the vertically opposite angles KAE, ΓAe, (fig. 17.) as the common hyperbola, FK, Ee being asymptotes.

But if n be an even number, then y is always positive whether x be positive or negative, because x^n in this case is always positive, and therefore the curve must all lie in the two adjacent angles KAE and KAe (fig. 18.) and have AK and AE for its asymptotes.

349. If an equation be such as can be reduced into two other equations of lower dimensions, without affecting y or x with any radical sign, then the *locus* shall consist of the two *loci* of those inferior equations. Thus the locus of the equation $y^3-2xy+by+x^2-bx=0$, which may be resolved into these two, $y-y=0$, $y-x+b=0$, is found to be two straight lines cutting the abscis AE (fig. 19.) in angles of 45° in the points A, B, whose distance AB$=b$. In like manner some cubic equations can be resolved into three simple equations, and then the *locus* is three straight lines, or may be resolved into a quadratic and simple equation, and then the locus is a straight line and a conic section. In general, curves of the superior orders include all the curves of the inferior orders, and what is demonstrated generally of any one order is also true of the inferior orders. Thus, for example, any general property of the conic sections holds true of two straight lines as well as a conic section, particularly that the rectangles of the segments of parallels bounded by them will always be to one another in a given ratio.

350. From the analogy which subsists between algebraic equations and geometrical curves, it is easy to see that the properties of the former must suggest corresponding properties of the latter. Hence the principles of algebra admit of the most extensive application to the theory of curve lines. It may be demonstrated, for example, that the *locus* of every equation of the second order is a conic section; and, on the contrary, the various properties of the diameters, ordinates, tangents, &c. of the conic sections may be readily deduced from the theory of equations.

Sect. XXV. *Of the Arithmetic of Sines.*

351. The relations which subsist between the sines and cosines of any arches of a circle, and those of their sums, or differences, &c. constitute what is called the *arithmetic of sines*. This branch of calculation has its origin in the application of algebra to geometry, and is of great importance in the more difficult parts of the mathematics, as well as in their application to physics.

352. In treating this subject, it is necessary to attend to the following observations.

1. If the sines of all arches between 0° and 180° be supposed positive, the sines of arches between 180° and 360° must be considered as negative; again, the sines of arches between 360° and 540° will be positive, and those of arches between 540° and 720° negative, and so on.

2. If the cosines of arches between 0° and 90° be supposed positive, the cosines of arches between 90° and 270° must be considered as negative, and the cosines of arches between 270° and 450° positive, and so on.

3. When an arch changes from + to −, or from − to +, its sine undergoes a like change, but its cosine is the same as before.

The truth of these observations must be evident from this consideration, that when a line, taken in a certain direction, decreases till it becomes $=0$, and afterwards increases, but in a contrary direction; then, if in the former state it was considered as positive, it must be negative in the latter, and contrariwise.

353. The following proposition may be considered as the foundation of the arithmetic of sines.

Let a and b denote any two arches of a circle.

Then, if radius be supposed $=1$.

$$\text{sin. } (a+b) = \text{sin. } a \times \text{cos. } b + \text{cos. } a \times \text{sin. } b.$$

Let

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Let C be the centre of the circle, (fig. 20.) and AB, BD the arches denoted by a and b; then AD $=a+b$: draw the radii CA, CB, CD, and the sines BE, BF, DG; then BE, BF, DG are the sines of a, b, and $a+b$, respectively; and CE, CF, CG their cosines. Join EF, and draw FH parallel to DG. Because the angles CEB, CFB are right angles, the points C, E, B, F are in the circumference of a circle, hence, the angle FCB is equal to FEB; that is, to the alternate angle EFH; now CFB, EHF are both right angles, therefore the triangles CFB, EHF are similar, hence CF : CB (= CD) : : FH : FE; but CF : CD : : FH : DG; therefore FH : FE : : FH : DG, hence FE=DG=sin. $(a+b)$. Because EBFC is a quadrilateral inscribed in a circle, from the elements of geometry, we have BC × EF=BE × CF + BF × CE; but BE = sin. a, CF = cos. b, BF = sin. b, CE = cos. a, BC = 1, and EF=DG=sin. $(a+b)$, therefore sin. $(a+b)$=sin. a × cos. b + cos. a × sin. b, as was to be proved.

354. If in the preceding theorem we suppose the arch b to become negative, then sin. b will also become negative. Thus we obtain a second theorem, viz.

$$\text{Sin. } (a-b) = \text{sin. } a \times \text{cos. } b - \text{cos. } a \times \text{sin. } b.$$

Because cos. $(a+b)$=sin. $((90^\circ - a)-b)$, and by the second theorem sin. $((90^\circ-a)-b)$ = sin. $(90^\circ-a)$ × cos. b—cos. $(90^\circ-a)$ × sin. b = cos. a × cos. b—sin. a × sin. b, therefore

$$\text{cos. } (a+b) = \text{cos. } a \times \text{cos. } b - \text{sin. } a \times \text{sin. } b$$

which is the third theorem.

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If we now suppose b to become negative, then sin. b becomes also negative; thus we have

Theor. IV. Cos. $(a-b)$ = cos. a × cos. b + sin. a × sin. b.

355. We have found that sin. $(a+b)$ = sin. a × cos. b + cos. a × sin. b; also, that sin. $(a-b)$ = sin. a × cos. b—cos. a × sin. b, therefore, taking the sum of these two equations, we find

Theor. V. Sin. $(a+b)$ + sin. $(a-b)$ = 2 sin. a × cos. b.

In like manner, by taking the difference between the equations, we have

Theor. VI. Sin. $(a+b)$—sin. $(a-b)$ = 2 cos. a × sin. b.

And, by taking the sum and difference of the equations, which constitute the third and fourth theorems, we also have

Theor. VII. Cos. $(a-b)$ + cos. $(a+b)$ = 2 cos. a × cos. b.
Theor. VIII. Cos. $(a-b)$—cos. $(a+b)$ = 2 sin. a × sin. b.

If in the four last theorems we substitute na for a, and a for b, we derive from them these other four:

Theor. IX. 2 Cos. a × sin. na = sin. $(n+1)\,a$ + sin. $(n-1)\,a$
Theor. X. 2 Sin. a × cos. na = sin. $(n+1)\,a$—sin. $(n-1)\,a$
Theor. XI. 2 Cos. a × cos. na = cos. $(n+1)\,a$ + cos. $(n-1)\,a$
Theor. XII. 2 Sin. a × sin. na = —cos. $(n+1)\,a$ + cos. $(n-1)\,a$.

356. By means of the four last theorems, the powers and products of the sines and cosines of arches may be expressed in terms of the sums and differences of certain multiples of those arches.

Thus, if in Theor XII. we suppose $n=1$, it becomes

$$2 \text{ Sin.}^2 a = -\text{cos. } 2a + 1.$$

To find the third power of sin. a, let both sides of this equation be multiplied by 2 sin. a, then 4 sin.^{3} a = 2 sin. a (—cos. $2a$ + 1), but 2 sin. a × cos. $2a$ = sin. $3a$—sin. a, Theor. X. Therefore

$$4 \text{ Sin.}^3 a = -\text{sin. } 3a + 3 \text{ sin. } a.$$

Again, for the fourth power, let both sides of the last equation be multiplied by 2 sin. a, then 8 sin.^{4} a = 2 sin. a (—sin. $3a$ + 3 sin. a); but 2 sin. a × sin. $3a$ = —cos. $4a$ + cos. $2a$; and 2 sin. a × sin. a = —cos. $2a$ + 1, Theor. XII. therefore by substitution

$$8 \text{ Sin.}^4 a = \text{cos. } 4a - 4 \text{ cos. } 2a + 3.$$

Proceeding in this way the successive powers of sin. a may be calculated as in the following table:

Sin. a = sin. a
2 Sin.^{2} a = —cos. $2a$ + 1
4 Sin.^{3} a = —sin. $3a$ + 3 sin. a
8 Sin.^{4} a = cos. $4a$ — 4 cos. $2a$ + 3
16 Sin.^{5} a = sin. $5a$ — 5 sin. $3a$ + 10 sin. a
32 Sin.^{6} a = —cos. $6a$ + 6 cos. $4a$ — 15 cos. $2a$ + 10
64 Sin.^{7} a = —sin. $7a$ + 7 sin. $5a$ — 21 sin. $3a$ + 35 sin. a.
&c.

The

Arithmetic of Sines. The succeſſive powers of the coſines may be found in the ſame manner. Thus

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$$\begin{aligned}
&\text{Cof. } a = \text{cof. } a\\
2\ &\text{Cof.}^2 a = \text{cof. } 2a + 1\\
4\ &\text{Cof.}^3 a = \text{cof. } 3a + 3\ \text{cof. } a\\
8\ &\text{Cof.}^4 a = \text{cof. } 4a + 4\ \text{cof. } 2a + 3\\
16\ &\text{Cof.}^5 a = \text{cof. } 5a + 5\ \text{cof. } 3a + 10\ \text{cof. } a\\
32\ &\text{Cof.}^6 a = \text{cof. } 6a + 6\ \text{cof. } 4a + 15\ \text{cof. } 2a + 10\\
64\ &\text{Cof.}^7 a = \text{cof. } 7a + 7\ \text{cof. } 5a + 21\ \text{cof. } 3a + 35\ \text{cof. } a,
\end{aligned}$$

&c.

357. As an example of the products of the ſines and coſines of an arch, let it be propoſed to expreſs $\text{ſin.}^3 a \times \text{cof.}^2 a$ by the ſines or coſines of multiples of a. We have already found $4\ \text{ſin.}^3 a = -3\ \text{ſin. } 3a + 3\ \text{ſin. } a$, therefore

$$16\ \text{ſin.}^3 a \times \text{cof.}^2 a \begin{cases} = 2\ \text{cof. } a \times 2\ \text{cof. } a(-3\ \text{ſin. } 3a + 3\ \text{ſin. } a) \\ = 2\ \text{cof. } a(-\ \text{ſin. } 4a + 2\ \text{ſin. } 2a) \\ = -\text{ſin. } 5a + \text{ſin. } 3a + 2\ \text{ſin. } a. \end{cases}$$

Thus it appears that all poſitive integer powers of the ſine and coſine of an arch, or any product of thoſe powers, may be expreſſed in finite terms by the ſines and coſines of multiples of that arch.

358. On the contrary, the ſine and coſine of any arch may be expreſſed by the powers of the ſine and coſine of an arch whereof it is a multiple. For it appears from the 9th and 11th theorems that

$$\text{Sin.}(n+1)a = 2\ \text{cof. } a \times \text{ſin. } na - \text{ſin. } (n-1)a,$$
$$\text{Cof.}(n+1)a = 2\ \text{cof. } a \times \text{cof. } na - \text{cof. } (n-1)a,$$

therefore, by taking $n = 0, 1, 2, 3$, &c. ſucceſſively, we have

$$\begin{aligned}
&\text{Sin. } a = \text{ſin. } a\\
&\text{Sin. } 2a = 2\ \text{cof. } a \times \text{ſin. } a\\
&\text{Sin. } 3a = 2\ \text{cof. } a \times \text{ſin. } 2a - \text{ſin. } a\\
&\text{Sin. } 4a = 2\ \text{cof. } a \times \text{ſin. } 3a - \text{ſin. } 2a\\
&\text{Sin. } 5a = 2\ \text{cof. } a \times \text{ſin. } 4a - \text{ſin. } 3a,
\end{aligned}$$

&c.

$$\begin{aligned}
&\text{Cof. } a = \text{cof. } a\\
&\text{Cof. } 2a = 2\ \text{cof. } a \times \text{cof. } a - 1.\\
&\text{Cof. } 3a = 2\ \text{cof. } a \times \text{cof. } 2a - \text{cof. } a\\
&\text{Cof. } 4a = 2\ \text{cof. } a \times \text{cof. } 3a - \text{cof. } 2a\\
&\text{Cof. } 5a = 2\ \text{cof. } a \times \text{cof. } 4a - \text{cof. } 3a,
\end{aligned}$$

&c.

So that, putting s for the ſine, and c for the coſine of the arch a, and remarking that $c^2 = 1 - s^2$.

$$\begin{aligned}
&\text{Sin. } a = s\\
&\text{Sin. } 2a = 2cs\\
&\text{Sin. } 3a = 4c^2 s - s = -4s^3 + 3s\\
&\text{Sin. } 4a = 8c^3 s - 4cs = c(-8s^3 + 4s)\\
&\text{Sin. } 5a = 16c^4 s - 12c^2 s + s = 16s^5 - 20s^3 + 5s,
\end{aligned}$$

&c.

$$\begin{aligned}
&\text{Cof. } a = c\\
&\text{Cof. } 2a = 2c^2 - 1\\
&\text{Cof. } 3a = 4c^3 - 3c\\
&\text{Cof. } 4a = 8c^4 - 8c^2 + 1\\
&\text{Cof. } 5a = 16c^5 - 20c^3 + 5c,
\end{aligned}$$

&c.

359. If it be required to find the ſine or coſine of an arch, from having given the ſine or coſine of ſome multiple of that arch, it may be found by reſolving an equation of an order denoted by the numerical coefficient of the multiple arch. Thus if the coſine of an arch be given, to determine the coſine of half the arch, let C denote the given coſine, and x that which is required, then the equation $\text{cof. } 2a = 2c^2 - 1$ becomes $C = 2x^2 - 1$, which equation being reſolved gives $x = \pm\sqrt{\frac{1+C}{2}}$. If the ſine be required, from that of twice the arch being given, it may be found from the equation $\text{ſin. } 2a = 2cs$, which, by putting S for the given ſine, and y for the ſine required, becomes $S = 2y\sqrt{1-y^2}$, or, by ſquaring both ſides, and reducing, $y^4 - y^2 = -\frac{S^2}{4}$; whence $y^2 = \frac{1 \pm \sqrt{1 - S^2}}{2}$ and $y = \pm\sqrt{\frac{1 \pm \sqrt{1 - S^2}}{2}}$.

The two values of x indicate that there are two arches, the one as much leſs than 90°, as the other exceeds 90°, ſuch, that the coſine of the double of each is expreſſed by the ſame number. And the four values of y ſhew that there are four arches, viz. two poſitive and two negative, ſuch, that the ſine of the double of each is expreſſed by the ſame number.

Suppoſe now that the coſine of an arch is given to find the coſine of one-third of that arch, then, putting C to denote the given coſine, and x that which is required, the equation to be reſolved is

$$4x^3 - 3x = C, \text{ or } x^3 - \tfrac{3}{4}x - \frac{C}{4} = 0.$$

By comparing this cubic equation with the general equation $x^3 + qx + r = 0$, it appears that q is negative and ſuch that $4q^3 > 27r^2$, for C is always leſs than unity; hence it follows that the equation belongs to the *irreducibile* caſe, or that which cannot be reſolved by Cardan's rule. The equation $4\ \text{ſin.}^3 - 3\ \text{ſin. } a = -\text{ſin. } 3a$ is alſo of the ſame form; in order, therefore, to find either the ſine or coſine of one-third of a given arch recourſe muſt be had to the methods of approximation explained in Sect. XVI.

360. The ſum of any powers of the ſines or coſines of arches which conſtitute the arithmetical progreſſion a, $a+d$, $a+2d$, $a+3d$, &c. to $a+nd$, may

be

Arithmetic of Sines. be found as follows. We have already found, Theor. V. that

$$\text{Sin. } (p+d) = 2 \text{ cof. } d \times \text{fin. } p - \text{fin. } (p-d);$$

therefore, by fubſtituting a, $a+d$, $a+2d$, &c. ſucceſſively for p, we obtain the following ſeries of equations: Arithmetic of Sines.

$$\begin{aligned}
&\text{Sin. } a = \text{fin. } a\\
&\text{Sin. } (a+d) = 2 \text{ cof. } d \times \text{fin. } a - \text{fin. } (a-d)\\
&\text{Sin. } (a+2d) = 2 \text{ cof. } d \times \text{fin. } (a+d) - \text{fin. } a\\
&\text{Sin. } (a+3d) = 2 \text{ cof. } d \times \text{fin. } (a+2d) - \text{fin. } (a+d,\\
&\quad \&c.\\
&\text{Sin. } (a+nd) = 2 \text{ cof. } d \times \text{fin. } (a+(n-1)d) - \text{fin. } (a+(n-2)d)\\
&\text{Sin. } (a+(n+1)d) = 2 \text{ cof. } d \times \text{fin. } (a+nd) - \text{fin. } (a+(n-1)d);
\end{aligned}$$

Therefore, if we ſubſtitute

$$S = \text{fin. } a + \text{fin. } (a+d) + \text{fin. } (a+2d), \text{ \&c. } + \text{fin. } (a+nd),$$

by taking the ſum of all the equations, it is evident that

$$S + \text{fin. } (a+(n+1)d) = \text{fin. } a + 2 \text{ cof. } d \times S - \text{fin. } (a-d) - (S - \text{fin. } (a+nd)),$$

which equation, by proper reduction, becomes

$$S = \frac{\text{fin. } a - \text{fin. } (a+(n+1)d) + \text{fin. } (a+nd) - \text{fin. } (a-d)}{2(1 - \text{cof. } d)}.$$

By proceeding in the ſame manner with Theor. VII. viz.

$$\text{cof. } (p+d) = 2 \text{ cof. } d \times \text{cof. } p - \text{cof. } (p-d),$$

and ſubſtituting a, $a+d$, $a+2d$, &c. ſucceſſively for p; alſo putting

$$C = \text{cof. } a + \text{cof. } (a+d) + \text{cof. } (a+2d) +, \text{ \&c. } + \text{cof. } (a+nd),$$

we obtain this other theorem

$$C = \frac{\text{cof. } a - \text{cof. } (a+(n+1)d) + \text{cof. } (a+nd) - \text{cof. } (a-d)}{2(1 - \text{cof. } d)}.$$

361. It is worthy of remark, that if the arch d is contained $n+1$ times, either in the whole circumference, or any number of circumferences, that is, if $(n+1)d = q \times 360^\circ$, where q is any whole number; then $nd = q \times 360^\circ - d$. Thus we have fin. $(a+(n+1)d)$ = fin. $(a+q \times 360^\circ)$ = fin. a, alſo fin. $(a+nd)$ = fin. $(a-d+q \times 360^\circ)$ = fin. $(a-d)$; for the ſine of any arch is equal to the ſine of the ſame arch increaſed by any number of circumferences, and the ſame is true alſo of the coſine of an arch. Hence it appears that in theſe circumſtances the terms in the numerators of the fractions, which are equal to S and C, deſtroy one another, and thus S and C are both = 0; that is, the poſitive ſines, and coſines, are equal to the negative ſines, and coſines, reſpectively. Now if the circumference of a circle be divided into $n+1$ equal parts at the points A, A′, A″, A‴, &c. (fig. 21.), and any diameter BC drawn, then, if the arch BA = a, and the arch AA′ = d, the arches BAA′, BAA′A″, &c. will be equal to $a+d$, $a+2d$, &c. reſpectively; and, ſuppoſing the extremity of the diameter to fall between A and A^{iv}, the arch BA, &c. A^{iv} will be equal to $a+nd$. Hence we derive the following remarkable property of the circle. Let the circumference of a circle be divided into any number of equal parts at the points A, A′, A″, &c.; and from the points of diviſion let the ſines AD, A′D′, A″D″, &c. be drawn upon any diameter BCE; then, the ſum of AD, A′D′, &c. the ſines on one ſide of the diameter ſhall be equal to the ſum of A″D″, A‴D‴, &c. the ſines on the other ſide of the diameter. Alſo, the ſum of CD, C^{iv} D^{iv}, the coſines on the ſide of the centre ſhall be equal to the ſum of C′ D′, C″ D″, &c. the coſines on the other ſide of the centre.

362. Let us next inveſtigate the ſum of the ſquares of the ſines of the arches a, $a+d$, $a+2d$, &c. For this purpoſe we may form a ſeries of equations from the theorem

$$2 \text{ fin.}^2 a = 1 - \text{cof. } 2a.$$

Thus we have

$$\begin{aligned}
&2 \text{ fin.}^2 a = 1 - \text{cof. } 2a\\
&2 \text{ fin.}^2 (a+d) = 1 - \text{cof. } 2(a+d)\\
&2 \text{ fin.}^2 (a+2d) = 1 - \text{cof. } 2(a+2d),\\
&\quad \&c.\\
&2 \text{ fin.}^2 (a+nd) = 1 - \text{cof. } 2(a+nd)
\end{aligned}$$

Arithmetic of Sines.

Let $S' = \text{fin.}^2 a + \text{fin.}^2 (a+d') + \text{fin.}^2 (a+2d') +$, &c. $+ \text{fin.}^2 (a+nd')$,

Then, by addition, and obſerving that cof. $2a$+cof. $2(a+d')+$, &c. $+$cof. $2(a+nd')$ is, by § 363,

$$= \frac{\text{cof. } 2a - \text{cof. } 2(a+(n+1)d') + \text{cof. } 2(a+nd') - \text{cof. } 2(a-d')}{2(1-\text{cof. } 2d')},$$

we have

$$2S' = n - \frac{\text{cof. } 2a - \text{cof. } 2(a+(n+1)d') + \text{cof. } 2(a+nd') - \text{cof. } 2(a-d')}{2(1-\text{cof. } 2d')}.$$

In the ſame manner, by forming a ſeries of equations from this theorem, $2\,\text{cof.}^2 a = 1 + \text{cof. } 2a$, and, putting

$$\text{cof.}^2 a + \text{cof.}^2 (a+d') + \text{cof.}^2 (a+2d') +, \text{ &c. } + \text{cof.}^2 (a+nd'),$$

we find

$$2C' = n + \frac{\text{cof. } 2a - \text{cof. } 2(a+(n+1)d') + \text{cof. } 2(a+nd') - \text{cof. } 2(a-d')}{2(1-\text{cof. } 2d')}.$$

363. If we now ſuppoſe d to be ſuch an arch that $(n+1)d =$ the whole circumference $= 360°$, then cof. $2(a+(n+1)d) = \text{cof. } (2a+2\times 360°) = \text{cof. } 2a$, alſo cof. $2(a+nd') = \text{cof.}(2(a-d')+2\times 360°) = \text{cof. } 2(a-d')$. Thus it appears, that in this particular caſe the numerators of the fractional parts of the values of $2S'$ and $2C'$, are each $= 0$; and hence $2S'$ and $2C'$ are each $= n$. We muſt except, however, the caſe of $n=1$, for then $d=180°$, and cof. $2d' = 1$, ſo that the denominator of each fraction vaniſhing, as well as the numerator, it would be wrong to conclude that the fractions themſelves vaniſh.

Now if the circumference of a circle be divided into $n+1$ equal parts at the points A, A′, A″, &c. (fig. 21.), and any diameter BE, as alſo the ſines AD, A′D′, A″D″, &c. be drawn, then, if the arch $BA = a$, and the arch $AA' = d$, we have, as in § 361, $AD = \text{ſin. } a$, $A'D' = \text{ſin. } (a+d)$, $A''D'' = \text{ſin. } (a+2d)$, &c. and, ſuppoſing the point B to fall between A and A^{iv}, $A^{iv}D^{iv} = \text{ſin.}(a+nd')$. Hence we derive the following very elegant and general theorem relating to the circle.

Let the circumference of a circle be divided into n equal parts (where n is any number greater than 2), at the points A, A′, A″, &c.; and from the points of diviſion let the ſines AD, A′D′, A″D″, &c. be drawn perpendicular to any diameter whatever. Twice the ſum of the ſquares of the ſines AD, A′D′, A″D″, &c. is equal to n times the ſquare of the radius of the circle: Alſo twice the ſum of the ſquares of the coſines CD, CD′, CD″, &c. is equal to n times the ſquare of the radius of the circle.

364. We might now proceed to find the ſum of the cubes of the ſines of the arches a, $a+d$, $a+2d$, &c. from the equation

$$4\,\text{ſin.}^3 a = 3\,\text{ſin. } a - \text{ſin. } 3a,$$

and the ſum of the cubes of the coſines from the equation

$$4\,\text{cof.}^3 a = 3\,\text{cof. } a + \text{cof. } 3a,$$

and thence deduce properties of the circle ſimilar to thoſe which we have found in § 361. and § 363.; but as the manner of proceeding, in the caſe of the cubes and higher powers, differs not at all from that which we have employed in finding the ſum of their ſquares, we ſhall, for the ſake of brevity, leave the powers which exceed the ſquare to exerciſe the ingenuity of the reader.

365. The chords of arches poſſeſs properties in all reſpects analogous to thoſe of their ſines. For, from the nature of the chord of an arch,

$$\tfrac{1}{2}\,\text{chord } a = \text{ſin. } \tfrac{1}{2}a, \text{ and } \tfrac{1}{2}\,\text{chord ſupp. } a = \text{cof. } \tfrac{1}{2}a.$$

Therefore, if in the various theorems which we have inveſtigated, relating to the ſines and coſines of arches, we ſubſtitute half the chord of the arch for the ſine of half the arch, and half the chord of its ſupplement for its coſine, we ſhall have a new claſs of theorems relating to the chords of arches and the chords of their ſupplements.

366. For example, the 9th and 11th theorems, which may alſo be expreſſed thus:

$$2\,\text{ſin. } (n+1)\tfrac{1}{2}a = 2\,\text{cof. } \tfrac{1}{2}a \times 2\,\text{ſin. } n\tfrac{1}{2}a - 2\,\text{ſin. } (n-1)\tfrac{1}{2}a.$$
$$2\,\text{cof. } (n+1)\tfrac{1}{2}a = 2\,\text{cof. } \tfrac{1}{2}a \times 2\,\text{cof. } n\tfrac{1}{2}a - 2\,\text{cof. } (n-1)\tfrac{1}{2}a$$

by making the propoſed ſubſtitutions, are transformed to theſe other two theorems,

$$\text{ch. } (n+1)a = \text{ch. ſup. } a \times \text{ch. } na - \text{ch. } (n-1)a$$
$$\text{ch. ſup. } (n+1)a = \text{ch. ſup. } a \times \text{ch. ſup. } na - \text{ch. ſup. } (n-1)a$$

367. Let $x =$ chord of a, and $y =$ chord of its ſupplement, then, putting 0, 1, 2, 3, &c. ſucceſſively for n, and obſerving that ch. $0\,a = 0$, we obtain from the firſt of theſe theorems the following ſeries of equations:

ch. $a = x$
ch. $2a = xy$
ch. $3a = x(y^2-1)$
ch. $4a = x(y^3-2y)$
ch. $5a = x(y^4-y^2+1)$
ch. $6a = x(y^5-2y^3+2y)$
ch. $7a = x(y^6-5y^4+6y^2-1)$,
&c.

Alſo, obſerving that ch. ſup. $0\,a =$ diam. $= 2$, we find from the ſecond theorem that

ch. ſup. $a = y$
ch. ſup. $2a = y^2-2$
ch. ſup. $3a = y^3-3y$
ch. ſup. $4a = y^4-4y^2+2$
ch. ſup. $5a = y^5-5y^3+5y$
ch. ſup. $6a = y^6-6y^4+9y^2-2$,
&c.

If $4-x^2$, and the powers of that quantity be ſubſtituted for y^2, and its powers, in the chords of $3a$, $5a$, $7a$,

Fig. 1.

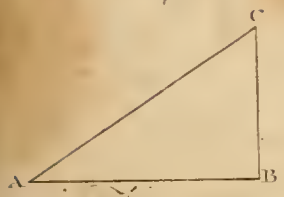


Fig. 2.

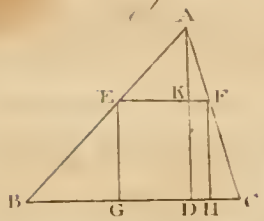


Fig. 3.

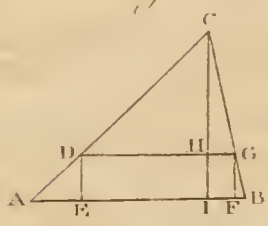


Fig. 4.

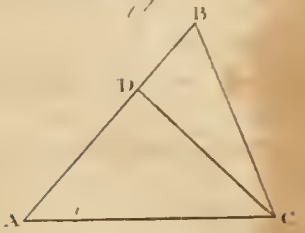


Fig. 5.

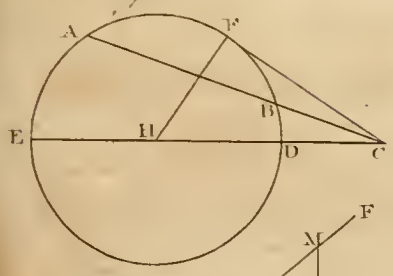


Fig. 6.

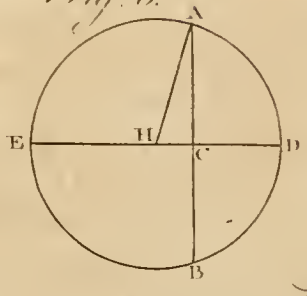


Fig. 7.

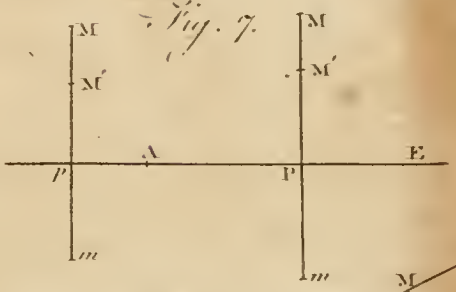


Fig. 8.

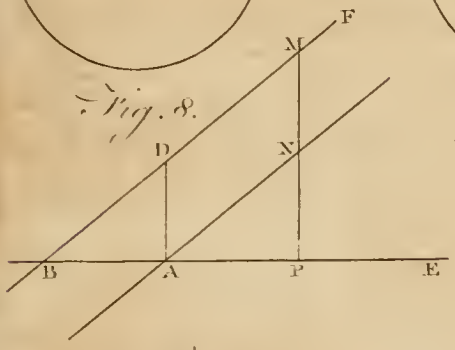


Fig. 9.

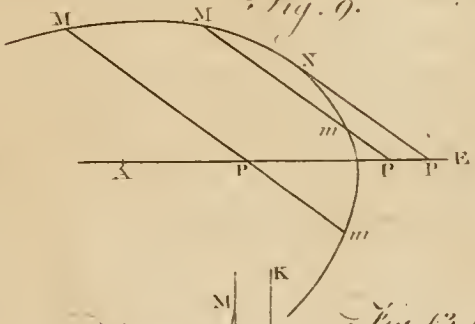


Fig. 10.

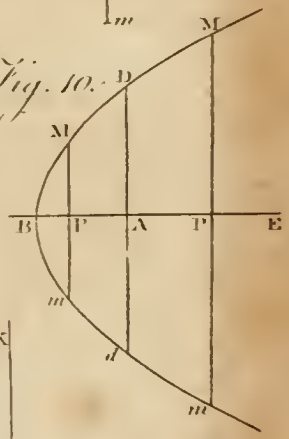
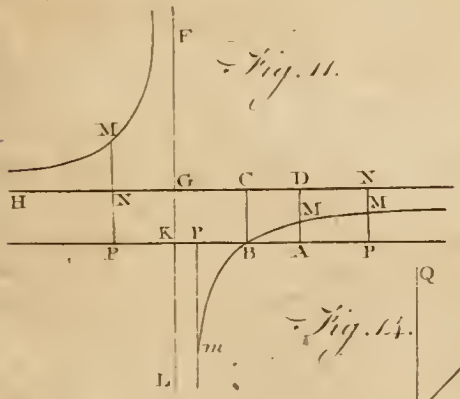


Fig. 11.



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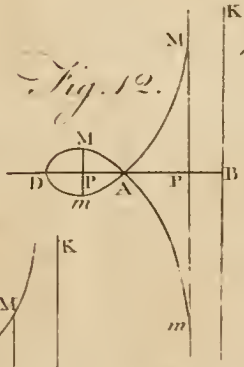


Fig. 13.

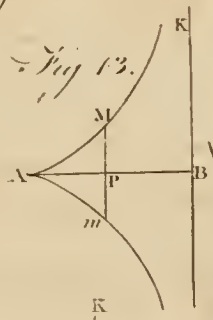
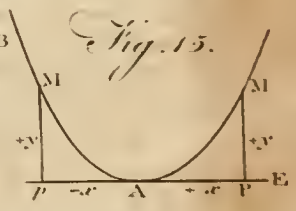


Fig. 15.



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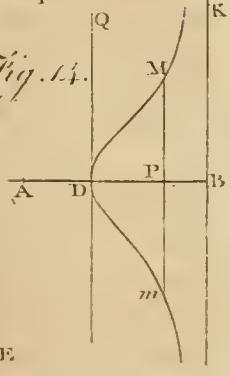


Fig. 16.

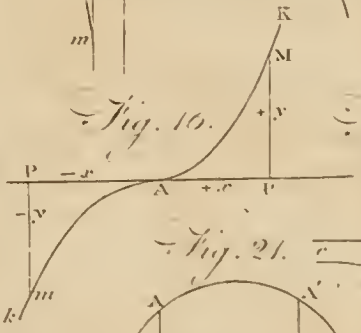


Fig. 17.

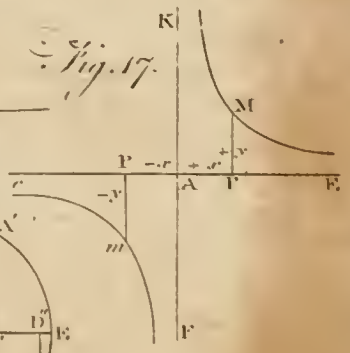


Fig. 18.

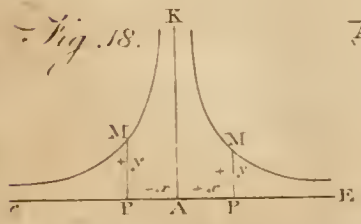


Fig. 21.

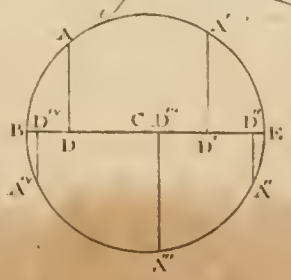


Fig. 19.

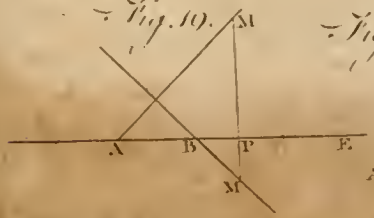
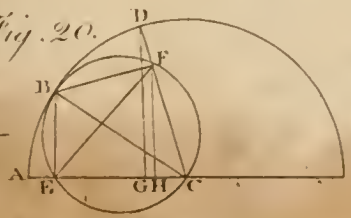


Fig. 20.



Arithmetic of Sines. a, &c. also in the chords of the supplements of $2a$, $3a$, $6a$, &c. we shall obtain the following series of equations, expressing the relations between the chord of any arch, and the chords of the multiples of that arch, if those multiples be odd numbers, or the chords of their supplements, if they be even numbers.

ch. $a = +x$
ch. sup. $2a = -x^2+2$
ch. $3a = -x^3+3x$
ch. sup. $4a = +x^4-4x^2+2$
ch. $5a = +x^5-5x^3+5x$
ch. sup. $6a = -x^6+6x^4-9x^2+2$
ch. $7a = -x^7+7x^5-14x^3+7x$
&c.

These equations are the foundation of the theory of angular sections, or method of dividing a given angle, or arch of a circle, into any proposed number of equal parts; a problem which evidently requires, for its general algebraic solution, the determination of the roots of an equation of a degree equal to the number of parts into which the arch is to be divided. By means of the same series of equations, we may also find the side of any regular polygon inscribed in a circle, and in this case the multiple arch, being equal to the whole circumference, will have its chord = 0.

363. The relation between the tangents of any two arches, and that of their sum, may be readily found by means of the 1st and 3d theorems of this section. For since sin. $(a+b)$=sin. $a \times$ cos. $b+$ cos. $a \times$ sin. b, and cos. $(a+b)$= cos. $a \times$ cos. $b-$sin. $a \times$ sin. b; therefore, dividing the former equation by the latter,

$$\frac{\text{sin. } (a+b)}{\text{cos. } (a+b)} = \frac{\text{sin. } a \times \text{cos. } b + \text{cos. } a \times \text{sin. } b}{\text{cos. } a \times \text{cos. } b - \text{sin. } a \times \text{sin. } b},$$

this equation, by dividing each term in the numerator and denominator of the latter part of it by cos. $a \times$ cos. b, may also be expressed thus: Arithmetic of Sines.

$$\frac{\text{sin. } (a+b)}{\text{cos. } (a+b)} = \frac{\frac{\text{sin. } a}{\text{cos. } a} + \frac{\text{sin. } b}{\text{cos. } b}}{1 - \frac{\text{sin. } a \times \text{sin. } b}{\text{cos. } a \times \text{cos. } b}}$$

But the sine of any arch divided by its cosine is equal to the tangent of that arch, hence the last equation becomes

$$\text{Theor. XIII. tan. } (a+b) = \frac{\text{tan. } a + \text{tan. } b}{1 - \text{tan. } a \times \text{tan. } b}$$

and by supposing the arch b negative, we also find

$$\text{Theor. XIV. tan. } (a-b) = \frac{\text{tan. } a - \text{tan. } b}{1 + \text{tan. } a \times \text{tan. } b}.$$

365. From the first of these two theorems a series of equations may be derived expressing the relations which take place between the tangent of an arch and the tangent of any multiple of that arch. Thus, by assuming $b=a$, $2a$, &c. and putting t for tan. a,

$$\text{tan. } 2a = \frac{2t}{1-t^2}$$

$$\text{tan. } 3a = \frac{3t-t^3}{1-3t^2},$$

&c.

and hence the tangent of an arch being given, the tangent of any part of that arch, as its half, third, &c. may be found by the resolution of an equation.

A L G

Algedo ‖ Algiabarii. ALGEDO, a suppressed gonorrhœa, a name which occurs in old authors. See GONORRHOEA, MEDICINE *Index*.

ALGENEB, a fixed star of the second magnitude, in Perseus's right side. Its longitude is 27° 46′ 12″ of Taurus, and its latitude 32° 50′ 28″ north, according to Mr Flamstead's catalogue.

ALGEZIRA, a town of Andalusia in Spain, with a port on the coast of the straits of Gibraltar. By this city the Moors entered Spain in 713; and it was taken from them in 1344, after a very long siege, remarkable for being the first in which cannon were made use of. It was called *Old Gibraltar*, and is about four leagues from the New. W. Long. 5. 20. N. Lat. 36. 0.

ALGHIER, or ALGERI, a town in Sardinia, with a bishop's see, upon the western coast of the island, between Sasseri and Bosa. Though it is not large, it is well peopled, and has a commodious port. The coral fished for on this coast is in the highest esteem of any in the Mediterranean. W. Long. 4. 2. N. Lat. 36. 0.

ALGIABARII, a Mahometan sect of predestinarians, who attribute all the actions of men, good or evil, to the agency or influence of God. The Algiabarii stand opposed to the ALKADARII. They hold absolute

A L G

decrees and physical promotion. For the justice of God in punishing the evil he has caused, they resolve it wholly into his absolute dominion over the creatures. Algidum, Algiers.

ALGIDUM, a town of Latium, in Italy, between Prenestе and Alba, near the mountains. On the top of one of these mountains was erected a temple of Diana, to which Horace refers, lib. i. ode 21. "*Quæcunque aut gelido prominet Algido*," and lib. iii. ode 23. "*Quæ nivali pascitur Algido*," &c.

ALGIERS, a kingdom of Africa, now one of the states of Barbary.—According to the latest and best computations, it extends 460 miles in length from east to west; but is very unequal in breadth, some places being scarcely 40 miles broad, and others upward of 100. It lies between Long. 0. 16. and 9. 16. W. and extends from Lat. 36. 55. to 44. 50. N.—It is bounded on the north by the Mediterranean, on the east by the river Zaine, the ancient Tusca, which divides it from Tunis; on the west by the Mulvya, and the mountains of Trava, which separate it from Morocco; and on the south by the Sahara, Zaara, or Numidian desert.

The kingdom of Algiers is at present divided into three provinces or districts, viz. the eastern, western, and Division of the kingdom.

Algiers. and ſouthern. The eaſtern or Levantine government, which is by far the moſt conſiderable of the three, and is alſo called *Beylick*, contains the towns of Bona, Conſtantina, Gigeri, Bujeya, Steffa, Tebeſ, Zamoura, Biſcara, and Necanz, in all which the Turks have their garriſons; beſides which, it includes the two ancient kingdoms of Cuco and Labez, though independent of the Algerine government, to whoſe forces their country is inacceſſible; ſo that they ſtill live under their own cheyks choſen by each of their adowars or hordes. To theſe we may add a French factory at Callo, under the direction of the company of the French Baſtion.—The weſtern government hath the towns of Oran, Tremecen, Moſtagan, Tenez, and Secrelly with its caſtle and garriſon.—The ſouthern government hath neither town, village, nor even a houſe, all the inhabitants living in tents, which obliges the dey and his forces to be always encamped.

Inhabitants. The inhabitants along the ſea coaſts are a mixture of different nations; but chiefly Moors and Moreſcos driven out of Catalonia, Arragon, and other parts of Spain. Here are alſo great numbers of Turks, who come from the Levant to ſeek their fortune; as well as multitudes of Jews and Chriſtians taken at ſea, who are brought hither to be ſold for ſlaves. The Berebers are ſome of the moſt ancient inhabitants of the country; and are ſuppoſed to be deſcended from the ancient Sabeans, who came hither from Arabia Felix under the conduct of one of their princes. Others believe them to be ſome of the Canaanites driven out of Paleſtine by Joſhua. Theſe are diſperſed all over Barbary, and divided into a multitude of tribes under their reſpective chiefs: moſt of them inhabit the mountainous parts; ſome range from place to place, and live in tents, or portable huts; others in ſcattered villages: they have nevertheleſs, kept themſelves for the moſt part from intermixing with other nations. The Berebers are reckoned the richeſt of all, go better clothed, and carry on a much larger traffic of cattle, hides, wax, honey, iron, and other commodities. They have alſo ſome artificers in iron, and ſome manufacturers in the weaving branch.—The name of *Bereber* is ſuppoſed to have been originally given them on account of their being firſt ſettled in ſome deſert place. Upon their increaſing in proceſs of time, they divided themſelves into five tribes, probably on account of religious differences, called the *Zinhagians*, *Muſamedins*, *Zeneti*, *Hoares*, and *Gomeres*; and theſe having produced 600 families, ſubdivided themſelves into a great number of petty tribes.—To theſe we may add the *Zwowahs*, by European authors called *Azuagues*, or *Aſſagues*, who are likewiſe diſperſed over moſt parts of Barbary and Numidia. Great numbers of theſe inhabit the mountainous parts of Cuco, Labez, &c. leading a wandering paſtoral life. But the moſt numerous inhabitants are the Moors and Arabians. The former are very ſtout and warlike, and ſkilful horſemen; but ſo addicted to robbing, that one cannot ſafely travel along the country at a diſtance from the towns without a guard, or at leaſt a marahout or ſaint for a ſafeguard. For as they look upon themſelves to be the original proprietors of the country, and not only as diſpoſſeſſed by the reſt of the inhabitants, but reduced by them to the loweſt ſtate of poverty, they make no ſcruple to plunder all they meet by way of repriſal. The inhabitants in general have a pretty fair complexion; they are robuſt and well proportioned. Algiers. People of diſtinction wear their beard; they have rich clothes made of ſilk, embroidered with flowers of gold, and turbans enriched with jewels. The Turks, who compoſe the military force, have great privileges, pay no taxes, are never publicly puniſhed, and rarely in private. The loweſt ſoldier domineers over the moſt diſtinguiſhed Moors at pleaſure. If he finds them better mounted than himſelf, he exchanges horſes without ceremony. The Turks alone have the privilege of carrying fire arms. Many good qualities, however, diſtinguiſh them in ſpite of this exceſs of deſpotiſm. They never game for money, not even for trifles; and they never profane the name of the Deity. They ſoon forget their private quarrels; and after the firſt paroxyſm of reſentment is over, it is infamy for a Turk to keep in remembrance the injuries he has received. In this reſpect certainly they are leſs barbarous than other nations that boaſt of their civilization. See MOORS.

Climate and ſoil. The climate of Algiers is in moſt places ſo temperate, that there is a conſtant verdure; the leaves of the trees being neither parched up by heat in ſummer, nor nipped by the winter's cold. They begin to bud in February; in April the fruit appears in its full bigneſs, and is commonly ripe in May. The ſoil, however, is exceſſively various; ſome places being very hot, dry, and barren, on which account they are generally ſuffered to lie uncultivated by the inhabitants, who are very negligent. Theſe barren places, eſpecially ſuch as lie on the ſouthern ſide, and are at a great diſtance from the ſea, harbour vaſt numbers of wild animals, as lions, tigers, buffaloes, wild boars, ſtags, porcupines, monkeys, oſtriches, &c. On account of their barrenneſs, they have but few towns, and thoſe thinly peopled; though ſome of them are ſo advantageouſly ſituated for trading with Bildulgerid and Negroland, as to drive a conſiderable traffic with them.

Rivers. The moſt conſiderable rivers of Algiers are (1.) the Ziz, which runs acroſs the province of Tremecen and the deſert of Anguid, falling into the Mediterranean near the town of Tabecrita, where it has the name of *Sirut*. (2.) The Haregol, ſuppoſed the *Sign* of Ptolemy, comes down from the great Atlas, croſſes the deſert of Anguid, and falls into the ſea about five leagues from Oran. (3.) The Mina, ſuppoſed the *Chylematis* of Ptolemy, a larger river, which runs through the plains of Bathala, and falls into the ſea near the town of Arzew. This river hath lately received the name of *Cena*, who rebuilt the town of Barthalaw after it had been deſtroyed. (4.) The Shellif, Zilef or Zilif, deſcending from the Mount Guanexeris, runs through ſome great deſerts, the lake Titteri, the frontiers of Tremecen, and Tenez, falling into the ſea a little above the city of Moſtagan. (5.) The Celef, ſuppoſed to be the *Carthena* of the ancients, falls into the ſea about three leagues weſt of Algiers, after a ſhort courſe of 18 or 20 leagues. (6.) The Hued-alquivir, ſuppoſed to be the *Nalobata* or *Naſaba* of the ancients, and called by the Europeans *Zinganir*, runs down with a ſwift courſe through ſome high mountains of Cuco, and falls into the ſea near Bujeyah. Whilſt the city of Bujeyah was in the hands of the Chriſtians, the mouth of this river was ſo choaked up with ſand, that no veſſel could come up into it: but in 1555, Harbour of Bujeyah cleared by accident.

Algiers. 1555, very ſoon after it was taken by the Moors, the great rains ſwelled it to ſuch a degree, that all the ſand and mud was carried off; ſo that galleys and other veſſels have ever ſince entered it with eaſe, where they lie ſafe from ſtorms, and all winds but that which blows from the north. (7.) Suf-Gemar, or Suf-Gimmar al Rumniel, ſuppoſed to be the *Ampſaga* of Ptolemy, hath its ſource in Mount Auras, on the confines of Atlas; thence runs through ſome barren plains, and the fruitful ones of Conſtantina, where its ſtream is greatly increaſed by ſome other rivers it receives; from thence running northward, along the ridges of ſome high mountains, it falls into the ſea a little eaſt of Gigeri. (8.) The Ladag or Ludeg, runs down from Mount Atlas through a part of Conſtantina, and falls into the ſea a little eaſtward of Bona. (9.) Guadi, or Guadel Barbar, ſprings from the head of Orbus, or Urbs, in Tripoli, runs through Bujeyah, and falls into the ſea near Tabarea.

The Algerine kingdom made formerly a conſiderable part of the Mauritania Tingitana (ſee MAURITANIA), which was reduced to a Roman province by Julius Cæſar, and from him alſo called *Mauritania Cæſarienſis*.—In the general account of Africa, it has been noticed, that the Romans were driven out of that continent by the Vandals; theſe by Beliſarius, the Greek emperor Juſtinian's general; and the Greeks in their turn by the Saracens. This laſt revolution happened about the middle of the ſeventh century; and the Arabs continued maſters of the country, dividing into a great number of petty kingdoms or ſtates, under chiefs of their own chooſing, till the year 1051.

Abu-Texefien ſubdues the Arab princes. This year, one Abubeker-ben-Omar, or, as the Spaniſh authors call him, *Abu Texefien*, an Arab of the Zinhagian tribe, being provoked at the tyranny of thoſe deſpots, gathered, by the help of his marabouts or ſaints, a moſt powerful army of malcontents, in the ſouthern provinces of Numidia and Libya. His followers were nicknamed *Marabites* or *Morabites*; by the Spaniards *Almoravides*; probably from their being aſſembled principally by the ſaints who were alſo called *Morabites*. The caliph of Kayem's forces were at this time taken up with quelling other revolts in Syria, Meſopotamia, &c. and the Arabs in Spain engaged in the moſt bloody wars; ſo that Texefien having nothing to fear from them, had all the ſucceſs he could wiſh againſt the Arabian cheyks or petty tyrants, whom he defeated in many battles, and at laſt drove them not only out of Numidia and Libya, but out of all the weſtern parts, reducing the whole province of Tingitania under his dominion.

Texefien was ſucceeded by his ſon Yuſef, or Joſeph, a brave and warlike prince. In the beginning of his reign, he laid the foundation of the city of Morocco, which he deſigned to make the capital of his empire. While that city was building, he ſent ſome of his marabouts ambaſſadors to Tremecen (now a province of Algiers), at that time inhabited by a powerful and inſolent ſect of Mahometans called *Zeneti*. The deſign of this embaſſy was to bring them back to what he called the *true faith*; but the Zeneti, deſpiſing his offers, aſſembled at Amaf, or Amfa, their capital, murdered the ambaſſadors, and invaded Joſeph's dominions with an army of 50,000 men.

Zeneti deſtroyed. The king hearing of their infamous proceedings, ſpeedily muſtered his army, and led it by long marches into their country, deſtroying all with fire and ſword; while the Zeneti, inſtead of oppoſing his progreſs, retired as faſt as poſſible towards Fez, in hopes of receiving aſſiſtance from thence. In this they were miſerably deceived: the Fezzans marched out againſt them in a hoſtile manner, and coming up with the unhappy Zeneti, encumbered with their families and baggage, and ready to expire with hunger and wearineſs, they cut them all to pieces, except a ſmall number who were moſtly drowned in attempting to ſwim acroſs a river, and ſome others who in their flight periſhed by falling from the high adjacent rocks. In the mean time Joſeph reduced their country to a mere deſert: which was, however, ſoon peopled by a numerous colony of Fezzans, who ſettled there under the protection of the reigning kings. In this war it is computed that near a million of the Zeneti, men, women, and children, loſt their lives.

Algiers.

The reſtleſs and ambitious temper of Joſeph did not let him remain long at peace. He quickly declared war againſt the Fezzans, reduced them to become his tributaries, and extended his conqueſts all along the Mediterranean. He next attacked ſome Arabian cheyks who had not yet ſubmitted to his juriſdiction; and purſued them with ſuch fury, that neither the Libyan deſerts, nor ridges of the moſt craggy rocks, could ſhelter them from his arms. He attacked them in ſuch of their retreats, caſtles, and fortreſſes, as were till then deemed impregnable; and at laſt ſubdued them, to the great grief of the other African nations, who were greatly annoyed by the ravages committed by his numerous forces.

Thus was founded the empire of the Morabites; which, however, was of no long duration; that race being in the 12th century driven out by Mohavedin, a marabout. This race of prieſts was expelled by Abdulac governor of Fez; and he, in the 13th century, ſhipped of his new conqueſts by the ſharifs of *Haſcen*, the deſcendants of thoſe Arabian princes whom Abu-Texefien had formerly expelled.

Shariffs of Haſcen, who.

The better to ſecure their new dominions, the ſharifs divided them into ſeveral little kingdoms or provinces; and among the reſt the preſent kingdom of Algiers was divided into four, namely, *Tremecen*, *Tenez*, *Algiers Proper*, and *Bujeyah*. The four firſt monarchs laid ſo good a foundation for a laſting balance of power between their little kingdoms, that they continued for ſome centuries in mutual peace and amity; but at length the king of Tremecen having ventured to violate ſome of their articles, Abul-Farez, king of Tenez, declared war againſt him, and obliged him to become his tributary. This king dying ſoon after, and having divided his kingdom among his three ſons, new diſcords aroſe; which Spain taking advantage of, a powerful fleet and army was ſent againſt Barbary, under the count of Navarre, in 1505. This commander ſoon made himſelf maſter of the important cities of Oran, Bujeyah, and ſome others; which ſo alarmed the Algerines, that they put themſelves under the protection of Selim Eutemi, a noble and warlike Arabian prince. He came to their aſſiſtance with a great number of his braveſt ſubjects, bringing with him his wife Zaphira, and a ſon then about 12 years old. This, however, was not ſufficient to prevent the Spaniards

Algerines in danger from the Spaniards.

Algiers.

niards from landing a number of forces near Algiers that ſame year, and obliging that metropolis to become tributary to Spain. Nor could Prince Selim hinder them from building a ſtrong fort on a ſmall iſland oppoſite to the city, which terrified their corſairs from ſailing either in or out of the harbour.

Invite Barbaroſſa.

To this galling yoke the Algerines were obliged to ſubmit till the year 1516; when, hearing of the death of Ferdinand king of Spain, they ſent an embaſſy to *Aruch Barbaroſſa*, who was at this time no leſs dreaded for his valour than his ſurpriſing ſucceſs, and was then ſent on a cruiſe with a ſquadron of galleys and barks. The purport of the embaſſy was, that he ſhould come and free them from the Spaniſh yoke; for which they agreed to pay him a gratuity anſwerable to ſo great a ſervice. Upon this Barbaroſſa immediately deſpatched 18 galleys and 30 barks to the aſſiſtance of the Algerines: while he himſelf advanced towards the city with 800 Turks, 3000 Jigelites, and 2000 Mooriſh volunteers. Inſtead of taking the neareſt road to Algiers, he directed his courſe towards *Sharſhel*, where *Haſſan*, another famed corſair, had ſettled himſelf. Him he ſurpriſed, and obliged to ſurrender; not without a previous promiſe of friendſhip: but no ſooner had Barbaroſſa got him in his power, than he cut off his head; and obliged all Haſſan's Turks to follow him in his new expedition.

His treachery and cruelty.

On Barbaroſſa's approach to Algiers, he was met by Prince Eutemi, attended by all the people of that metropolis, great and ſmall; who looked for deliverance from this abandoned villain, whom they accounted invincible. He was conducted into the city amidſt the acclamations of the people, and lodged in one of the nobleſt apartments of Prince Eutemi's palace, where he was treated with the greateſt marks of diſtinction. Elated beyond meaſure with this kind reception, Barbaroſſa formed a deſign of becoming king of Algiers; and fearing ſome oppoſition from the inhabitants, on account of the exceſſes he ſuffered his ſoldiers to commit, murdered Prince Eutemi, and cauſed himſelf to be proclaimed king; his Turks and Moors crying out as he rode along the ſtreets, "Long live King Aruch Barbaroſſa, the invincible king of Algiers, *the choſen of God* to deliver the people from the oppreſſion of the Chriſtians; and deſtruction to all that ſhall oppoſe, or refuſe to own him as their lawful ſovereign." Theſe laſt threatening words ſo intimidated the inhabitants, already apprehenſive of a general maſſacre, that he was immediately acknowledged king. The unhappy princeſs Zaphira, it is ſaid, poiſoned herſelf, to avoid the brutality of this new king, whom ſhe unſucceſsfully endeavoured to ſtab with a dagger.

Barbaroſſa was no ſooner ſeated on the throne, than he treated his ſubjects with ſuch cruelty, that they uſed to ſhut up their houſes and hide themſelves when he appeared in public. In conſequence of this, a plot was ſoon formed againſt him; but being diſcovered, he cauſed twenty of the principal conſpirators to be beheaded, their bodies to be buried in a dunghill, and laid a heavy fine on thoſe who ſurvived. This ſo terriſied the Algerines, that they never afterwards durſt attempt any thing againſt either Barbaroſſa or his ſucceſſors.

In the mean time, the ſon of Prince Eutemi having fled to Oran, and put himſelf under the protection of the marquis of Gomarez, laid before that nobleman a plan for putting the city of Algiers into the hands of the king of Spain. Upon this, young Selim Eutemi was ſent to Spain, to lay his plan before Cardinal Ximenes; who having approved of it, ſent a fleet with 10,000 land forces, under the command of *Don Franciſco*, or, as others call him, *Don Diego de Vera*, to drive out the Turks, and reſtore the young prince. But the fleet was no ſooner come within ſight of land, than it was diſperſed by a ſtorm, and the greateſt part of the ſhips daſhed againſt the rocks. Moſt of the Spaniards were drowned; and the few who eſcaped to ſhore were either killed by the Turks or made ſlaves. Algiers.

Though Barbaroſſa had nothing to boaſt on this occaſion, his pride and inſolence were now ſwelled to ſuch a degree, that he imagined himſelf invincible, and that the very elements conſpired to make him ſo. The Arabians were ſo much alarmed at his ſucceſs, that they implored the aſſiſtance of Hamid el Abdes king of Tenez, to drive the Turks out of Algiers. That prince readily undertook to do what was in his power for this purpoſe, provided they agreed to ſettle the kingdom on himſelf and his deſcendants. This propoſal being accepted, he immediately ſet out at the head of 10,000 Moors; and, upon his entering the Algerine dominions, was joined by all the Arabians in the country. Barbaroſſa engaged him, with only 1000 Turkiſh muſqueteers and 500 Granada Moors; totally defeated his numerous army; purſued him to the very gates of his capital, which he eaſily made himſelf maſter of; and having given it up to be plundered by the Turks, obliged the inhabitants to acknowledge him as their ſovereign. This victory, however, was chiefly owing to the advantage which his troops had from their fire-arms; the enemy having no other weapons than arrows and javelins.

No ſooner was Barbaroſſa become maſter of the kingdom of Tenez, than he received an embaſſy from the inhabitants of Tremecen; inviting him to come to their aſſiſtance againſt their then reigning prince, with whom they were diſſatisfied on account of his having dethroned his nephew, and forced him to fly to Oran; offering him even the ſovereignty, in caſe he accepted of their propoſal. The king of Tremecen, not ſuſpecting the treachery of his ſubjects, met the tyrant with an army of 6000 horſe and 3000 foot: but Barbaroſſa's artillery gave him ſuch an advantage, that the king was at length forced to retire into the capital; which he had no ſooner entered, than his head was cut off, and ſent to Barbaroſſa, with a freſh invitation to come and take poſſeſſion of the kingdom. On his approach, he was met with by the inhabitants, whom he received with complaiſance, and many fair promiſes; but beginning to tyrannize as uſual, his new ſubjects ſoon convinced him that they were not ſo paſſive as the inhabitants of Algiers. Apprehending, therefore, that his reign might prove uneaſy and precarious, he entered into an alliance with the king of Fez; after which, he took care to ſecure the reſt of the cities in his new kingdom, by garriſoning them with his own troops. Some of theſe, however, revolted ſoon after; upon which he ſent one of his corſairs, named *Eſcander*, a man no leſs cruel than himſelf, to reduce them. The Tremecenians now began to repent

Algiers. pent in good earneſt of their having invited ſuch a tyrant to their aſſiſtance; and held conſultations on the moſt proper means of driving him away, and bringing back their lawful prince *Abuchen Men;* but their cabals being diſcovered, a great number of the conſpirators were maſſacred in the moſt cruel manner. The prince had the good luck to eſcape to Oran, and was taken under the protection of the marquis of Gomarez, who ſent immediate advice of it to Charles V. then lately arrived in Spain, with a powerful fleet and army. That monarch immediately ordered the young king a ſuccour of 10,000 men, under the command of the governor of Oran; who, under the guidance of Abuchen Men, began his march towards Tremecen; and in their way they were joined by Prince Selim, with a great number of Arabs and Moors. The firſt thing they reſolved upon was, to attack the important fortreſs of *Calau*, ſituated between Tremecen and Algiers, and commanded by the corſair Eſcander at the head of about 300 Turks. They inveſted it cloſely on all ſides, in hopes Barbaroſſa would come out of Tremecen to its relief, which would give the Tremecenians an opportunity of keeping him out. That tyrant, however, kept cloſe in his capital, being embarraſſed by his fears of a revolt, and the politic delays of the king of Fez, who had not ſent the auxiliaries he promiſed. The garriſon of Calau, in the meantime, made a brave defence; and, in a ſally they made at night, cut off near 300 Spaniards. This encouraged them to venture a ſecond time; but they were now repulſed with great loſs, and Eſcander himſelf wounded: ſoon after which, they ſurrendered upon honourable terms; but were all maſſacred by the Arabians, except 16, who clung cloſe to the ſtirrups of the king and of the Spaniſh general.

Barbaroſſa being now informed that Abuchen Men, with his Arabs, accompanied by the Spaniards, were in full march to lay ſiege to Tremecen, thought proper to come out, at the head of 1500 Turks and 5000 Mooriſh horſe, in order to break his way through the enemy; but he had not proceeded far from the city, before his council adviſed him to return and fortify himſelf in it. This advice was now too late; the inhabitants being reſolved to keep him out, and open their gates to their own lawful prince as ſoon as he appeared. In this diſtreſs Barbaroſſa ſaw no way left but to retire to the citadel, and there to defend himſelf till he could find an opportunity of ſtealing out with his men and all his treaſure. Here he defended himſelf vigorouſly; but his proviſions failing him, he took advantage of a ſubterraneous back way, which he had cauſed to be digged up for that purpoſe; and, taking his immenſe treaſure with him, ſtole away as ſecretly as he could. His flight, however, was ſoon diſcovered; and he was ſo cloſely purſued, that to amuſe, as he hoped, the enemy, he cauſed a great deal of his money, plate, jewels, &c. to be ſcattered all the way, thinking they would not fail to ſtop their purſuit to gather it up. This ſtratagem, however, failed, through the vigilance of the Spaniſh commander, who being himſelf at the head of the purſuers, obliged them to march on, till he was come up cloſe to him on the banks of the *Huexda*, about eight leagues from Tremecen. Barbaroſſa had juſt croſſed the river, with his vanguard, when the Spaniards came up with his rear on the other ſide, and cut them all off; and then croſſing the water, overtook him at a ſmall diſtance from it. Here a bloody engagement enſued, in which the Turks fought like as many lions; but, but being at length overpowered by numbers, they were all cut to pieces, and Barbaroſſa among the reſt, in the 44th year of his age, and four years after he had raiſed himſelf to the royal title of *Jigel* and the adjacent country; two years after he had acquired the ſovereignty of Algiers, and ſcarce a twelvemonth after the reduction of Tremecen. His head was carried to Tremecen on the point of a ſpear; and Abuchen Men proclaimed king, to the joy of all the inhabitants. A few days after the fight, the king of Fez made his appearance at the head of 20,000 horſe, near the field of battle; but hearing of Barbaroſſa's defeat and death, marched off with all poſſible ſpeed, to avoid being attacked by the enemy. Algiers. Barbaroſſa defeated and killed by the Spaniards.

The news of Barbaroſſa's death ſpread the utmoſt conſternation among the Turks at Algiers: however, they cauſed his brother Hayradin to be immediately proclaimed king. The Spaniſh commander now ſent back the emperor's forces, without making any attempt upon Algiers; by which he loſt the opportunity of driving the Turks out of that country; while Hayradin, juſtly dreading the conſequences of the tyranny of his officers, ſought the protection of the Grand Signior. This was readily granted, and himſelf appointed baſhaw or viceroy of Algiers; by which means he received ſuch conſiderable reinforcements, that the unhappy Algerines durſt not make the leaſt complaint; and ſuch numbers of Turks reſorted to him, that he was not only capable of keeping the Moors and Arabs in ſubjection at home, but of annoying the Chriſtians at ſea. His firſt ſtep was to take the Spaniſh fort above mentioned, which was a great nuiſance to his metropolis. The Spaniards held out to the laſt extremity; but being all ſlain or wounded, Hayradin eaſily became maſter of the place. Succeeded by Hayradin. He takes the Spaniſh fort.

Hayradin next ſet about building a ſtrong mole for the ſafety of his ſhips. In this he employed 30,000 Chriſtian ſlaves, whom he obliged to work without intermiſſion for three years; in which time the work was completed. He then cauſed the fort he had taken from the Spaniards to be repaired, and placed a ſtrong garriſon in it, to prevent any foreign veſſels from entering the harbour without giving an account of themſelves. By theſe two important works, Hayradin ſoon became dreaded not only by the Arabs and Moors, but alſo by the maritime Chriſtian powers, eſpecially the Spaniards. The viceroy failed not to acquaint the Grand Signior with his ſucceſs, and obtained from him a freſh ſupply of money, by which he was enabled to build a ſtronger fort, and to erect batteries on all places that might favour the landing of an enemy. All theſe have ſince received greater improvements from time to time, as often as there was occaſion for them.

In the mean time the ſultan, either out of a ſenſe of the great ſervices Hayradin had done, or perhaps out of jealouſy leſt he ſhould make himſelf independent, raiſed Hayradin to the dignity of baſhaw of the empire, and appointed Haſſan Aga, a Sardinian renegado, an intrepid warrior, and an experienced officer, to ſucceed him as baſhaw of Algiers. Haſſan had no ſooner taken poſſeſſion of his new government, than he began to purſue his ravages on the Spaniſh coaſt with greater Succeeded by Haſſan Aga.

Algiers.

Charles V.'s expedition againſt Algiers.

greater fury than ever; extending them to the eccleſiaſtical ſtate, and other parts of Italy. But Pope Paul III. being alarmed at this, exhorted the emperor Charles V. to ſend a powerful fleet to ſuppreſs thoſe frequent and cruel piracies; and, that nothing might be wanting to render the enterpriſe ſucceſsful, a bull was publiſhed by his holineſs, wherein a plenary abſolution of ſins, and the crown of martyrdom, was promiſed to all thoſe who either fell in battle or were made ſlaves; the emperor on his part needed no ſpur; and therefore ſet ſail at the head of a powerful fleet conſiſting of 120 ſhips and 20 galleys, having on board 30,000 choſen troops, and an immenſe quantity of money, arms, ammunition, &c. In this expedition many young nobility and gentry attended as volunteers, and among theſe many knights of Malta, ſo remarkable for their valour againſt the enemies of Chriſtianity. Even ladies of birth and character attended Charles in his expedition, and the wives and daughters of the officers and ſoldiers followed them with a deſign to ſettle in Barbary after the conqueſt was finiſhed. All theſe meeting with a favourable wind, ſoon appeared before Algiers; every ſhip diſplaying the Spaniſh colours on the ſtern, and another at the head, with a crucifix to ſerve them for a pilot.

Algiers in great conſternation.

By this prodigious armament, the Algerines were thrown into the utmoſt conſternation. The city was ſurrounded only by a wall with ſcarce any outworks. The whole garriſon conſiſted of 800 Turks and 6000 Moors, without fire-arms, and poorly diſciplined and accoutred; the reſt of their forces being diſperſed in the other provinces of the kingdom, to levy the uſual tribute on the Arabs and Moors. The Spaniards landed without oppoſition, and immediately built a fort, under the cannon of which they encamped, and diverted the courſe of a ſpring which ſupplied the city with water. Being now reduced to the utmoſt diſtreſs, Haſſan received a ſummons to ſurrender at diſcretion, on pain of being put to the ſword with all the garriſon. The herald was ordered to extol the vaſt power of the emperor both by ſea and land, and to exhort him to return to the Chriſtian religion. But to this Haſſan only replied, that he muſt be a madman who would pretend to adviſe an enemy, and that the adviſed muſt ſtill act more madly who would take counſel of ſuch an adviſer. He was, however, on the point of ſurrendering the city, when advice was brought him that the forces belonging to the weſtern government were in full march towards the place; upon which it was reſolved to defend it to the utmoſt. Charles, in the mean time, reſolving upon a general aſſault, kept a conſtant firing upon the town; which, from the weak defence made by the garriſon, he looked upon as already in his hands. But while the *dowan*, or Algerine ſenate,

Prevented by a mad prophet from ſurrendering

were deliberating on the moſt proper means of obtaining an honourable capitulation, a mad prophet, attended by a multitude of people, entered the aſſembly, and foretold the ſpeedy deſtruction of the Spaniards before the end of the moon, exhorting the inhabitants to hold out till that time. This prediction was ſoon accompliſhed in a very ſurpriſing and unexpected manner: for, on the 28th of October 1541, a dreadful ſtorm of wind, rain, and hail, aroſe from the north, accompanied with violent ſhocks of earthquakes, and a diſmal and univerſal darkneſs both by ſea and land; ſo that the ſun, moon, and elements, ſeemed to combine together for the deſtruction of the Spaniards. In that one night, ſome ſay in leſs than half an hour, 86 ſhips and 15 galleys were deſtroyed, with all their crews and military ſtores; by which the army on ſhore was deprived of all means of ſubſiſting in theſe parts. Their camp alſo, which ſpread itſelf along the plain under the fort, was laid quite under water by the torrents which deſcended from the neighbouring hills. Many of the troops, by trying to remove into ſome better ſituation, were cut in pieces by the Moors and Arabs; while ſeveral galleys and other veſſels, endeavouring to gain ſome neighbouring creeks along the coaſts, were immediately plundered, and their crews maſſacred, by the inhabitants.

Algiers.

Spaniſh fleet deſtroyed by ſtorm.

The next morning Charles beheld the ſea covered with the fragments of ſo many ſhips, and the bodies of men, horſes, and other creatures, ſwimming on the waves; at which he was ſo diſheartened, that abandoning his tents, artillery, and all his heavy baggage, to the enemy, he marched at the head of his army, though in no ſmall diſorder, towards Cape *Malabux*, in order to reimbark in thoſe few veſſels which had outweathered the ſtorm. But Haſſan, who had cauſed his motions to be watched, allowed him juſt time to get to the ſhore, when he ſallied out and attacked the Spaniards in the midſt of their hurry and confuſion to get into their ſhips, killing great numbers, and bringing away a ſtill greater number of captives; after which he returned in triumph to Algiers, where he celebrated with great rejoicings his happy deliverance from ſuch diſtreſs and danger.

Siege of Algiers raiſed.

Soon after this, the prophet *Yuſef*, who had foretold the deſtruction of the Spaniards, was not only declared the deliverer of his country, but had a conſiderable gratuity decreed him, with the liberty of exerciſing his prophetic function unmoleſted. It was not long, however, before the marabouts, and ſome interpreters of the law, made a ſtrong oppoſition againſt him; remonſtrating to the baſhaw, how ridiculous and ſcandalous it was to their nation, to aſcribe the deliverance of it to a poor fortune-teller, which had been obtained by the fervent prayers of an eminent ſaint of their own profeſſion. But though the baſhaw and his dowan ſeemed, out of policy, to give into this laſt notion, yet the impreſſion which Yuſef's predictions and their late accompliſhment had made upon the minds of the common people, proved too ſtrong to be eradicated; and the ſpirit of divination and conjuring has ſince got into ſuch credit among them, that not only their great ſtateſmen, but their prieſts, marabouts, and ſantoons, have applied themſelves to that ſtudy, and dignified it with the name of *Mahomet's Revelations*.

The mad prophet rewarded.

The unhappy Spaniards had ſcarcely reached their ſhips, when they were attacked by a freſh ſtorm, in which ſeveral more of them periſhed; one ſhip in particular, containing 700 ſoldiers, beſides ſailors, ſunk in the emperor's ſight, without a poſſibility of ſaving a ſingle man. At length, with much labour, they reached the port of *Bujeyah*, at that time poſſeſſed by the Spaniards, whither Haſſan king of Tunis ſoon after repaired, with a ſupply of proviſions for the emperor, who received him graciouſly, with freſh aſſurances of his favour and protection. Here he diſmiſſed the few remains of the Malteſe knights and their forces, who embarked in three ſhattered galleys, and with much difficulty

Freſh calamities of the Spaniards.

Algiers. ficulty and danger reached their own country. Charles himſelf ſtaid no longer than till the 16th of November, when he ſet ſail for Carthagena, and reached it on the 25th of the ſame month. In this unfortunate expedition upwards of 120 ſhips and galleys were loſt, above 300 colonels and other land and ſea officers, 8000 ſoldiers and marines, beſides thoſe deſtroyed by the enemy on the reimbarkation, or drowned in the laſt ſtorm. The number of priſoners was ſo great, that the Algerines ſold ſome of them, by way of contempt, for an onion per head.

Haſſan reduces Tremecen. Haſſan, elated with this victory, in which he had very little ſhare, undertook an expedition againſt the king of Tremecen, who, being now deprived of the aſſiſtance of the Spaniards, was forced to procure a peace, by paying a vaſt ſum of money, and becoming tributary to him. The baſhaw returned to Algiers, laden with riches; and ſoon after died of a fever, in the 66th year of his age.

Bujeyah taken from the Spaniards. From this time the Spaniards were never able to annoy the Algerines in any conſiderable degree. In 1555, they loſt the city of Bujeyah, which was taken by Salha Rais, Haſſan's ſucceſſor; who next year ſet out on a new expedition, which he kept a ſecret, but was ſuſpected to be intended againſt Oran; but he was ſcarcely got four leagues from Algiers, when the plague, which at that time raged violently in the city, broke out in his groin, and carried him off in 24 hours.

Haſſan Corſo choſen baſhaw by the janizaries. Immediately after his death the Algerine ſoldiery choſe a Corſican renegado, Haſſan Corſo, in his room, till they ſhould receive farther orders from the Porte. He did not accept of the baſhawſhip without a good deal of difficulty; but immediately proſecuted the intended expedition againſt Oran, deſpatching a meſſenger to acquaint the Porte with what had happened. They had hardly begun their hoſtilities againſt the place, when orders came from the Porte, expreſsly forbidding Haſſan Corſo to begin the ſiege, or, if he had begun it, enjoining him to raiſe it immediately. This news was received with great grief by the whole fleet and army, as they thought themſelves ſure of ſucceſs, the garriſon being at that time very weak. Nevertheleſs, as they dared not diſobey, the ſiege was immediately raiſed.

Superſeded by Tekelli, who puts him to a cruel death. Corſo had hardly enjoyed his dignity four months, before news came, that eight galleys were bringing a new baſhaw to ſucceed him; one *Tekelli*, a principal Turk of the Grand Signior's court: upon which the Algerines unanimouſly reſolved not to admit him. By the treachery of the Levantine ſoldiers, however, he was admitted at laſt, and the unfortunate Corſo thrown over a wall in which a number of iron hooks were fixed; one of which catching the ribs of his right ſide, he hung three days in the moſt exquiſite torture before he expired.

Tekelli had no ſooner entered upon his new government, than he behaved with ſuch cruelty and rapaciouſneſs, that he was aſſaſſinated even under the dome of a ſaint, by Yuſef Calabres, the favourite renegado of Haſſan Corſo; who for this ſervice was unanimouſly choſen baſhaw, but died of the plague ſix days after his election.

Haſſan reinſtated. Yuſef was ſucceeded by Haſſan the ſon of Hayradin, who had been formerly recalled from his baſhawſhip, when he was ſucceeded by Salha Rais; and now had the good fortune to get himſelf reinſtated in his employment. Immediately on his arrival, he engaged in a war with the Arabs, by whom he was defeated with great loſs. The next year, the Spaniards undertook an expedition againſt Moſtagan, under the command of the count d'Alcandela; but were utterly defeated, the commander himſelf killed, and 12,000 men taken priſoners. This diſaſter was owing to the inconſiderate raſhneſs, or rather madneſs, of the commander; which was ſo great, that, after finding it impoſſible to rally his ſcattered forces, he ruſhed ſword in hand into the thickeſt of the enemy's ranks, at the head of a ſmall number of men, crying out, "St Jago! St Jago! the victory is ours, the enemy is defeated;" ſoon after which he was thrown from his horſe, and trampled to death.

Algiers. Spaniards defeated with great ſlaughter.

Haſſan having had the misfortune to diſoblige his ſubjects by allowing the mountaineers of Cuco to buy ammunition at Algiers, was ſent in irons to Conſtantinople, while the aga of the janizaries, and general of the land forces, ſupplied his place. Haſſan eaſily found means to clear himſelf; but a new baſhaw was appointed, called Achmet; who had no ſooner arrived than he ſent the two deputy baſhaws to Conſtantinople, where their heads were ſtruck off.—Achmet was a man of ſuch inſatiable avarice, that, upon his arrival at Algiers, all ranks of people came in ſhoals to make him preſents; which he the more greedily accepted, as he had bought his dignity by the money he had amaſſed while head gardener to the Sultan. He enjoyed it, however, only four months; and after his death, the ſtate was governed other four months by his lieutenant: when Haſſan was a third time ſent viceroy to Algiers, where he was received with the greateſt demonſtrations of joy.

Haſſan ſent in irons to Conſtantinople.

Reinſtated.

Siege of Marſalquiver. The firſt enterpriſe in which Haſſan engaged, was the ſiege of Marſalquiver, ſituated near the city Oran, which he deſigned to inveſt immediately after. The army employed in this ſiege conſiſted of 26,000 foot and 10,000 horſe, beſides which he had a fleet conſiſting of 32 galleys and galliots, together with three French veſſels laden with biſcuit, oil, and other proviſions. The city was defended by Don Martin de Cordova, brother of the count d'Alcandela, who had been taken priſoner in the battle where that nobleman was killed, but had obtained his liberty from the Algerines with immenſe ſums, and now made a moſt gallant defence againſt the Turks. The city was attacked with the utmoſt fury by ſea and land, ſo that ſeveral breaches were made in the walls. The Turkiſh ſtandards were ſeveral times planted on the walls, and as often diſlodged; but the place muſt have in the end ſubmitted, had not Haſſan been obliged to raiſe the ſiege in haſte, on the news that the famed Genoeſe admiral Doria was approaching with conſiderable ſuccours from Italy. The fleet accordingly arrived ſoon after; but miſſing the Algerine galleys, bore away for Pennon de Velez, where they were ſhamefully repulſed by a handful of Turks who garriſoned that place; which, however, was taken the following year.

Haſſan again recalled. In 1567, Haſſan was again recalled to Conſtantinople, where he died three years after. He was ſucceeded by Mahomet, who gained the love of the Algerines by ſeveral public ſpirited actions. He incorporated the janiſſaries and Levantine Turks together, and by that means put an end to their diſſenſions, which laid

Algiers. laid the foundation of the Algerine independency on the Porte. He likewiſe added ſome conſiderable fortifications to the city and caſtle, which he deſigned to render impregnable. But while he was thus ſtudying the intereſt of Algiers, one John Gaſcon, a bold Spaniſh adventurer, formed a deſign of ſurpriſing the whole piratic navy in the bay, and ſetting them on fire in the night-time, when they lay defenceleſs, and in their firſt ſleep. For this he had not only the permiſſion of King Philip II. but was furniſhed by him with proper veſſels, mariners, and fireworks, for the execution of his plot. With theſe he ſet ſail for Algiers in the moſt proper ſeaſon, viz. the beginning of October, when moſt, if not all the ſhips lay at anchor there, and eaſily ſailed near enough, unſuſpected, to view their manner of riding, in order to catch them unawares, at a time when the greater part of their crews were diſperſed in their quarters. He came accordingly, unperceived by any, to the very mole-gate, and diſperſed his men with their fireworks; but to their great ſurpriſe, they found them ſo ill mixed, that they could not with all their art make them take fire. In the mean time, Gaſcon took it into his head, by way of bravado, to go to the mole gate, and give three loud knocks at it with the pommel of his dagger, and to leave it fixed in the gate by its point, that the Algerines might have cauſe to remember him. This he had the good fortune to do without meeting with any diſturbance or oppoſition: but it was not ſo with his men; for no ſooner did they find their endeavours unſucceſsful, than they made ſuch a buſtle as quickly alarmed the guard poſted on the adjacent baſtion, from which the uproar quickly ſpread itſelf through the whole garriſon. Gaſcon now finding himſelf in the utmoſt danger, ſailed away with all poſſible haſte: but he was purſued, overtaken, and brought back a priſoner to Mahomet; who no ſooner got him into his power, than he immediately cauſed a gibbet of conſiderable height to be erected on the ſpot where Gaſcon had landed, ordering him to be hoiſted up, and hung by the feet to a hook, that he might die in exquiſite torture; and to ſhow his reſentment and contempt of the king his maſter, he ordered his commiſſion to be tied to his toes. He had not, however, hung long in this ſtate, when the captain who took him, accompanied by a number of other corſairs, interceded ſo ſtrongly in his behalf, that he was taken down, and put under the care of ſome Chriſtian ſurgeons; but two days after, ſome Moors reporting that it was the common talk and belief in Spain, that the Algerines durſt not hurt a hair of Gaſcon's head, &c. the unfortunate Spaniard was hoiſted up by a pulley to the top of the execution wall, and let down again upon the hook, which in his fall catched him by the belly, and gave him ſuch a wound, that he expired without a groan.—Thus ended the expedition of John Gaſcon, which has procured him a place among the Spaniſh martyrs; while, on the other hand, the Algerines look upon his diſappointment to have been miraculous, and owing to the efficacious protection of the powerful ſaint *Sidi Outededda*, whoſe prayers had before raiſed ſuch a terrible ſtorm againſt the Spaniſh fleet.

John Gaſcon's bold attempt to fire the Algerine fleet.

His bravado at the city gate.

Is taken and put to death.

Mahomet, being ſoon after recalled, was ſucceeded by the famous renegado Ochali, who reduced the kingdom of Tunis; which, however, remained ſubject to the vicercy of Algiers only till the year 1586, when a baſhaw of Tunis was appointed by the Porte. Algiers.

The kingdom of Algiers continued to be governed, till the beginning of the ſeventeenth century, by viceroys or baſhaws appointed by the Porte; concerning whom we find nothing very remarkable, further than that their avarice and tyranny were intolerable both to the Algerines and the Turks themſelves. At laſt the Turkiſh janizaries and militia becoming powerful enough to ſuppreſs the tyrannic ſway of theſe baſhaws, and the people being almoſt exhauſted by the heavy taxes laid upon them, the former reſolved to depoſe theſe petty tyrants, and ſet up ſome officer of their own at the head of the realm. The better to ſucceed in this attempt, the militia ſent a deputation of ſome of their chief members to the Porte, to complain of the avarice and oppreſſion of theſe baſhaws, who ſunk both the revenue of the ſtate, and the money remitted to it from Conſtantinople, into their own coffers, which ſhould have been employed in keeping up and paying the ſoldiery; by which means they were in continual danger of being overpowered by the Arabians and Moors, who, if ever ſo little aſſiſted by any Chriſtian power, would hardly fail of driving all the Turks out of the kingdom. They repreſented to the Grand Vizier how much more honourable, as well as eaſier and cheaper, it would be for the Grand Signior to permit them to chooſe their own dey, or governor, from among themſelves, whoſe intereſt it would then be to ſee that the revenue of the kingdom was rightly applied in keeping up its forces complete, and in ſupplying all other exigencies of the ſtate, without any further charge or trouble to the Porte than that of allowing them its protection. On their part, they engaged always to acknowledge the Grand Signiors as their ſovereigns, and to pay them their uſual allegiance and tribute, to reſpect their baſhaws, and even to lodge and maintain them and their retinue, in a manner ſuitable to their dignity, at their own charge. The baſhaws, however, were, for the future, to be excluded from aſſiſting at any but general douwans, unleſs invited to it; and from having the liberty of voting in them, unleſs when their advice was aſked, or the intereſt of the Porte was likely to ſuffer by their ſilence. All other concerns, which related to the government of Algiers, were to be wholly left under the direction of the dey and his douwan.

Theſe propoſals having been accepted by the Porte, the deputies returned highly ſatisfied; and having notified their new privileges, the great *douwan* immediately proceeded to the election of a dey from among themſelves. They compiled a new ſet of laws, and made ſeveral regulations for the better ſupport and maintenance of this new form of government, to the obſervation of which they obliged all their ſubjects to ſwear; and the militia, navy, commerce, &c. were all ſettled pretty early on the footing upon which they now are, and which ſhall be afterwards deſcribed; though the ſubſequent altercations that frequently happened between the baſhaws and deys, the one endeavouring to recover their former power, and the other to curtail it, cauſed ſuch frequent complaints and diſcontents at the Ottoman court, as made them frequently repent their compliance. Algerines allowed to chooſe their own deys.

In

Algiers.

In the year 1601, the Spaniards, under the command of Doria the Genoeſe admiral, made another attempt upon Algiers, in which they were more fortunate than uſual, their fleet being only driven back by contrary winds, ſo that they came off without loſs. In 1609, the Moors being expelled from Spain, flocked in great number to Algiers; and as many of them were very able ſailors, they undoubtedly contributed to make the Algerine fleet ſo formidable as it became ſoon after; though it is probable the frequent attempts made on their city would alſo induce them to increaſe their fleet. In 1616, their fleet conſiſted of 40 ſail of ſhips between 200 and 400 tons, their admiral 500 tons. It was divided into two ſquadrons, one of 18 ſail, before the port of Malaga; and the other at the cape of Santa Maria, between Liſbon and Seville; both of which attacked all Chriſtians ſhips, both Engliſh and French, with whom they pretended to be in friendſhip, as well as Spaniards and Portugueſe, with whom they were at war.

Become formidable to the Europeans.

The Algerines were now become very formidable to the European powers. The Spaniards, who were moſt in danger, and leaſt able to cope with them, ſolicited the aſſiſtance of England, the pope, and other ſtates. The French, however, were the firſt who dared to ſhow their reſentment of the perfidious behaviour of theſe miſcreants; and in 1617, M. Beaulieu was ſent againſt them with a fleet of 50 men of war, who defeated their fleet, took two of their veſſels, while their admiral ſunk his own ſhip and crew, rather than fall into his enemies hands.

An Engliſh ſquadron ſent againſt the Algerines.

In 1620, a ſquadron of Engliſh men of war was ſent againſt Algiers, under the conduct of Sir Robert Manſel; but of this expedition we have no other account, than that it returned without doing any thing; and the Algerines, becoming more and more inſolent, openly defied all the European powers, the Dutch only excepted; to whom, in 1625, they ſent a propoſal directed to the prince of Orange, that in caſe they would fit out 20 ſail of ſhips the following year, upon any good ſervice againſt the Spaniards, they would join them with 60 ſail of their own.

The next year, the *Coulolies*, or *Cologlies* (the children of ſuch Turks as had been permitted to marry at Algiers), who were enrolled in the militia, having ſeized on the citadel, had well nigh made themſelves maſters of the city; but were attacked by the Turks and renegadoes, who defeated them with terrible ſlaughter. Many of them were put to death; and their heads thrown in heaps upon the city walls, without the eaſtern gate. Part of the citadel was blown up; and the remaining Coulolis were diſmiſſed from the militia, to which they were not again admitted till long after.

States of Barbary throw off their dependence on the Porte.

In 1623, the Algerines and other ſtates of Barbary threw off their dependence on the Porte altogether, and ſet up for themſelves. What gave occaſion to this was the 25 years truce which Sultan Amurath IV. was obliged to make with the emperor Ferdinand II. to prevent his being overmatched by carrying on a war againſt him and the ſophi of Perſia at the ſame time. As this put a ſtop to the piratical trade of the Algerines, they proceeded as above mentioned; and reſolved, that whoever deſired to be at peace with them, muſt, diſtinctly and ſeparately, apply to their government.—

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No ſooner was this reſolution taken, than the Algerines began to make prizes of ſeveral merchant ſhips belonging to powers at peace with the Porte. Nay, having ſeized a Dutch ſhip and polacre at Scanderoon, they ventured on ſhore; and finding the town abandoned by the Turkiſh aga and inhabitants, they plundered all the magazines and warehouſes, and ſet them on fire.—About this time Louis XIII. undertook to build a fort on their coaſts, inſtead of one formerly built by the Marſilians, and which they had demoliſhed. This, after ſome difficulty, he accompliſhed; and it was called the *Baſtion of France:* but the ſituation being afterwards found inconvenient, the French purchaſed the port of La Calle, and obtained liberty to trade with the Arabians and Moors. The Ottoman court, in the mean time, was ſo much embarraſſed with the Perſian war, that there was no leiſure to check the Algerine piracies. This gave an opportunity to the vizier and other courtiers to compound matters with the Algerines, and to get a ſhare of their prizes, which were very conſiderable. However, for form's ſake, a ſevere reprimand, accompanied with threats, was ſent them; to which they replied, "that theſe depredations deſerved to be indulged to them, ſeeing they were the only bulwark againſt the Chriſtian powers, eſpecially againſt the Spaniards, the ſworn enemies of the Moſſem name; adding, that "if they ſhould pay a punctilious regard to all that could purchaſe peace, or liberty to trade with the Ottoman empire, they would have nothing to do but ſet fire to all their ſhipping, and turn camel-drivers for a livelihood."

Deſperate undertaking of four younger brothers.

In the year 1635, four younger brothers of a good family in France entered into an undertaking ſo deſperate, that perhaps the annals of knight-errantry can ſcarcely furniſh its equal.—This was no leſs than to retort the piracies of the Algerines upon themſelves; and as they indiſcriminately took the ſhips of all nations, ſo were theſe heroes indiſcriminately to take the ſhips belonging to Algiers; and this with a ſmall frigate of ten guns!—In this ridiculous undertaking, 100 volunteers embarked; a Malteſe commiſſion was procured, together with an able maſter, and 36 mariners.—They had the good fortune, on their firſt ſetting out, to take a ſhip laden with wine, on the Spaniſh coaſt: with which they were ſo much elated, that three days after they madly encountered two large Algerine corſairs, one of 20 and the other of 24 guns, both well manned, and commanded by able officers. Theſe two large veſſels having got the ſmall frigate between them, plied her furiouſly with great ſhot, which ſoon took off her mainmaſt: notwithſtanding which, the French made ſo deſperate a reſiſtance, that the pirates were not able to take them, till the noiſe of their fire brought up five more Algerines; when the French veſſel, being almoſt torn to pieces, was boarded and taken. The young knight-errants were puniſhed for their temerity by a dreadful captivity, from which they redeemed themſelves in 1642 at the price of 6000 dollars.

A French admiral carries off the Turkiſh baſhaw.

The Algerines proſecuted their piracies with impunity, to the terror and diſgrace of the Europeans, till the year 1652; when a French fleet being accidentally driven to Algiers, the admiral took it into his head to demand a releaſe of all the captives of his nation, without exception. This being refuſed, the Frenchman without ceremony carried off the Turkiſh vice-

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roy, and his cadi or judge, who had juſt arrived from the Porte, with all their equipage and retinue. The Algerines, by way of reprifal, ſurpriſed the Baſtion of France already mentioned, and carried off the inhabitants to the number of 600, with all their effects; which ſo provoked the admiral, that he ſent them word that he would pay them another viſit the next year with his whole fleet.

The Algerines fit out a formidable fleet.

The Algerines, undiſmayed by the threats of the French admiral, fitted out a fleet of 16 galleys and galliots, excellently manned and equipped, under the command of Admiral Hali Pinchinin.—The chief deſign of this armament was againſt the treaſure of Loretto; which, however, they were prevented by contrary winds from obtaining. On this they made a deſcent on Puglia in the kingdom of Naples; where they ravaged the whole territory of Necotra, carrying off a vaſt number of captives, and among them ſome nuns. From thence ſteering towards Dalmatia, they ſcoured the Adriatic; and loading themſelves with immenſe plunder, left thoſe coaſts in the utmoſt conſternation and reſentment.

which is totally deſtroyed by the Venetians.

At laſt the Venetians, alarmed at ſuch terrible depredations, equipped a fleet of 28 ſail, under the command of Admiral Capello, with expreſs orders to burn, ſink, or take, all the Barbary corſairs he met with, either on the open ſeas, or even in the Grand Signior's harbours, purſuant to a late treaty of peace with the Porte. On the other hand, the captain baſhaw, who had been ſent out with the Turkiſh fleet to chaſe the Florentines and Malteſe cruiſers out of the Archipelago, underſtanding that the Algerine ſquadron was ſo near, ſent expreſs orders to the admiral to come to his aſſiſtance. Pinchinin readily agreed; but having firſt reſolved on a deſcent upon the iſland of Liſſa, or Liſina, belonging to the Venetians, he was overtaken by Capello, from whom he retired to Valona, a ſea port belonging to the Grand Signior, whither the Venetian admiral purſued him; but the Turkiſh government refuſing to eject the pirates according to the articles of the peace between the Ottoman court and Venice, Capello was obliged to content himſelf with watching them for ſome time. Pinchinin was ſoon weary of reſtraint, and ventured out; when an engagement immediately enſued, in which the Algerines were defeated, and five of their veſſels diſabled, with the loſs of 1300 men, Turks, and Chriſtian ſlaves; beſides 1600 galley ſlaves who regained their liberty. Pinchinin, after this defeat, returned to Valona, where he was again watched by Capello; but the latter had not long lain at his old anchorage before he received a letter from the ſenate, deſiring him to make no farther attempt on the pirates at that time, for fear of a rupture with the Porte. This was followed by a letter from the governor of Valona, deſiring him to take care leſt he incurred the ſultan's diſpleaſure by ſuch inſults. The brave Venetian was forced to comply; but reſolving to take ſuch a leave of the Algerines as he thought they deſerved, obſerved how they had reared their tents, and drawn their booty and equipage along the ſhore. He then kept firing among their tents, while ſome well manned galliots and brigantines were ordered among their ſhipping, who attacked them with ſuch bravery, that, without any great loſs, they rowed out their 16 galleys, with all their cannon, ſtores, &c.—In this laſt engagement a ball from one of the Venetian galleys happening to ſtrike a Turkiſh moſque, the whole action was conſidered as an inſult upon the Grand Signior. To conceal this, Capello was ordered to ſink all the Algerine ſhips he had taken, except the admiral; which was to be conducted to Venice, and laid up as a trophy. Capello came off with a ſevere reprimand; but the Venetians were obliged to buy, with 500,000 ducats, a peace from the Porte. The Grand Signior offered to repair the loſs of the Algerines by building ten galleys for them, upon condition that they ſhould continue in his ſervice till the end of the enſuing ſummer; but Pinchinin, who knew how little the Algerines choſe to lie under obligations to him, civilly declined the offer. Algiers

Algiers in the utmoſt confuſion at the news.

In the mean time, the news of this defeat and loſs filled Algiers with the utmoſt grief and confuſion. The whole city was on the point of a general inſurrection, when the baſhaw and douwan iſſued a proclamation, forbidding nor only complaints and outcries, under the ſevereſt penalties; but all perſons whatever to *take their thumbs from within their girdles*, while they were deliberating upon this important point. In the mean time they applied to the Porte for an order that the Venetians ſettled in the Levant ſhould make up their loſs. But with this the Grand Signior refuſed to comply, and left them to repair their loſſes, as well as build new ſhips in the beſt manner they could. It was not long, however, before they had the ſatisfaction to ſee one of their corſairs land, with a freſh ſupply of 600 ſlaves, whom he had brought from the coaſt of Iceland, whither he had been directed by a miſcreant native taken on board a Daniſh ſhip.

They ſet out a new fleet.

Our pirates did not long continue in their weak and defenceleſs ſtate; being able, at the end of two years, to appear at ſea with a fleet of 65 ſail. The admiral Pinchinin equipped four galliots at his own expence: with which, in conjunction with the chiayah, or ſecretary of the baſhaw of Tripoli, he made a ſecond excurſion. This ſmall ſquadron, conſiſting of five galleys and two brigantines, fell in with an Engliſh ſhip of 40 guns; which, however, Pinchinin's captains refuſed to engage; but being afterwards reproached by him for their cowardice, they ſwore to attack the next Chriſtian ſhip which came in their way. This happened to be a Dutch merchantman, of 28 guns, which was deeply laden, and unable to uſe her ſails by reaſon of a calm. Pinchinin immediately ſummoned her to ſurrender; but receiving an ironical anſwer, drew up his ſquadron in form of a half moon, that they might pour all their ſhot at once into their adverſary. This, however, the Dutchman avoided, by means of a breeze of wind which fortunately ſprung up and enabled him to turn his ſhip; upon which the galleys ran foul of each other. Upon this, Pinchinin ran his own galley along ſide of the merchantman, the upper deck of which 70 Algerines immediately took poſſeſſion of, ſome of them cutting the rigging, and others plying the hatches with hand grenadoes: but the Dutchmen having ſecured themſelves in their cloſe quarters, began to fire at the Algerines on board, from two pieces of cannon loaded with ſmall ſhot; by which they were all ſoon killed, or forced to ſubmit. Pinchinin, in the mean time, made ſeveral unſucceſsful attempts to relieve his men, as well as to ſurround the Dutchman with his other galleys; but that ſhip lay ſo deep in the

Five of their galleys defeated by a Dutch merchantman

water,

Algiers.

water, that every ſhot did terrible execution among the pirates; ſo that they were obliged to remove farther off. At laſt the Dutch captain, having ordered his guns to be loaded with cartouches, gave them ſuch a parting volley as killed 200 of them, and ſent the reſt back to Algiers in a moſt diſmal plight.

But though Pinchinin thus returned in diſgrace, the reſt of the fleet quickly came back with vaſt numbers of ſlaves, and an immenſe quantity of rich ſpoils; inſomuch that the Engliſh, French, and Dutch, where obliged to cringe to the mighty Algerines, who ſometimes vouchſafed to be at peace with them, but ſwore eternal war againſt Spain, Portugal, and Italy, whom they looked upon as the greateſt enemies to the Mahometan name. At laſt Louis XIV. provoked by the grievous outrages committed by the Algerines on the coaſt of Provence and Languedoc, ordered, in 1681, a conſiderable fleet to be fitted out againſt them, under the marquis du Queſne, vice-admiral of France. His firſt expedition was againſt a number of Tripolitan corſairs; who had the good fortune to outrow him, and ſhelter themſelves in the iſland of Scio belonging to the Turks. This did not, however, prevent him from purſuing them thither, and making ſuch terrible fire upon them as quickly deſtroyed 14 of their veſſels, beſides battering the walls of the caſtle.

Preparations againſt Algiers by Louis XIV.

Algiers bombarded and ſet on fire by the French.

This ſeverity ſeemed only to be deſigned as a check to the piracies of the Algerines; but, finding they ſtill continued their outrages on the French coaſt, he ſailed to Algiers in Auguſt 1682, cannonading and bombarding it ſo furiouſly, that the whole town was in flames in a very little time. The great moſque was battered down, and moſt of the houſes laid in ruins, inſomuch that the inhabitants were on the point of abandoning the place; when on a ſudden the wind turned about, and obliged du Queſne to return to Toulon. The Algerines immediately made repriſals, by ſending a number of galleys and galliots to the coaſt of Provence, where they committed the moſt dreadful ravages, and brought away a vaſt number of captives: upon which a new armament was ordered to be got ready at Toulon and Marſeilles againſt the next year; and the Algerines, having received timely notice, put themſelves into as good a ſtate of defence as the time would allow.

Algerines commit dreadful ravages in France.

The city again bombarded.

In May 1683, du Queſne with his ſquadron caſt anchor before Algiers; where, being joined by the Marquis d'Affranville at the head of five ſtout veſſels, it was reſolved to bombard the town next day. Accordingly 100 bombs were thrown into it the firſt day, which did terrible execution; while the beſieged made ſome hundred diſcharges of their cannon againſt them without doing any conſiderable damage. The following nights the bombs were again thrown into the city in ſuch numbers, that the dey's palace and other great edifices were almoſt deſtroyed; ſome of their batteries were diſmounted, and ſeveral veſſels ſunk in the port. The dey and Turkiſh baſhaw, as well as the whole ſoldiery, alarmed at this dreadful havock, immediately ſued for peace. As a preliminary, the immediate ſurrender was inſiſted on of all Chriſtian captives who had been taken fighting under the French flag; which being granted, 142 of them were immediately delivered up, with a promiſe of ſending him the remainder as ſoon as they could be got from the different parts of the country. Accordingly Du Queſne ſent his commiſſary-general and one of his engineers into the town; but with expreſs orders to inſiſt upon the delivery of all the French captives without exception, together with the effects they had taken from the French: and that Mezomorto their then admiral, and Hali Rais one of their captains, ſhould be given as hoſtages. Algiers.

This laſt demand having embarraſſed the dey, he aſſembled the douwan, and acquainted them with it; upon which Mezomorto fell into a violent paſſion, and told the aſſembly, that the cowardice of thoſe who ſat at the helm had occaſioned the ruin of Algiers: but that, for his part, he would never conſent to deliver up any thing that had been taken from the French. He immediately acquainted the ſoldiery with what had paſſed; which ſo exaſperated them, that they murdered the dey that very night, and on the morrow choſe Mezomorto in his place. This was no ſooner done, than he cancelled all the articles of peace which had been made, and hoſtilities were renewed with greater fury than ever.

The French admiral now kept pouring in ſuch volleys of bombs, that in leſs than three days the greateſt part of the city was reduced to aſhes; and the fire burnt with ſuch vehemence, that the ſea was enlightened with it for more than two leagues round. Mezomorto, unmoved at all theſe diſaſters, and the vaſt number of the ſlain, whoſe blood ran in rivulets along the ſtreet; or rather, growing furious and deſperate, fought only how to wreak his revenge on the enemy; and, not content with cauſing all the French in the city to be cruelly murdered, ordered their conſul to be tied hand and foot, and faſtened alive to the mouth of a mortar, from whence he was ſhot away againſt their navy.—By this piece of inhumanity Du Queſne was ſo exaſperated, that he did not leave Algiers till he had utterly deſtroyed all their fortifications, ſhipping, almoſt all the lower part, and above two thirds of the upper part of the city, by which means it became little elſe than a heap of ruins. Set on fire and almoſt deſtroyed.

The haughty Algerines were now thoroughly convinced that they were not invincible; and therefore immediately ſent an embaſſy into France, begging in the moſt abject terms for peace; which Louis immediately granted, to their inexpreſſible joy. They now began to pay ſome regard to other nations, and to be a little cautious how they wantonly incurred their diſpleaſure. The firſt bombardment by the French had ſo far humbled the Algerines, that they condeſcended to enter into a treaty with England; which was renewed upon terms very advantageous to the latter in 1686. It is not to be ſuppoſed, however, that the natural perfidy of the Algerines would diſappear on a ſudden: notwithſtanding this treaty, therefore, they loſt no opportunity of making prizes of the Engliſh ſhips when they could conveniently come at them. Upon ſome infringement of this kind, Captain Beach drove aſhore and burnt ſeven of their frigates in 1695; which produced a renewal of the treaty five years after; but it was not till the taking of Gibraltar and Port Mahon, that Britain could have a ſufficient check upon them to enforce the obſervation of treaties; and theſe have ſince proved ſuch reſtraints upon Algiers, that they ſtill continue to pay a greater deference to the Engliſh than to any other European power. Algerines ſue for peace.

Seven of their ſhips burnt by Captain Beach.

The

Algiers.

Expulſion of the Turkiſh baſhaw.

The preſent century furniſhes no very remarkable events with regard to Algiers, except the taking of the famed city of Oran from the Spaniards in 1708 (which however they regained in 1737), and the expulſion of the Turkiſh baſhaw, and uniting his office to that of dey in 1710. This introduced the form of government which ſtill continues in Algiers.

Revenues, &c. of the dey.

The dey is now abſolute monarch; and pays no other revenue to the Porte than that of a certain number of fine boys or youths, and ſome other preſents which are ſent thither yearly. His own income probably riſes and falls according to the opportunities he has of fleecing both natives and foreigners; whence it is variouſly computed by different authors. Dr Shaw computes the taxes of the whole kingdom to bring into the treaſury no more than 300,000 dollars; but ſuppoſes that the eighth part of the prizes, the effects of thoſe perſons who die without children, joined to the yearly contributions raiſed by the government, preſents from foreigners, fines and oppreſſions, may bring in about as much more. Both the dey and officers under him enrich themſelves by the ſame laudable methods of rapine and fraud; which it is no wonder to find the common people practiſing upon one another, and eſpecially upon ſtrangers, ſeeing they themſelves are impoveriſhed by heavy taxes and the injuſtice of thoſe who are in authority.

We have already hinted, that the firſt deys were elected by the militia, who were then called the *douwan* or common council. This elective body was at firſt compoſed of 800 militia officers, without whoſe conſent the dey could do nothing; and upon ſome urgent occaſions all the officers reſiding in Algiers, amounting to above 1500, were ſummoned to aſſiſt. But ſince the deys, who may be compared to the Dutch ſtadtholders, have become more powerful, the douwan is principally compoſed of 30 chiah baſhaws or colonels, with now and then the mufti and cadi upon ſome emergencies; and, on the election of a dey, the whole ſoldiery are allowed to come and give their votes. All the regulations of ſtate ought to be determined by that aſſembly, before they paſs into a law, or the dey hath power to put them in execution: but, for many years back, the douwan has been of ſo little account, that it is only convened out of formality, and to give aſſent to what the dey and his chief favourites have concerted beforehand. The method of gathering the votes in this auguſt aſſembly is perfectly agreeable to the character of thoſe who compoſe it. The aga, or general of the janizaries, or the preſident *pro tempore*, firſt propoſes the queſtion; which is immediately repeated with a loud voice by the chiah baſhaws, and from them echoed again by officers called *baſhaldalas;* from theſe the queſtion is repeated from one member of the douwan to another, with ſtrange contortions, and the moſt hideous growlings, if it is not to their liking. From the loudneſs of this growling noiſe, the aga is left to gueſs as well as he can whether the majority of the aſſembly are pleaſed or diſpleaſed with the queſtion; and from ſuch a prepoſterous method, it is not ſurpriſing that theſe aſſemblies ſhould ſeldom end without ſome tumult or diſorder. As the whole body of the militia is concerned in the election of a new dey, it is ſeldom carried on without blows and bloodſhed: but when once the choice is made, the perſon elected is ſaluted with the words ALLA BARICK, "God bleſs you, and proſper you;" and the new dey uſually cauſes all the officers of the douwan who had oppoſed his election to be ſtrangled, filling up their places with thoſe who had been moſt zealous in promoting it. From this account of the election of the deys, it cannot be expected that their government ſhould be at all ſecure; and as they arrive at the throne by tumult, diſorder, and bloodſhed, they are generally deprived of it by the ſame means, ſcarcely one in ten of them having the good fortune to die a natural death.

Algiers.

Strange method of gathering the votes of the douwan.

In this country it is not to be expected that juſtice will be adminiſtered with any degree of impartiality. The Mahometan ſoldiery, in particular, are ſo much favoured, that they are ſeldom put to death for any crime except rebellion: in which caſe they are either ſtrangled with a bow ſtring or hanged to an iron hook. In leſſer offences, they are fined, or their pay ſtopped; and if officers, they are reduced to the ſtation of common ſoldiers, from whence they may gradually raiſe themſelves to their former dignity. Women guilty of adultery, have a halter tied about their necks, with the other end faſtened to a pole, by which they are held under water till they are ſuffocated. The baſtinado is likewiſe inflicted for ſmall offences; and is given either upon the belly, back, or ſoles of the feet, according to the pleaſure of the cadi; who alſo appoints the number of ſtrokes. Theſe ſometimes amount to 200 or 300, according to the indulgence the offender can obtain either by bribery or friends; and hence he often dies under this puniſhment for want of powerful enough advocates. But the moſt terrible puniſhments are thoſe inflicted upon the Jews or Chriſtians who ſpeak againſt Mahomet or his religion; in which caſe, they muſt either turn Mahometans or be impaled alive. If they afterwards apoſtatize, they are burned or roaſted alive, or elſe thrown down from the top of the city walls upon iron hooks, where they are caught by different parts of their body according as they happen to fall, and ſometimes expire in the greateſt torments; though by accident they may be put out of pain at once, as we have already related of the Spaniſh adventurer John Gaſcon. This terrible puniſhment, however, begins now to be diſuſed.

Puniſhments, &c.

The officer next in power to the dey is the aga of the janizaries, who is one of the eldeſt officers in the army, and holds his poſt only for two months. He is then ſucceeded by the chiah, or next ſenior officer.—During the two months in which the aga enjoys his dignity, the keys of the metropolis are in his hands; all military orders are iſſued out in his name; and the ſentence of the dey upon any offending ſoldier, whether capital or not, can only by executed in the court of his palace.—As ſoon as he has gone through this ſhort office, he is conſidered as *mazoul*, or ſuperannuated; receives his pay regularly, like the reſt of the militia, every two moons; is exempt from all further duties, except when called by the dey to aſſiſt at the grand council, to which he hath, however, a right to come at all times, but hath no longer a vote in it. Next to the aga in dignity is the ſecretary of ſtate, who regiſters all the public acts; and after him are the 30 chiahs or colonels, who ſit next to the aga in the douwan, and in the ſame gallery with him. Out of this claſs are generally choſen thoſe who go ambaſſadors to foreign

Aga of the janizaries and other military officers.

Algiers. reign courts, or who diſperſe the dey's orders throughout the realm. Next to them are 800 bolluck baſhaws or eldeſt captains, who are promoted to that of chiah baſhaws according to their ſeniority. The oldack baſhaws or lieutenants are next; who amount to 400, and are regularly raiſed to the rank of captains in their turn, and to other employments in the ſtate, according to their abilities. Theſe, by way of diſtinction, wear a leather ſtrap, hanging down to the middle of their back. One rule is ſtrictly obſerved in the rotation of theſe troops from one degree to a higher, viz. the right of ſeniority; one ſingle infringement of which would cauſe an inſurrection, and probably coſt the dey his life. Other military officers of note are the vekelards or purveyors of the army; the peys, who are the four oldeſt ſoldiers, and conſequently the neareſt to preferment; the foulacks, who are the next in ſeniority to them, and are part of the dey's body-guard, always marching before him when he takes the field, and diſtinguiſhed by their carabines and gilt ſcimitars, with a braſs gun on their caps; the kayts or Turkiſh ſoldiers, each band of whom has the government of one or more adowars or itinerant villages, and collects their taxes for the dey; and the ſagiards or Turkiſh lancemen, 100 of whom always attend the army, and watch over the water appointed for it. To theſe we may add the beys or governors of the three great provinces of the realm. All the above-mentioned officers ought to compoſe the great douwan or council above mentioned; but only the 30 chiah baſhaws have a right to ſit in the gallery next after the dey; the reſt are obliged to ſtand on the floor of the hall or council chamber, with their arms acroſs, and as much as poſſible without motion; neither are they permitted to enter with their ſwords on, for fear of a tumult. As for thoſe who have any matters to tranſact with the douwan, they muſt ſtand without, let the weather be ever ſo bad; and there they are commonly preſented with coffee by ſome of the inferior officers, till they are diſmiſſed.

Account of the corſairs, commerce, &c. It does not appear that the Algerines avail themſelves of the benefit of their internal reſources to the extent they might do; for their genius leads them too much to the piratical trade to mind any real advantage that might be derived from their own country. The corſairs or pirates form each a ſmall republic, of which the rais or captain is the ſupreme baſhaw; who, with the officers under him, form a kind of douwan, in which every matter relating to the veſſel is decided in an arbitrary way. Theſe corſairs are chiefly inſtrumental in importing whatever commodities are brought into the kingdom either by way of merchandiſe or prizes. Theſe conſiſt chiefly of gold and ſilver ſtuffs, damaſks, cloths, ſpices, tin, iron, plated braſs, lead, quickſilver, cordage, ſail-cloth, bullets, cochineal, linen, tartar, alum, rice, ſugar, ſoap, cotton raw and ſpun, copperas, aloes, brazil and logwood, vermilion, &c. Very few commodities, however, are exported from this part of the world: the oil, wax, hides, pulſe, and corn produced, being but barely ſufficient to ſupply the country; though before the loſs of Oran the merchants have been known to ſhip off from one or other of the ports of Barbary ſeveral thouſand tons of corn. The conſumption of oil, though here in great abundance, is likewiſe ſo conſiderable in this kingdom, that it is ſeldom permitted to be ſhipped Algiers. off for Europe. The other exports conſiſt chiefly in oſtriches feathers, copper, rugs, ſilk ſaſhes, embroidered handkerchiefs, dates, and Chriſtian ſlaves. Some manufactures in ſilk, cotton, wool, leather, &c. are carried on in this country, but moſtly by the Spaniards ſettled here, eſpecially about the metropolis. Carpets are alſo a manufacture of the country; which, though much inferior to thoſe of Turkey both in beauty and fineneſs, are preferred by the people to lie upon on account of their being both cheaper and ſofter. There are alſo at Algiers looms for velvet, taffetas, and other wrought ſilks; and a coarſe ſort of linen is likewiſe made in moſt parts of the kingdom. The country furniſhes no materials for ſhip-building. They have neither ropes, tar, ſails, anchors, nor even iron. When they can procure enough of new wood to form the main timbers of a ſhip, they ſupply the reſt from the materials of prizes which they have made; and thus find the ſecret of producing new and ſwift-ſailing veſſels from the ruins of the old. Of all the ſtates on the coaſt of Barbary, the Algerines are the ſtrongeſt at ſea.

Religion. The religion of the Algerines is chiefly diſtinguiſhed from that of the Turks by a greater variety of ſuperſtitious rites. The Koran is their acknowledged rule of faith and practice; but they are not very ſcrupulous in the obſervance of it. The muſti, or high prieſt; the cadi, or chief judge; and the grand marabout, are the three principal officers who preſide in matters of religion. The cadi attends in the court of juſtice once or twice every day, to hear and determine cauſes; but thoſe of ſuperior importance are ſubmitted to the dey himſelf, or, in his abſence, to one of the principal officers of the regency, who ſits in the gate of the palace for that expreſs purpoſe. Of this cuſtom ſome traces are found in ſacred hiſtory, Deut. xx. 11. 15. xxv. 7.

ALGIERS, a city, the capital of the above kingdom, is probably the ancient *Icoſium*: by the Arabians called *Algezair*, or rather *Al-Jezier*, or *Al-Jezerah*, i. e. *the iſland*, becauſe there was an iſland before the city, to which it has ſince been joined by a mole. It is built on the declivity of a hill by the ſea-ſide, in the form of an amphitheatre: at ſea, it looks like the top-ſail of a ſhip. The tops of the houſes are quite flat and white, and have all the appearance of a bleachfield. One houſe riſes above another in ſuch a manner that they do not hinder each other's proſpect. The ſtreets are ſo narrow, that they will ſcarcely admit two perſons to walk abreaſt, and the middle part is lower than the ſides. When any loaded beaſts, ſuch as camels, horſes, mules, or aſſes, paſs along, you are forced to ſtand up cloſe to the wall to let them paſs by. There is but one broad ſtreet, which runs through the city from eaſt to weſt, in which are the ſhops of the principal merchants, and the market for corn and other commodities. The lower part of the walls of the city is of hewn ſtone, and the upper part of brick; they are 30 feet high on the land ſide, and 40 towards the ſea; the foſſes or ditches are 20 feet broad and ſeven deep. There is no ſweet water in the city; and though there is a tank or ciſtern in every houſe, yet they often want water, becauſe it rains but ſeldom: the chief ſupply is from a ſpring on a hill, the water of which is conveyed

Algiers, Algoa.

conveyed by pipes to above a hundred fountains, at which a bowl is faſtened for the uſe of paſſengers. The common reſervoir is at the end of the mole, where the ſhips take in their water. Every one takes his turn at theſe places, except the Turks, who are firſt, and the Jews laſt. There are five gates, which are open from ſunriſing till ſun-ſetting; and ſeven forts or caſtles without the walls, the greateſt of which is on the mole without the gate, all of which are well ſupplied with great guns. There are 10 large moſques and 50 ſmall ones; three great colleges or public ſchools, and a great number of petty ones for children. The houſes are ſquare, and built of ſtone and brick, with a ſquare court in the middle, and galleries all around. There are ſaid to be about 100,000 inhabitants in the city, comprehending 5000 Jewiſh families, beſides Chriſtians. There are four fundics or public inns, ſuch as are in Turkey; and ſix cazernes, or barracks, for the unmarried Turkiſh ſoldiers, which will hold 600 each. There are no inns for Chriſtians to lodge at; but only a few tippling huts kept by ſlaves, for the accommodation of Greeks and the poorer ſort of travellers, where any thing may be had for money. Here are bagnios or public baths, in the ſame manner as in Turkey, at a very moderate rate. The women have baths of their own, where the men dare not come. Without the city there is a great number of ſepulchres, as alſo cells or chapels, dedicated to marabouts or reputed ſaints, which the women viſit every Friday. The Turkiſh ſoldiers are great tyrants; for they not only turn others out of the way in the ſtreets, but will go to the farmhouſes in the country for 20 days together, living at free quarters, and making uſe of every thing, not excepting the women. The Algerines eat, as in Turkey, ſitting croſs-legged round a table about four inches high, and uſe neither knives nor forks. Before they begin, every one ſays *Be iſme Allah*, "In the name of God." When they have done, a ſlave pours water on all their hands as they ſit, and then they waſh their mouths. Their drink is water, ſherbet, and coffee. Wine is not allowed, though drank immoderately by ſome. The proſpect of the country and ſea from Algiers is very beautiful, it being built on the declivity of a mountain; but the city, though for ſeveral ages it has braved ſome of the greateſt powers in Chriſtendom, it is ſaid, could make but a faint defence againſt a regular ſiege; and that three Engliſh fifty-gun ſhips might batter it about the ears of its inhabitants from the harbour. If ſo, the Spaniards muſt have been very deficient either in courage or conduct. They attacked it in the year 1775, by land and by ſea, but were repulſed with great loſs; though they had near 20,000 foot and 2000 horſe, and 47 king's ſhips of different rates and 346 tranſports. In the years 1783 and 1784, they alſo renewed their attacks by ſea to deſtroy the city and galleys; but after ſpending a quantity of ammunition, bombs, &c. were forced to retire without either its capture or extinction. The mole of the harbour is 500 paces in length, extending from the continent to a ſmall iſland where there is a caſtle and large battery. E. Long. 2. 12. N. Lat. 36. 49.

ALGOA BAY, or *Zwart-hops*, in ſouthern Africa, is ſituated in S. Lat. 33. 56. E. Long. 26. 53. and 500 miles diſtant from the Cape of Good Hope. Mr Barrow, who viſited this place, found, in an adjoining valley, a ſpecies of antelope, called the *riet-bok*, or red-goat, previouſly unknown to naturaliſts. He alſo mentions that great advantages might accrue to the Eaſt India Company from the erection of an eſtabliſhment at this place, for the purpoſe of preparing ſalted beef and fiſh, in conſequence of the ſalt-pans, and the abundance of large bullocks in the vicinity; together with great numbers of excellent fiſh, with which the coaſt abounds.

Algoa || Algorithm

ALGOL, a fixed ſtar of the third magnitude, called *Meduſa's Head*, in the conſtellation Perſeus. Its longitude is 21° 50′ 42″ of Taurus, and its latitude 23° 23′ 47″ north; according to Flamſtead's catalogue. For an account of its changes, period, and other circumſtances, ſee ASTRONOMY *Index*.

ALGONQUINS, a nation in North America, who formerly poſſeſſed great tracts of land along the north ſhore of the river St Lawrence. For a long time they had no rivals as hunters and warriors, and were long in alliance with the Iroquois; whom they agreed to protect from all invaders, and to let them have a ſhare of their veniſon. The Iroquois, on the other hand, were to pay a tribute to their allies, out of the culture of the earth; and to perform for them all the menial duties, ſuch as flaying the game, curing the fleſh, and dreſſing the ſkins. By degrees, however, the Iroquois aſſociated in the hunting matches and warlike expeditions of the Algonquins; ſo that they ſoon began to fancy themſelves as well qualified, either for war or hunting, as their neighbours. One winter a large detachment of both nations having gone out a hunting, and ſecured, as they thought, a vaſt quantity of game, ſix young Algonquins and as many Iroquois were ſent out to begin the ſlaughter. The Algonquins, probably become a little jealous of their aſſociates, upon ſeeing a few elks, deſired the Iroquois to return on pretence that they would have ſufficient employment in flaying the game they ſhould kill; but after three days hunting, having killed none, the Iroquois exulted, and in a day or two privately ſet out to hunt for themſelves. The Algonquins were ſo exaſperated at ſeeing their rivals return laden with game, that they murdered all the hunters in the night time. The Iroquois diſſembled their reſentment; but in order to be revenged, applied themſelves to ſtudy the art of war as practiſed among thoſe ſavage nations. Being afraid of engaging with the Algonquins, at firſt they tried their proweſs on other inferior nations, and, when they thought themſelves ſufficiently expert, attacked the Algonquins with ſuch diabolical fury, as ſhowed they could be ſatisfied with nothing leſs than the extermination of the whole race; which, had it not been for the interpoſition of the French they would have accompliſhed.—The few Algonquin nations, that are now to be ſeen, ſeem entirely ignorant of agriculture, and ſubſiſt by fiſhing and hunting. They allow themſelves a plurality of wives; notwithſtanding which, they daily decreaſe in populouſneſs, few or none of their nations containing above 6000 ſouls, and many of them not 2000. Their language is one of the three radical ones in North America, being underſtood from the river St Lawrence to the Miſſiſſippi.

ALGOR, with phyſicians, an unuſual coldneſs in any part of the body.

ALGORITHM, an Arabic word expreſſive of numerical computation.

ALGUAZIL,

Alguazil
Alhambra.

ALCUAZIL, in the *Spaniſh polity*, an officer whoſe buſineſs it is to ſee the decrees of a judge executed.

ALHAMA, a very pleaſant town of the kingdom of Granada, in Spain, ſituated in the midſt of ſome craggy mountains, about 25 miles S. W. of Granada, on the banks of the Rio Frio, in W. Long. 3. 26. N. Lat. 36. 59. and having the fineſt warm baths in all Spain. It was taken from the Moors in 1481. The inhabitants, though ſurpriſed, and the town without a garriſon, made a gallant defence: but being at length forced to ſubmit, the place was abandoned to the pillage of the Chriſtian ſoldiers, who, not ſatisfied with an immenſe quantity of gold, and jewels, made ſlaves of upwards of 3000 of the inhabitants.

ALHAMBRA, the ancient fortreſs and reſidence of the Mooriſh monarchs of Granada. It derives its name from the red colour of the materials which it was originally built with, Alhambra ſignifying a red houſe. It appears to a traveller a huge heap of as ugly buildings as can well be ſeen, all huddled together, ſeemingly without the leaſt intention of forming *one* habitation out of them. The walls are entirely unornamented, all gravel and pebbles, daubed over with plaſter by a very coarſe hand: yet this is the palace of the Mooriſh kings of Granada, indiſputably the moſt curious place within that exiſts in Spain, perhaps in the world. In many countries may be ſeen excellent modern as well as ancient architecture, both entire and in ruins; but nothing to be met with anywhere elſe can convey an idea of this edifice, except the decorations of an opera, or the tales of the genii.

Paſſing round the corner of the emperor's palace, one is admitted at a plain unornamented door in a corner. On my firſt viſit, ſays Mr Swinburne, I confeſs I was ſtruck with amazement, as I ſtept over the threſhold, to find myſelf on a ſudden tranſported into a ſpecies of fairy land. The firſt place you come to is the court called the *communa* or *del meſucar*, that is the *common baths*; an oblong ſquare, with a deep baſon of clear water in the middle; two flights of marble ſteps leading down to the bottom; on each ſide a parterre of flowers, and a row of orange trees. Round the court runs a periſtyle paved with marble; the arches bear upon very ſlight pillars, in proportions and ſtyle different from all the regular orders of architecture. The ceilings and walls are incruſtated with fretwork in ſtucco, ſo minute and intricate, that the moſt patient draughtſman would find it difficult to follow it, unleſs he made himſelf maſter of the general plan. This would facilitate the operation exceedingly; for all this work is frequently and regularly repeated at certain diſtances, and has been executed by means of ſquare moulds applied ſucceſſively, and the parts joined together with the utmoſt nicety. In every diviſion are Arabic ſentences of different lengths, moſt of them expreſſive of the following meanings: "There is no conqueror but God;" or, "Obedience and honour to our lord Abouabdoulah." The ceilings are gilt or painted; and time has cauſed no diminution in the freſhneſs of their colours, though conſtantly expoſed to the air. The lower part of the walls is moſaic, diſpoſed in fantaſtic knots and feſtoons. A work ſo novel, ſo exquiſitely finiſhed, and ſo different from all that he had ever ſeen, muſt afford a ſtranger the moſt agreeable ſenſations while he treads this magic ground. The porches at the ends are more like grotto-work than any thing elſe to which they can be compared. That on the right hand opens into an octagon vault, under the emperor's palace, and forms a perfect whiſpering gallery, meant to be a communication between the offices of both houſes.

Alhambra

Travels in Spain.

Oppoſite to the door of the communa through which you enter, is another leading into the *quarto de los leones*, or apartment of the lions; which is an oblong court, 100 feet in length and 50 in breadth, environed with a colonnade ſeven feet broad on the ſides and 10 at the end. Two porticoes or cabinets about 15 feet ſquare, project into the court at the two extremities. The ſquare is paved with coloured tiles; the colonnade with white marble. The walls are covered five feet up from the ground with blue and yellow tiles, diſpoſed chequerwiſe. Above and below is a border of ſmall eſcutcheons, enamelled blue and gold, with an Arabic motto on a bend; ſignifying, "No conqueror but God." The columns that ſupport the roof and gallery are of white marble, very ſlender, and fantaſtically adorned. They are nine feet high, including baſe and capital, and eight inches and a half diameter. They are very irregularly placed; ſometimes ſingly, at others in groups of three, but more frequently two together. The width of the horſe-ſhoe arches above them is four feet two inches for the large ones, and three for the ſmaller. The ceiling of the portico is finiſhed in a much finer and more complicated manner than that of the communa, and the ſtucco laid on the walls with inimitable delicacy; in the ceiling it is ſo artfully froſted and handled as to exceed belief. The capitals are of various deſigns, though each deſign is repeated ſeveral times in the circumference of the court, but not the leaſt attention has been paid to placing them regularly or oppoſite to each other. Not the ſmalleſt repreſentation of animal life can be diſcovered amidſt the varieties of foliages, groteſques, and ſtrange ornaments. About each arch is a large ſquare of arabeſques, ſurrounded with a rim of characters, that are generally quotations from the Koran. Over the pillars is another ſquare of delightful filligree work. Higher up is a wooden rim, or kind of cornice, as much enriched with carving as the ſtucco that covers the part underneath. Over this projects a roof of red tiles, the only thing that diſfigures this beautiful ſquare. This ugly covering is a modern addition made by a late prime miniſter, who a few years ago gave the Alhambra a thorough repair. In Mooriſh times, the building was covered with large painted and glazed tiles, of which ſome few are ſtill to be ſeen. In the centre of the court are twelve ill-made lions muzzled, their fore parts ſmooth, their hind parts rough, which bear upon their backs an enormous baſon, out of which a leſſer riſes. While the pipes were kept in good order, a great volume of water was thrown up, that, falling down into the baſons, paſſed through the beaſts, and iſſued out of their mouths into a large reſervoir, where it communicated by channels with the jets d'eau in the apartments. This fountain is of white marble, embelliſhed with many feſtoons and Arabic diſtichs, thus tranſlated:

"Seeſt thou not how the water flows copiouſly like the Nile?"

Alhambra. "This resembles a sea washing over its shores threatening shipwreck to the mariner." Alhambra.

"This water runs abundantly, to give drink to the lions."

"Terrible as the lion is our king in the day of battle."

"The Nile gives glory to the king, and the lofty mountains proclaim it."

"This garden is fertile in delights: God takes care that no noxious animal shall approach it."

"The fair princess that walks in this garden, covered with pearls, augments its beauty so much, that thou may'st doubt whether it be a fountain that flows, or the tears of her admirers."

Passing along the colonnade, and keeping on the south side, you come to a circular room occupied by the men as a place for drinking coffee, &c. A fountain in the middle refreshed the apartment in summer. The form of this hall, the elegance of its cupola, the cheerful distribution of light from above, and the exquisite manner in which the stucco is designed, painted, and finished, exceed all power of description. Every thing in it inspires the most pleasing voluptuous ideas: yet in this sweet retreat they pretend that Abouabdoulah assembled the Abencerrages, and caused their heads to be struck off into the fountain. Continuing your walk round, you are next brought to a couple of rooms at the head of the court, which are supposed to have been tribunals or audience chambers.

Opposite to the *Sala de los Abencerrages* is the entrance into the *Torre de las dos hermanas*, or the tower of the two sisters; so named from two very beautiful pieces of marble laid as flags in the pavement. This gate exceeds all the rest in profusion of ornaments, and in beauty of prospect which it affords through a range of apartments, where a multitude of arches terminate in a large window open to the country. In a gleam of sunshine, the variety of tints and lights thrown upon this enfilade are uncommonly rich. The first hall is the concert-room, where the women sat; the musicians played above in four balconies. In the middle is a jet d'eau. The marble pavement is equal to the finest existing, for the size of the flags and evenness of the colour. The two sisters which give name to the room, are slabs that measure 15 feet by seven and a half, without flaw or stain. The walls, up to a certain height, are mosaic, and above are divided into very neat compartments of stucco, all of one design, which is also followed in many of the adjacent halls and galleries. The ceiling is a fretted cove. To preserve this vaulted roof, as well as some of the other principal cupolas, the outward walls of the towers are raised 10 feet above the top of the dome, and support another roof over all, by which means no damage can ever be caused by wet weather or excessive heat and cold. From this hall you pass round the little myrtle garden of Lindaraxa, into an additional building made to the east end by Charles V. The rooms are small and low. His dear motto, *Plus outrè*, appears on every beam. This leads to a little tower, projecting from the line of the north wall, called *el tocador*, or the dressing-room of the sultana. It is a small square cabinet, in the middle of an open gallery, from which it receives light by a door and three windows. The look-out is charming. In one corner is a large marble flag, drilled full of holes, through which the smoke of perfumes ascended from furnaces below; and here, it is presumed, the Moorish queen was wont to sit to fumigate and sweeten her person. The emperor caused this pretty room to be painted with representations of his wars, and a great variety of grotesques, which appear to be copies, or at least imitations, of those in the loggie of the Vatican. From hence you go through a long passage to the hall of ambassadors, which is magnificently decorated with innumerable varieties of mosaics, and the mottos of all the kings of Granada. This long narrow antichamber opens into the communa on the left hand, and on the right into the great audience hall in the tower of Comares; a noble apartment, 36 feet square, 36 high up to the cornice, and 18 from thence to the centre of the cupola. The walls on three sides are 15 feet thick, on the other nine; the lower range of windows 13 feet high. The whole wall is inlaid with mosaic of many colours, disposed in intricate knots, stars, and other figures. In every part various Arabic sentences are repeated.

Having thus completed the tour of the upper apartments, which are upon a level with the offices of the new palace, you descend to the lower floor, which consisted of bedchambers and summer-rooms; the back stairs and passages, that facilitated the intercourse between them, are without number. The most remarkable room below is the king's bedchamber, which communicated by means of a gallery with the upper story. The beds were placed in two alcoves, upon a raised pavement of blue and white tiles; but as it was repaired by Philip V. who passed some time here, it cannot be said how it may have been in former times. A fountain played in the middle, to refresh the apartment in hot weather. Behind the alcoves are small doors, that conduct you to the royal baths. These consist of one small closet with marble cisterns for washing children, two rooms for grown-up persons, and vaults for boilers and furnaces that supplied the baths with water and the stoves with vapours. The troughs are formed of large slabs of white marble; the walls are beautiful with party-coloured earthen ware; light is admitted by holes in the coved ceiling.

Hard by is a whispering gallery, and a kind of labyrinth, said to have been made for the diversion of the women and children. One of the passages of communication is fenced off with a strong iron grate, and called *the prison of the Sultana;* but it seems more probable that it was put up to prevent any body from climbing up into the women's quarter.

Under the council-room is a long slip, called *the king's study;* and adjoining to it are several vaults, said to be the place of burial of the royal family. In the year 1574, four sepulchres were opened; but as they contained nothing but bones and ashes, were immediately closed again.

This description of the Alhambra may be finished by observing how admirably every thing was planned and calculated for rendering this palace the most voluptuous of all retirements; what plentiful supplies of water were brought to refresh it in the hot months of summer; what a free circulation of air was contrived, by the judicious disposition of doors and windows; what shady gardens of aromatic trees; what noble views over the beautiful hills and fertile plains! No-

wonder

Ali. wonder the Moors regretted Granada! no wonder that they ſtill offer up prayers to God every Friday for the recovery of this city, which they regard as a terreſtrial paradiſe!

ALI, the ſon of Abu Taleb, is one of the moſt celebrated characters in Mahometan hiſtory. He was couſin to Mahomet; and at the age of fourteen engaged with youthful ardour in his cauſe. When Mahophet firſt revealed his prophetic character to his friends, and inquired who among them would undertake to be his companion, Ali exclaimed, "O Prophet, I will be thy attendant; the man who dares to riſe againſt thee I will break his legs, pluck out his eyes, daſh out his teeth, and even rip up his belly." Mahomet accepted his ſervices, and honoured him with the titles of brother, vicegerent, and Aaron to a new Moſes. He was remarkable both for eloquence and valour; and the latter obtained him the ſurname of "*the Lion of God, always victorious.*" He ſucceeded to the chief dignity of the renowned houſe of Haſhem, and was alſo hereditary guardian of the temple and city of Mecca. Mahomet gave him his daughter Fatimah in marriage, and the grandfather lived to embrace the children of his daughter. Theſe advantages induced Ali to caſt a wiſhful eye towards the regal ſucceſſion; however, Abubeker, Omar, and Othman reigned before him. But after the death of the latter he was ſaluted caliph by the chiefs of the tribes, and companions of the Prophet, when he was repairing to the moſque of Medina at the hour of prayer, A. D. 655. Hegir. 35.

Ayeſha, the widow of the Prophet, ſtrenuouſly oppoſed his ſucceſſion; and under her influence two powerful chiefs ſoon raiſed the ſtandard of rebellion. Ali greatly increaſed his difficulties by the imprudent removal of all the governors of provinces from their ſtations. Telha and Zobeir, two chiefs of great influence, collected a numerous army, and induced Ayeſha to attend them to the field of battle; but Ali gained a complete victory and took Ayeſha priſoner. Telha fell in the field, and Zobeir was aſſaſſinated after ſurrendering upon promiſe of quarter. This daſtardly action was ſeverely reprehended by Ali. He likewiſe kindly treated the captive widow, and ſent her back to the tomb of the Prophet.

Ali next attacked Moawiyah, who had been proclaimed caliph, and ſtrongly ſupported by a powerful and numerous party. When the two armies approached each other, Ali propoſed to decide the matter by ſingle combat, but to this his opponent would not agree. Several ſkirmiſhes were fought with conſiderable loſs on both ſides; but at length a pious fraud produced a diviſion of ſentiment in the army of Ali. They fixed to the points of lances a number of copies of the Koran, carried them before the troops, and exclaimed, ſaying, "This is the book which forbids Muſſulmans to ſhed each others blood, and ought therefore to decide our diſputes." Ali was conſtrained to yield, and umpires were mutually choſen; on the ſide of Ali, Abu Mouſſa; Amru, the conqueror of Egypt on the part of Moawiyah. The day of final deciſion arrived. Abu Mouſſa aſcended the pulpit, and cried, "As I draw this ring from my finger, ſo I depoſe both Ali and Moawiyah from the caliphate." When Amru aſcended, he cried, "As I put on this ring, ſo I inveſt Moawiyah with the caliphate, and alſo depoſe Ali." Ali. He alſo added, that Othman the former caliph had declared Moawiyah both his ſucceſſor and avenger. Thus began that memorable conteſt among the Mahometans which was long agitated with conſiderable violence by both parties.

Ali was highly enraged at this injuſtice; but conſtrained for the preſent to yield, he retired to Kufa. A ſect of enthuſiaſts called the *Kharejites* revolted againſt Ali; but he quickly reduced them to ſubjection, and again obtained poſſeſſion of Arabia. But Syria, Perſia, and Egypt fell to the ſhare of his rival.

An unexpected event terminated the exiſting diſputes. Three Kharejites one day converſing together concerning the blood which had been ſhed, and the impending calamities, reſolved to aſſaſſinate Ali, Moawiyah, and Amru, the three authors of the preſent diſaſters. They provided themſelves with poiſoned ſwords, and haſtened to accompliſh their purpoſe. Moawiyah was wounded, but the wound did not prove fatal. A friend of Amru fell in his ſtead. Ali was fatally wounded at the door of the moſque, and in the ſixty-third year of his age, he expired on the fifth day after his wound, A. D. 660. A. Hegir. 40.

Ali had eight wives beſides Fatimah, and left a numerous family who were very remarkable for their valour. He alſo roſe to high eminence for learning and wiſdom; and of his works there are ſtill extant a hundred maxims, a collection of verſes, and a prophecy of all the great events which are to happen to the end of time. One of his ſayings may be quoted as an example. "He who would be rich without wealth, powerful without ſubjects, and a ſubject without a maſter, has only to forſake ſin, and ſerve God."

The Muſſulmans term Ali *the heir of Mahomet, and the accepted of God*, and his particular followers have poſſeſſed various ſtates in Africa and Aſia, and the Perſian part of the Uſbec Tartars; and ſome ſovereigns of India are at preſent of the ſect of Ali. A monument is raiſed upon his tomb near Kufa, which the kings of Perſia have ſucceſſively decorated and religiouſly revered. Near the ruins of Kufa a city named *Meſhed Ali* has been built to his memory. Some of his deluded followers imagine that he is ſtill alive, and that he will reviſit the earth and fill the ſame with juſtice. A green turban ſtill continues to diſtinguiſh the deſcendants of Ali. (*Gen. Biog.*)

ALI *Bey*, an eaſtern adventurer, is ſaid to have been a native of Mount Caucaſus, and about the age of twelve or fourteen he was ſold for a ſlave in Cairo. The two Jews who became his maſters preſented him to Ibrahim, then one of the moſt reſpectable men in the kingdom. In the family of this powerful man he received the rudiments of literature, and was alſo inſtructed in the military art. Both in letters and military ſkill he made a rapid improvement. He gradually gained the affection of his patron to ſuch a degree, that he gave him his freedom, permitted him to marry, promoted him to the rank of governor of a diſtrict, and afterwards by election he was raiſed to the elevated ſtation of one of the governors of provinces. Deprived of his protector by death, and engaging in the dangerous intrigues that pave the way to power in that unſtable government, he procured his own baniſhment to Upper Egypt. Here he ſpent two years in maturing

Ali. his ſchemes for future greatneſs, and in 1766, returning to Cairo, he either ſlew or expelled the beys, and ſeized the reins of government.

Emboldened by ſucceſs, he reſcued himſelf from the power of the Porte, coined money in his own name, and boldly aſſumed the rank of ſultan of Egypt. Occupied in more important concerns, the Porte made no vigorous oppoſition to his meaſures, and Ali Bey ſeized this favourable opportunity to recover a part of the Said or Upper Egypt, which had been taken by an Arab ſhaik. Next he ſent out a fleet from Suez, which ſeized upon Djedda, entered the port of Mecca; while a body of cavalry, commanded by Mohammed Bey his favourite, took and plundered Mecca itſelf. A young Venetian merchant laid before him a plan of reviving the ancient trade to the Eaſt Indies through the Mediterranean and Red ſeas. Having formed an alliance, in 1770, with one Shaik Daher, a rebel againſt the Porte in Syria, he aimed at the conqueſt of all Syria and Paleſtine. He firſt endeavoured to ſecure Gaza; then his army forming a junction with that of Daher at a place called Acre, advanced to Damaſcus. On the 6th of June 1771, a battle was fought at this place with the Turkiſh pachas, and Mohamed and Daher the commanders of Ali Bey routed them with great ſlaughter. They inſtantly took poſſeſſion of Damaſcus, and the caſtle itſelf had alſo capitulated, when all on a ſudden Mohammed haſtened back to Egypt with all his Mamelukes. Some aſcribe this ſtrange conduct to an impreſſion made upon Mohammed by the Turkiſh agents, and others to a report of the death of Ali Bey.

Although unſucceſsful, Ali Bey never loſt ſight of his favourite object, and Mohammed loſing his confidence was forced to ſave his life by exile. Mohammed, however, quickly returned with an army and drove Ali Bey from Cairo. In this unfortunate ſtate of affairs Ali Bey fled to Daher, and combining their forces, they attacked the Turkiſh commander at Sidon, and came off victorious, although the Turkiſh army was three times their number. After a ſiege of eight months they next took the town of Jaffa. Deceived by letters from Cairo which were only intended to enſnare him, and ſtimulated with recent victories, he returned to Cairo. Entering the deſerts which divide Gaza from Egypt, he was furiouſly attacked by a thouſand choſen Mamelukes led on by Murad Bey, who was enamoured with the beauty of Ali Bey's wife, and had obtained the promiſe of her, provided that he could take Ali Bey captive. Murad wounded and made Ali Bey priſoner, and carried him up to Mohammed, who received him with affected reſpect: but in three days, either in conſequence of poiſon or the effects of his wounds, Ali breathed his laſt.

Ali Bey was certainly a ſingular production in the ſchool of ignorance and barbarity, and diſplayed a very great degree of original vigour of character and active penetration of mind. He is blamed for engaging in enterpriſes beyond his power to accompliſh; but he is acknowledged to have been very favourable to the Franks, and to have governed Egypt with no ſmall degree of ſteady moderation. He is alſo charged with devolving too much upon his lieutenants, and not being ſufficiently attentive to the exactions made by his officers. Among his failings may alſo be ranked that of an unbounded confidence in his favourite. Generoſity and a ſenſe of juſtice were not wanting in his character, although his morals, under the ſanction of his claſs and country, were ſtrongly tainted with perfidy and murder in the purſuit of his ambitious plans. (*Gen. Biog.*)

Aljameia || Alien.

ALJAMEIA, is a name which the Moriſcoes in Spain give to the language of the Spaniards. Among other articles agreed on by the junto, which was appointed by the emperor Charles V. in 1526, in favour of the Moriſcoes, this was one, That the Moriſcoes ſhould no longer ſpeak Algavareia, i. e. Mooriſh, or Arabic; but ſhould all ſpeak *Aljameia*, i. e. Spaniſh, as it was called by the Moors, and all their writings and contracts ſhould be in that language.

ALIAS, in *Law*, a ſecond or farther writ iſſued from the courts of Weſtminſter, after a *capias*, &c. ſued out without effect.

ALIBI, in *Law*, denotes the abſence of the accuſed from the place where he is charged with having committed a crime; or his being *elſewhere*, as the word imports, at the time ſpecified.

ALICANT, a large ſea-port town in the province of Valencia, and territory of Segura. It is ſeated between the mountains and the ſea, and has a caſtle deemed impregnable. The port is defended by three baſtions furniſhed with artillery. To prevent the viſits of the Algerine pirates, watch-towers were built to give notice of the approach of an enemy's ſhip. It was taken from the Moors in 1264. The caſtle was taken by the Engliſh in 1706, and held out a ſiege of two years before it was retaken by the French and Spaniards, and at laſt ſurrendered upon honourable terms, after part of the rock was blown up on which the caſtle ſtood, and the governor killed. The houſes are high, and well built; and a very great trade is carried on here, particularly in wine and fruit. It is ſeated on the Mediterranean, on a bay of the ſame name, 37 miles north-eaſt of Murcia, and 75 ſouth of Valencia. W. Long. 0. 36. N. Lat. 38. 24.

ALICATA, a mountain of Sicily, near the valleys Mazara and Noto, upon which was ſituated (as is generally thought) the famous Dædalion, where the tyrant Phalaris kept his brazen bull.

ALICATA, a town of Sicily, remarkable for corn and good wine. It was plundered by the Turks in 1543; and is ſeated on a ſort of peninſula near the ſea, 22 miles ſouth-eaſt of Girgenti. E. Long. 15. 20. N. Lat. 37. 11.

Alicata Chlamys, was a ſort of veſt with ſleeves worn by the Roman boys till the age of thirteen, at which time they put on the *pretexta*.

ALIEN, in *Law*, implies a perſon born in a ſtrange country, not within the king's allegiance; in contradiſtinction to a denizen or natural ſubject. The word is formed from the Latin *alius*, "another;" q. d. one born in another country. An alien is incapable of inheriting lands in Britain till naturalized by an act of parliament. No alien is entitled to vote at the election of members of parliament: nor can he enjoy any office, or be returned on any jury, unleſs where an alien is party in a cauſe, when the inqueſt is compoſed of an equal number of denizens and aliens. The reaſons for eſtabliſhing theſe laws were, that every man is preſumed to bear faith and love to that prince and country where he received protection during his infancy;

Alien, Alienation.

cy; and that one prince might not ſettle ſpies in another's country; but chiefly that the rents and revenues of the country might not be drawn to the ſubjects of another. Some have thought that the laws againſt aliens were introduced in the time of Henry II. when a law was made at the parliament of Wallingford, for the expulſion of ſtrangers, in order to drive away the Flemings and Picards introduced into the kingdom by the wars of King Stephen. Others have thought that the origin of this law was more ancient; and that it is an original branch of the feudal law: for by that law no man can purchaſe any lands but he muſt be obliged to do fealty to the lords of whom the lands are holden; ſo that an alien who owed a previous faith to another prince, could not take an oath of fidelity in another ſovereign's dominions. Among the Romans only the *Cives Romani* were eſteemed freemen; but when their territories increaſed, all the Italians were made free under the name of *Latins*, though they had not the privilege of wearing gold rings till the time of Juſtinian. Afterwards all born within the pale of the empire were conſidered as citizens.

Alien-Duty, an impoſt laid on all goods imported by aliens, over and above the cuſtoms paid for ſuch goods imported by Britiſh, and on Britiſh bottoms.

Aliens-Duty is otherwiſe called *petty cuſtoms*, and *navigation duty*.—Fiſh dried or ſalted, and cod-fiſh or herring not caught in Britiſh veſſels and cured by Britiſh ſubjects, pay a double *aliens-duty*.—On what footing aliens are permitted to import foreign commodities into Great Britain, ſee DUTY.

Alien-Priories, a kind of inferior monaſteries, formerly very numerous in England, and ſo called from their belonging to foreign abbeys.

ALIENATION, in *Law*, denotes the act of making over a man's property in lands, tenements, &c. to another perſon.

Alienation in mortmain, is the making over lands, tenements, &c. to a body politic, or to a religious houſe, for which the king's licenſe muſt firſt be obtained, otherwiſe the lands, &c. alienated will be forfeited.

Alienation in fee is the felling the fee-ſimple of any land or other incorporeal right. All perſons who have a right to lands may generally alien them to others: but ſome alienations are prohibited; ſuch as alienations by tenants for life, &c. whereby they incur a forfeiture of their eſtate. By the ſtatute of Edward I. a bar was put to alienations by what we call *entails*, which is an expedient for procuring perpetuities in families; but counter-expedients were deviſed to defeat this intent, and a practice was introduced of cutting off entails by fines, and of barring remainders and reverſions by recoveries. The ſtatute for alienations in Henry VII.'s time had a great effect on the conſtitution of this kingdom; as, among other regulations of that reign, it tended to throw the balance of power more into the hands of the people. By the ſtat. 12 Car. II. cap. 24. fines for alienations are taken away. Crown lands are only alienable under a faculty of perpetual redemption. The council of Lateran, held in 1123, forbids any clerk to alienate his benefice, prebend, or the like. By the laws of the ancient Jews, lands could only be alienated for the ſpace of 50 years. At each return of the jubilee all returned again to the primitive owners, or their deſcendants, to whom the lands were originally allotted at the firſt diſtribution of Canaan.

Alienation, Aliment.

Alienation-Office, is an office to which all writs of covenants and entry, upon which fines are levied, and recoveries ſuffered, are carried, to have fines for alienation ſet and paid thereon.

ALIMENT (from *alo* to nouriſh), implies food both ſolid and liquid: from which, by the proceſs of digeſtion, is prepared a very mild, ſweet, and whitiſh liquor, reſembling milk, and diſtinguiſhed by the name of *chyle*; which being abſorbed by the lacteal veins, by them conveyed into the circulation, and there aſſimilated into the nature of blood, affords that ſupply of nutrition which the continual waſte of the body is found to require.—Next to air, food is the moſt neceſſary thing for the preſervation of our bodies: and as on the choice thereof our health greatly depends, it is of great importance to underſtand, in general, what is the propereſt for our nouriſhment; and, in particular deviations from health, what is the beſt adapted to reſtore us. The blood and fluids naturally incline to waſte and diminiſh: freſh chyle, duly received, prevents this waſte and diminution, and preſerves in them that mild ſtate which alone conſiſts with health. An animal diet affords the moſt of this bland nutritious mucilage; watery fluids dilute the too groſs parts, and carry off what is become unfit for uſe. It is only the ſmall portion of jelly which is ſeparated from the farinaceous parts of vegetables, that, after being much elaborated, is converted into the animal nature; yet the uſe of vegetables prevents both repletion and a too great tendency to a putreſcent acrimony of the blood. In hot climates, as well as againſt the conſtitutional heat of particular perſons, vegetables are demanded in the largeſt proportion. Animal ſubſtances afford the higheſt reliſh while our appetite continues; but will ſate the appetite before the ſtomach is duly filled. Vegetables may be eaten after either fleſh or fiſh: few herbs or fruits ſatiate ſo much as that the ſtomach may not be filled with them, when it is already ſatisfied with fleſh or fiſh; whence it may be obſerved, that no diet which is very nouriſhing can be eaten to fulneſs, becauſe its nutritious parts are oily and ſatiating. Health depends almoſt wholly on a proper craſis of the blood; and to preſerve this a mixture of vegetables in ſome degree is always required, for a loathing is ſoon the conſequence of animal food alone: hot acrid habits, too, receive from milk and vegetables the needful for correcting their exceſſes; but in cold, pituitous, and nervous habits, who want moſt nouriſhment from leaſt digeſtion, and from the ſmalleſt quantity of food, animal diet is to be uſed more freely.

Thus much being offered as general principles with reſpect to the matter and quality of our aliment, the valetudinarian may eaſily regulate his diet with ſome advantage to himſelf by an attention to the few enſuing particulars. In winter, eat freely, but drink ſparingly: roaſt meat is to be preferred, and what is drank ſhould be ſtronger than at other ſeaſons. In ſummer, let thirſt determine the quantity to be drunk; cold ſtomachs never require much: boiled meats and vegetables, if not otherwiſe contraindicated, may now be more freely uſed. Lax habits require the winter's diet to be continued all the year, and rigid ones ſhould be confined to that of ſummer. Fat people ſhould faſt

at

Aliment || Aliquant.

at times, but the lean ſhould never do ſo. Thoſe who are troubled with eructations occaſioned by their food ſhould drink but little, and uſe ſome unaccuſtomed exerciſe. The thirſty ſhould drink freely, but eat ſparingly. In general, let moderation be obſerved; and though no dinner hath been had, a light ſupper is at all times to be preferred. After very high ſeaſoned meats, a glaſs of water acidulated with the acid elixir of vitriol, or in very weak ſtomachs the ſweet elixir of vitriol, is far more aſſiſtant to the work of digeſtion than the common method of taking brandy. See further FOOD and DRINK.

Obligation of ALIMENT, in *Scots Law*, the natural obligation on parents to provide their children with the neceſſaries of life, &c. See LAW *Index*.

Alimentarii Pueri, &c. were certain children maintained and educated by the munificence of the emperors, in a ſort of public places, not unlike our hoſpitals.—Trajan was the firſt who brought up any of theſe alimentary boys. He was imitated by Adrian. Antoninus Pius did the ſame for a number of maids, at the ſolicitation of Fauſtina; and hence, in ſome medals of that empreſs, we read PVELLAE FAVSTINIANAE.—Alexander Severus did the like at the requeſt of Mammæa; and the maids thus educated were called *Mammæanæ*.

Alimentary Duct or *Canal*, is a name given by Dr Tyſon and ſome others to that part of the body through which the food paſſes from its reception into the mouth to its exit at the *anus*; including the *gula*, ſtomach, and inteſtines. See ANATOMY.

This duct has been ſaid to be the true characteriſtic of an animal, or (in the jargon of the ſchools) *in proprium quarto modo*; no animal being without it. Plants receive their nouriſhment by the numerous fibres of their roots; but have no common receptacle for digeſting the food received, or for carrying off the recrements. But in all, even the loweſt degree of animal life, we may obſerve a ſtomach and inteſtines, even where we cannot perceive the leaſt formation of any organ of the ſenſes, unleſs that common one of feeling, as in oyſters. *Phil. Tranſ.* N° 269, p. 776, *et ſeq.*

Dr Wallis brings an argument from the ſtructure of the alimentary tube in man, to prove that he is not naturally carnivorous; to which Dr Tyſon makes ſome objections. *Vid. Phil. Tranſ.* N° 260. p. 777.

Alimentary Law, *lex alimentaria*, was an old law among the Romans, whereby children were obliged to find ſuſtenance for their parents.

ALIMONY, in *Law*, implies that allowance which a married woman ſues for, and is entitled to, upon any occaſional ſeparation from her huſband. See LAW *Index*.

ALIPILARIUS, or ALIPILUS, in Roman antiquity, a ſervant belonging to the baths, whoſe buſineſs it was, by means of waxen plaſters, and an inſtrument called *volſella*, to take off the hair from the arm-pits, and even arms, legs, &c. this being deemed a point of cleanlineſs.

ALIPTERIUM, αλειπτηριον, in antiquity, a place in the ancient *paleſtræ*, where the *athletæ* were anointed before their exerciſes.

ALIQUANT PART, in *Arithmetic*, is that number which cannot meaſure any other exactly without ſome remainder. Thus 7 is an aliquant part of 16; for twice 7 wants two of 16, and three times 7 exceeds 16 by 5. Aliquot || Alkermes.

ALIQUOT PART, is that part of a number or quantity which will exactly meaſure it without any remainder. Thus 2 is an aliquot part of 4, 3 of 9, 4 of 16, &c.

ALISANDERS, or ALEXANDERS, in *Botany*. See SMYRNIUM, BOTANY *Index*.

ALISONTIA, or ALISUNTIA, in *Ancient Geography*, a river of Belgic Gaul, now *Alſitz*; which, riſing on the borders of Lorrain, and running through that duchy, waters the city of Luxemburgh, and, ſwelled by other rivulets, falls into the Sur.

ALITES, in Roman antiquity, a deſignation given to ſuch birds as afforded matter of auguries by their flight.

ALKADARII, a ſect among the Mahometans who deny any eternal, fixed, divine decrees, and are aſſertors of free-will. The word is formed from the Arabic *alkadar*, which ſignifies "decree." The Alkadarii are a branch of Motazalites, and ſtand oppoſed to the Algiabarii. See ALGIABARII.

ALKAHEST, or ALCAHEST, among alchemiſts, derived from a word which ſignifies *ſpirit of ſalt*, or *all-ſpirit*, was ſuppoſed to be an univerſal menſtruum capable of reſolving all bodies into their principles. Van Helmont pretended he was poſſeſſed of ſuch a menſtruum.—It is likewiſe uſed by ſome authors for all fixed ſalts volatilized.

ALKALI, in *Chemiſtry*, denotes a particular claſs of ſalts. The word *alkali* is of Arabian origin, and was introduced into chemiſtry after it had been applied to a plant which ſtill retains the name of *kali*. When this plant is burnt, the aſhes waſhed in water, and the water evaporated to dryneſs, a white ſubſtance remains, which was called *alkali*. According to Albertus Magnus, who uſes the word, it ſignifies *fæx amaritudinis*, "the dregs of bitterneſs." Alkali may be obtained from other ſubſtances beſides kali. Chemiſts gradually diſcovered that bodies, differing from one another in ſeveral of their properties, had been confounded together under the ſame name. The word, in conſequence, became general, and is now applied to all bodies which poſſeſs the following properties: 1. Incombuſtible. 2. A hot cauſtic taſte. 3. Volatilized by heat. 4. Soluble in water even when combined with carbonic acid. 5. Capable of converting vegetable blues to green.

The alkalies at preſent known are three in number: 1. Potaſs; 2. Soda; 3. Ammonia. The two firſt are called *fixed alkalies*, becauſe they require a red heat to volatilize them; the laſt is called *volatile alkali*, becauſe it readily aſſumes a gaſeous form, and conſequently is diſſipated by a very moderate degree of heat. See CHEMISTRY *Index*.

ALKALI, or *Sal Kali*. See SALICORNIA, BOTANY *Index*.

ALKANET. See ANCHUSA, BOTANY *Index*.

ALKEKENGI, the trivial name of a ſpecies of phyſalis. See PHYSALIS, BOTANY *Index*.

ALKENNA. See LAWSONIA, BOTANY *Index*.

ALKERMES, in *Pharmacy*, a compound cordial medicine made in the form of a confection, deriving its name from the kermes berries uſed in its compoſition.

ALKORAN,

Alkoran || Allahabad.

ALKORAN. See ALCORAN.

ALL-HALLOWS. See *All-Saints*.

All Good. See CHENOPODIUM, BOTANY *Index*.

All-Heal. See HERACLEUM and STACHYS, BOTANY *Index*.

All-Saints, in the *Kalendar*, denotes a feſtival celebrated on the firſt of November, in commemoration of all the ſaints in general; which is otherwiſe called *All-Hallows*. The number of ſaints being ſo exceſſively multiplied, it was found too burdenſome to dedicate a feaſt day to each. In reality, there are not days enough, ſcarce hours enough, in the year, for this purpoſe. Hence an expedient was had recourſe to, by commemorating ſuch in the lump as had not their own days. Boniface IV. in the ninth century, introduced the feaſt of *All-Saints* in Italy, which was ſoon after adopted into the other churches.

All-Saints, iſlands near Guadaloupe, in the Weſt Indies.

All-Saints, a pariſh in Georgetown diſtrict, South Carolina, containing 2225 inhabitants, of whom 429 are whites, and 1795 ſlaves. It ſends a member to each houſe of the ſtate legiſlature.

All-Saints Bay, a ſpacious harbour near St Salvador in Brazil, in S. America, on the Atlantic ocean, W. Long. 40°, S. Lat. 12°.

All-Saints Bay, a captainſhip in the middle diviſion of Braſil, ſo called from the harbour of that name, bounded on the north by the Rio Real; on the ſouth by that of Las Ilheos: on the eaſt by the ocean; and on the weſt by three unconquered nations of Indians. It is reckoned one of the richeſt and moſt fertile captainſhips in all Brazil, producing great quantities of cotton and ſugar. The bay itſelf is about two and a half leagues over, interſperſed with a number of ſmall but pleaſant iſlands, and is of prodigious advantage to the whole country. It has ſeveral cities and towns, particularly St Salvador, which is its capital. All-Saints Bay lies in S. Lat. 12. 3. W. Long. 40. 10. See SALVADOR.

All-Souls, in the *Kalendar*, denotes a feaſt-day, held on the ſecond of November, in commemoration of all the faithful deceaſed.—The feaſt of All-Souls was firſt introduced in the eleventh century, by Odilon abbot of Cluny, who enjoined it on his own order; but it was not long before it became adopted by the neighbouring churches.

All-Spice. See MYRTUS and CALYCANTHUS, BOTANY *Index*.

ALLA, or ALLAH, the name by which the profeſſors of Mahometaniſm call the Supreme Being.

The term *alla* is Arabic, derived from the verb *alah*, to adore. It is the ſame with the Hebrew *Eloah*, which ſignifies the *Adorable Being*.

ALLAHABAD, in *Geography*, a province of Hindoſtan, about 160 miles in length, and 120 in breadth. Its eaſtern boundaries meet the province of Bahar, the ſouthern Berar, the weſtern Malwa and Agra, and the northern Oude. According to the diſtribution of the emperor Akbar, recorded in the Ayeen Akberry; it contains 10 circars or counties, which are divided into 177 pergunnahs or hundreds. According to the ſtatement of Maurice, in his Indian Antiquities, it affords a revenue of 3,310,695 ſicca rupees. It contributes to the public ſervice 323 elephants, 237,870 infantry, and 11,375 cavalry. Azuph Dowla, a tributary ally of the Britiſh power, poſſeſſes the greater part of this province. Allahabad, Benares, and Iconpour, are the principal cities. Allahabad || Allatius.

ALLAHABAD, the capital of the above province, is ſituated at the confluence of the great rivers Jumna and Ganges. This city is divided into two parts, called *the Old* and *the New Town*: The old is ſituated upon the Ganges, and the new upon the Jumna. The emperor Akbar erected a ſtrong fortreſs of ſtone, which occupies a large ſpace in this city, and from him it received its preſent name. Of this fortreſs, Mr Hodges, in N° IV. of his ſelect views in India, gives an accurate and elegant delineation. A pillar conſiſting of one ſtone 40 feet high, aſcribed by tradition to Bima, one of the heroes of Mahabarat, wholly covered with illegible inſcriptions, and the elegant tomb of Sultan Khuſru, are excellent ſpecimens of Mahometan architecture. Devotion has fixed her reſidence, and flouriſhes to ſuch a degree in this city, that it hath obtained the appellation of "the king of worſhipped places." According to the evidence of the Ayeen-Akberry, the adjacent territory, to the extent of 40 miles, is deemed holy ground. In ſuch veneration is this place held by the Hindoos, that when a man dies here, they believe he will obtain the utmoſt of his wiſhes in his next regeneration. They deem it a meritorious action for a man to ſlay himſelf, although they teach that ſuicide will be puniſhed with torments in a future ſtate. In and about this city there are various objects of veneration, which immenſe numbers of pilgrims continue to viſit with great devotion. Major Rennel has placed Palibothra on the ſame ſite with Patna; but Dr Robertſon is of opinion that the ancient Palibothra is the modern city of Allahabad. N. Lat. 25. 27. E. Long. 82. 5.

ALLAMANDA, in *Botany*. See BOTANY *Index*.

ALLAN, a river of Perthſhire, in Scotland, which paſſes by Dunblane, and falls into the Forth near Stirling.

ALLANTOIS, or ALLANTOIDES, a thin tranſparent bag inveſting the fœtus of quadrupeds, as cows, goats, ſheep, &c. filled with an urinous liquor conveyed to it from the bladder of the young animals by means of the urachus. See ANATOMY *Index*.

ALLATIUS, LEO, keeper of the Vatican library, a native of Scio, and a celebrated writer of the 17th century. He was of great ſervice to the gentlemen of Port Royal in the controverſy they had with M. Claude touching the belief of the Greeks with regard to the euchariſt. No Latin was ever more devoted to the ſee of Rome, or more inveterate againſt the Greek ſchiſmatics, than Allatius. He never was married; nor did he take orders; and Pope Alexander VII. having aſked him one day, why he did not enter into orders? he anſwered, Becauſe I would be free to marry." The pope rejoined, "If ſo, why do you not marry? "Becauſe," replied Allatius, "I would not be at liberty to take orders." Thus, as Mr Bayle obſerves, he paſſed his whole life, wavering betwixt a pariſh and a wife; ſorry, perhaps, at his death, for having choſen neither of them; when, if he had fixed upon one, he might have repented his choice for 30 or 40 years.—If we believe John Patricius, Allatius had a very extraordinary pen, with which, and no other, he wrote Greek for 40 years; at the loſs of which, he was ſo

grieved

Allay
Alleghany

grieved as to lament it with tears. He publiſhed ſeveral manuſcripts, ſeveral tranſlations of Greek authors, and ſeveral pieces of his own compoſing. In his works he diſcovers more erudition and induſtry than ſound judgement. His manner of writing is diffuſe and perplexed, making frequent digreſſions from one ſubject to another. He died at Rome in 1669, aged 83.

ALLAY. See ALLOY.

ALLECTUS, the prime miniſter and confidential friend of Caraufius, emperor of Britain. In order to avoid the puniſhment due to the ſeveral enormous crimes with which he was chargeable, he fell upon the deſperate expedient of murdering his maſter, and uſurping the imperial dignity, which he maintained for three years. With a deſign of recovering Britain, Conſtantius about this period fitted out a large ſquadron, which being aſſembled in the mouth of the Seine, the command was devolved upon the prefect Aſclepiodotus. The fleet of Allectus was ſtationed off the Iſle of Wight to receive them; but under the cover of a thick fog, the invaders eſcaped their notice, and landed in ſafety on the weſtern coaſt, and, according to Gibbon, convinced the Britons "that a ſuperiority of naval ſtrength will not always protect their country from a foreign invaſion." No ſooner had the intrepid commander diſembarked his forces, than he ſet fire to his ſhips, and marched forward to meet the enemy. In expectation of an attack from Conſtantius, who commanded the fleet off Boulogne, the uſurper had taken his ſtation in the vicinity of London; but informed of the deſcent of Aſclepiodotus, he made forced marches to oppoſe his progreſs. Allectus attacked the imperial troops, and his army being reduced to a ſmall number of fatigued and diſpirited men, he fell in the field, and his forces received a total defeat. Thus, in one day, and by a ſingle battle, the fate of this great iſland was decided; and Britain, after a ſeparation of 10 years, was reſtored to the Roman empire, A. D. 297. Conſtantius landing on the ſhores of Kent, was ſaluted with the loud applauſes and unanimous acclamation of obedient ſubjects, and welcomed to the Britiſh ſoil.

ALLEGATA, a word anciently ſubſcribed at the bottom of reſcripts and conſtitutions of the emperors; as *ſignata*, or *teſtata*, was under other inſtruments.

ALLEGEAS, or ALLEGIAS, a ſtuff manufactured in the Eaſt Indies. There are two ſorts of them: ſome are of cotton, and others of ſeveral kinds of herbs, which are ſpun like flax and hemp. Their length and breadth are of eight ells, by five, ſix, or ſeven eighths; and of twelve ells, by three-fourths or five-eighths.

ALLEGHANY, is the moſt weſtern county in Maryland, and has Pennſylvania on the north. The windings of the Patowmac river ſeparate it from Virginia on the ſouth, and Sideling-hill Creek divides it from Waſhington county on the eaſt. It contains 4809 inhabitants, including 258 ſlaves. Cumberland is its chief town.

ALLEGHANY County, in Pennſylvania, extends from the junction of the river of that name with the Ohio, where its chief town, Pittſburgh, is ſituated, to the New-York line. It contains 10,309 inhabitants, including 159 ſlaves.

ALLEGHANY Mountains, between the Atlantic ocean, the Miſſiſſippi river, and the lakes, are a long and broad range of mountains, made up of a great number of ridges, extending north-eaſterly and ſouth-weſterly, nearly parallel to the ſea coaſt, about 900 miles in length, and from 60 to 150 and 200 miles in breadth. Mr Evans obſerves, with reſpect to that part of theſe mountains which he travelled over, viz. in the back parts of Pennſylvania, that ſcarcely one acre in ten is capable of culture. This, however, is far from being the caſe in all parts of this range. Numerous tracts of fine arable and grazing land intervene between the ridges. The different ridges which compoſe this immenſe range of mountains, have different names in the different ſtates, viz. the *Blue Ridge*, the *North mountain*, or *North ridge*, or *Devil's Back-Bone*, *Laurel ridge*, *Jackſon's mountains*, and *Kittatinny mountains*. All theſe different and immenſe ridges, except the *Alleghany*, are broken through by rivers, which appear to have forced their way through ſolid rocks. This principal ridge is more immediately called *Alleghany*, and is deſcriptively named the *Back bone of the United States*. From theſe ſeveral ridges proceed innumerable branches, or ſpurs.

Alleghany, Allegiance

The general name of the whole range, taken collectively, ſeems not yet to have been determined. Mr Evans calls them the *Endleſs mountains*; others have called them the *Appalachian mountains*, from a tribe of Indians who live on a river which proceeds from this mountain, called the *Appalachicola*; but the moſt common name is the *Alleghany mountains*, ſo called, probably, from the principal ridge of the range. Theſe mountains are not confuſedly ſcattered, riſing here and there into high peaks, overtopping each other; but run along in uniform ridges, ſcarcely half a mile high. They ſpread as you proceed ſouth, and ſome of them terminate in high perpendicular bluffs: others gradually ſubſide in a level country, giving riſe to the rivers which run ſoutherly into the gulf of Mexico.

ALLEGHANY River, in Pennſylvania, riſes on the weſtern ſide of the Alleghany mountains, and after running about 200 miles in a ſouth-weſt direction, meets the Monongahela at Pittſburg, and both united form the Ohio. The lands on each ſide of this river, for 150 miles above Pittſburg, conſiſt of white oak and cheſnut ridges, and in many places of poor pitch pines, interſperſed with tracts of good land, and low meadows. This river, and the Ohio likewiſe, from its head waters until it enters the Miſſiſſippi, are known and called by the name of *Alleghany river*, by the Seneka and other tribes of the Six Nations, who once inhabited it.

ALLEGIANCE, in *Law*, is the tie, or *ligamen*, which binds the ſubject to the king, in return for that protection which the king affords the ſubject. The thing itſelf, or ſubſtantial part of it, is founded in reaſon and the nature of government; the name and the form are derived to us from our Gothic anceſtors. Under the feodal ſyſtem, every owner of lands held them in ſubjection to ſome ſuperior or lord, from whom or from whoſe anceſtors the tenant or vaſſal had received them; and there was a mutual truſt or confidence ſubſiſting between the lord and vaſſal, that the lord ſhould protect the vaſſal in the enjoyment of the territory he had granted him; and, on the other hand, that the vaſſal ſhould be faithful to the lord, and defend him againſt all his enemies. This obligation on the part of the vaſſal was called his

fidelitas

Allegiance. *fidelitas* or fealty: and an oath of fealty was required by the feodal law to be taken by all tenants to their landlord, which is couched in almoſt the ſame terms as our ancient oath of allegiance; except that, in the uſual oath of fealty, there was frequently a ſaving or exception of the faith due to a ſuperior lord by name, under whom the landlord himſelf was perhaps only a tenant or vaſſal. But when the acknowledgement was made to the abſolute ſuperior himſelf, who was vaſſal to no man, it was no longer called the oath of fealty, but the oath of allegiance; and therein the tenant ſwore to bear faith to his ſovereign lord, in oppoſition to all men, without any ſaving or exception. Land held by this exalted ſpecies of fealty, was called *feudum ligium*, a liege fee; the vaſſals *homines ligii*, or liege men; and the ſovereign, their *dominus ligius*, or liege lord. And when ſovereign princes did homage to each other for lands held under their reſpective ſovereignties, a diſtinction was always made between *ſimple* homage, which was only an acknowledgement of tenure; and *liege* homage, which included the fealty before mentioned, and the ſervices conſequent upon it. In Britain, it becoming a-ſettled principle of tenure, that all lands in the kingdom are holden of the king as their ſovereign and lord paramount, no oath but that of fealty could ever be taken to inferior lords; and the oath of allegiance was neceſſarily confined to the perſon of the king alone. By an eaſy analogy, the term of *allegiance* was ſoon brought to ſignify all other engagements which are due from ſubjects to their prince, as well as thoſe duties which were ſimply and merely territorial. And the oath of allegiance, as adminiſtered in England for upwards of 600 years, contained a promiſe "to be true and faithful to the king and his heirs, and truth and faith to bear of life and limb and terrene honour, and not to know or hear of any ill or damage intended him, without defending him therefrom." But, at the Revolution, the terms of this oath being thought perhaps to ſavour too much of the notion of non-reſiſtance, the preſent form was introduced by the convention parliament, which is more general and indeterminate than the former; the ſubject only promiſing "that he will be faithful and bear *true* allegiance to the king," without mentioning "his heirs," or ſpecifying in the leaſt wherein that allegiance conſiſts. The oath of ſupremacy is principally calculated as a renunciation of the pope's pretended authority: and the oath of abjuration, introduced in the reign of King William, very amply ſupplies the looſe and general texture of the oath of allegiance; it recogniſing the right of his majeſty, derived under the act of ſettlement; engaging to ſupport him to the utmoſt of the juror's power; promiſing to diſcloſe all traiterous conſpiracies againſt him; and expreſsly renouncing any claim of the deſcendants of the late pretender, in as clear and explicit terms as the Engliſh language can furniſh. This oath muſt be taken by all perſons in any office, truſt, or employment; and may be tendered by two juſtices of the peace to any perſon whom they ſhall ſuſpect of diſaffection. And the oath of allegiance may be tendered to all perſons above the age of twelve years, whether natives, denizens, or aliens.

Blackſt. Comment.

But, beſides theſe *expreſs* engagements, the law alſo holds that there is an *implied*, *original*, and *virtual* allegiance, owing from every ſubject to his ſovereign, antecedently to any expreſs promiſe, and although the ſubject never ſwore any faith or allegiance in form. Thus Sir Edward Coke very juſtly obſerves, that "all ſubjects are equally bounden to their allegiance as if they had taken the oath; becauſe it is written by the finger of the law in their hearts, and the taking of the corporal oath is but an outward declaration of the ſame." Allegiance

Allegiance, both expreſs and implied, is however diſtinguiſhed by the law into two ſorts or ſpecies, the one *natural*, the other *local*; the former being alſo perpetual, the latter temporary.

Natural allegiance is ſuch as is due from all men born within the king's dominions immediately upon their birth. For, immediately upon their birth they are under the king's protection; at a time too, when (during their infancy) they are incapable of protecting themſelves. Natural allegiance is, therefore, a debt of gratitude; which cannot be forfeited, cancelled, or altered, by any change of time, place, or circumſtance, nor by any thing but the united concurrence of the legiſlature. A Briton who removes to France, or to China, owes the ſame allegiance to the king of Britain there as at home, and 20 years hence as well as now. For it is a principle of univerſal law, That the natural-born ſubject of one prince cannot by any act of his own, no, not by ſwearing allegiance to another, put off or diſcharge his natural allegiance to the former: for this natural allegiance was intrinſic and primitive, and antecedent to the other; and cannot be diveſted without the concurrent act of that prince to whom it was firſt due.

Local allegiance is ſuch as is due from an alien, or ſtranger born, for ſo long time as he continues within the king's dominion and protection; and it ceaſes the inſtant ſuch ſtranger transfers himſelf from this kingdom to another. Natural allegiance is therefore *perpetual*, and local *temporary* only; and that for this reaſon, evidently founded upon the nature of government, That allegiance is a debt due from the ſubject, upon an implied contract with the prince; that ſo long as the one affords protection, ſo long the other will demean himſelf faithfully.

The *oath* of allegiance, or rather the *allegiance* itſelf, is held to be applicable, not only to the political capacity of the king, or regal office, but to his natural perſon and blood royal: and for the miſapplication of their allegiance, viz. to the regal capacity or crown, excluſive of the perſon of the king, were the Spencers baniſhed in the reign of Edward II. And from hence aroſe that principle of perſonal attachment and affectionate loyalty, which induced our forefathers (and, if occaſion required, would doubtleſs induce their ſons) to hazard all that was dear to them, life, fortune, and family, in defence and ſupport of their liege lord and ſovereign.

It is to be obſerved, however, in explanation of this allegiance, That it does not preclude reſiſtance to the king, when his miſconduct or weakneſs is ſuch as to make reſiſtance beneficial to the community. It ſeems fairly preſumable, that the convention parliament, which introduced the oath of allegiance in its preſent form, did not intend to exclude all reſiſtance: ſince the

Paley's Moral and Political Philoſophy.

Allegory. very authority by which the members ſat together, was itſelf the effect of a ſucceſsful oppoſition to an acknowledged ſovereign.

Again: The allegiance above deſcribed can only be underſtood to ſignify obedience to lawful commands. If, therefore, the king ſhould iſſue a proclamation, levying money or impoſing any ſervice or reſtraint upon the ſubject, beyond what the law authorized, there would exiſt no ſort of obligation to obey ſuch a proclamation, in conſequence of having taken the oath of allegiance.

Neither can allegiance be ſuppoſed to extend to the king after he is actually and abſolutely depoſed, driven into exile, or otherwiſe rendered incapable of exerciſing the regal office. The promiſe of allegiance implies, that the perſon to whom the promiſe is made continues king; that is, continues to exerciſe the power, and afford the protection, which belong to the office of king; for it is the poſſeſſion of theſe which makes ſuch a particular perſon the object of the oath.

ALLEGORY, in *Compoſition*, conſiſts in chooſing a ſecondary ſubject, having all its properties and circumſtances reſembling thoſe of the principal ſubject, and deſcribing the former in ſuch a manner as to repreſent the latter. The principal ſubject is thus kept out of view, and we are left to diſcover it by reflection. In other words, an allegory is, in every reſpect, ſimilar to a hieroglyphical painting, excepting only that words are uſed inſtead of colours. Their effects are preciſely the ſame: A hieroglyphic raiſes two images in the mind; one ſeen, that repreſents one that is not ſeen: An allegory does the ſame; the repreſentative ſubject is deſcribed, and the reſemblance leads us to apply the deſcription to the ſubject repreſented.

There cannot be a finer or more correct allegory than the following, in which a vineyard is made to repreſent God's own people the Jews:

"Thou haſt brought a vine out of Egypt; thou haſt caſt out the heathen, and planted it. Thou didſt cauſe it to take deep root, and it filled the land. The hills were covered with its ſhadow, and the boughs thereof were like the goodly cedars. Why haſt thou then broken down her hedges, ſo that all that paſs do pluck her? The boar out of the wood doth waſte it, and the wild beaſt doth devour it. Return, we beſeech thee, O God of hoſts: look down from heaven, and behold, and viſit this vine and the vineyard thy right hand hath planted, and the branch thou madeſt ſtrong for thyſelf," Pſal. lxxx.

Nothing gives greater pleaſure than an allegory, when the repreſentative ſubject bears a ſtrong analogy, in all its circumſtances, to that which is repreſented. But moſt writers are unlucky in their choice, the analogy being generally ſo faint and obſcure, as rather to puzzle than to pleaſe. Allegories, as well as metaphors and ſimilies, are unnatural in expreſſing any ſevere paſſion which totally occupies the mind. For this reaſon, the following ſpeech of Macbeth is juſtly condemned by the learned author of the Elements of Criticiſm:

> Methought I heard a voice cry, Sleep no more!
> Macbeth doth murder Sleep; the innocent ſleep;
> Sleep that knits up the ravell'd ſleeve of Care,
> The birth of each day's life, ſore Labour's bath,
> Balm of hurt minds, great Nature's ſecond courſe, Allegri.
> Chief nouriſher in life's feaſt. *Act* ii. *ſc.* 3.

But ſee this ſubject more fully treated under the article *Metaphor and Allegory*.

ALLEGRI, Antonio, called *Correggio* from the place of his birth, an eminent hiſtorical painter, was born in the year 1494. Being deſcended of poor parents, and educated in an obſcure village, he enjoyed none of thoſe advantages which contributed to form the other great painters of that illuſtrious age. He ſaw none of the ſtatues of ancient Greece or Rome; nor any of the works of the eſtabliſhed ſchools of Rome and Venice. But Nature was his guide; and Correggio was one of her favourite pupils. To expreſs the facility with which he painted, he uſed to ſay that he always had his thoughts ready at the end of his pencil.

The agreeable ſmile, and the profuſion of graces, which he gave to his madonas, ſaints, and children, have been taxed with being ſometimes unnatural; but ſtill they are amiable and ſeducing: An eaſy and flowing pencil, an union and harmony of colours, and a perfect intelligence of light and ſhade, give an aſtoniſhing relief to all his pictures, and have been the admiration both of his cotemporaries and his ſucceſſors. Annibal Caracci, who flouriſhed 50 years after him, ſtudied and adopted his manner in preference to that of any other maſter. In a letter to his couſin Louis, he expreſſed with great warmth the impreſſion which was made on him by the firſt ſight of Correggio's paintings: "Every thing which I ſee here (ſays he) aſtoniſhes me; particularly the colouring and the beauty of the children. They live—they breathe—They ſmile with ſo much grace and ſo much reality, that it is impoſſible to reſrain from ſmiling and partaking of their enjoyment. My heart is ready to break with grief when I think on the unhappy fate of poor Correggio—that ſo wonderful a man (if he ought not rather to be called an angel) ſhould finiſh his days ſo miſerably, in a country where his talents were never known!"——

From want of curioſity or of reſolution, or from want of patronage, Correggio never viſited Rome, but remained his whole life at Parma, where the art of painting was little eſteemed, and of conſequence poorly rewarded. This occurrence of unfavourable circumſtances occaſioned at laſt his premature death at the age of 40. He was employed to paint the cupola of the cathedral at Parma, the ſubject of which is an aſſumption of the Virgin: and having executed it in a manner that has long been the admiration of every perſon of good taſte, for the grandeur of deſign, and eſpecially for the boldneſs of the fore-ſhortenings (an art which he firſt and at once brought to the utmoſt perfection), he went to receive his payment. The canons of the church, either through ignorance or baſeneſs, found fault with his work; and although the price originally agreed upon had been very moderate, they alleged that it was far above the merit of the artiſt, and forced him to accept of the paltry ſum of 200 livres; which, to add to the indignity, they paid him in copper money. To carry home this unworthy load to his indigent wife and children, poor Correggio had to travel ſix or eight miles from Parma. The weight

of

Allegri. of his burden, the heat of the weather, and his chagrin at this villanous treatment, immediately threw him into a pleurisy, which in three days put an end to his life and his misfortunes.

For the preservation of this magnificent work the world is indebted to Titian. As he passed through Parma, in the *suite* of Charles V. he run instantly to see the *chef d'œuvre* of Corregio. While he was attentively viewing it, one of the principal canons of the church told him that such a grotesque performance did not merit his notice, and that they intended soon to have the whole defaced. "Have a care of what you do, (replied the other)": If I were not Titian, I would certainly wish to be Corregio."

Corregio's exclamation upon viewing a picture by Raphael is well known. Having long been accustomed to hear the most unbounded applause bestowed on the works of that divine painter, he by degrees became less desirous than afraid of seeing any of them. One, however, he at last had occasion to see. He examined it attentively for some minutes in profound silence; and then with an air of satisfaction exclaimed, *I am still a painter.* Julio Romano, on seeing some of Corregio's pictures at Parma, declared they were superior to any thing in painting he had yet beheld. One of these no doubt would be the famous Virgin and Child, with Mary Magdalen and St Jerome: but whether our readers are to depend upon his opinion, or upon that of Lady Millar, who in her *Letters from Italy* gives a very unfavourable account of it, we shall not presume to determine. This lady, however, speaks in a very different style of the no less famous *Notte* or Night of Corregio, of which she saw only a copy in the duke's palace at Modena, the original having been sold for a great sum of money to the king of Poland. "It surprises me very much (says she), to see how different the characters are in this picture from that which I already have described to you. The subject is a Nativity; and the extraordinary beauty of this picture proceeds from the *clair obscure:* there are two different lights introduced, by means of which the personages are visible; namely, the light proceeding from the body of the child, and the moon light. These two are preserved distinct, and produce a most wonderful effect. The child's body is so luminous, that the superficies is nearly transparent, and the rays of light emitted by it are verified in the effect they produce upon the surrounding objects. They are not rays distinct and separate, like those round the face of a sun that indicates an insurance office; nor linear, like those proceeding from the man in the almanack; but of a dazzling brightness: by their light you see clearly the face, neck, and hands, of the Virgin (the rest of the person being in strong shadow), the faces of the *pastori* who crowd round the child, and particularly one woman, who holds her hand before her face, lest her eyes should be so dazzled as to prevent her from beholding the infant. This is a beautiful natural action, and is most ingeniously introduced. The straw on which the child is laid appears gilt, from the light of his body shining on it. The moon lights up the back ground of the picture, which represents a landscape. Every object is distinct, as in a bright moonlight night; and there cannot be two lights in nature more different than those which appear in the same picture. The virgin and the child are of the most perfect beauty. There is a great variety of character in the different persons present, yet that uniformity common to all herdsmen and peasants. In short, this copy is so admirable, that I was quite sorry to be obliged to lose sight of it so soon; but I never shall forget it. The duke of Modena, for whom Corregio did the original picture, gave him only 600 livres of France for it; a great sum in those days: but at present, what ought it to cost?" This great painter's death happened in 1534. Allegri, Allegro.

ALLEGRI, Gregorio, an ecclesiastic by profession, and a celebrated composer of music of the 17th century, was a native of Rome. He was the disciple of Nanini, the intimate friend and contemporary of Palestrina. His abilities as a singer were not remarkable, but he was deemed an excellent master of harmony; and so much respected by all the musical professors of his time, that the pope, in the year 1629, appointed him to be one of the singers of his chapel. To his uncommon merit as a composer of church music, he united an excellent moral character, exhibiting in his actions the devotion and benevolence of his heart. The poor crowded daily to his door, whom he relieved to the utmost of his ability; and not content with these beneficent actions, he daily visited the prisons of Rome, in order to relieve the most deserving and afflicted objects which were immured in these dreary mansions. With such divine simplicity and purity of harmony, did he compose many parts of the church service, that his loss was severely felt and sincerely lamented by the whole college of singers in the papal service. He died Feb. 18. 1650, and was interred in the Chiesa Nuova, in a vault destined for the reception of deceased singers in the pope's chapel, before the chapel of S. Filippo Neri, near the altar of annunciation.

Among his other musical works preserved in the pontifical chapel, is the celebrated *miserere*, which, for 170 years, has been annually performed at that chapel on Wednesday and Good Friday, in Passion-week, by the choral band, and the best singers in Italy. It is, however, generally believed, that it owes its reputation more to the manner in which it is performed, than to the composition itself. The beauty and effect of the music is not discernible upon paper, but the singers have, by tradition, certain customs, expressions, and graces of convention, which produce wonderful effects. Some of the effects produced may be justly attributed to the time, the place, and the solemnity of the ceremonials observed during the performance. "The pope and conclave are all prostrated on the ground, the candles of the chapel and the torches of the ballustrade are extinguished one by one, and the last verse of this psalm is terminated by two choirs; the *maestra di capello* beating time slower and slower, and the singers diminishing, or rather extinguishing the harmony by little and little, to a perfect point." Padre Martini says, that there were never more than three copies made by authority, "one of which was for the emperor Leopold, one for the late king of Portugal, and the other for himself; but a very complete one was presented by the pope himself to King George III. as an inestimable curiosity." *(Gen. Biog.)*

ALLEGRO, in *Music*, an Italian word, denoting

Allegro, Allein.

that the part is to be played in a ſprightly, briſk, lively, and gay manner.

Piu Allegro, ſignifies, that the part it is joined to ſhou'd be ſung or played quicker; as

Poco piu Allegro intimates, that the part to which it refers ought to be played or ſung only a little more briſkly than allegro alone requires.

ALLEIN, Joseph, the ſon of Tobias Allein, was born in the Devizes, in Wiltſhire, in 1633, and educated at Oxford. In 1655, he became aſſiſtant to Mr Newton, in Taunton Magdalen, in Somerſetſhire; but was deprived for nonconformity. He died in 1668, aged 35. He was a man of great learning, and greater charity; preſerving, though a nonconformiſt, and a ſevere ſufferer on that account, great reſpect for the church, and loyalty to his ſovereign. He wrote ſeveral books of piety, which are highly eſteemed; but his *Alarm to unconverted ſinners* is more famous than the reſt. There have been many editions of this little pious work, the ſale of which has been very great; of the edition 1672, there were 20,000 ſold; of that of 1675, with this title, *A ſure guide to heaven*, 50,000. There was alſo a large impreſſion of it with its firſt title, in 1720.

Allein, *Richard*, an Engliſh nonconformoſt divine, a native of Ditchet, in Somerſetſhire, was born in the year 1611. His father was rector of Ditchet, and conducted the education of his ſon, until he was prepared for the univerſity. There he ſoon obtained the degree of maſter of arts, and after he entered into holy orders, firſt as an aſſiſtant to his father, and afterwards as rector of Batcomb, in Somerſetſhire, he diſcharged the duties of a clergyman with great induſtry and ſingular fidelity. From his education, he conceived an early predilection for the ſentiments of the Puritans, and conſequently, in the conteſt between Charles I. and the parliament, he firmly adhered to the latter. Having adopted theſe ſentiments, he ſometimes received a little diſturbance from the king's forces, but he never carried his oppoſition to any undue length. He, along with ſeveral others, ſigned a paper, entitled "The Teſtimony of the Miniſters of Somerſetſhire to the truth of Chriſt," in which their declared principles and becoming candour were amply diſplayed. Along with his father, he was employed by the commiſſioners appointed by parliament for ejecting ſcandalous miniſters; a commiſſion which was executed with rigour, and originated in intolerance.

Upon the Reſtoration he manifeſted a diſpoſition to loyalty, but unable with a good conſcience to unite in the act of conformity, he reſigned his living after enjoying it for 20 years, and ranked with the meritorious band of ſufferers, to the number of 2000, commonly denominated the *ejected miniſters*. In the houſe of Mr More who had been a member of the parliament, he exerciſed the duties of his miniſterial office under the penalties of that act, and was conſequently reprimanded by the magiſtrates and impriſoned; but his piety and exemplary conduct procured him a mitigation of puniſhment. But no dangers could deter him from duty; for although conſtrained to remove from that place in conſequence of the "five-mile act," he continued in the diſcharge of his miniſterial office at Frome-Selwood. Here he remained until he terminated his labours by death, in 1681.

Allein, Allemand

Piety, boldneſs, activity, and candour, ſhone in the character of Richard Allein. He was admired as a pathetic and practical preacher, and juſtly reſpected for the diligence with which he diſcharged the public and private duties of his profeſſion. Mr Jenkins, the vicar of the pariſh where he reſided, preached his funeral ſermon, and bore an honourable teſtimony to his activity, moderation, and piety. Richard Allein, ſimilar to his nonconformiſt brethren, chiefly confined his ſtudies and publications to ſubjects of religion. His works are ſtrongly marked with the peculiar features of the religious character then prevalent among the nonconformiſts. They have been frequently reprinted, and very much peruſed. His moſt celebrated work is "*Vindiciæ Pietatis*, or a Vindication of Godlineſs in its greateſt Strictneſs and Spirituality, with directions for a godly life;" this book was publiſhed in 1665, without a printer's name; and being unlicenſed, the copies of it were ſeized and ſent to the king's kitchen for waſte paper. The other productions of his pen are, "Heaven opened, or a brief and plain diſcovery of the riches of God's Covenant of Grace;" printed in 1665. "The World Conquered;" publiſhed in 8vo, in 1688. "Godly Fear," printed in 8vo, in 1674. "A Rebuke to Backſliders, and a Spur for Loiterers," printed in 8vo in 1677. "A Companion for Prayer;" in 12mo, 1680. "A brief character of Mr Joſeph Allein;" and "Inſtructions about heart-work, what is to be done on God's part and ours for the cure and keeping of the heart;" a poſthumous piece publiſhed in 8vo, by Dr Anneſley in the year 1681. (*Gen. Biog.*)

ALLELUIAH, or Hallelujah, a word ſignifying, *praiſe the Lord*, to be met with either at the beginning or end of ſome pſalms: ſuch as pſalm cxlv. and thoſe that follow to the end. Alleluiah was ſung upon ſolemn days of rejoicing, Tobit. xiii. 12. St John in the Revelation (xix. 1, 3, 4, 6.) ſays, that he "heard a great voice of much people in heaven, who ſaid, Alleluiah; and the four and twenty elders, and the four beaſts, fell down and worſhipped God that ſat on the throne, ſaying, *Alleluiah*." This hymn of joy and praiſes was transferred from the ſynagogue to the church. St Jerome tells us, that at the funeral of Fabiola ſeveral pſalms were ſung with loud alleluiahs; and that the monks of Paleſtine were awakened at their midnight watchings, with the ſinging of alleluiahs. So much energy has been obſerved in this term, that the ancient church thought proper to preſerve it, without tranſlating it either into Greek or Latin, for fear of impairing the genius and ſoftneſs of it. The fourth council of Toledo has prohibited the uſe of it in times of Lent, or other days of faſting, and in the ceremonies of mourning: and, according to the preſent practice of the Romiſh church, this word is never repeated in Lent, nor in the obſequies of the dead; notwithſtanding which, it is uſed in the maſs for the dead, according to the Moſarabic ritual, at the introit, when they ſing, *Tu es portio mea, Domine, Alleluiah, in terra viventium, Alleluiah, Alleluiah.* The ſinging alleluiah was oftentimes an invitatory or call to each other to praiſe the Lord.

ALLEMAENGEL, a ſmall Moravian ſettlement on Swetara river, in Pennſylvania.

ALLEMAND, a ſort of grave ſolemn muſic, with good

Allemand
ll
[Allen.

good measure, and a slow movement. It is also a brisk kind of dance, very common in Germany and Switzerland.

ALLEMAND, a river which falls into the Mississippi from the south-east, about 43 miles south of the Natches.

ALLEMANNIC, in a general sense, denotes any thing belonging to the ancient Germans. Thus, we meet with Allemannic history, Allemannic language, Allemannic law, &c.

ALLEN, JOHN, archbishop of Dublin in the reign of King Henry VIII. was educated in the university of Oxford; from whence removing to Cambridge, he there took the degree of bachelor of laws. He was sent by Dr Warham, archbishop of Canterbury, to the pope, about certain matters relating to the church. He continued at Rome nine years; and was created doctor of laws, either there or in some other university of Italy. After his return, he was appointed chaplain to Cardinal Wolsey, and was commissary or judge of his court as legate *à latere*: in the execution of which office he was suspected of great dishonesty, and even perjury. He assisted the cardinal in visiting, and afterwards suppressing, 40 of the smaller monasteries, for the erection of his college at Oxford and that at Ipswich. The cardinal procured for him the living of Dalby in Leicestershire, though it belonged to the master and brethren of the hospital of Burton-Lazars. About the latter end of the year 1525 he was incorporated doctor of laws in the university of Oxford. On the 13th of March 1528 he was consecrated archbishop of Dublin, in the room of Dr Hugh Inge deceased; and about the same time was made chancellor of Ireland. He wrote, 1. *Epistola de Pallii significatione activa et passiva*; penned by him at the time when he received the archiepiscopal pall. 2. *De consuetudinibus ac statutis in tuitoriis causis observandis*. He wrote also several other pieces relating to the church. His death, which happened in July 1534, was very tragical: for being taken in a time of rebellion by Thomas Fitzgerald, eldest son to the earl of Kildare, he was by his command most cruelly murdered, being brained like an ox, at Tartaine in Ireland, in the 58th year of his age. The place where the murder was committed was afterwards hedged in, overgrown, and unfrequented, in detestation of the fact.

ALLEN, *Thomas*, a famous mathematician of the 16th century, born at Utoxeter in Staffordshire the 21st of December 1542. He was admitted scholar of Trinity college, Oxford, the 4th of June 1561; and in 1567 took his degree of master of arts. In 1580 he quitted his college and fellowship, and retired to Gloucester-hall; where he studied very closely, and became famous for his knowledge in antiquity, philosophy, and mathematics. Having received an invitation from Henry earl of Northumberland, a great friend and patron of the mathematicians, he spent some time at the earl's house, where he became acquainted with those celebrated mathematicians Thomas Harriot, John Dee, Walter Warner, and Nathaniel Torporley. Robert earl of Leicester had a particular esteem for Mr Allen, and would have conferred a bishopric upon him, but his love of solitude and retirement made him decline the offer. His great skill in the mathematics made the ignorant and vulgar look upon him as a magician or conjuror: the author of a book entitled *Leicester's Commonwealth*, has accordingly accused him with using the art of figuring, to procure the earl of Leicester's unlawful designs, and endeavouring by the black art to bring about a match betwixt him and Queen Elizabeth. But without pretending to point out the absurdity of the charge, it is certain that the earl placed such confidence in Allen, that nothing material in the state was transacted without his knowledge; and the earl had constant information, by letter from Mr Allen, of what passed in the university. Mr Allen was very curious and indefatigable in collecting scattered manuscripts relating to history, antiquity, adronomy, philosophy, and mathematics: these collections have been quoted by several learned authors, &c. and mentioned to have been in the Bibliotheca Alleniana. He published in Latin the second and third books of Claudius Ptolemy of Pelusium, *Concerning the Judgement of the Stars*, or, as it is commonly called, of the *Quadripartite Construction*, with an exposition. He wrote also notes on many of Lilly's books, and some on John Bale's work *De Scriptoribus M. Britanniæ*. Having lived to a great age, he died at Gloucester-hall on the 30th September 1632.

Allendorf
Allerby.

ALLENDORF, a small town in the circle of the Upper Rhine, and in the landgravate of Hesse Cassel, remarkable for its salt works, and three stone-bridges. It is seated on the river Weser, 15 miles east of Cassel. E. Long. 10. 5. N. Lat. 51. 26.

ALLENSTOWN, a town in New Jersey, in Monmouth county, 15 miles north-east from Burlington, and 13 south-by-east from Princeton.

ALLENSTOWN, a township in Rockingham county, New Hampshire, containing 254 inhabitants; situated on the east side of Merrimack river, 25 miles north-west of Exeter, and 40 from Portsmouth.

ALLENTOWN, in Pennsylvania, Northampton county, on the point of land formed by Jordan's creek, and the Little Leheigh. It contains about 90 houses, and an academy.

ALLER, a river which runs through the duchy of Lunenburg, and falls into the Weser a little below Verden.

ALLER, *good*, in our ancient writers. The word *aller* serves to make the expression of superlative signification. So, *aller-good* is the greatest good. Sometimes it is written *alder*.

ALLERION, or ALERION, in *Heraldry*, a sort of eagle without beak or feet, having nothing perfect but the wings. They differ from martlets by having their wings expanded, whereas those of the martlets are close; and denote imperialists vanquished and disarmed: for which reason they are more common in French than in German coats of arms.

ALLESTRY, RICHARD, D. D. was born at Uppington in Shropshire, in 1619, was educated in the grammar school of Coventry, and afterwards at Christ-church in Oxford. His natural talents, which were uncommonly vigorous, he carefully improved by an unwearied application to study. Accordingly, his promotion was rapid. First he obtained the degree of bachelor of arts; next he was chosen moderator in philosophy; then made a canon of Christ church, created doctor of divinity, appointed chaplain in ordinary to the king, and afterwards regius professor of divinity.

But in the early part of life his studies were interrupted

Alleſtry. rupted, and he was called to military ſervice by hoſtile occurrences of the times. In the year 1641, he, along with many other ſtudents of Oxford, entered the royal ſervice, and gave eminent proofs of their courage and loyal attachment. A ſhort interval of hoſtilities permitted them to return to their literary purſuits; but a republican party ſoon after diſturbed their repoſe, and entering Oxford, attempted to plunder the colleges. Having entered the treaſury, and finding nothing but fourpence and a halter, they haſtened to the deanery, and ſeizing many valuable articles, they locked them in an apartment, intending next day to carry them along with them. During the night, however, Alleſtry having a key to that apartment, found means to remove the whole of the articles. Informed that he was the cauſe of their diſappointment, they ſeized him; and had they not been unexpectedly called off by an order of the earl of Eſſex, they would have ſeverely wrecked their indignation upon him. In October following he again took up arms, was preſent at the battle of Keinton-field, and on his way to Oxford to prepare for the reception of the king he was taken priſoner, but ſoon afterwards releaſed by the king's forces.

A violent diſeaſe which then prevailed in the garriſon of Oxford, brought Alleſtry to the brink of the grave; but recovering, he again joined a regiment of volunteers, chiefly conſiſting of Oxford ſtudents. Here he ſerved as a common ſoldier, and was often ſeen with the muſket in one hand and the book in the other. When the republican party prevailed, he returned at the termination of the war to his favourite ſtudies, but ſtill continued true to that ſide of politics which he had adopted. This conduct occaſioned his expulſion from the college; but he was provided with a comfortable retreat, in the families of the honourable Francis Newport, and Sir Anthony Cope.

Such was the confidence repoſed in him, that, when the friends of Charles II. were ſecretly preparing the way for his reſtoration, they entruſted him with perſonal meſſages to the king. In returning from one of theſe interviews, he was ſeized at Dover, and upon examination committed a priſoner to Lambeth-houſe. The earl of Shafteſbury obtained his releaſe in a few weeks. Returning to viſit his friends, and among others the learned Dr Hammond, he met his corpſe at the gate of his houſe, carrying to the grave. This deeply afflicted his mind, and added much to his preſent diſtreſſes. The doctor left him his valuable library, aſſigning as a reaſon that "he well knew that his books in his hands would be uſeful weapons, for the defence of that cauſe he had ſo vigorouſly ſupported." This valuable library along with his own, Alleſtry bequeathed at his death to the univerſity.

During his life he erected at his own private expence the weſt ſide of the outward court of Eton college, the grammar ſchool in Chriſt-church college, and ſettled ſeveral liberal penſions upon individual perſons and families. His original biographer gives him the following character. "Memory, fancy, judgement, elocution, great modeſty, and no leſs aſſurance, a comprehenſion of things, and a fluency of words; an aptneſs for the pleaſant, and ſufficiency for the rugged parts of knowledge; a courage to encounter and an induſtry to maſter all things, make up the character of his happy genius. There was not in the world a man of clearer honeſty and courage; no temptation could bribe him to do a baſe thing, or terror affright him from the doing a good one. This made his friendſhip as laſting and inviolable as his life, without the mean conſiderations of profit, or ſly reſerves of craft; without the pageantry of ceremonious addreſs, the cold civility of ſome, and the ſervile falſeneſs and obſequious flattery of others." He left a volume of ſermons printed at Oxford in 1684, from the peruſal of which poſterity may judge of his literary abilities. Although his lectures gave univerſal ſatisfaction, yet he prohibited their publication. Alleſtry || Alley.

ALLESTRY, *Jacob*, an Engliſh poet of the laſt century. He was the ſon of James Alleſtry, a bookſeller of London who was ruined by the great fire in 1666. Jacob was educated at Weſtminſter ſchool, entered at Chriſt-church, Oxford, in the act-term 1671, at the age of 18, and was elected ſtudent in 1672. He took the degree of arts; was muſic reader in 1679, and terræ filius in 1681; both which offices he executed with great applauſe, being eſteemed a good philologiſt and poet. He had a chief hand in the verſes and paſtorals ſpoken in the theatre at Oxford May 21. 1681, by Mr William Saville ſecond ſon of the marquis of Halifax, and George Cholmondely ſecond ſon of Robert Viſcount Kells (both of Chriſt-church), before James duke of York, his duchefs, and the lady Anne; which verſes and paſtorals, were afterwards printed in the "Examen Poeticum." He died October 15. 1686, and was buried in St Thomas's churchyard.

ALLEVEURE, a ſmall braſs Swediſh coin, worth about ½d. Engliſh money.

ALLEVIATION, denotes the making a thing lighter, and eaſier to bear or endure. It ſtands oppoſed to *aggravation*.

ALLEY, William, biſhop of Exeter in the reign of Queen Elizabeth, was born at Great Wycomb in Buckinghamſhire. From Eton ſchool, in the year 1528, he removed to King's college, Cambridge, where he took the degree of bachelor of arts. He alſo ſtudied ſome time at Oxford; afterwards he married, was preſented to a living, and became a zealous reformer. Upon Queen Mary's acceſſion he left his cure and retired into the north of England; where he maintained his wife and himſelf by teaching a ſchool, and practiſing phyſic. Queen Elizabeth aſcending the throne, he went to London, where he acquired great reputation by reading the divinity lecture at St Paul's, and in July 1560 was conſecrated biſhop of Exeter. He was created doctor of divinity at Oxford in November 1561. He died on the 15th of April 1570, and was buried at Exeter in the cathedral. He wrote, 1. The Poor Man's Library, 2 vols. fol. Lond. 1571. Theſe volumes contain twelve lectures on the firſt epiſtle of St Peter, read at St Paul's. 2. A Hebrew Grammar. Whether it was ever publiſhed is uncertain. He tranſlated the Pentateuch, in the verſion of the Bible which was undertaken by Queen Elizabeth's command.

Alley, in *Gardening*, a ſtraight parallel walk, bounded on both ſides with trees, ſhrubs, &c. and uſually covered with gravel or turf.

Alley, among builders, denotes a narrow paſſage leading from one place to another.

Alley, in *Perſpective*, that which, in order to have

Alley || Alleyn.

a greater appearance of length, is made wider at the entrance than at the termination.

ALLEY, in the new husbandry, implies the vacant space between the outermost row of corn on one bed and the nearest row to it on the next parallel bed; and it is usually about four feet in breadth, exclusive of the partitions between the rows of corn in the beds. The first hoeing of wheat is performed in the beginning of winter, and the earth is ploughed away from the rows into the intervals, which forms small ridges in the middle between the double rows. The second hoeing is in the spring, which turns it back to the rows, leaving a furrow in the middle of the alley. The third hoeing is from the rows, after the wheat has blossomed: this turns the earth into the intervals, forming small ridges there, as at the first hoeing. The fourth hoeing returns the earth to the ridges, which is performed a month or more after the third hoeing. This commonly finishes the horse-hoeings, if the land is in good heart; otherwise one or two more hoeings are necessary.

ALLEYN, EDWARD, a celebrated English actor in the reign of Queen Elizabeth and King James, and founder of the college at Dulwich in Surry, was born at London in the parish of St Botolph, Sept. 1. 1566, as appears from a memorandum of his own writing. Dr Fuller says, that he was bred a stage-player; and that his father would have given him a liberal education, but that he was not turned for a serious course of life. He was, however, a youth of an excellent capacity, a cheerful temper, a tenacious memory, a sweet elocution, and in his person of a stately port and aspect: all which advantages might well induce a young man to take to the theatrical profession. By several authorities we find he must have been on the stage some time before 1592; for at this time he was in high favour with the town, and greatly applauded by the best judges, particularly by Ben Johnson.

Haywood, in his prologue to Marloe's Jew of Malta, calls him Proteus for shapes, and Roscius for a tongue. He usually played the capital parts, and was one of the original actors in Shakespeare's plays; in some of Ben Johnson's he was also a principal performer: but what characters he personated in either of these poets, it is difficult now to determine. This is owing to the inaccuracy of their editors, who did not print the names of the players opposite to the characters they performed, as the modern custom is; but gave one general list of actors to the whole set of plays, as in the old folio edition of Shakespeare; or divided one from the other, setting the dramatis personæ before the plays, and the catalogue of performers after them, as in Johnson's.

It may appear surprising how one of Mr Alleyn's profession should be enabled to erect such an edifice as Dulwich college, and liberally endow it for the maintenance of so many persons. But it must be observed that he had some paternal fortune, which, though small, might lay a foundation for his future affluence; and it is to be presumed, that the profits he received from acting, to one of his provident and managing disposition, and one who by his excellence in playing drew after him such crowds of spectators, must have considerably improved his fortune: besides he was not only an actor, but master of a playhouse built at his own expence, by which he is said to have amassed considerable wealth. He was also keeper of the king's wild beasts, or master of the royal bear-garden, which was frequented by vast crowds of spectators; and the profits arising from these sports are said to have amounted to 500l. per annum. He was thrice married; and the portions of his two first wives, they leaving him no issue to inherit, might probably contribute to this benefaction. Such kind of donations have been frequently thought to proceed more from vanity and ostentation than real piety; but this of Mr Alleyn has been ascribed to a very singular cause, for the devil has been said to be the first promoter of it. Mr Aubrey mentions a tradition, "that Mr Alleyn playing a demon, with six others, in one of Shakespeare's plays, was, in the midst of the play, surprised by an apparition of the devil; which so worked on his fancy, that he made a vow, which he performed by building Dulwich college." He began the foundation of this college, under the direction of Inigo Jones, in 1614; and the buildings, gardens, &c. were finished in 1617, in which he is said to have expended about 10,000l. After the college was built, he met with some difficulty in obtaining a charter for settling his lands in mortmain: for he proposed to endow it with 800l. per annum, for the maintenance of one master, one warden, and four fellows, three whereof were to be clergymen, and the fourth a skilful organist; also six poor men and as many women, besides twelve poor boys to be educated till the age of fourteen or sixteen, and then put out to some trade or calling. The obstruction he met with arose from the lord chancellor Bacon, who wished King James to settle part of those lands for support of two academical lectures; and he wrote a letter to the Marquis of Buckingham, dated August 18. 1618, entreating him to use his interest with his Majesty for that purpose. Mr Alleyn's solicitation was however at last complied with, and he obtained the royal license, giving him full power to lay his foundation, by his Majesty's letters patent, bearing date the 21st of June 1619; by virtue whereof he did, in the chapel at the said new hospital at Dulwich, called *The College of God's Gift*, on the 13th of September following, publicly read and publish a quadripartite writing in parchment, whereby he created and established the said college; he then subscribed it with his name, and fixed his seal to several parts thereof, in presence of several honourable persons, and ordered copies of the writings to four different parishes. He was himself the first master of his college; so that to make use of the words of Mr Haywood, one of his contemporaries, "He was so mingled with humility and charity, that he became his own pensioner, humbly submitting himself to that proportion of diet and clothes which he had bestowed on others." We have no reason to think he ever repented of this distribution of his substance; but, on the contrary, that he was entirely satisfied, as appears from the following memorial in his own writing, found amongst his papers: "May 26. 1620.—My wife and I acknowledged the fine at the common pleas bar, of all our lands to the college: blessed be God that he has given us life to do it." His wife died in the year 1623; and about two years afterwards he married Constance Kinchtoe, who survived him, and received

Alleyn.

remarkable

Alleyn || Alliance.

remarkable proofs of his affection, if at leaſt we may judge of it by his will, wherein he left her conſiderably. He died Nov. 25. 1626, in the 61ſt year of his age, and was buried in the chapel of his new college, where there is a tomb-ſtone over his grave, with an inſcription. His original diary is alſo there preſerved.

The ſubjoining anecdote is entertaining in itſelf, and ſhows the high eſteem in which Mr Alleyn was held as an actor: "Edward Alleyn, the Garrick of Shakeſpeare's time, had been on the moſt friendly footing with our poet, as well as Ben Johnſon. They uſed frequently to ſpend their evenings together at the ſign of the Globe, ſomewhere near Blackfriars, where the playhouſe then was. The world need not be told, that the convivial hours of ſuch a triumvirate muſt be pleaſing as well as profitable, and may be ſaid to be ſuch pleaſures as might bear the reflections of the morning. In conſequence of one of theſe meetings, the following letter was written by G. Peele, a Fellow of Chriſt church college, Oxford, and a dramatic poet, who belonged to the Club, to one Marle, an intimate of his:

'Friend Marle.

'I muſt deſyr that my ſyſter hyr watch, and the 'cookerie book you promyſed, may be ſente bye the 'man.——I never longed for thy company more than 'laſt night: we were all very merrye at the Globe, 'when Ned Alleyn did not ſcruple to affyrme pleaſauntely to thy Friende Will, that he had ſtolen his 'ſpeech about thee Qualityes of an actor's excellencye 'in Hamlet hys Tragedye, from converſations many-'fold whych had paſſed betweene them, and opinyons 'given by Alleyn touchinge the ſubjecte.——Shake-'ſpeare did not take this talke in good ſorte; but 'Johnſon put an ende to the ſtriſe with wittylye re-'markinge, *This affaire needeth no Contentione; you 'ſtole it from Ned, no doubte; do not marvel: Have 'you not ſeen him act tymes out of number?*—Believe 'me moſt ſyncerilie, yours, *G. Peele.*'

ALLIA, a river of Italy, in the Sabine territory, which running down a very deep channel from the mountains of Cruſtuminum, mixes with the Tiber 40 miles from Rome; famous for the great ſlaughter of the Romans by the Gauls, under Brennus, when 40,000 Romans were killed or put to flight; hence *Allienſis dies*, an unlucky day (Virgil, Ovid, Lucan). Our anceſtors, ſays Cicero, deemed the day of the fight of *Allia* more fatal than that of taking the city.

ALLIANCE, in the *Civil and Canon Law*, the relation contracted between two perſons or two families by marriage.

ALLIANCE is alſo uſed for a treaty entered into by ſovereign princes and ſtates, for their mutual ſafety and defence.—In this ſenſe, alliances may be diſtinguiſhed into ſuch as are offenſive, whereby the contracting parties oblige themſelves jointly to attack ſome other power; and into defenſive ones, whereby they bind themſelves to ſtand by and defend each other in caſe they are attacked by others. Alliance with the ancient Romans, though a ſort of ſervitude, was much coveted. Ariarathes, we are told by Polybius, offered a ſacrifice to the gods by way of thankſgiving for having obtained this alliance. The reaſon was, that thenceforward people were ſure not to receive any injuries except from them. There were different ſorts of allies: ſome only united to them by a participation of the privileges of Romans, as the Latini and Hernici; others by their very foundation, as the colonies; others by the benefactions they received from them, as Maſiniſſa, Eumenes, and Attalus, who owed their kingdoms to Rome; others by free treaties, which laſt by a long alliance became ſubjects, as the kings of Bithynia, Cappadocia, Egypt, and moſt of the cities of Greece: Laſtly, others by compulſive treaties, and the law of ſubjection, as Philip and Antiochus. For they never granted peace to an enemy, without making an alliance with him; that is, they never ſubdued any people without uſing it as a means of ſubduing others.

Alliance || Alligation.

The forms or ceremonies of alliances have been various in different ages and countries. Among us, ſigning and ſwearing, ſometimes at the altar, are the chief; anciently eating and drinking together, chiefly offering ſacrifices together, were the cuſtomary rite of ratifying an alliance. Among the Jews and Chaldeans, heifers or calves, among the Greeks bulls or goats, and among the Romans hogs, were ſacrificed on this occaſion. Among the ancient Arabs, alliances were confirmed by drawing blood out of the palms of the hands of the two contracting princes with a ſharp ſtone, dipping herein a piece of their garments, and therewith ſmearing ſeven ſtones, at the ſame time invoking the gods Vrotalt and Alilat, i. e. according to Herodotus, Bacchus and Uranius. Among the people of Colchis, the confirmation of alliances is ſaid to be effected by one of the princes offering his wife's breaſts to the other to ſuck, which he was obliged to do till there iſſued blood.

ALLIANCE, in a figurative ſenſe, is applied to any kind of union or connection; thus we ſay, there is an alliance between the church and ſtate.

ALLIARA, See ERYSIMUM, BOTANY *Index*.

ALLIER, in *Geography*, a river of France, which gives name to a department, has its ſource near Chateau Neuf de Randon, in the department of Lozere, and joins the Loire near Nevers.

ALLIER, a department of France, formerly the province of Bourbonnois, is bounded on the north by the departments of Saone and Loire, Nievre and Cher; on the eaſt by thoſe of Saone and Loire and the Loire; on the ſouth by thoſe of the Loire, Puy de Dome, and Creuſe; and on the weſt by thoſe of Creuſe and Cher. It contains 1,454,341 ſquare acres; the number of inhabitants is about 266,105; and it is divided into four communal diſtricts. The principal town is Moulins.

ALLIGATI, in Roman antiquity, the baſeſt kind of ſlaves, who were uſually kept fettered. The Romans had three degrees, or orders, of ſlaves or ſervants; the firſt employed in the management of their eſtates; the ſecond in the menial or lower functions of the family; the third called *alligati*, above mentioned.

ALLIGATION the name of a method of ſolving all queſtions that relate to the mixture of one ingredient with another. Though writers on arithmetic generally make allegation a branch of that ſcience; yet, as it is plainly nothing more than an application of the common properties of numbers, in order to ſolve a few queſtions

Alligation. queſtions that occur in particular branches of buſineſs, we chooſe rather to keep it diſtinct from the ſcience of arithmetic.

Alligation is generally divided into *medial* and *alternate*.

Alligation Medial, from the rates and quantities of the ſimples given, diſcovers the rate of the mixture.

Rule. As the total quantity of the ſimples,
To their price or value;
So any quantity of the mixture,
To the rate.

Examp. A grocer mixeth 30lb. of currants, at 4d. per lb. with 10lb. of other currants, at 6d. per lb.: What is the value of 1lb. of the mixture? *Anſ.* 4½d.

lb.	d.		d.
30, at	4	amounts to	120
10, at	6	———	60
40			180

lb. d. lb. d.
If 40 : 180 :: 1 : 4½.

Note 1. When the quantity of each ſimple is the ſame, the rate of the mixture is readily found by adding the rates of the ſimples, and dividing their ſum by the number of ſimples Thus,

Suppoſe a grocer mixes ſeveral ſorts of ſugar, and of each an equal quantity, viz. at 50s. at 54s. and at 60s. per cwt. the rate of the mixture will be 54s. 8d. per cwt.; for

s. s. d.
50+54+60=164, and 3)164(54 8

Note 2. If it be required to increaſe or diminiſh the quantity of the mixture, ſay, As the ſum of the given quantities of the ſimples, to the ſeveral quantities given; ſo the quantity of the mixture propoſed, to the quantities of the ſimples ſought.

Note 3. If it be required to know how much of each ſimple is an aſſigned portion of the mixture, ſay, As the quantity of the mixture, to the ſeveral quantities of the ſimples given; ſo the quantity of the aſſigned portion, to the quantities of the ſimples ſought. Thus.

Suppoſe a grocer mixes 10lb. of raiſins with 30lb. of almonds and 40lb. of currants, and it be demanded how many ounces of each ſort are found in every pound, or in every 16 ounces of the mixture, ſay,

oz.
80 : 10 :: 16 : 2 raiſins.
80 : 30 :: 16 : 6 almonds.
80 : 40 :: 16 : 8 currants.

Proof 16

Note 4. If the rates of two ſimples, with the total value and total quantity of the mixture, be given, the quantity of each ſimple may be found as follows: viz. Multiply the leſſer rate into the total quantity, ſubtract the product from the total value, and the remainder will be equal to the product of the exceſs of the higher rate above the lower, multiplied into the quantity of the higher priced ſimple; and conſequently the ſaid remainder, divided by the difference of the rates, will quote the ſaid quantity. Thus, Alligation.

Suppoſe a grocer has a mixture of 400lb. weight, that coſt him 7l. 10s. conſiſting of raiſins at 4d. per lb. and almonds at 6d. how many pounds of almonds were in the mixture?

	lb.	Rates.
	400	6d.
L. s. d.	4	4d.
7 10=1800		
1600	1600d.	2d.

	L. s.
2)200(100lb. of almonds at 6d. is	2 10
And 300lb. of raiſins at 4d. is	5 0
Total 400	Proof 7 10

Alligation Alternate, being the converſe of alligation medial, from the rates of the ſimples, and rate of the mixture given, finds the quantities of the ſimples.

Rules. I. Place the rate of the mixture on the left ſide of a brace, as the root; and on the right ſide of the brace ſet the rates of the ſeveral ſimples, under one another, as the branches. II. Link or alligate the branches, ſo as one greater and another leſs than the root may be linked or yoked together. III. Set the difference betwixt the root and the ſeveral branches right againſt their reſpective yoke-fellows. Theſe alternate differences are the quantities required. Note 1. If any branch happen to have two or more yoke-fellows, the difference betwixt the root and theſe yoke-fellows muſt be placed right againſt the ſaid branch, one after another, and added into one ſum. 2. In ſome queſtions, the branches may be alligated more ways than one: and a queſtion will always admit of ſo many anſwers as there are different ways of linking the branches.

Alligation alternate admits of three varieties, viz. 1. The queſtion may be unlimited, with reſpect both to the quantity of the ſimples and that of the mixture. 2. The queſtion may be limited to a certain quantity of one or more of the ſimples. 3. The queſtion may be limited to a certain quantity of the mixture.

Variety I. When the queſtion is unlimited, with reſpect both to the quantity of the ſimples, and that of the mixture, this is called *Alligation Simple*.

Examp. A grocer would mix ſugars at 5d. 7d. and 10d. per lb. ſo as to ſell the mixture or compound at 8d. per lb.: What quantity of each muſt he take?

lb.
8 { 5 \ 2 | 2
  { 7 / 2 | 2
  { 10 \ 3,1 | 4

Here the rate of the mixture 8 is placed on the left ſide of the brace, as the root; and on the right ſide of the ſame brace are ſet the rates of the ſeveral ſimples, viz. 5, 7, 10, under one another, as the branches; according to Rule I.

The branch 10 being greater than the root, is alligated or linked with 7 and 5, both theſe being leſs than the root; as directed in Rule II.

The difference between the root 8 and the branch 5, viz. 3, is ſet right againſt this branch's yoke-fellow 10. The difference between 8 and 7 is likewiſe ſet right againſt

Alligation

against the yoke-fellow 10. And the difference betwixt 8 and 10. viz. 2, is set right against the two yoke fellows 7 and 5; as prescribed by Rule III.

As the branch 10 has two differences on the right, viz. 3 and 1, they are added; and the answer to the question is, that 2lb. at 5d. 2lb. at 7d. and 4lb. at 10d. will make the mixture required.

The truth and reason of the rules will appear by considering, that whatever is lost upon any one branch is gained upon its yoke-fellow. Thus in the above example by selling 4lb. of 10d. sugar at 8d. per lb. there is 8d. lost: but the like sum is gained upon its two yoke-fellows; for by selling 2lb. of 5d. sugar at 8d. per lb. there is 6d. gained; and by selling 2lb. of 7d. sugar at 8d. there is 2d. gained; and 6d. and 2d. make 8d.

Hence it follows, that the rate of the mixture must always be mean or middle with respect to the rates of the simples; that is, it must be less than the greatest, and greater than the least; otherwise a solution would be impossible. And the price of the total quantity mixed, computed at the rate of the mixture, will always be equal to the sum of the prices of the several quantities cast up at the respective rates of the simples.

Variety II. When the question is limited to a certain quantity of one or more of the simples, this is called *Alligation Partial.*

If the quantity of one of the simples only be limited, alligate the branches, and take their differences, as if there had been no such limitation; and then work by the following proportion:

As the difference right against the rate of the simple, whose quantity is given,
To the other differences respectively;
So the quantity given,
To the several quantities sought.

Examp. A distiller would, with 40 gallons of brandy at 12s per gallon, mix rum at 7s. per gallon, and gin at 4s. per gallon: How much of the rum and gin must he take, to sell the mixture at 8s. per gallon?

Gal.

$$8\left\{\begin{matrix}12\\7\\4\end{matrix}\right.\begin{matrix}\diagdown\\\diagup\\\diagdown\end{matrix}\begin{matrix}14,\\4\\4\end{matrix}\left|\begin{matrix}5\\4\\4\end{matrix}\right|\left.\begin{matrix}40\text{ of brandy.}\\32\text{ of rum.}\\32\text{ of gin.}\end{matrix}\right\}\textit{Anf.}$$

The operation gives for answer, 5 gallons of brandy, 4 of rum, and 4 of gin. But the question limits the quantity of brandy to 40 gallons; therefore say,

If 5 : 4 :: 40 : 32

The quantity of gin, by the operation, being also 4, the proportion needs not be repeated.

Variety III. When the question is limited to a certain quantity of the mixture, this is called *Alligation Total.*

After linking the branches, and taking the differences, work by the proportion following:

As the sum of the differences,
To each particular difference;
So the given total of the mixture,
To the respective quantities required.

Examp. A vintner hath wine at 3s. per gallon, and would mix it with water, so as to make a composition of 144 gallons, worth 2s. 6d. per gallon: How much wine, and how much water, must he take? Alligator ll Alliteration.

Gal.

$$30\left\{\begin{matrix}36\\0\end{matrix}\right)\begin{matrix}30\\6\end{matrix}\left|\begin{matrix}120\text{ of wine}\\24\text{ of water.}\end{matrix}\right\}\textit{Anf.}$$

36 | 144 total.

120 × 36 = 4320

24 × 0 = 0

Proof 144)4320(30

As 36 : 30 :: 144 : 120

As 36 : 6 :: 144 : 24.

There being here only two simples, and the total of the mixture limited, the question admits but of one answer.

ALLIGATOR, in *Zoology*, a synonyme of the lacerta crocodilus. See LACERTA.

Alligator Pear. See LAURUS, BOTANY *Index.*

ALLIONIA. See BOTANY *Index.*

ALLIOTH, a star in the tail of the Greater Bear, much used for finding the latitude at sea.

ALLITERATION, an ornament of language chiefly used in poetry, and consisting in the repetition of the same letter at certain intervals. We do not remember to have ever seen any satisfactory account of alliteration in the writings of the critics. They seem to have passed it over in contemptuous silence; either as a false refinement or as a mere trifle. It perhaps deserves a better fate. Many chapters have been composed on quantity, on the expression resulting from different arrangements of long and short syllables, and on the powers of pauses as they are variously placed, without a word of alliteration. This is the more extraordinary, as one should think it impossible for any man to examine minutely, and, as it were, dissect a number of verses, without perceiving the vast abundance of this ornament. It is as if an anatomist should publish a complete table of the arteries in the human body, and affect never to have seen a vein or a nerve: for it may be affirmed, with small danger of mistake, that if you examine any number of verses, remarkable either for sweetness or for energy, they will be found in some degree alliterative. We do not pretend to say, that the sweetness and energy of versification depends chiefly on this circumstance, yet we cannot help believing that it may claim some share; for it is a constant appearance, as far as we have ever observed, that the poets whose fame is highest for versification, have been attentive to alliteration.

The very trifling appearance of the ornament itself, upon a superficial view, and the frequent abuse of it, are circumstances indeed which give no encouragement to a serious inquiry into its nature and operation. How common is it for writers, who affect to be comic, when in want of other means for raising a smile, to use affected alliteration with success? But, in the fine arts, no beauty or grace is beyond the power of ridicule. The noblest attitudes in painting have been rendered laughable by caricatura. St Paul preaching at Athens, in the design of Raphael, appears elegant, noble, and in some degree awful. The same apostle, represented by Hogarth in nearly the same attitude, pleading before

Alliteration. fore the governor Felix, ſeems altogether ridiculous. So the language and verſification of Milton in the Paradiſe Loſt appear only proper for the moſt elevated ſubjects. In the Splendid Shilling of Philips, they appear equally proper for the loweſt. So fares it alſo with alliteration. Nor ought we to be mortified at the diſcovery, that much of the delight afforded by verſification ariſes from a cauſe ſo pitiful as the repetition of the ſame letter twice, or oftener, on the accented parts of a verſe; for there are many other cauſes of pleaſure, which, when thus detected and taken to pieces, ſeem equally contemptible.

We apprehend the principal operation of this ornament to be quite mechanical. It is eaſier for the organs of ſpeech to reſume, at ſhort intervals, one certain conformation, than to throw themſelves into a number of different ones, unconnected and diſcordant. For example, a ſucceſſion of labials, interſperſed at regular diſtances with dentals and gutturals, will be more eaſily pronounced than the ſucceſſion of all the three at random. Sounds of which the articulation is eaſieſt, are moſt completely in the power of the ſpeaker. He can pronounce them ſlowly or rapidly, ſoftly or with force, at pleaſure. In this we imagine the power and advantage of alliteration are founded; for we would not lay any ſtreſs on the pleaſure which can reſult to the ear from the repetition of the ſame letter. It has been compared to the frequent returns of the key-note in a muſical ſtrain; but that analogy is extremely faint. The ear, we preſume, can be pleaſed with alliteration only in ſo far as it contributes to the ſuperior eaſineſs of recitation; for what is recited with eaſe muſt be heard with pleaſure.

Theſe remarks might be confirmed and illuſtrated by numberleſs paſſages from the beſt poets. Some few lines will ſuffice, taken from Gray, who ſeems to have paid particular attention to this grace. He profeſſed to have learned his verſification from Dryden, as Dryden did from Spenſer; and theſe three abound in alliteration above all the Engliſh poets. We chooſe Gray for another reaſon, in proof of what we mentioned before, that alliteration contributes not only to the *ſweetneſs*, but alſo to the *energy*, of verſification; for he uſes it chiefly when he aims at ſtrength and boldneſs. In the *Siſter Odes* (as Dr Johnſton ſtyles them), almoſt every ſtrophe commences and concludes with an alliterative line. The poet, we ſuppoſe, wiſhed to begin with force, and end with dignity.

" *R*uin ſeize thee, *r*uthleſs king."
" To *h*igh-born *H*oel's *h*arp, or ſoft *L*lewe*l*lyn's *l*ay."
" *W*eave the *w*arp, and weave the *w*oof."
" Stamp we our vengeance *d*eep, and ratify his *d*oom."
" Regardleſs of the *ſ*weeping whirlwind's *ſ*way."
" That huſh'd in grim re*p*oſe, ex*p*ects his ev'ning *p*rey."

It muſt be obſerved here, that we hold a verſe alliterative which has a letter repeated on its accented parts, although thoſe parts do not begin words; the repeated letter bearing a ſtrong analogy to the bars in a muſical phraſe. Gray ſeems to have had a particular liking to theſe ſort of balanced verſes, which divide equally, and of which the oppoſite ſides have an alliterative reſemblance.

" Eyes that *g*low, and fangs that *g*rin."
" Thoughts that *b*reathe, and words that *b*urn."
" *H*auberk craſh, and *h*elmet ring."

Alliteration illuſtrated.

All theſe lines appear to us to have a force and energy, ariſing from alliteration, which renders them eaſy to be recited; or, if the reader pleaſes, *mouthed*. For the ſame reaſon the following paſſage appears ſad and ſolemn, by the repetition of the labial liquid.

" *M*ountains, ye *m*ourn in vain,"
" *M*odred, whoſe *m*agic ſong."—&c.

If alliteration thus contributes to enforce the expreſſion of a poetical ſentiment, its advantages in poetry muſt be conſiderable. It is not, therefore, unworthy a poet's regard in the act of compoſition. If two words offer of equal propriety, the one alliterative, the other not, we think the firſt ought to be choſen. We would compare this to the practice of fuguing in muſic. A compoſer who aims at expreſſion will not hunt after fugues; but if they offer, if they ſeem to ariſe ſpontaneouſly from the ſubject, he will not reject them. So a good poet ought not to ſelect an epithet merely for beginning with a certain letter, unleſs it ſuit his purpoſe well in every other reſpect; for the beauty of alliteration, when happy, is not greater than its deformity when affected. A couplet from Pope will exemplify both; the firſt line being bad, and the ſecond good:

" Eternal beauties grace the *ſ*hining *ſ*cene,
" *F*ields ever *ſ*reſh, and *g*roves for ever green."

ALLIUM (from *αλεω*, " to avoid or ſhun," becauſe many ſhun the ſmell of it), GARLIC. See BOTANY *Index*.

ALLIX, PETER, a French Proteſtant divine, was born at Alençon in France, in the year 1641. He became a learned divine of the Engliſh church, and a ſtrenuous defender of the Proteſtant faith. At the time when the edict of Nantes tolerated and protected the Proteſtants of France, he entered upon his clerical profeſſion, and remained miniſter of Rouen until the thirty-fifth year of his age. In this period he wrote ſeveral pieces upon the controverſy between the Papiſts and the Proteſtants, which obtained him great fame among his own party. He removed to Charenton in the vicinity of Paris, which was the principal church among the reformed, and frequented by perſons of the firſt rank in France, who profeſſed the Proteſtant faith. Here Allix preached a courſe of excellent ſermons in defence of the Proteſtant religion, ſome of which were afterwards printed in Holland, and added to his increaſing fame. The chief object of theſe ſermons was to repel the attack of the biſhop of Meaux, the moſt ingenious and able opponent of the Reformation at that time. The unwiſe revocation of the edict of Nantes drove Allix and many others to ſeek refuge in England. Three years after his arrival in England, he had made himſelf ſo perfectly maſter of the Engliſh language as to be able to write very correctly a " Defence of the Chriſtian Religion." This work he dedicated to James II. in teſtimony of gratitude for his kind reception of the diſtreſſed refugees of France. In juſtice to the memory of James,

Allix, Alloa.

and as a ſpecimen of the talents of Allix, it may be proper to give an extract from this curious dedication. —"As your majeſty continues ſtill to give ſuch illuſtrious inſtances of your clemency and royal protection to thoſe of your nation; ſo I confeſs, Sir, I thought myſelf under an obligation to lay hold upon this opportunity of publiſhing what all thoſe who find ſo ſure a protection in your majeſty's dominions feel and think as much as myſelf upon theſe new teſtimonies of your royal bounty. When your majeſty had taken us into your particular care, and had granted us ſeveral privileges, and ſo made us ſharers in all the advantages which thoſe who live under your government enjoy; your majeſty did yet ſomething more, and inſpired all your ſubjects with the ſame compaſſion towards us, with which your royal breaſt was already touched. You ſaw our miſeries, and reſolved to give us eaſe; and this generous deſign was executed, and your royal clemency diffuſed in the hearts of all your ſubjects. The whole world, Sir, which has received upon all its coaſts ſome remainders of our ſhipwreck, is filled with admiration of the unexampled effects of your majeſty's clemency. I could wiſh, Sir, that this work which I now preſent to your majeſty might be ſo happy as to paſs to poſterity with this character of our acknowledgment, and that it might ſtand as a faithful record for ever to perpetuate the memory of that lively ſenſe of your bounty which is imprinted on all our hearts."

Not long after his arrival in England, he was honoured with the title of doctor of divinity, and alſo received the more ſubſtantial honour of being appointed treaſurer of the church of Saliſbury. Allix ſtill maintained the ſtation of a champion for the Proteſtant cauſe, and in oppoſition to the biſhop of Meaux, proved that the charge of hereſy juſtly belonged to the Papiſts, and not to their opponents, becauſe they had introduced new doctrines into the church.

After having with much induſtry and learning exerciſed his talents in defence of Proteſtantiſm, he employed his pen to ſupport the doctrine of the Trinity againſt the Unitarians, who contended that the idea of Chriſt's divinity could be traced up no higher than the time of Juſtin Martyr. With a great diſplay of erudition, he attempted to prove that the Trinitarian doctrine was believed by the Jewiſh church. But the reputation which he had acquired for learning and ability was ſomewhat diminiſhed by the ridicule which he brought upon himſelf in attempting to fix the preciſe time of Chriſt's ſecond coming to the year 1720, or at the very lateſt, to the year 1736. He died at London in the year 1717, after his ſtudious life had been protracted to the length of 76 years. He left behind him numerous proofs of his great talents, extenſive learning, uncommon induſtry, and zealous attachment to the doctrines of the church of England. (*Gen Biog.*)

ALLOA, or ALLOWAY, a ſea-port town in Scotland, ſeated on the Forth, about 20 miles higher up the river than Leith, and five miles eaſt of Stirling. It is a populous place; has two market days in the week; and is remarkable for its fine caſtle, the ſeat of Mr Erſkine of Mar, and for the coal mines near it. The harbour is extremely commodious, with great depth of water; and veſſels are expeditiouſly loaded with coals from the pits by an uncommon waggon-way, on which one horſe draws with eaſe three waggons at once, each waggon containing a ton and a half. An excellent dry dock has alſo lately been erected here, capable of receiving ſhips of the greateſt burden. There is likewiſe a large glaſs-houſe for blowing bottles, of which veſſels are ſupplied with any quantity upon the ſhorteſt notice. Alloa. Alloa.

The tower and lands of Alloa were exchanged by David II. king of Scots, *anno* 1365, with Thomas Lord Erſkine, for the lands and eſtate of Strathgartney in Perthſhire; and ſince that time the caſtle of Alloa has been the favourite reſidence of the family of Mar. The ſituation is uncommonly beautiful. The gardens here were the firſt that were laid out on a great ſcale in Scotland; and, with the advice of Le Nautre, were indebted to the taſte of John the late earl of Mar, who began to plant them in the year 1706. They contain about forty acres, in which there is ſome very fine timber, near a century old.

The tower of Alloa is 89 feet in height, with walls of 11 feet in thickneſs; and was built in the end of the 13th century. In this reſidence of the family of Erſkine many of the Scottiſh princes received their education, having been for more than two centuries the wards of the Lords Erſkine and Earls of Mar, who held generally the caſtle of Stirling, and frequently the three principal fortreſſes of the kingdom, Edinburgh, Stirling, and Dumbarton. The laſt heir of the Scottiſh monarchy who was nurtured there was Henry prince of Wales; whoſe cradle, golf-clubs, and other infantine and youthful remains, are preſerved by the heir of the earls of Mar, in remembrance of that ſpirited and promiſing prince; of whom Dr Birch has preſerved ſeveral anecdotes, connected with the Erſkines and his reſidence at Alloa. Among other remains of antiquity preſerved at Alloa, in remembrance of the confidence and affection which ſubſiſted always betwixt the Stuarts and the Erſkines, is the private ſignet of the unfortunate Mary, which ſhe gave to the regent Mar, after ſhe was obliged by the treaty of Edinburgh to deſiſt from wearing the arms of England in the firſt quarter; the child's chair of James VI. her ſon; and the feſtive chair of Thomas Lord Erſkine the ſecond earl of Mar of the name, with the faſhionable grace carved on it, *Soli Deo Honor et Gloria.*

ALLOBROGES, (Inſcription, Livy, Velleius, Florus); from *Allobrox* (Horace): a people of Gallia Narbonenſis, ſituated between the rivers Iſara and Rhodanus, and the Lacus Lemanus; commended by Cicero for their fidelity; but reproached by Horace on account of their fondneſs for novelty.

Noviſque rebus infidelis Allobrox. Epod. 16.

ALLOCATION denotes the admitting or allowing of an article of an account, eſpecially in the exchequer. Hence

Allocatione Facienda, is a writ directed to the lord treaſurer, or barons of the exchequer, commanding them to allow an accountant ſuch ſums as he has lawfully expended in the execution of his office.

ALLOCUTIO, an oration or ſpeech of a general addreſſed to his ſoldiers, to animate them to fight, to appeaſe ſedition, or to keep them to their duty. A mount of earth was raiſed upon the occaſion, as it were a kind of a tribunal of turf. From this the general pronounced his harangue to the army, which was ranged

Allodium || Alluſh.

ged in ſeveral ſquadrons round him, with their captains at their head. When the time and circumſtances would not admit of a formal harangue, the general went through the ranks, and called each by his name, putting them in mind of their courage upon former occaſions, mentioning the victories they had won, and making promiſes of plunder.

ALLODIUM, or ALLEUD, denotes lands which are the abſolute property of their owner, without being obliged to pay any ſervice or acknowledgment whatever to a ſuperior or lord. See FEE and *Feodal Syſtem*.

ALLOPHYLLUS, in *Botany*. See BOTANY *Index*.

ALLOTTING, or *Allotment of Goods*, in matters of commerce, is when a ſhip's cargo is divided into ſeveral parts, bought by divers perſons, whoſe names are written on as many pieces of paper, which are applied by an indifferent perſon to the ſeveral lots or parcels; by which means the goods are divided without partiality, every man having the parcel which the lot with his name appropriates.

ALLOWAY CREEK, in Salem county, New Jerſey, empties into the Delaware. It is navigable 16 miles, interrupted, however, by ſeveral draw-bridges.

ALLOY, or ALLAY, properly ſignifies a proportion of a baſer metal mixed with a finer one. The alloy of gold is eſtimated by carats, that of ſilver by pennyweights. In different nations different proportions of alloy are uſed; whence their moneys are ſaid to be of different degrees of fineneſs or baſeneſs, and are valued accordingly in foreign exchanges. The chief reaſons alledged for the alloying of coin are: 1. The mixture of the metals, which, when ſmelted from the mine, are not perfectly pure. 2. The ſaving the expence it muſt otherwiſe coſt if they were to be refined. 3. The neceſſity of rendering them harder, by mixing ſome parts of other metals with them, to prevent the diminution of weight by wearing in paſſing from hand to hand. 4. The melting of foreign gold or coin which is alloyed. 5. The charges of coinage, which muſt be made good by the profit ariſing from the money coined. 6. and laſtly, The duty belonging to the ſovereign, on account of the power he has to cauſe money to be coined in his dominions.

In a more general ſenſe, the word is employed in chemiſtry to ſignify the union of different metallic matters.—As an infinity of different combinations may be made according to the nature, the number, and the proportions of the metallic matters capable of being alloyed, we ſhall not here enter into the detail of the particular alloys, all which are not yet nearly known. Thoſe which are uſed, as *Bronze*, *Tombac*, *Braſs*, *White Copper*, &c. may be found in the article CHEMISTRY, and what is known concerning other alloys will be treated of along with the metals in the ſame article. See CHEMISTRY *Index*.

ALLUM. See ALUM.

ALLUMINOR, from the French *allumer*, "to lighten," is uſed for one who coloureth or painteth upon paper or parchment; and the reaſon is, becauſe he gives light and ornament by his colours to the letters or other figures. Such ornaments are ſtyled *illuminations*. The word is uſed in ſtat. 1 R. III. cap. 9. But now ſuch a perſon is called a *limner*.

ALLUSH, in *Ancient Geography*. The Iſraelites being in the wilderneſs of Shur, departed from Dophkah, and went to Alluſh, from whence they proceeded to Rephidim; Num. xxxiii. 13, 14. Euſebius and St Jerome ſix Alluſh in Idumea, about Gabala or Petra, the capital of Arabia Petræa. In the accounts of the empire, it is ſituated in the third Paleſtine; and by Ptolemy, among the cities of Idumæa.

Alluſion || Almagro

ALLUSION, in *Rhetoric*, a figure by which ſomething is applied to, or underſtood of, another, on account of ſome ſimilitude between them.

ALLUVION, in *Law*, denotes the gradual increaſe of land along the ſea-ſhore, or on banks of rivers.

ALLY, in matters of polity, a ſovereign prince or ſtate that has entered into alliance with others. See ALLIANCE.

ALMACANTARS. See ALMUCANTARS.

ALMACARRON, a ſea-port town of Spain, in the province of Murcia, at the mouth of the river Guadalantin. It is about twenty miles weſt of Carthagena, and is remarkable for the prodigious quantity of alum found in its territory. W. Long. 1. 15. N. Lat. 37. 40.

ALMADEN, a town of Spain, in the province of La Mancha, in the kingdom of Caſtile, ſituated upon the top of a mountain, where are the moſt ancient as well as the richeſt ſilver mines in Europe.

ALMADIE, a kind of canoe, or ſmall veſſel, about four fathoms long, commonly made of bark, and uſed by the negroes of Africa.

ALMADIE is alſo the name of a kind of long boats, fitted out at Calicut, which are eighty feet in length, and ſix or ſeven in breadth. They are exceedingly ſwift, and are otherwiſe called *cathuri*.

ALMAGEST, in matters of literature, is particularly uſed for a collection or book compoſed by Ptolemy, containing various problems of the ancients both in geometry and aſtronomy.

ALMAGEST is alſo the title of other collections of this kind. Thus, Riccioli has publiſhed a book of aſtronomy, which he calls the *New Almageſt*; and Plukenet, a book which he calls *Almageſtum Botanicum*.

ALMAGRA, a fine deep red ochre, with ſome admixture of purple, very heavy, and of a denſe yet friable ſtructure, and rough duſty ſurface. It adheres very firmly to the tongue, melts freely and eaſily in the mouth, is of an auſtere and ſtrongly aſtringent taſte, and ſtains the ſkin in touching. It is the *Sil Atticum* of the ancients; it ferments very violently with acid menſtruums; by which ſingle quality, it is ſufficiently diſtinguiſhed from the *Sil Syricum*, to which it has in many reſpects a great affinity. It is found in immenſe quantities in many parts of Spain; and in Andaluſia there are in a manner whole mountains of it. It is uſed in painting, and in medicine as an aſtringent.

ALMAGRO, a fortreſs of Spain, the capital of one of the diſtricts of La Mancha. It was built by the archbiſhop Roderic of Toledo, who finiſhed it in 1214, and put a conſiderable garriſon into it to reſtrain the incurſions of the Moors. This was hardly done, when the fortreſs was beneged by an army of 5000 horſe and foot, under the command of a Mooriſh officer of great reputation; but the prelate, its founder, took care to ſupply thoſe within with ſuch plenty of neceſſaries, that at length the enemy found themſelves obliged to raiſe the ſiege and retire with great loſs.

ALMAGRO, *Diego de*, a Spaniſh commander, was of

Almagro. of ſuch obſcure birth and mean parentage, that he derived his name from the village where he was born, in 1463. Deprived of the means of early inſtruction, he could neither read nor write, but nevertheleſs, in conſequence of his improvements in the military art, he formed an aſſociation with Pizarro and de Luque, for the purpoſe of diſcoveries and conqueſt upon the Peruvian coaſt. The governor of Panama having ſanctioned their enterpriſe, they devoted their united exertions to that undertaking. Pizarro directed the conqueſt, and Almagro was appointed to conduct the ſupplies, proviſions, and reinforcements. In the two firſt unſucceſsful attempts, he performed this office with perſevering fidelity and uncommon activity. His perſeverance was followed with complete ſucceſs; for they at laſt diſcovered the coaſt of Peru, and landed at Tumbez, diſtinguiſhed by its temple and palace of the incas or ſovereigns, and ſituated about three degrees ſouth of the line. Pizarro was ſent over to Spain to ſolicit farther powers, after the three adventurers had previouſly adjuſted their future preferments, and agreed that Pizarro ſhould be governor, Almagro lieutenant-governor, and Luque biſhop. In this negociation, Pizarro obtained the clerical dignity for Luque; but chiefly concerned about his own intereſt, he neglected the preferment of Almagro. On his return, Almagro was ſo enraged, that he refuſed to act with ſuch a perfidious companion, and reſolved to form a new aſſociation. Pizarro for the preſent artfully endeavoured to avert the indignation of Almagro, and gradually ſoothed the rage and diſappointment of the ſoldier. The union was renewed upon the former terms; and it was ſolemnly ſtipulated that a common expence and a common advantage ſhould take place.

In February 1531, leaving Almagro at Panama, to ſupply proviſions and reinforcements, Pizarro ſet ſail for Peru. He attacked a principal ſettlement of the natives, in the province of Coaque, obtained immenſe ſpoil, and made ſuch ample remittances to Almagro, as enabled him to complete his reinforcement, and in the cloſe of the year 1532, he arrived at St Michael with a body of men, which nearly doubled the number of thoſe which Pizarro had along with him. The Spaniards about this time took captive the unfortunate Inca Atahualpa; and after they had received an immenſe ſum for his ranſom, they barbarouſly put him to death. Pizarro ſailed for Spain with the news of their ſucceſs, and with remittances to a great amount; and conſequently Almagro gained that elevated ſtation he ſo long and eagerly deſired. But no ſooner had Almagro received the intelligence of his promotion by the royal grant, than he attempted to ſeize Cuzco, the imperial reſidence of the incas, under pretence that it lay within his deſtined territory. This produced a new quarrel; but peace was reſtored upon the determination of Almagro to attempt the conqueſt of Chili, and likewiſe to have part of the territory of Peru.

In 1535, he accordingly ſet out at the head of 570 Europeans, and in croſſing the mountains, he ſuffered great hardſhips and loſſes by miſtaking the route, but at length he deſcended into the plains of that devoted region. Here he met with a more vigorous reſiſtance from the natives than the Spaniards had ever experienced in other countries. He had, however, made ſome progreſs, when he was recalled to Peru by the news of the natives having riſen in great numbers, and attacked Lima and Cuzco. He purſued a new route, and marching through the ſandy plains on the coaſt, he ſuffered by heat and drought calamities not inferior to thoſe which he had endured from cold and famine on the ſummit of the Andes. Arriving at a favourable moment, he reſolved to hold the place both againſt the Indians and his Spaniſh rivals. He attacked the Peruvian army with great vigour, and making a great ſlaughter, he proceeded to the gates of Cuzco without any further interruption. The open, affable, and generous temper of Almagro, gained over to his ſide many of the adherents of the Pizarros, who were diſguſted with their harſh and oppreſſive conduct. With their aid, he advanced towards the city by night, ſurpriſed the ſentinels, and ſurrounded the houſe where the two brothers reſided, who were compelled, after an obſtinate defence, to ſurrender at diſcretion. A form of government was ſettled in the name of Almagro, and his juriſdiction over Cuzco was univerſally acknowledged. This was the origin of a civil war; the beginning of which was very advantageous to Almagro, who by ſkilful manœuvres entirely routed a body of Spaniſh troops advancing to the relief of Cuzco, and made Alvarado their commander priſoner. But inſtead of improving theſe advantages, he unwiſely marched back to Cuzco, and there awaited the arrival of Pizarro. Pizarro, convinced of his own feeble reſources, propoſed an accommodation, and with his uſual art protracted the negociation until he found himſelf in a condition to meet his antagoniſt in the field of battle. Meanwhile Alvarado and one of the Pizarros, by bribing their keepers, found means to eſcape, and perſuaded 60 of the men who guarded them to attend them in their flight; and the governor releaſed the other Pizarro. When Pizarro thought himſelf ſufficiently prepared to ſettle the dominion of Peru, he marched with an army of 500 men to Cuzco. Almagro, previous to this, worn out with age and infirmity, reſigned the command to Orgognez. A fierce and bloody battle enſued, in which Almagro was made priſoner, his army defeated, and the commander wounded. About 140 ſoldiers fell in the field, and Orgognez, along with ſeveral others, was maſſacred in cold blood. During that fatal day, Almagro, placed in a litter, which was ſtationed on an eminence, beheld from thence the total defeat of his troops, and felt all the indignation of a ſoldier who had ſeldom experienced defeat. He was taken priſoner, remained ſeveral months in confinement, and afterwards was tried, and condemned to death. In the view of an ignominious death, the courage of the veteran forſook him, and he unſucceſsfully ſupplicated for life, in a manner unworthy of his former character. All the arguments he could employ were ineffectual. The Pizarros remained unmoved by all his entreaties. As ſoon, however, as Almagro ſaw that his fate was inevitable, he reſumed his courage, and exhibited all his uſual dignity and fortitude. In the year 1538, and in the 75th year of his age, he was ſtrangled in priſon, and afterwards beheaded. He left one ſon by an Indian woman of Panama; and in conſequence of a power which the emperor had granted, he declared his ſon his ſucceſſor in

Almamon. in the government, although he was then a priſoner in Lima.

With the qualities of intrepid valour, indefatigable activity, and inſurmountable conſtancy, he blended the more amiable diſpoſitions of frankneſs, generoſity, and candour. Theſe qualities rendered him beloved by his followers; and his misfortunes excited their ſympathy and pity, ſo that his death was univerſally regretted, and particularly by the poor Indians, who deemed him their guardian and protector againſt the cruel and unfeeling Pizarro. Upon the whole review of his character, it appears juſt to conclude, that he was, although of inferior abilities, a more amiable man than his rival. (*Gen. Biog.*)

ALMAGRO the Younger, by his courage, generoſity, and other accompliſhments, was placed at the head of the party after the death of his father. The father, conſcious of his own inferiority from the total want of education, uſed every poſſible mean to improve the mind and embelliſh the manners of his ſon; ſo that he ſoon acquired thoſe accompliſhments which rendered him reſpected by illiterate adventurers, who cheerfully ranged round his ſtandard; and, by his dexterity and ſkill, ſought deliverance from the oppreſſions of Pizarro. Juan de Herrada, an officer of great abilities, continued ſtill to direct his counſels and to regulate his enterpriſes: and, while Pizarro confided in his own ſecurity, a conſpiracy was formed againſt him, which terminated in his death. The aſſaſſins, exulting in their ſucceſs, and waving their bloody ſwords, haſtened to the ſtreet, proclaimed the death of the tyrant, and compelled the magiſtrates and principal citizens of Lima to acknowledge Almagro as lawful ſucceſſor to his father. But his reign was of ſhort duration; for, in 1541, Vaca de Caſtro, arriving at Quito, produced the royal commiſſion, appointing him governor of Peru, together with all the privileges and authority of Pizarro. The talents and influence of the new governor ſoon overpowered the intereſt of Almagro, who, perceiving the rapid decline of his influence, haſtened with his troops to Cuzco, where his opponents had erected the royal ſtandard under the command of Pedro Alvarez Holguin. Herrada the guide of his counſels died during his march; and from that time his meaſures were conſpicuous for their violence, concerted with little ingenuity, and executed with little addreſs. On September 16. 1542 at length the forces of Almagro and Vaca de Caſtro met, and victory long remained doubtful; till at laſt it declared for the new governor. The followers of Almagro diſplayed uncommon valour, and Almagro conducted the military operations of that fatal day with a gallant ſpirit, worthy of a better cauſe and deſerving of a better fate. In proportion to the number of combatants the carnage was very great. Of 1500 men 500 fell in the field, and many more were wounded. Almagro eſcaped, but being betrayed by ſome of his own officers, he was publicly beheaded at Cuzco, and in him the name and ſpirit of the party of Almagro became extinct. (*Gen. Biog.*)

ALMAMON, or MAMON, alſo named *Abdallah*, caliph of Bagdad, was born A. D. 785. His elder brother Al Amin ſucceeded to the caliphate on the death of his father, and Almamon at that time was governor of Choraſan. As by the will of the father it was provided, that his three ſons ſhould ſucceed to the caliphate in order, Almamon ordered his elder brother to be proclaimed caliph throughout his government. But his brother repaid his friendſhip and attachment to his intereſt with open expreſſions of hatred, and unjuſt attempts to exclude him from the deſtined ſucceſſion. Almamon was thus forced to conſult meaſures for his own ſafety and promotion, by cauſing himſelf to be proclaimed caliph. After various ſtruggles, his general, Thaher, in the year 813 took poſſeſſion of Bagdad, purſued Al Amin to his retreat, and cauſed him to be aſſaſſinated, ſo that Almamon remained without a competitor. Various rebellions diſturbed the tranquillity of the firſt years of his reign; but by his prudent adminiſtration and vigorous exertions, theſe were at length extinguiſhed. Inſtigated by the advice of his vizier, he ſoon after raiſed greater commotions, and expoſed his dignity to greater dangers, by countenancing the ſect of Ali. He invited to court Iman Rizza, gave him his daughter in marriage, and even declared him his ſucceſſor in the empire. He aſſumed the green turban, the colour of the houſe of Ali, and obliged his courtiers and ſoldiers to imitate his example. Alarmed at theſe proceedings, the orthodox Muſſulmans, and the houſe of Abbas, excited a great revolt in Bagdad, and proclaimed Ibrahim, Almamon's uncle, caliph. A civil war was juſt about to commence when Fadel the vizier was aſſaſſinated, and Rizza died. The people of Bagdad then depoſed Ibrahim, and returned to their former allegiance. Taking the advantage of Almamon's abſence, Thaher his general ſeized upon the government of Choraſan, where he founded a dynaſty which exiſted during a period of 16 years. Almamon

Almamon employed the period of tranquillity that followed in the introduction and improvement of literature into his dominions, which conſtitutes the greateſt glory of his reign. During the days of his father he diſcovered an ardent thirſt after knowledge, by forming a college in Choraſan, adorned with the moſt eminent men of various countries; and appointed Meſue, a famous Chriſtian phyſician of Damaſcus, for their preſident. When his father remonſtrated againſt conferring ſuch an honour upon a Chriſtian, he reminded him, that the moſt learned men and the moſt ſkilful artiſts in his dominions were Jews and Chriſtians; and added, that he had choſen Meſue as a preceptor in ſcience and uſeful arts, and not as a teacher of religion. Under his auſpices Bagdad became the ſeat of literature, of private and academical inſtruction, and the habitation of men of eminence from all quarters. Many valuable books in the Greek, Perſian, Chaldean, and Coptic languages, among which were the works of Ariſtotle and Galen, were tranſlated into the Arabic at his own expence. The caliph himſelf deemed it an honour to ſet an example to others of the becoming reſpect due to mental cultivation, by viſiting the ſchools, and treating the profeſſors with great regard. In mathematics, aſtronomy, and philoſophy, he made a rapid and extenſive progreſs. He was the author of aſtronomical tables, which on account of their accuracy have been much admired. By theſe various exertions the character of the Saracens was ſuddenly changed from

Almamon. a rude and ferocious to a polite and civilized people, while the moſt powerful and extenſive of the European ſtates were involved in ignorance and barbariſm. Literature has ſuſtained ſome irreparable loſſes from his too great partiality to the Arabic writers, which induced him to deſtroy the originals of the tranſlated manuſcripts. He is repreſented by the Sonnites or orthodox Mahometans as little better than an Infidel, becauſe of his attention to philoſophy and letters. His conduct, however, ſhows that he was not ſufficiently careful to preſerve a philoſophical mean betwixt the different religious parties during the time of his adminiſtration, as he openly manifeſted a predilection to the doctrines of the Motazeli, who aſſerted the free will of man, and denied the eternity of the Koran. Some allege, that on account of the murmurs which aroſe againſt him, he was induced to exhibit too great a zeal by eſtabliſhing a kind of inquiſition, to compel all his ſubjects to profeſs Iſlamiſm. The experiment, however, ſoon terminated in the better and juſter expedient of univerſal toleration; and it is abundantly evident, that the Chriſtians in his dominions never felt the power of his inquiſition.

The public tranſactions of his reign are in themſelves important. In the year 822 he ſent a body of his troops to the aſſiſtance of Thomas, a Greek, who made war on Michael the Stammerer, the emperor of Conſtantinople, and beſieged his capital. This expedition, which on the part of the caliph ſeems to have been founded in injuſtice, proved unſucceſsful; Thomas was taken priſoner, and ſuffered death. In the years 829 and 830, he commenced open hoſtilities upon the Greeks, rendered himſelf maſter of many places, and carried devaſtation into their territories. He was ſucceſsful in ſuppreſſing a revolt in Egypt in the year 831. In this country he was led to diſcover a treaſure buried under two columns by Merwan, the laſt caliph of the houſe of Ommijah. In repairing a decayed *mikias* or meaſuring pillar, and erecting a new one for determining the gradation of the increaſe of the Nile, Almamon diſplayed his love of ſcience. In the year 833 he again viſited Egypt; on his return he penetrated into the territories of the Greek emperor, even into Cilicia. Returning home he encamped on the banks of a river, and excited by thirſt, he drank too freely of the water; and at the ſame time indulged himſelf immoderately in eating a particular kind of dates, which brought on a complaint in his ſtomach, and reduced him to the moſt imminent danger. Senſible of his approaching diſſolution, he wrote letters into all the provinces, announcing his brother Motaſſem his ſucceſſor; and then patiently awaited the event. After a tedious ſtruggle under the preſſure of his diſeaſe, and while uttering this ejaculation; "O thou who never dieſt, have mercy on me, a dying man!" he expired at the age of forty-eight or forty-nine years. He reigned 20 years and ſome months, and was buried at Tarſus, which ſome religious zealots interpreted as a mark of reprobation.

The hiſtory of this caliph affords an illuſtrious inſtance of the meliorating effect of ſcience and literature upon the conduct and temper of rude and uncultivated men. Under the milder features of a liberal, virtuous, and beneficent ſovereign, the uſual cruelty of a Saracen and a deſpot ſeemed entirely loſt. He diſplayed Almamon. an uncommon greatneſs of mind and an unuſual example of clemency in his conduct towards his rival and uncle Ibrahim. After his depoſition, that prince concealed himſelf in ſome ſequeſtered corner of Bagdad. The place of his concealment being at length diſcovered, he was inſtantly brought before the caliph, and informed that the council had unanimouſly condemned him to death. "Your counſellors (ſaid Ibrahim) have judged according to the cuſtomary rules of political government; if you pardon me, you will not, indeed, judge according to precedent, but you will have no equal among ſovereigns." The caliph roſe up and embracing him tenderly, with great emotion, ſaid, "Uncle be of good cheer; I will not do you the leaſt injury;" and he added to forgiveneſs a fortune ſuitable to his birth and former elevated ſtation. When Almamon's courtiers complimented him on this generous action, he exclaimed, "O! did men but know the pleaſure I feel in pardoning, all who have offended me would come and confeſs their faults." To the ſame generoſity of diſpoſition may be aſcribed his ſtrong predilection to the oppreſſed houſe of Ali, which filld the beginning of his reign with political troubles. By his frequent intercourſe with men of enlightened minds, and of different religious ſentiments, he acquired a liberality very unuſual in a Muſſulman; and his preference to ſome particular opinions ſeems to have originated from his own vigour of mind, and his knowledge of theſe opinions. *(Gen. Biog.)*

ALMANACK, a book or table, containing a kalendar of days and months, the riſing and ſetting of the ſun, the age of the moon, the eclipſes of both luminaries, &c.—Authors are divided with regard to the etymology of the word; ſome deriving it from the Arabic particle *al* and *manach*, to count; ſome from *almanach*, new-year's gifts, becauſe the Arabian aſtrologers uſed at the beginning of the year to make preſents of their emphemerides; and others, from the Teutonic *almaen achte*, obſervations on all the months. Dr Johnſon derives it from the Arabic particle *al*, and the Greek μην, a month. But the moſt ſimple etymology appears from the common ſpelling; the word being compoſed of two Arabic ones, *Al Manack*, which ſignify *the Diary*. All the claſſes of Arabs are commonly much given to the ſtudy of aſtronomy and aſtrology; to both which a paſtoral life, and a ſort of huſbandry, not only incline them, but afford time and opportunity to cultivate them. They neither ſow, reap, plant, travel, buy or ſell, or undertake any expedition or buſineſs, without previouſly conſulting the ſtars, or, in other words, their almanacks, or ſome of the makers of them. From theſe people, by their vicinity to Europe, this art, no leſs uſeful in one ſenſe than trifling and ridiculous in another, hath paſſed over hither: and thoſe aſtronomical compoſitions have ſtill everywhere not only retained their old Arabic name; but were, like theirs, for a long while, and ſtill are among many European nations, interſperſed with a great number of aſtrological rules for planting, ſowing, bleeding, purging, &c. down to the cutting of the hair and paring of the nail.—Regiomontanus appears to have been the firſt in Europe, however, who reduced almanacks into their preſent form and method, gave the characters of each

Almanack each year and month, foretold the eclipſes and other phaſes, calculated the motions of the planets, &c. His firſt almanack was publiſhed in 1474.

The eſſential part of an almanack is the kalendar of months and days, with the riſings and ſettings of the ſun, age of the moon, &c. To theſe are added various parerga. aſtronomical, meteorological, chronological, political, rural, &c. as calculations and accounts of eclipſes, ſolar ingreſſes, prognoſtics of the weather, tables of the tides, terms, &c. liſts of ports, offices, dignities, public inſtitutions, with many other articles political as well as local, and differing in different countries. A great variety are annually publiſhed in Britain; ſome for binding, which may be denominated *book almanacks*; others in looſe papers, called *ſheet almanacks*.

The modern almanack anſwers to the *Faſti* of the ancient Romans. See FASTI.

Conſtruction of ALMANACKS. The firſt thing to be done is, to compute the ſun's and moon's place for each day of the year, or it may be taken from ſome ephemerides and entered into the almanack; next, find the dominical letter, and, by means thereof, diſtribute the kalendar into weeks; then, having computed the time of Eaſter, by it fix the other moveable feaſts; adding the immoveable ones, with the names of the martyrs, the riſing and ſetting of each luminary, the length of day and night, the aſpects of the planets, the phaſes of the moon, and the ſun's entrance into the cardinal points of the ecliptic, i. e. the two equinoxes and ſolſtices. (See ASTRONOMY, *paſſim*). By the help of good aſtronomical tables or ephemerides, the conſtruction of almanacks is extremely eaſy.

For every almanack or kalendar for one year or leſs, a ſtamp duty of 8d. muſt be paid. And for every almanack ſerving more than a year, the ſame duty is paid for each year. Perpetual almanacks pay for three years only. All books and pamphlets ſerving chiefly the purpoſe of almanacks, are charged as ſuch. If any almanack contains more than one ſheet, one ſheet only need be ſtamped; and every almanack is required by law to be ſo printed, that ſome part of the print ſhall be upon the ſtamp. Selling unſtamped almanacks incurs the ſame penalty as for ſelling unſtamped newſpapers. Almanacks in bibles and common prayer books are exempted.

ALMANACKS, among *Antiquaries*, is alſo the name given to a kind of inſtrument, uſually of wood, inſcribed with various figures and Runic characters, and repreſenting the order of the feaſts, dominical letters, days of the week, and golden number, with other matters neceſſary to be known throughout the year; uſed by the ancient northern nations, in their computations of time, both civil and eccleſiaſtical. Almanacks of this kind are known by various names, among the different nations wherein they have been uſed; as rimſtocks, primſtaries, runſtocks, runſtaffs, *Scipiones Runici*, *Baculi Annales*, clogs, &c. They appear to have been uſed only by the Swedes, Danes, and Norwegians. From the ſecond of theſe people, their uſe was introduced into England, whence divers remains of them in the counties. Dr Plot has given the deſcription and figure of one of theſe clogs, found in Staffordſhire, under the title of *The Perpetual Staffordſhire Almanack*. The external figure and matter of theſe kalendars appear to have been various. Sometimes they were cut on one or more wooden leaves, Vind. 1. bound together after the manner of books; ſometimes on the ſcabbards of ſwords, or even daggers; ſometimes on tools and implements, as portable ſteelyards, hammers, the helves of hatchets, flails, &c. Sometimes they were made of braſs or horn; ſometimes of the ſkins of eels, which being drawn over a ſtick properly inſcribed, retained the impreſſions of it. But the moſt uſual form was that of walking ſtaves, or ſticks, which they carried about with them to church, market, &c. Each of theſe ſtaves is divided into three regions; whereof the firſt indicates the ſigns, the ſecond the days of the week and year, and the third the golden number. The characters engraven on them are, in ſome, the ancient Runic; in others the latter Gothic characters of Ulfilas. The ſaints days are expreſſed in hieroglyphics, ſignificative either of ſome endowment of the ſaint, the manner of his martyrdom, or the like. Thus againſt the notch for the firſt of March, or St David's day, is repreſented a harp; againſt the 25th of October, or Criſpin's day, a pair of ſhoes; againſt the 10th of Auguſt, or St Lawrence's day, a gridiron; and laſtly, againſt New-year's day, a horn, the ſymbol of liberal potations, which our anceſtors indulged in at that ſeaſon.

ALMANSOR the Victorious, the ſecond caliph of the houſe of Al Abbas, ſucceeded his brother Abul Abbas Al Saffah, in the year 753, of the Hegira 136, and in the following year was inaugurated at Al Haſhemiyah. Although Al Saffah had declared him preſumptive heir of the crown, and he had been proclaimed caliph in the imperial city of Anbar, yet immediately upon his inauguration, his uncle Abdallah ebn Ali had ſufficient intereſt to cauſe himſelf to be proclaimed caliph at Damaſcus. In Arabia, Syria, and Meſopotamia, he collected a numerous army, and arrived at the banks of the Maſius, near Niſibis, where he encamped, ready to diſpute his royal acceſſion by arms. Almanſor collected an immenſe army in Perſia, Khoraſan, and Irak, and gave the command of it to Abu Moſlem, who haraſſed his uncle's troops for five months, and at laſt totally defeated him, A. D. 754. Notwithſtanding the ſervices which Abu Moſlem had rendered to the family of Al Abbas, after this victory he became an object of jealouſy, and was aſſaſſinated in the preſence of Almanſor himſelf, by his expreſs order. After the death of Abu Moſlem, the ſtandard of rebellion was raiſed by Sinon a Magian, who ſeized on the treaſures of the deceaſed governor of Khoraſan, and excited the people of that country to a general revolt; but this inſurrection was ſuddenly quelled by the general of Almanſor, Jambur ebn Morad. The caliph avariciouſly ſeized the ſpoils of this victory, which ſo incenſed Jambur that he immediately turned his arms againſt his royal maſter; but he was ſoon defeated by the caliph's forces. The patriarch of Antioch was about this time detected in an illicit correſpondence with the Grecian emperor, and conſequently was baniſhed into an obſcure part of Paleſtine; and in the mean time the Chriſtians in the dominions of the caliph were prohibited from building or repairing any churches, and alſo were laid under ſeveral other ſevere reſtraints.

Almanſor ſent a large army into Cappadocia in the year 757, fortified the city of Malatia or Me-

Almanſor. litene, and depoſited in it a great part of his treaſures. But in this year he was attacked by a ſect of believers in the metempſychoſis, called the *Rawandians*. This ſect aſſembled at Al Haſhemiyah the reſidence of the caliph, and by the ceremony of going in proceſſion round his palace, intimated their purpoſe of invoking him as a deity, and paying him divine homage. Incenſed by their impiety, the caliph ordered ſeveral of theſe ſectaries to be impriſoned, which rouſed their reſentment, and led them to form the deſign of his aſſaſſination. The generous interpoſition of Maan ebn Zaidet an Ommiyan chief, who had been under the neceſſity of concealing himſelf from the caliph's reſentment, however defeated their intention. This inſult received in his capital, induced him to build the city of Bagdad, and to fix his reſidence there, A. D 762. In the preceding year a plan was formed to dethrone him; but it being diſcovered, he ſeverely puniſhed all who were either directly or indirectly concerned in it. Abdallah his uncle ſhared the fate of other rebels: for being allured to court under the promiſe of pardon and protection, he was placed in a building which was ſo conſtructed that it immediately fell and cruſhed him in its ruins. Not long after his reſidence at Bagdad, he was ſeized with a diſorder of which he was cured by the advice of a famous Chriſtian phyſician, whoſe name was George ebn Baktiſhua Al Jondiſaburi. The caliph, previouſly informed that he was married to a wife old and infirm, as a recompenſe preſented him with three beautiful Greek girls, and a conſiderable ſum of money; the girls, to the caliph's ſurpriſe, were ſent back, with a declaration on the part of George, that it was not lawful for a Chriſtian to have more wives than one at a time. The conduct of the phyſician, on this occaſion, raiſed him in the eſteem of the caliph, and procured him a greater profuſion of favours. In his ſucceeding military tranſactions, Almanſor was generally victorious. His conduct to his Chriſtian ſubjects was rigorous and ſevere. He ſet out on a pilgrimage to Mecca in the year 774, and being ſeized on the road with a dangerous diſeaſe, he ſent for his ſon and intended ſucceſſor Al Mohdi, and gave him ſome ſalutary advice. "I command you" ſaid he, "to treat publicly your relations with the greateſt marks of diſtinction, ſince this conduct will reflect no ſmall degree of honour and glory upon yourſelf. Increaſe the number of your freedmen, and treat them with all kindneſs, as they will be of great ſervice to you in your adverſity; but neither this, nor the other injunction will you fulfil. Enlarge not that part of your capital erected on the eaſtern bank of the Tigris, as you will never be able to finiſh it; but this work I know you will attempt. Never permit any of your women to intermeddle in affairs of ſtate, or to have any influence over your counſels; but this advice I know you will not take. Theſe are my laſt commands; or, if you pleaſe, my dying advice; and to God I now recommend you." In parting they both gave vent to their feelings in a flood of tears. He purſued his journey to Bir-Maimun, *i. e.* the well of Maimun, where he died in the 63d year of his age and the 20th of his reign, and his remains were interred at Mecca.

The character of Almanſor was formed of very different and even contradictory qualities. His temper conciliated affection and attachment in private life, but in his public character his aſpect and demeanour inſpired terror. He was well acquainted with the arts of government; he was prudent and brave, but perfidious, covetous, cruel, and implacable; and amid ſuch a variety of character, it is ſingular that he ſhould have diſplayed a love of ſtudy and literature, and particularly of aſtronomy. *(Gen. Biog.)* Almanza || Almé

ALMANZA, a little town of New Caſtile, on the frontiers of the kingdom of Valencia in Spain, ſituated in W. Long. 1. 19. N. Lat. 38. 54. It is remarkable for the defeat of the allies in 1707, under the marquis de las Minas and the earl of Galway. In the beginning of this action the Engliſh troops penetrated through the centre of the Spaniſh army; but the Portugueſe cavalry being broken by the Spaniſh, and the French infantry making a dreadful fire on their flanks, the allied army was at laſt broken, and began their retreat when it was almoſt dark. Colonel Hill carried off the remains of thirteen battalions towards the river Xucar, which, if they could have paſſed, they might have been ſafe: but being very much fatigued, they were obliged to halt; by which means they were ſurrounded, and forced to ſurrender priſoners of war. In this battle, the allies loſt 120 ſtandards, together with all their artillery and baggage; a great number were killed, and ſeveral thouſands taken priſoners. The Marquis de las Minas was dangerouſly wounded; and his miſtreſs, in the garb of an amazon, killed by his ſide. The earl of Galway had two cuts acroſs the face, which, though not dangerous, had prevented him from ſeeing, or giving orders properly.

HERESY OF ALMARIC, a tenet broached in France by one Almaric, in the year 1209. It conſiſted in affirming, that every Chriſtian was actually a member of Chriſt; and that without this faith no one could be ſaved. His followers went farther, and affirmed, that the power of the Father laſted only during the continuance of the Moſaic law; that the coming of Chriſt introduced a new law; that at the end of this began the reign of the Holy Ghoſt; and that now confeſſion and the ſacraments were at an end, and that every one is to be ſaved by the internal operations of the Holy Spirit alone, without any external act of religion.—Their morals were as infamous as their doctrine was abſurd. Their tenets were condemned by a public decree of the council of Sens, in the year 1209.

ALME, or ALMA, ſinging and dancing girls in Egypt, who, like the Italian *Improviſatori*, can occaſionally pour forth "unpremeditated verſe." They are called *Almé*, from having received a better education than other women. They form a celebrated ſociety in that country. To be received into it, according to M. Savary, it is neceſſary to have a good voice, to underſtand the language well, to know the rules of poetry, and be able to compoſe and ſing couplets on the ſpot, adapted to the circumſtances. The Almé know by heart all the new ſongs. Their memory is furniſhed with the moſt beautiful tales. There is no feſtival without them; no entertainment of which they do not conſtitute the ornament. They are placed in a roſtrum, from whence they ſing during the repaſt. They then deſcend into the ſaloon, and form dances which have no reſemblance to ours. They are pantomime ballets, in which they repreſent the uſual occurrences of life. The myſteries of love, too, generally

Almé
Almehrab.

nerally furniſh them with ſcenes. The ſuppleneſs of their bodies is inconceivable. One is aſtoniſhed at the mobility of their features, to which they give at pleaſure the impreſſion ſuited to the characters they play. The indecency of their attitudes is often carried to exceſs. Their looks, their geſtures, every thing ſpeaks, but in ſo expreſſive a manner, that it is impoſſible to miſtake them. At the beginning of the dance, they lay aſide with their veils the modeſty of their ſex. A long robe of very thin ſilk goes down to their heels, which is ſlightly faſtened with a rich girdle. Long black hair, plaited and perfumed, is flowing on their ſhoulders. A ſhift, tranſparent as gauze, ſcarcely hides their boſom. As they put themſelves in motion, the ſhapes, the contours of their bodies, ſeem to develope themſelves ſucceſſively. Their ſteps are regulated by the ſound of the flute, of caſtanets, the tambour de baſque, and cymbals, which accelerates or retards the meaſure. They are ſtill further animated by words adapted to ſuch ſcenes. They appear in a ſtate of intoxication. They are the bacchants in a delirium. It is when they are at this point, that throwing off all reſerve, they abandon themſelves totally to the diſorder of their ſenſes; it is then that a people far from delicate, and who like nothing hidden, redouble their applauſes. Theſe Almé are ſent for into all the harams. They teach the women the new airs; they amuſe them with amorous tales, and recite in their preſence poems, which are ſo much the more intereſting, as they furniſh a lively picture of their manners. They initiate them into the myſteries of their art, and teach them to contrive laſcivious dances. Theſe girls, who have a cultivated underſtanding, are very agreeable in converſation. They ſpeak their language with purity. The habit of dedicating themſelves to poetry renders the ſofteſt and moſt ſonorous expreſſions familiar to them. They repeat with a great deal of grace. In ſinging, nature is their only guide. Sometimes two of them ſing together, but always with the ſame voice. It is the ſame with an orcheſtra, where all the inſtruments playing in uniſon execute the ſame part.

The Almé aſſiſt at the marriage-ceremonies, and march before the bride, playing on inſtruments. They make a figure likewiſe at funerals, and accompany the proceſſion, ſinging ſorrowful airs. They break forth into groans and lamentations, and give every ſign of grief and deſpair. Theſe women are paid very high, and ſeldom appear but amongſt the grandees and rich men

The common people have alſo their Almé. They are girls of the ſecond claſs, who try to imitate the former; but they have neither their elegance, their graces, nor their knowledge. They are everywhere to be met with. The public places and the walks about Grand Cairo are full of them. As the populace require alluſions ſtill more ſtrongly marked, decency will not permit the relation to what a pitch they carry the licentiouſneſs of their geſtures and attitudes.

ALMEDIA, a frontier town of Portugal, in the province of Tralos Montes, on the confines of Leon, where there was a very briſk action between the French and Portugueſe in 1663; 17 miles north-weſt of Cividad Rodrigo. W. Long. 7. 10. N. Lat. 40. 41.

ALMEHRAB, in the Mahometan cuſtoms, a niche in their moſques, pointing towards the kebla or temple of Mecca, to which they are obliged to bow in praying. See KEBLA.

Almeiſar
Alme ria.

ALMEISAR, a celebrated game among the ancient Arabs, performed by a kind of caſting of lots with arrows, ſtrictly forbidden by the law of Mahomet, on account of the frequent quarrels occaſioned by it.

The manner of the game was thus: A young camel being brought and killed, was divided into a number of parts. The adventurers, to the number of ſeven, being met, 11 arrows were provided without heads or feathers; ſeven of which were marked, the firſt with one notch, the ſecond with two, the third with three, &c. the other four had no marks. Theſe arrows were put promiſcuouſly into a bag, and thus drawn by an indifferent perſon. Thoſe to whom the marked arrows fell, won ſhares in proportion to their lot; the reſt to whom the blanks fell, were entitled to no part of the camel, but obliged to pay the whole price of it. Even the winners taſted not of the fleſh themſelves more than the loſers, but the whole was diſtributed to the poor.

ALMENE, in *Commerce*, a weight of two pounds, uſed to weigh ſaffron in ſeveral parts of the continent of the Eaſt Indies.

ALMERIA, a ſea-port town in the kingdom of Granada in Spain, pleaſantly ſituated on a fine bay at the mouth of the river Almeria, on the Mediterranean. W. Long. 3. 20. N. Lat. 36. 51. This town is by ſome thought to have riſen upon the ruins of the ancient Abdera, and was formerly a place of great conſequence. It was taken from the Moors in 1147, by the emperor Conrad III. in conjunction with the French, Genoeſe, and Piſans. It was at that time the ſtrongeſt place in Spain held by the Infidels; from which their privateers, which were exceedingly numerous, not only troubled the ſea-coaſts inhabited by the Chriſtians, but gave equal diſturbance to the maritime provinces of France, Italy, and the adjacent iſlands. The city being well fortified, having a ſtrong caſtle, a numerous garriſon, and being excellently provided with every thing neceſſary, made a vigorous reſiſtance; but was at laſt taken by ſtorm, when the victor put to the ſword all the inhabitants who were found in arms, diſtributing the beſt part of the plunder among his allies, whom he ſent away thoroughly ſatisfied. The Genoeſe, particularly, acquired here that emerald veſſel which ſtill remains in their treaſury, and is deemed invaluable.

Upon its reduction by the Chriſtians, Almeria became a biſhopric; but is at preſent very little better than a village, indifferently inhabited, and has nothing to teſtify ſo much as the probability of its former greatneſs, except certain circumſtances which cannot be effaced even by the indolence of the Spaniards themſelves. What theſe are, Udal ap Rhys, a Welſhman, thus deſcribes, in his Tour through Spain and Portugal. "Its climate (ſays he) is ſo peculiarly bleſſed, that one really wants words to expreſs its charms and excellence. Its fields and meads are covered with flowers all the year round; they are adorned alſo with palms, myrtles, plane trees, oranges, and olives; and the mountains and promontories near it are as noted for their producing a great variety of precious ſtones, inſomuch that the next promontory to it is called the *Cape of Gates*, which is a corruption from the word *agates*, the

Almiggim || Almohedes.

hills thereabouts abounding in that ſort of precious ſtones, as well as in emeralds and amethyſts, garnets or coarſe rubies, and extreme curious alabaſter in the mountains of Filaures."

ALMIGGIM. See ALMUGGIM.

ALMEYDA, DON FRANCIS, was the ſon of the Count d'Abrantes, a grandee of Portugal, who ſerved with great diſtinction in the war of Ferdinand of Caſtile with Granada; and in conſequence of his important ſervices he became highly eſteemed in the court of his ſovereign. Without any ſolicitation on his part he was nominated the firſt governor general and viceroy of the newly conquered countries in the Eaſt Indies; and ſet ſail from Liſbon in March 1505-6 with a powerful fleet. To give dignity and influence to his elevated ſtation, a body of guards was appointed to attend his perſon, ſeveral chaplains were aſſigned him, together with every other appendage of grandeur. He touched at the Cape Verd iſlands, doubled the cape at a conſiderable diſtance to the ſouth, and arrived at Guiloa. From thence he proceeded to Mombaza, a well fortified city in an iſland, which he reduced, and proceeded to the Angediva iſlands not far from Goa, where he built a fort; he likewiſe erected and garriſoned another fort at Cannanor, and arriving at Cochin, he ſecured it to the Portugueſe intereſt. The iſland of Madagaſcar was diſcovered during his government, and his ſon Don Lorenzo firſt ſurveyed the Maldive iſlands; and about the ſame time diſcovered the fine iſland of Ceylon, the principal ſovereign of which he brought under ſubmiſſion to the crown of Portugal. Returning from this expedition, while employed in the fleet deſtined againſt Calicut, he loſt his life in a ſea-fight againſt the Zamorin. His father ſuſtained his loſs with a heroic firmneſs, ſaying, "that Lorenzo could not die better than in the ſervice of his country." On the arrival of Alphonſo d'Albuquerque, who was deſtined to be his ſucceſſor, Almeyda yielded to the impreſſions of jealouſy; and under the pretence of miſconduct he confined him in the citadel of Cannanor. He engaged in 1508, the whole force of the Mahometans in the port of Diu; and, gaining a complete victory, facilitated the enterpriſes of Albuquerque his ſucceſſor, by contributing to break that formidable league by which the Zamorin was in hopes of being able to compel the Portugueſe to abandon their Indian conqueſts. Returning home with the great riches which he had acquired, he unfortunately touched at Saldanha Point on the coaſt of Africa, where ſome of the ſailors, in queſt of water, quarrelled with the natives, who attacked and drove them to their ſhips. With a view to revenge this pretended affront, they perſuaded Almeyda himſelf to go aſhore, with a body of 150 men, armed only with ſwords and lances. While ſtepping into the boat, Almeyda exclaimed, "whither do you carry my 60 years?" The Portugueſe furiouſly ruſhed on to attack the natives, whoſe numbers were greatly augmented, and Almeyda with 57 of his men were killed in this raſh and unprovoked attempt, (*Gen. Biog.*)

ALMISSA, a ſmall but ſtrong town at the mouth of the Cetina, in Dalmatia, famous for its piracies; ten miles eaſt of Spalatro. E. Long. 18. 14. N. Lat. 43. 56.

ALMOHEDES, the name of a dynaſty, which, in the commencement of the twelfth century, ſucceeded that of the Almoravides in Barbary. It derived its name from an obſcure founder called Al Mohedi, or Al Mohedes, and it roſe into public notice in the 25th year of the reign of Al Abraham, or Brahem, who ſucceeded his father Ali, A. D. 1115. This perſon was a Bereber, and was a famous preacher of the tribe of Muzamada, which was ſettled along Mount Atlas. His ſcheme was the exertion of ingenuity, and it was executed with unremitting activity. In order to obtain attention and ſucceſs, he aſſumed the title of Mohdi or Mohedi, and claimed the honour of leader of the orthodox, or unitarians, and, by his preaching they became ſo numerous, that he even dared to ſet the royal power at defiance. Confident of ſecurity, and immerſed in pleaſure, Brahem looked with a contemptuous eye upon the inſurrection of a party compoſed of ſuch perſons. They increaſed in number and ſtrength, ſo that the king was at laſt rouſed from his indolence, and prepared for his own ſecurity and their ſubjection. In the firſt engagement he was defeated, being overpowered with ſuperior numbers. The artful Abdallah took poſſeſſion of the capital, ſo that Brahem, purſued as a fugitive by Abdolmumen, one of the party, ſought refuge in the city of Fez. The gates were ſhut againſt him; but they were opened to admit his purſuers. He next took refuge in the city of Auran, or Oran; but he was purſued by Abdolmumen, who threatened to deſtroy the city with fire and ſword; and the magiſtrates, unable to defend themſelves, urged him to leave the town, and provide for his own ſafety. Concealed by the darkneſs of the night, he eſcaped with his favourite wife on horſeback behind him; but being cloſely purſued by the enemy, rather than fall into their hands, he ruſhed over a precipice, and, along with his wife, he was daſhed to pieces. Such was the death of this prince, which put a final period to the empire of the Almoravides. When the death of Brahem was known, Abdolmumen was choſen by the chiefs of that party his ſucceſſor, and proclaimed king of the Almohedes, under the title of Al Emir Al Mumin Abdallah Mohammed Abdal Mumin Ebn Abdallah Ibni Ali, i. e. Chief or Emperor of the true Believers of the houſe of Mohammed Abdal Mumin, the ſon of Abdal Mumin, the ſon of Abdallah, of the lineage of Ali. Abdallah, during his reign, enacted prudential laws for the eſtabliſhment of his new kingdom, and the regulation of the conduct of his followers. He appointed a council of forty of his diſciples, all of whom were preachers. Some of theſe were commiſſioned to regulate all public affairs; and at proper ſeaſons they went forth as itinerant preachers for the purpoſe of ſtrengthening their party, and ſpreading their doctrines, and ſixteen of their number acted as ſecretaries. As both the regal and pontifical dignities were united in the ſame perſon, the king was choſen from both of theſe two claſſes. The diſciples of this ſect were denominated Mohameddin, or Ali Mohaddin; but the Arabian writers only ſtyle them preachers, and the Spaniſh Al Mohedes. The deſcendants and ſucceſſors of that tribe continued to retain the appellation of Emir Al Mumenin, or chiefs of the faithful believers, as long as their dynaſty laſted; and they became very powerful both in Africa and Spain. By their invectives againſt the

Almohedes

Almohedes.

the tyranny of the Almoravides, and their loud clamours for liberty, they induced the greater part of the kingdom to revolt, and to embrace their religious doctrines. The chief thing in them was their ſpecious pretence to orthodoxy, and ſtrict adherence to the unity of the Godhead, which they inculcated with the greateſt zeal and diligence.

On his acceſſion to power, the new ſovereign extirpated all the unhappy remains and ſteady adherents of this race, by ſtrangling Iſaac the ſon of Brahem. The Almoravides governor taking advantage of the general tumult and diſtraction that prevailed, conſtituted their governments into independent principalities and petty kingdoms; and they who inhabited the mountainous parts, eſtabliſhed under their own cheyks a variety of lordſhips. The Libyans and Nubians took the lead; and the ſtates of Barbary, Tripoli, Kairwan, Tunis, Algiers, Tremecen, and Bujeyah, followed their example. Abdolmumen, however, ſucceſsfully purſued his conqueſts; and in a few years he reduced to his ſubjection the Numidians and Galatians in the weſt, and the kingdoms of Tunis, Tremecen, and the greater part of Mauritania and Tingitana. He expelled the Chriſtians of Mohedia, the chief city of Africa, and ſome others on the ſame coaſt; and likewiſe made conqueſts both in Spain and Portugal. He died in the ſeventh year of his reign, and was ſucceeded, A. D. 1156, by his ſon Yuſef or Joſeph. Yuſef proved a valiant and martial prince, and in his military court he firſt eſtabliſhed the kings of Tunis and Bujeyah in their reſpective dominions, as his tributaries and vaſſals; and then by earneſt ſolicitation he embarked for Spain to aſſiſt the Mooriſh princes. Yakub or Jacob, or the Conqueror, ſucceeding, him after providing for his own ſafety againſt the revolted and plundering Arabs, purſued his conqueſts with ſuch ſucceſs, that he ſoon became maſter of the whole country lying between Numidia and the entire length of the Barbary coaſts, from Tripoli to the boundaries of the kingdom of Morocco. Thus he was acknowledged as ſovereign by moſt of the Arabian Mooriſh princes in his Spaniſh dominions; but alſo extended his territory above 1200 leagues in length, and 480 in breadth. The remaining part of the hiſtory of this prince is involved in obſcurity. About the year 1206, he quelled a revolt in Morocco, but violated his faith with the governor of the capital, which he reduced, and in a cruel and perfidious manner he extirpated all his adherents. Touched, it is ſaid, with remorſe, he diſappeared, and, according to report, wandered about obſcure and unknown, until he died in the humble condition of a baker at Alexandria. His ſon Mohammed, ſurnamed Al Naker, ſucceeded his father; and, on his acceſſion to the crown, he paſſed over into Spain with an immenſe army of 120,000 horſe and 300,000 foot, and engaging the whole force of the Chriſtians on the plains of Tholoſa, received a total defeat, with the loſs of above 150,000 foot, 30,000 horſe, and 50,000 priſoners. According to Spaniſh and other hiſtorians, this famous battle was fought in 617, A. D. 1220; but according to the Arabian writers, it was in the year of the Hegira 609, A. D. 1212. Returning home to Africa, he was received with coldneſs and diſguſt by his ſubjects, on account of his defeat; and ſoon after died of vexation, having appointed his grandſon Zeyed Arrax his ſucceſſor. A deſcendant of the Abdolwates, ancient monarchs of the kingdom, named Gumarazan Ebn Zeyen, of the tribe of the Zeneti, cauſed him to be aſſaſſinated. With him terminated the dynaſty or government of the Almohedes, having poſſeſſed it for about 170 years, which gave place to that of the Benimerini, another branch of the Zeneti. Theſe having enlarged their conqueſts, and enriched themſelves by frequent inroads, not only into the neighbouring kingdoms, but even Nubia, Libya, and Numidia, were at length loſt in the general prevalence of Mohamediſm, after having exiſted 117 years. (*Mod. Univ. Hiſt.*)

Almond || Almoravides.

ALMOND, the fruit of the almond tree. See AMYGDALUS, BOTANY *Index*.

ALMOND, in *Commerce*, a meaſure by which the Portugueſe ſell their oil: 26 almonds make a pipe.

ALMONDS, in *Anatomy*, a name ſometimes given to two glands, generally called the *tonſils*.

ALMONDS, among lapidaries, ſignify pieces of rock-cryſtal, uſed in adorning branch-candleſticks, &c. on account of the reſemblance they bear to the fruit of that name.

ALMOND Furnace, among refiners, that in which the ſlags of litharge, left in refining ſilver, are reduced to lead again by the help of charcoal.

ALMONDBURY, a village in England, in the weſt riding of Yorkſhire, ſix miles from Halifax.

ALMONER, in its primitive ſenſe, denotes an officer in religious houſes, to whom belonged the management and diſtribution of the alms of the houſe. By the ancient canons, all monaſteries were to ſpend at leaſt a tenth part of their income in alms to the poor. The almoner of St Paul's is to diſpoſe of the moneys left for charity, according to the appointment of the donors, to bury the poor who die in the neighbourhood, and to breed up eight boys to ſinging, for the uſe of the choir. By an ancient canon, all biſhops are required to keep almoners.

Lord ALMONER, or *Lord High ALMONER of England*, is an eccleſiaſtical officer, generally a biſhop, who has the forfeiture of all deodands, and the goods of *felos de ſe*, which he is to diſtribute among the poor. He has alſo, by virtue of an ancient cuſtom, the power of giving the firſt diſh from the king's table to whatever poor perſon he pleaſes, or, inſtead of it, an alms in money.

Great ALMONER, *Grand AUMONIER*, in France, before the revolution, was the higheſt eccleſiaſtical dignity in that kingdom. To him belonged the ſuperintendency of all hoſpitals and houſes of lepers. The king received the ſacrament from his hand; and he ſaid maſs before the king in all grand ceremonies and ſolemnities.

ALMONER is alſo a more faſhionable title given by ſome writers to chaplains. In this ſenſe we meet with almoner of a ſhip, almoner of a regiment.

ALMONRY, or AUMBRY, the office or lodgings of the almoner; alſo the place where alms are given. See AMBRY.

ALMORAVIDES, in *Hiſtory*, the name of an Arab tribe, who took poſſeſſion of a diſtrict of Africa, with the pretence of living in retirement, that their minds might not be diſtracted from the rigid obſervance of the precepts of the Koran. Hence they aſſumed the name of Morabites, which was changed by the

Almoravides.

the Spaniards into that of Almoravides. Abubeker ben Omar, called by the Spaniſh authors Abu Texefien, was the firſt chief of this tribe. Supported by a powerful army of malecontents from the provinces of Numidia and Libya, which was aſſembled by the influence of the Morabites, or Marabouts, he founded the dynaſty of the Almoravides in Barbary, in the year 1051. Texefien was ſucceeded by his ſon Yuſef or Joſeph, who, after having reduced to a ſtate of vaſſalage the kingdoms of Tremecen, Fez, and Tunis, paſſed over into Spain during the time of the civil wars, vigorouſly repulſed the Chriſtians, and ſoon ſaw the greateſt part of the kingdoms of Murcia, Granada, Cordova, Leon, and ſome parts of Valencia, ſubjected to his power. He then returned into Africa, and left his newly acquired dominions, with a conſiderable army, under the government of his nephew Mohammed. On his arrival in Africa, with a view to proſecute and extend his conqueſts in Spain, he announced, in a public declaration, a general *gazie*, or religious war; aſſembled a numerous army, with which he embarked at Ceuta; and rejoining his nephew in Andaluſia, ſoon laid waſte that province with fire and ſword.

In the year 1107, five years afterwards, he undertook another invaſion, penetrated into the kingdom of Portugal, and reduced the city of Liſbon, with a conſiderable part of the kingdom. At this time he loſt the cities of Alguazir and Gibraltar, which he had formerly taken. On his return to Barbary, he was defeated at ſea. This induced him to propoſe a truce, which was agreed to only on condition of his ſubmitting to become the tributary of the Spaniſh king. Indignant at theſe humiliating terms, Yuſef made a vow that he would never deſiſt in his attempts, till he had utterly rooted out the Chriſtian religion in Spain. He made preparations accordingly for a freſh invaſion, embarked his army, and landing at Malaga, marched into the enemy's country. His progreſs was rapid; but his meaſures were inconſiderately planned and raſhly executed. In the famous battle of the Seven Counts, he was indeed victorious, but after a terrible ſlaughter, and the loſs of great part of his army. This diſaſtrous victory obliged him to retrn to Africa; and he died ſoon after at his capital of Morocco. Ali his ſon, ſucceeded to the ſovereignty in 1110. This prince who ſeems to have been of a leſs warlike diſpoſition than his father, neglecting his Spaniſh conqueſts, turned his attention to the arts of peace, and erected many ſumptuous buildings, and in particular the great moſque of Morocco. Alphonſo then king of Arragon, retook from him ſome conſiderable cities; which obliged him to undertake an expedition to Spain in ſupport of the Mooriſh princes. But all his attempts proved unfortunate; and in his laſt enterpriſe, though powerfully aſſiſted by the Mooriſh chiefs, with the loſs of 30,000 men he was defeated and ſlain by Alphonſo, in the ſixth year of his reign.

He was ſucceeded by his ſon Al Abraham, who devoted himſelf entirely to pleaſure. His ſubjects were haraſſed and oppreſſed with heavy taxes, which excited diſcontent and open rebellion. A revolution was ſoon effected, and in the 25th year of his reign, the government transferred from the tribe of the Almoravides to the Almohedes. (*Mod. Univ. Hiſt.*)

ALMS, a general term for what is given out of charity to the poor. Alms || Almuggim.

In the early ages of Chriſtianity, the alms of the charitable were divided into four parts; one of which was allotted to the biſhop, another to the prieſts, and a third to the deacons and ſubdeacons, which made their whole ſubſiſtence; the fourth part was employed in relieving the poor, and in repairing the churches.

No religious ſyſtem is more frequent or warm in its exhortations to almſgiving than the Mahometan. The Alcoran repreſents alms as a neceſſary means to make prayer be heard. Hence that ſaying of one of their caliphs: "Prayer carries us half way to God, faſting brings us to the door of his palace, and alms introduces us into the preſence chamber." Hence many illuſtrious examples of this virtue among the Mahometans. Haſan, the ſon of Ali, and grandſon of Mohammed, in particular, is related to have thrice in his life divided his ſubſtance equally between himſelf and the poor, and twice to have given away all he had. And the generality are ſo addicted to the doing of good, that they extend their charity even to brutes.

ALMS, alſo denotes lands or other effects left to churches or religious houſes, on condition of praying for the ſoul of the donor. Hence,

Free ALMS, that which is liable to no rent or ſervice.

Reaſonable ALMS, a certain portion of the eſtates of inteſtate perſons, allotted to the poor.

ALMS-BOX, or *Cheſt*, a ſmall cheſt, or coffer, called by the Greeks Κιβωτιον, wherein anciently the alms were collected, both at church and at private houſes.

The alms-cheſt, in Engliſh churches, is a ſtrong box, with a hole in the upper part, having three keys, one to be kept by the parſon or curate, the other two by the church-wardens. The erecting of ſuch alms-cheſt in every church is enjoined by the book of canons, as alſo the manner of diſtributing what is thus collected among the poor of the pariſh.

ALMS-Houſe, a petty kind of hoſpital for the maintenance of a certain number of poor, aged, or diſabled people.

ALMUCANTARS, in *Aſtronomy*, an Arabic word denoting circles of the ſphere paſſing through the centre of the ſun or a ſtar, parallel to the horizon, being the ſame as *PARALLELS of Altitude*.

ALMUCANTAR'S-Staff, is an inſtrument uſually made of pear tree or box, having an arch of 15 degrees; uſed to take obſervations of the ſun, about the time of its riſing and ſetting, in order to find the amplitude, and conſequently the variation of the compaſs.

ALMUCIUM denotes a kind of cover for the head, worn chiefly by monks and eccleſiaſtics. It was of a ſquare form, and ſeems to have given riſe to the bonnets of the ſame ſhape ſtill retained in univerſities and cathedrals.

ALMUGGIM, ALMIGGIM, or ALMUG TREE, a certain kind of wood mentioned in the firſt book of Kings (x. 11.), which the Vulgate tranſlates *ligna thyina*, and the Septuagint *wrought wood*. The Rabbins generally render it *coral*; others, *ebony*, *brazil*, or *pine*. But it is obſerved, that the almug tree can by no means be coral, becauſe that is not fit for the purpoſes that the Scripture tells us the almug tree was

Almunecar ‖ Alnwick

was uſed, ſuch as muſical inſtruments, ſtaircaſes, &c. The word *thyinum* is a name for the citron tree, known to the ancients, and very much eſteemed for its ſweet odour and great beauty. It came from Mauritania. The almug tree, or almugim, algumim, or ſimply gummim, taking *al* for a kind of article, is therefore by the beſt commentators underſtood to be an oily and gummy ſort of wood; and particularly that ſort of tree which produces the gum ammoniac, which is alſo thought to be the ſame with the Shittim wood, whereof there is ſuch frequent mention made by Moſes.

ALMUNECAR, a ſea-port town in the kingdom of Granada, ſeated on the Mediterranean, with a good harbour, defended by a ſtrong caſtle, 20 miles ſouth of Alhama. W. Long. 3. 45. N. Lat. 36. 50.

ALNAGE, or AULNAGE, the meaſuring of woollen manufactures with an ell. It was at firſt intended as a proof of the goodneſs of that commodity; and accordingly a ſeal was invented as a mark that the commodity was made according to the ſtatute; but, it being now poſſible to purchaſe theſe ſeals, they are affixed, whenever the vender pleaſes, to all cloths indiſcriminately, to the great prejudice of our woollen manufactures.

ALNAGER, ALNEGER, or AULNEGER, q. d. *meaſurer by the ell*, ſignifies a ſworn public officer, who, by himſelf or deputy, is to look to the aſſize of woollen cloth made throughout the land, i. e. the length, width, and work thereof; and to the ſeals for that purpoſe ordained. The office of king's aulnager ſeems to have been derived from the ſtatute of Richard I. A. D. 1197, which ordained that there ſhould be only one weight and one meaſure throughout the kingdom; and that the cuſtody of the aſſize, or ſtandard of weights and meaſures, ſhould be committed to certain perſons in every city and borough. His buſineſs was, for a certain fee, to meaſure all cloths made for ſale, till the office was aboliſhed by the ſtatute 11 and 12 W. III. cap. 20.

ALNUS, the ALDER TREE. See BETULA, BOTANY *Index*.

ALNUS, in the ancient theatres, that part which was moſt diſtant from the ſtage.

ALNWICK, a thoroughfare town in Northumberland, on the road to Scotland. Here Malcolm, king of Scotland, making an inroad into Northumberland, was killed, with Edward his ſon, and his army defeated by Robert Moubray, earl of this county, anno 1092. Likewiſe William, king of Scotland, in 1174, invading England with an army of 80,000 men, was here encountered, his army routed, and himſelf made priſoner. The town is populous, and in general well built; it has a large town-houſe, where the quarter-ſeſſions and county-courts are held, and members of parliament elected. It has a ſpacious ſquare, in which a market is held every Saturday. Alnwick appears to have been formerly fortified, by the veſtiges of a wall ſtill viſible in many parts, and three gates which remain almoſt entire. It is governed by four chamberlains, who are choſen once in two years out of a common council, conſiſting of 24 members. It is ornamented by a ſtately old Gothic caſtle, which has been the ſeat of the noble family of Piercy, earls of Northumberland. As the audits for receipt of rents have ever been in the caſtle, it has always been kept in tolerable repair; and not many years ago it was repaired and beautified by the duke of Northumberland, who made very conſiderable alterations, upon a moſt elegant plan, with a view to reſide in it ſome part of the ſummer ſeaſon. The manner of making freemen is peculiar to this place, and indeed is as ridiculous as ſingular. The perſons who are to be made free, or, as the phraſe is, leap the well, aſſemble in the market-place, very early in the morning, on the 25th of April, being St Mark's day. They appear on horſeback, with every man his ſword by his ſide, dreſſed in white, and with white nightcaps, attended by the four chamberlains and the caſtle bailiff, mounted and armed in the ſame manner; from hence they proceed, with muſic playing before them, to a large dirty pool, called *Freeman's-well*, where they diſmount, and draw up in a body, at ſome diſtance from the water; and thenruſh into it all at once, and ſcramble through the mud as faſt as they can. As the water is generally very foul, they come out in a dirty condition; but taking a dram, they put on dry clothes, remount their horſes, and ride full gallop round the confines of the diſtrict; then re-enter the town, ſword in hand, and are met by women dreſſed in ribbons with bells and garlands, dancing and ſinging. Theſe are called *timber-waſts*. The houſes of the new freemen are on this day diſtinguiſhed by a great holly buſh, as a ſignal for their friends to aſſemble and make merry with them after their return. This ceremony is owing to King John, who was miſled in this well, and who, as a puniſhment for not mending the road, made this a part of their charter. Alnwick is 310 miles north by weſt from London, 33 north of Newcaſtle, and 29 ſouth of Berwick. Long. 1. 10. Lat. 55. 24.

Alnwick ‖ Aloof.

ALOA, in Grecian antiquity, a feſtival kept in honour of Ceres by the huſbandmen, and ſuppoſed to reſemble our harveſt-home.

ALOE, in *Botany*. See BOTANY *Index*.

American Aloe. See AGAVE, BOTANY *Index*.

ALOGIANS, in *Church Hiſtory*, a ſect of ancient heretics, who denied that Jeſus Chriſt was the Logos, and conſequently rejected the goſpel of St John. The word is compounded of the privative α and λογος, q. d. *Without Logos* or *Word*. Some aſcribe the origin of the name, as well as of the ſect of Alogians, to Theodore of Byzantium, by trade a currier; who having apoſtatized under the perſecution of the emperor Severus, to defend himſelf againſt thoſe who reproached him therewith, ſaid, that it was not God he denied, but only man. Whence his followers were called in Greek αλογοι, becauſe they rejected the Word. But others, with more probability, ſuppoſe the name to have been firſt given them by Epiphanius in the way of reproach. They made their appearance toward the cloſe of the ſecond century.

ALOGOTROPHIA, among phyſicians, a term ſignifying the unequal growth or nouriſhment of any part of the body, as in the rickets.

ALOOF, has frequently been mentioned as a ſea-term: but whether juſtly or not, we ſhall not preſume to determine. It is known in common diſcourſe to imply *at a diſtance*; and the reſemblance of the phraſes *keep aloof*, and *keep a luff*, or *keep the luff*, in all probability gave riſe to the conjecture. If it was really a ſea-

Alopece
||
Alp Arflan.

ſea-phraſe originally, it ſeems to have referred to the dangers of a lee-ſhore, in which ſituation the pilot might naturally apply it in the ſenſe commonly underſtood, viz. keep *all off*, or quite off: it is, however, never expreſſed in that manner by ſeamen now. See LUFF. It may not be improper to obſerve, that beſides uſing this phraſe in the ſame ſenſe with us, the French alſo call the weather-ſide of a ſhip, and the weather-clue of a courſe, *le lof*.

ALOPECE, ALOPECIA, in *Ancient Geography*, an iſland placed by Ptolemy at the mouth of the Tanais, and called the iſland *Tanais*, now *l'Iſle des Renards*. (Baudrand). Alſo an iſland of the Boſphorus Cimmerius (Pliny); and another in the Ægean ſea, over againſt Smyrna.

ALOPECIA, a term uſed among phyſicians to denote a total falling off of the hair from certain parts, occaſioned either by the defect of nutricious juice, or by its vicious quality corroding the roots of it, and leaving the ſkin rough and colourleſs.

The word is formed from αλωπηξ, *vulpes*, "a fox;" whoſe urine, it is ſaid, will occaſion baldneſs, or becauſe it is a diſeaſe which is common to that creature. It is directed to waſh the head every night at going to bed with a ley prepared by boiling the aſhes of vine branches in red wine. A powder made by reducing hermodactyls to fine flour is alſo recommended for the ſame purpoſe.

In caſes where the baldneſs is total, a quantity of the fineſt burdock roots are to be bruiſed in a marble mortar, and then boiled in white wine until there remains only as much as will cover them. This liquor, carefully ſtrained off, is ſaid to cure baldneſs, by waſhing the head every night with ſome of it warm. A ley made by boiling aſhes of vine branches in common water is alſo recommended with this intention. A freſh cut onion, rubbed on the part until it be red and itch, is likewiſe ſaid to cure baldneſs.

A multitude of ſuch remedies are everywhere to be found in the works of Valeſcus de Taranta, Rondeletius, Hallerius, Trincavellius, Celſus, Senertay, and other practical phyſicians.

ALOPECURUS, or FOXTAIL-GRASS. See BOTANY *Index*.

ALOPEX, in *Zoology*, a ſpecies of the canis, with a ſtraight tail and black tip. It is commonly called the *fiſh fox*.

ALOSA, the-ſhad, or mother of herrings, a ſpecies of the clupea. See CLUPEA, ICHTHYOLOGY *Index*.

ALOST, a town in Flanders, belonging to the houſe of Auſtria, ſituated on the river Dender, in the midway between Bruſſels and Ghent. It has but one pariſh; but the church is collegiate, and has a provoſt, a dean, and 12 canons. Here is a convent of Carmelites, another of Capuchines, another of barefooted Carmelites, three nunneries, an hoſpital, and a convent of Guillemins, in which is the tomb of Theodore Martin, who brought the art of printing out of Germany into the Low Countries. He was the friend of Eraſmus, and wrote his epitaph. Aloſt was taken and diſmantled by Marſhal Turenne in 1667; and after the battle of Ramillies in 1706, was abandoned to the allies. E. Long. 3. 56. N. Lat. 49. 55.

ALP ARSLAN, the ſecond ſultan of the dynaſty of Seljuk in Perſia, was the ſon of David, and great grandſon of Seljuk the founder of the dynaſty. He was born in the year 1030, of the Hegira 421. In place of Iſhael, which was his original name, he aſſumed that of Mohammed, when he embraced the Muſſulman faith, and he obtained the ſurname *Alp Arſlan*, which in the Turkiſh language ſignifies *a valiant lion*, on account of his military proweſs. Having held the chief command in Khoraſan for ten years as lieutenant of his uncle Togrul Beg, he ſucceeded him in the year 1063, and at the commencement of his reign ſaw himſelf ſole monarch of Perſia, from the river Amu to the Tigris. When he aſſumed the reins of government, faction and open rebellion prevailed in his dominions, in ſubduing of which he was ably aſſiſted by Nadham al Molk his viſir, one of the moſt diſtinguiſhed characters of his time, whoſe prudence and integrity in the adminiſtration of the affairs of the kingdom proved of moſt eſſential ſervice to this prince and to his ſucceſſor. Peace and ſecurity being eſtabliſhed in his dominions, he convoked an aſſembly of the ſtates; and having declared his ſon Malek Shaw his heir and ſucceſſor, ſeated him on a throne of gold, and exacted an oath of fidelity to him from the principal officers of the empire. With the hope of acquiring immenſe booty in the rich temple of St Baſil in Cæſarea, the capital of Cappadocia, he placed himſelf at the head of the Turkiſh cavalry, croſſed the Euphrates, and entered and plundered that city. He then marched into Armenia and Georgia, which in the year 1065 he finally conquered. In the former country, the very name of a kingdom and the ſpirit of a nation were totally extinguiſhed. But the native Georgians, who had retired to the woods and valleys of Mount Caucaſus, made a more vigorous reſiſtance. They too, however, overpowered by the arms of the ſultan and his ſon Malek, were forced to ſubmiſſion, and reduced to ſlavery. To puniſh them for the brave defence which they had made, and as a badge of their humiliating condition, Alp Arſlan obliged them to wear at their ears horſe ſhoes of iron. Some, to eſcape this mark of cruelty and ignominy, profeſſed to embrace the religion of Mahomet.

Alp Arſlan

In the year 1068 Alp Arſlan invaded the Roman empire, the ſeat of which was then at Conſtantinople. Eudocia, the reigning empreſs, ſaw and dreaded the progreſs of his arms. To avert the threatened danger, ſhe married Romanus Diogenes, a brave ſoldier, who was accordingly aſſociated with her in the government, and raiſed to the imperial dignity. The new emperor, during the exhauſted ſtate of their reſources, ſuſtained the Roman power with ſurpriſing valour and invincible courage. His ſpirit and ſucceſs animated his ſoldiers in the field to act with fortitude and firmneſs, inſpired his ſubjects with hope, and ſtruck terror in his enemies. In three ſevere campaigns his arms were victorious; and the Turks were forced to retreat beyond the Euphrates. In the fourth he advanced with an army of 100,000 men into the Armenian territory for the relief of that country. Here he was met by Alp Arſlan with 40,000 cavalry, or, according to ſome authors, a much ſmaller number; and the ſultan having propoſed terms of peace, which were inſultingly rejected by the emperor, a bloody and deciſive engagement took place. Alp Arſlan, it is ſaid, when he ſaw that a battle was inevitable, wept at the thought that ſo many of his faithful followers muſt fall

Alp Arſlan in the ſtruggle; and after offering up a devout prayer, granted free permiſſion to all who choſe it to retire from the field. Then with his own hand he tied up his horſe's tail, exchanged his bow and arrows for a mace and ſcymitar, and robing himſelf in a white garment perfumed with muſk, reſolved to periſh on the ſpot unleſs he came off victorious. The ſkilful movements of the Turkiſh cavalry ſoon made an impreſſion on the ſuperior numbers of the Greeks, who were thrown into great diſorder, and after a terrible ſlaughter, were totally routed. Romanus, deſerted by the main body of his army, with unſhaken courage kept his ſtation, till he was recognized by a ſlave, taken priſoner, and conducted into the preſence of Alp Arſlan. In the Turkiſh divan, the captive emperor was commanded to kiſs the ground as a degrading mark of ſubmiſſion to the power and authority of the ſultan, who, it is ſaid, leapt from his throne and ſet his foot on his neck. But this is ſcarcely probable or conſiſtent with the generous and reſpectful treatment which he otherwiſe experienced. For the ſultan inſtantly raiſed him from the ground, embraced him tenderly, and aſſured him that his life and dignity ſhould remain inviolate under the protection of a prince who had not forgotten the reſpect due to the majeſty of his equals, and the viciſſitudes of fortune. When the terms of his ranſom were about to be ſettled, Romanus was aſked by Alp Arſlan what treatment he expected to receive. To this queſtion the emperor, with ſeeming indifference, replied, "If you are cruel, you will take my life; if you follow the dictates of pride, you will drag me at your chariot wheels; if you conſult your intereſt, you will accept a ranſom, and reſtore me to my country." "But what," ſays the ſultan, "would you have done in ſuch circumſtances?" "Had I been victorious," ſaid the inſolent Romanus, "I would have inflicted on thy body many a ſtripe." The conqueror ſmiled at the fierce and unſubdued ſpirit of his captive; obſerved that the Chriſtian precepts ſtrongly inculcated the love of enemies and the forgiveneſs of injuries; and, with a noble greatneſs of mind, declared that he would never imitate an example which he diſapproved. A ranſom of a million, an annual tribute of 3000 pieces of gold, an intermarriage between the families, and the deliverance of all the captive Muſſulmans in the power of the Greeks, were at laſt agreed to as the terms of peace and the liberty of the emperor. Romanus was now diſmiſſed loaded with preſents, and reſpectfully attended by a military guard. But the diſtracted ſtate of his dominions, the conſequence of a revolt of his ſubjects, precluded him from fulfilling the terms of the treaty, and remitting the ſtipulated price of his ranſom. The ſultan ſeemed diſpoſed to favour and ſupport the declining fortunes of his ally; but the defeat, impriſonment, and death of Romanus interrupted the accompliſhment of his generous, or rather ambitious, deſign.

As this time the dominion of Alp Arſlan extended over the faireſt part of Aſia; 1200 princes, or ſons of princes, ſurrounded his throne; and 200,000 ſoldiers were ready to execute his commands. He now meditated a greater enterpriſe, and declared his purpoſe of attempting the conqueſt of Turkeſtan, the original ſeat of his anceſtors. After great preparations for the expedition, he marched with a powerful army, and arrived at the banks of the Oxus. Before he could paſs the river with ſafety, it was neceſſary to gain poſſeſſion of ſome fortreſſes in its vicinity; one of which was for ſeveral days vigorouſly defended by the governor, Joſeph Cothual, a Carizmian. He was, however, obliged to ſurrender, and was carried a priſoner before the ſultan, who, being enraged at his obſtinacy and preſumption, addreſſed him in very reproachful terms. Joſeph replied with ſo much ſpirit, that he rouſed the reſentment of Alp Arſlan, and was commanded inſtantly to be faſtened by the hands and feet to four ſtakes, to ſuffer a painful and cruel death. Joſeph, on hearing this ſentence, became furious and deſperate; and drawing a dagger which he had concealed in his boots, ruſhed towards the throne to ſtab the ſultan; the guards raiſed their battle-axes, and moved forward to defend their ſovereign; but Alp Arſlan, the moſt expert archer of his age, checking their zeal, forbade them to advance, and drew his bow: his foot ſlipped, and the arrow miſſed Joſeph, who ruſhed forward, and plunging his dagger in the breaſt of the ſultan, was himſelf inſtantly cut in pieces. The wound proved mortal, and the ſultan expired in a few hours after he received it, in the year 1072. When he found his end approaching, he addreſſed himſelf in theſe words to his attendants: "In my youth," ſaid he, "I was adviſed by a wiſe man to humble myſelf before God, never to confide in my own ſtrength, or to deſpiſe the moſt contemptible enemy. Theſe leſſons I have neglected, for which I have now met deſerved puniſhment. Yeſterday, when I beheld from an eminence the number and diſcipline of my troops, I ſaid in the confidence of my heart, 'What power on earth can oppoſe me? what man dares to attack me?' To day, vainly truſting to my own ſtrength and dexterity, I fooliſhly checked the prompt zeal and alacrity of my guards for my ſafety, and now I have fallen by the hand of an aſſaſſin! But I perceive that no force or addreſs can reſiſt fate." He died in the 10th year of his reign, at the age of 44. He was buried at Maru, one of the four cities of Khoraſan, in the tomb of the Seljukian dynaſty. On his tomb was inſcribed the following epitaph: "All you who have beheld the grandeur of Alp Arſlan exalted to the heavens, come to Maru, and you will ſee it buried in the duſt."

This prince was diſtinguiſhed for his valour, liberality, and piety. He was patient, juſt, and ſincere. His ſtature, aſpect, and voice, commanded the reſpect of all who approached him. He had long whiſkers, and uſually wore a high turban in the form of a crown. He was ſucceeded by his ſon Malek Shaw, who had been proclaimed and acknowledged ſultan of the Turks during his life. (*Mod. Univ. Hiſt. Gibbon's Hiſt.*)

Alp Arſlan, Alpha.

ALPHA, the name of the firſt letter of the Greek alphabet, anſwering to our A. As a numeral, it ſtands for one, or the firſt of any thing. It is particularly uſed, among ancient writers, to denote the chief or firſt man of his claſs or rank. In this ſenſe, the word ſtands contradiſtinguiſhed from *beta*, which denotes the ſecond perſon. Plato was called the *Alpha* of the the wits: Eratoſthenes, keeper of the Alexandrian library, whom ſome called a *Second Plato*, is frequently named *Beta*.

ALPHA is alſo uſed to denote the beginning of any thing. In which ſenſe it ſtands oppoſed to *omega*,

Alphabet. which denotes the end. And these two letters were made the symbol of Christianity; and accordingly were engraven on the tombs of the ancient Christians, to distinguish them from those of idolaters. Moralez, a Spanish writer, imagined that this custom only commenced since the rise of Arianism; and that it was peculiar to the orthodox, who hereby made confession of the eternity of Christ: but there are tombs prior to the age of Constantine whereon the two letters were found, besides that the emperor just mentioned bore them on his labarum before Arius appeared.

ALPHABET, the natural or customary series of the several letters of a language (see LANGUAGE and WRITING). The word is formed from *alpha* and *beta*, the first and second letters of the Greek alphabet. The number of letters is different in the alphabets of different languages. The English alphabet contains 24 letters; to which if we add *j* and *v* consonant, the sum will be 26: the French contains 23; the Hebrew, Chaldee, Syriac, and Samaritan 22 each; the Arabic 28; the Persian 31; the Turkish 33; the Georgian 36; the Coptic 32; the Muscovite 43; the Greek 24; the Latin 22; the Sclavonic 27; the Dutch 26; the Spanish 27; the Italian 20; the Ethiopic and Tartarian, each 202; the Indians of Bengal 21; the Barames 19. The Chinese have, properly speaking, no alphabet, except we call their whole language by that name; their letters are words, or rather hieroglyphics, amounting to about 80,000.

It has been a matter of considerable dispute whether the method of expressing our ideas by visible symbols called *letters* be really a human invention; or whether we ought to attribute an art so exceedingly useful to an immediate revelation from the Deity.—In favour of the latter opinion it has been urged,

Arguments for writing being a divine revelation. 1. The five books of Moses are universally acknowledged to be the most ancient compositions as well as the most early specimens of alphabetical writing we have. If, therefore, we suppose writing to be the result of human ingenuity, it must be different from all other arts, having been brought to perfection at once; as it seems impossible to make any real improvement on the Hebrew alphabet. It may indeed be replied, that alphabetical characters perhaps have existed many ages before the writings of Moses, though the more ancient specimens have perished. This, however, being a mere unsupported assertion, without any historical testimony to corroborate it, cannot be admitted as a proof. Again, Setting aside the evidence to be derived from Scripture on this subject, the simplicity of manners predominant in the early ages, the small extent of the intellectual powers of mankind, and the little intercourse which nations had with one another, which would seem more particularly to render writing necessary, can scarcely allow us to suppose that such a complex and curious contrivance as alphabetical writing could be invented by a race of men whose wants were so few, their advantages so circumscribed, and their ideas so limited.

2. If alphabetical writing were a mere human invention, it might be expected that different nations would have fallen upon the same expedient independent of each other during the compass of so many ages. But no such thing has taken place; and the writing of every people on earth may be referred to one common original. If this can be proved, the argument from successive derivation, without a single instance of independent discovery, must be allowed to amount to the very highest degree of probability in favour of our hypothesis, which will now rest on the evidence for or against this fact; and which may be summed up in the following manner. Alphabet.

Among the European nations we find none who can pretend any right to the discovery of letters. All of them derived the art from the Romans, excepting only the Turks, who had it from the Arabians. The Romans never laid claim to the discovery; but confessed that they derived their knowledge from the Greeks, and the latter owned that they had it from the Phœnicians; who, as well as their colonists the Carthaginians, spoke a dialect of the Hebrew scarcely varying from the original. The Coptic, or Egyptian, resembles the Greek in most of its characters, and is therefore to be referred to the same original. The Chaldee, Syriac, and latter Samarian, are dialects of the Hebrew, without any considerable deviation, or many additional words. The Ethiopic differs more from the Hebrew, but less than the Arabic; yet these languages have all issued from the same stock, as the similarity of their formation, and the numberless words common to them, all sufficiently evince: and the Persic is very nearly allied to the Arabic. Alterations indeed would naturally be produced, in proportion to the civilization of the several nations, and their intercourse with others; which will account for the superior copiousness of some above the rest. It appears then, that all the languages in use amongst men that have been conveyed in alphabetical characters, have been the languages of people connected ultimately or immediately with the Hebrews, who have handed down the earliest specimens of writing to posterity; and we have therefore the greatest reason to believe, that their method of writing, as well as their language, was derived from the same source.

This proposition will be farther confirmed from considering the sameness of the artificial denominations of the letters in the Oriental, Greek, and Latin languages, accompanied also by a similar arrangement, as *alpha*, *beta*, &c. It may still be objected, however, that the characters employed by the ancients to discriminate their letters are entirely dissimilar. Why should not one nation, it may be urged, adopt from the other the mode of expressing the art as well as the art itself? To what purpose did they take the trouble of inventing other characters? To this objection it may be replied, 1. From the instance of our own language we know what diversities may be introduced in this respect merely by length of time and an intercourse with neighbouring nations. And such an effect would be more likely to take place before the art of printing had contributed to establish an uniformity of character: For when every work was transcribed by the hand, we may easily imagine how many variations would arise from the fancy of the scribe, and the mode of writing so constantly different in individuals. 2. This diversity might sometimes arise from vanity. When an individual of another community had become acquainted with this wonderful art, he might endeavour to recommend himself as the inventor; and, to avoid detection, might invent other characters. 3. The characters

Alphabet. racters of the alphabet might ſometimes be accommodated as much as poſſible to the ſymbolical marks already in uſe amongſt a particular people. Theſe having acquired a high degree of ſanctity by the uſe of many generations, would not eaſily be ſuperſeded without the aid of ſome ſuch contrivance. 4. This is ſupported by the teſtimony of Herodotus; who informs us, "that thoſe Phœnicians who came with Cadmus introduced many improvements among the Greeks, and alphabetical writing too, not known among them before that period. At firſt they uſed the Phœnician character; but in proceſs of time, as the pronunciation altered, the ſtandard of the letters was alſo changed. The Ionian Greeks inhabited at the time the parts adjacent to Phœnicia: who having received the art of alphabetical writing from the Phœnicians, uſed it, with an alteration of ſome few characters, and confeſſed ingenuouſly, that it was called Phœnician from the introducers of it." He tells us that he had himſelf ſeen the characters of Cadmus in the temple of Iſmenian Apollo at Thebes in Bœotia, engraven upon tripods, and very much reſembling the Ionian characters. 5. The old Samaritan is preciſely the ſame as the Hebrew language: and the Samaritan Pentateuch does not vary by a ſingle letter in twenty words from the Hebrew: but the characters are widely different: for the Jews adopted the Chaldaic leters during their captivity at Babylon inſtead of the characters of their forefathers.

3. What we know of thoſe nations who have continued for many centuries unconnected with the reſt of the world, ſtrongly militates againſt the hypotheſis of the human invention of alphabetical writing. The experiment has been fairly made upon the ingenuity of mankind for a longer period than that which is ſuppoſed to have produced alphabetical writing by regular gradations; and this experiment determines peremptorily in their favour. The Chineſe, a people famous for their diſcoveries and mechanical turn of genius, have made ſome advances towards the delineation of their ideas by arbitrary ſigns, but have nevertheleſs been unable to accompliſh this exquiſite device; and after ſo long a trial to no purpoſe, we may reaſonably infer, that their mode of writing, which is growing more intricate and voluminous every day, would never terminate in ſo clear, ſo comparatively ſimple, an expedient as that of alphabetical characters. The Mexicans, too, had made ſome rude attempts of the ſame kind; but with leſs ſucceſs than the Chineſe. We know alſo, that hieroglyphics were in uſe among the Egyptians poſterior to the practice of alphabetical writing by the Jews; but whether the epiſtolography, as it is called, of the former people, which was in vogue during the continuance of the hieroglyphics, might not poſſibly be another name for alphabetical writing, cannot be decided.

4. We ſhall conſider the argument on which the commonly received ſuppoſition entirely depends: that is, the natural gradation, through the ſeveral ſpecies of ſymbols acknowledged to have been in uſe with various people, terminating at laſt, by an eaſy tranſition, in the detection of alphabetical characters. The ſtrength of this argument will be beſt underſtood from the following repreſentation.

"1. The firſt method of embodying ideas would be by drawing a repreſentation of the objects themſelves. The imperfection of this method is very obvious, both on account of its tedioufneſs and its inability of going beyond external appearances to the abſtract ideas of the mind. Alphabet.

"2. The next method would be ſomewhat more general, and would ſubſtitute two or three principal circumſtances for the whole tranſaction. So two kings, for example, engaging each other with military weapons, might ſerve to convey the idea of a war between the two nations. This abbreviated method would be more expeditious than the former; but what it gained in conciſeneſs would be loſt in perſpicuity. It is a deſcription more compendious indeed, but ſtill a deſcription of outward objects alone, by drawing their reſemblance. To this head may be referred the picture-writing of the Mexicans.

"3. The next advance would be to the uſe of ſymbols: the incorporation, as it were, of abſtract and complex ideas in figures more or leſs generalized, in proportion to the improvement of it. Thus, in the earlier ſtages of this device, a circle might ſerve to expreſs the ſun, a ſemicircle the moon; which is only a contraction of the foregoing method. This ſymbol writing in its advanced ſtate would become more refined, but enigmatical and myſterious in proportion to its refinement. Hence it would become leſs fit for common uſe, and therefore more particularly appropriated to the myſteries of philoſophy and religion. Thus, two feet ſtanding upon water ſerved to expreſs an impoſſibility; a ſerpent denoted the oblique trajectories of the heavenly bodies; and the beetle, on account of ſome ſuppoſed properties of that inſect, ſerved to repreſent the ſun. The Egyptian hieroglyphics were of this kind.

"4. This method being ſtill too ſubtle and complicated for common uſe, the only plan to be purſued was a reduction of the firſt ſtage of the preceding method. Thus a dot, inſtead of a circle, might ſtand for the ſun; and a ſimilar abbreviation might be extended to all the ſymbols. On this ſcheme every object and idea would have its appropriated mark: theſe marks, therefore, would have a multiplicity proportionable to the works of nature and the operations of the mind. This method was likewiſe practiſed by the Egyptians; but has been carried to greater perfection by the Chineſe. The vocabulary of the latter is therefore infinite, or at leaſt capable of being extended to any imaginable length. But if we compare this tedious and awkward contrivance with the aſtoniſhing brevity and perſpicuity of alphabetical writing, we muſt be perſuaded that no two things can be more diſſimilar; and that the tranſition from a ſcheme conſtantly enlarging itſelf, and growing daily more intricate, to the expreſſion of every poſſible idea by the modified arrangement of four-and-twenty marks, is not ſo very eaſy and perceptible as ſome have imagined. Indeed this ſeems ſtill to be rather an expreſſion of things in a manner ſimilar to the ſecond ſtage of ſymbol writing than the notification of ideas by arbitrary ſigns."

To all this we ſhall ſubjoin the following remarks, which ſeem to give additional force to the foregoing reaſoning. Additional remarks in confirmation of theſe arguments.

"1. Pliny aſſerts the uſe of letters to have been eternal;

Alphabet

nal; which ſhows the antiquity of the practice to extend beyond the era of authentic hiſtory.

" 2. The cabaliſtical doctors of the Jews maintain, that alphabetical writing was one of the ten things which God created on the evening of the Sabbath.

" 3. Moſt of the profane authors of antiquity aſcribe the firſt uſe of alphabetical characters to the Egyptians, who, according to ſome, received them from Mercury; and, according to others, from their god Teuth.

" 4. There is very little reaſon to ſuppoſe that even language itſelf is the effect of human ingenuity and invention."

Anſwers to the above arguments.

Thus we have ſtated the arguments in favour of the revelation of alphabetical writing; which are anſwered, by thoſe who take the contrary ſide, in the following manner.

1. Moſes nowhere ſays that the alphabet was a new thing in his time; nor does he give the leaſt hint of his being the inventor of it. The firſt mention we find of *writing* is in the 17th chapter of Exodus; where Moſes is commanded to *write in a book*; and which took place before the arrival of the Iſraelites at Sinai. This ſhows that writing did not commence with the delivery of the two tables of the law, as ſome have ſuppoſed. Neither are we to conclude that the invention had taken place only a ſhort time before; for the *writing in a book* is commanded as a thing commonly underſtood, and with which Moſes was well acquainted. It is plain, from the command to engrave the names of the twelve tribes of Iſrael upon ſtones *like the engravings of a ſignet*, that writing had been known and practiſed among them, as well as other nations, long before. We muſt alſo remember, that the people were commanded to write the law on their door poſts, &c. ſo that the art ſeems not only to have been known, but univerſally practiſed among them. But had writing been a new diſcovery in the time of Moſes, he would probably have commemorated it as well as the other inventions of muſic, &c.: Nor is there any reaſon to ſuppoſe that God was the immediate revealer of the art; for Moſes would never have omitted to record a circumſtance of ſuch importance, as the memory of it would have been one of the ſtrongeſt barriers againſt idolatry.

Again, Though ſeveral profane writers attribute the origin of letters to the gods, or to ſome divine perſon, yet this is no proof of its being actually revealed; but only that the original inventor was unknown. The learned biſhop of Glouceſter obſerves, that the ancients gave nothing to the gods of whoſe original they had any records; but where the memory of the invention was loſt, as of ſeed-corn, wine, writing, civil ſociety, &c. the gods ſeized the property, by that kind of right which gives ſtrays to the lord of the manor.

As neither the ſacred nor profane hiſtorians, therefore, have determined any thing concerning the invention of letters, we are at liberty to form what conjectures we think moſt plauſible concerning the origin of them; and this, it is thought, might have taken place in the following manner.

" 1. Men, in their rude uncultivated ſtate, would have neither leiſure, inclination, nor inducement, to cultivate the powers of the mind to a degree ſufficient for the formation of an alphabet: but when a people arrived at ſuch a pitch of civilization as required them to repreſent the conceptions of the mind which have no corporeal forms, neceſſity would occaſion further exertions, and urge them to find out a more expeditious manner of tranſacting their buſineſs than by picture-writing. Alphabet.

" 2. Theſe exertions would take place whenever a nation began to improve in arts, manufactures, and commerce; and the greater genius ſuch a nation had, the more improvements would be made in the notation of their language; whilſt thoſe people who had made leſs progreſs in civilization and ſcience, would have a leſs perfect ſyſtem of elementary characters; and perhaps advance no farther for many ages than the marks or characters of the Chineſe. Hence we may ſee, that the buſineſs of princes, as well as the manufactures and commerce of each country, would produce the neceſſity of deviſing ſome expeditious manner of communicating information to one another."

The art of writing, however, is of ſo great antiquity, and the early hiſtory of moſt nations ſo full of fable, that it muſt be extremely difficult to determine what nation or people may juſtly claim the honour of the invention. But as it is probable that letters were the produce of a certain degree of civilization among mankind, we muſt therefore have recourſe to the hiſtory of thoſe nations who ſeem to have been firſt civilized.

Claim of the Egyptians to the invention of letters.

The Egyptians have an undoubted title to a very early civilization; and many learned men have attributed the invention of letters to them. The late biſhop of Glouceſter contends, that Egypt was the parent of all the learning of Greece, and was reſorted to by all the Grecian legiſlators, naturaliſts, and philoſophers; and endeavours to prove that it was one of the firſt civilized countries on the globe. Their writing was of four kinds: 1. *Hieroglyphic;* 2. *Symbolic;* 3. *Epiſtolic;* and, 4. *Hierogrammatic.* In the moſt early ages they wrote, like all other infant nations, by pictures; of which ſome traces yet remain among the hieroglyphics of Horapollo, who informs us, that they repreſented a *fuller* by a man's two feet in water; *fire*, by ſmoke aſcending, &c. But to render this rude invention leſs incommodious, they ſoon deviſed the method of putting one thing of ſimilar qualities for another.

The former was called the *curiologic*, the latter the *tropical* hieroglyphic; which laſt was a gradual improvement on the former. Theſe alterations in the manner of delineating hieroglyphic figures produced and perfected another character, called the *running-hand of the hieroglyphics*, reſembling the Chineſe writing; which having been firſt formed by the outlines of each figure, became at length a kind of *marks;* the natural effects of which were, that the conſtant uſe of them would take off the attention from the ſymbol and fix it on the thing ſignified. Thus the ſtudy of ſymbolic writing would be much abbreviated; becauſe the writer or decypherer would have then little to do but to remember the power of the ſymbolic mark; whereas before, the properties of the thing or animal delineated were to be learned. This, together with the other marks by inſtitution, to denote mental conceptions, would reduce the characters to a ſimilar ſtate with the preſent Chineſe; and theſe were properly what the ancients called *hieroglyphical.* We are informed by Dr Robert Huntingdon, in his account of the Porphyry pillars,

Alphabet. pillars, that there are ſome ancient monuments of this kind yet remaining in Egypt.

The ſacred book or ritual of the Egyptians, according to Apuleius, was written partly in ſymbolic, and partly in theſe hieroglyphic characters, in the following manner: "He (the hierophant) drew out certain books from the ſecret repoſitories of the ſanctuary, written in unknown characters, which contained the words of the ſacred formula compendiouſly expreſſed, partly by figures of animals, and partly by certain marks or notes intricately knotted, revolving in the manner of a wheel, crowded together, and curled inward like the tendrils of a vine, ſo as to hide the meaning from the curioſity of the profane."

Letters not invented in Egypt.

But though letters were of great antiquity in Egypt, there is reaſon to believe that they were not firſt invented in that country. Mr Jackſon, in his Chronological Antiquities, has endeavoured to prove, that they were not invented or carried into Egypt by *Taaut* or *Thoth*, the firſt Hermes, and ſon of Miſraim, who lived about 500 years after the deluge; but that they were introduced into that country by the ſecond Hermes, who lived about 400 years after the former. This ſecond Hermes, according to Diodorus, was the inventor of grammar and muſic, and added many words to the Egyptian language. According to the ſame author alſo, he invented letters, rhythm, and the harmony of ſounds. This was the Hermes ſo much celebrated by the Greeks, who knew no other than himſelf. On the other hand, Mr Wiſe aſſerts that Moſes and Cadmus could not learn the alphabet in Egypt; and that the Egyptians had no alphabet in their time. He adduces ſeveral reaſons to prove that they had none till they received what was called the *Coptic*, which was introduced either in the time of the Ptolemies or under Pſammitichus or Amaſis; and the oldeſt alphabetic letters which can be produced as Egyptian, appear plainly to have been derived from the Greek. Herodotus confeſſes, that all he relates before the reign of Pſammitichus is uncertain; and that he reports the early tranſactions of that nation on the credit of the Egyptian prieſts, on which he did not greatly depend; and Diodorus Siculus is ſaid to have been greatly impoſed upon by them. Manetho, the oldeſt Egyptian hiſtorian, tranſlated the ſacred regiſters out of Egyptian into Greek, which are ſaid by Syncellus to have been written in the ſacred letters, and to have been laid up by the ſecond Mercury in the Egyptian temples. He allows the Egyptian gods to have been mortal men; but his hiſtory was very much corrupted by the Greeks, and hath been called in queſtion by ſeveral writers from the account which he himſelf gave of it. After Cambyſes had carried away the Egyptian records, the prieſts, to ſupply their loſs, and to keep up their pretenſions to antiquity, began to write new records; wherein they not only unavoidably made great miſtakes, but added much of their own invention, eſpecially as to diſtant times.

Claim of the Phœnicians.

The Phœnicians have likewiſe been ſuppoſed the inventors of letters; and we have the ſtrongeſt proofs of the early civilization of this people. Their moſt ancient hiſtorian, Sanchoniatho, lived in the time of Abibalus, father of Hiram king of Tyre. He informs us, that letters were invented by *Taaut*, who lived in Phœnicia in the 12th and 13th generations after the creation. "Miſor (ſays he) was the ſon of Hamyn; the ſon of Miſor was *Taaut*, who invented the firſt letters for writing." The Egyptians call him *Thoth*; the Alexandrians *Thoyth*; and the Greeks *Hermes*, or *Mercury*. In the time of this Taaut or Mercury, (the grandſon of Ham the ſon of Noah), Phœnicia and the adjacent country was governed by Uranus, and after him by his ſon Saturn or Cronus. He invented letters either in the reign of Uranus or Cronus; and ſtaid in Phœnicia with Cronus till the 32d year of his reign. Cronus, after the death of his father Uranus, made ſeveral ſettlements of his family, and travelled into other parts; and when he came to the ſouth country, he gave all Egypt to the god Taautus, that it ſhould be his kingdom. Sanchoniatho began his hiſtory with the creation, and ended it with placing Taautus on the throne of Egypt. He does not mention the deluge, but makes two more generations in Cain's line from Protagonus to Agrovenus (or from Adam to Noah than Moſes. As Sanchoniatho has not told us whether Taaut invented letters either in the reign of Uranus or Cronus, "we cannot err much (ſays Mr Jackſon) if we place his invention of them 550 years after the flood, or 20 years after the diſperſion, and 2619 years before the Chriſtian era, and ſix, or perhaps ten years, before he went into Egypt." This prince and his poſterity reigned at Thebes in Upper Egypt for 15 generations. Alphabet.

Several Roman authors attribute the invention of letters to the Phœnicians. Pliny ſays (A), the Phœnicians were famed for the invention of letters, as well as for aſtronomical obſervations and novel and martial arts. Curtius informs us, that the Tyrian nation are related to be the firſt who either taught or learned letters; and Lucan ſays, that they were the firſt who attempted to expreſs ſounds or words by letters. Euſebius alſo tells us from Porphyry, that "Sanchoniatho ſtudied with great application the writings of Taaut, knowing that he was the firſt who invented letters."

The Greeks, as we have already obſerved, knew no older Hermes than the ſecond, who lived about 400 years after the Mezrite Taaut or Hermes. This ſecond Hermes is called by Plato *Theuth*, and counſellor or ſacred ſcribe to King Thanius; but it is not ſaid that he ever reigned in Egypt: but the former Taaut, or Athothes, as Manetho calls him, was the immediate ſucceſſor of Menes the firſt king of Egypt. This ſecond Mercury, if we may believe Manetho, compoſed ſeveral books of the Egyptian hiſtory, and having improved both the language and letters of that nation, the Egyptians attributed the arts and inventions of the former to the latter. The Phœnician language is generally allowed to have been a dialect of the Hebrew; and though their alphabet does not entirely agree with the

(A) he ſays in another place, that the knowledge of letters is eternal. What dependance can we put in the opinion of a writer who thus contradicts himſelf?

Alphabet. the Samaritan, yet there is a great ſimilarity between them. Aſtronomy and arithmetic were much cultivated among them in the moſt early ages; their fine linen, purple, and glaſs, were much ſuperior to thoſe of other nations; and their extraordinary ſkill in architecture and other arts was ſuch, that whatever was great, elegant, or pleaſing, whether in buildings, apparel, or toys, was diſtinguiſhed by the epithet of Tyrian or Sidonian; theſe being the chief cities of Phœnicia. Their great proficiency in learning and arts of all kinds, together with their engroſſing all the commerce of the weſtern world, are likewiſe thought to give them a juſt claim to the invention of letters.

Of the Chaldeans. The Chaldeans alſo have laid claim to the invention of letters; and with regard to this, there is a tradition among the Jews, Indians, and Arabians, that the Egyptians derived their knowledge from Abraham, who was a Chaldean. This tradition is in ſome degree confirmed by moſt of the weſtern writers, who aſcribe the inventions of arithmetic and aſtronomy to the Chaldeans. Joſephus poſitively aſſerts, that the Egyptians were ignorant of the ſciences of arithmetic and aſtronomy before they were inſtructed by Abraham; and Sir Iſaac Newton admits, that letters were known in the line of that patriarch for many centuries before Moſes. The Chaldaic letters appear to have been derived from the Hebrew or Samaritan; which are the ſame, or nearly ſo, with the old Phœnician. Ezra is ſuppoſed to have exchanged the old Hebrew characters for the more beautiful and commodious Chaldee, which are ſtill in uſe. Beroſus, the moſt ancient Chaldean hiſtorian, who was born in the minority of Alexander the Great, does not ſay that he believed his countrymen to have been the inventors of letters.

Of the Syrians. The Syrians have alſo laid claim to the invention of letters. It is certain indeed, that they yielded to no nation in knowledge and ſkill in the fine arts. Their language is ſaid to have been the vernacular of all the oriental tongues, and was divided into three dialects. 1. The Aramean, uſed in Meſopotamia, and by the inhabitants of Roha and Edeſa of Harram, and the Outer Syria. 2. The dialect of Paleſtine; ſpoken by the inhabitants of Damaſcus, Mount Libanus, and the Inner Syria. 3. The Chaldee or Nabathean dialect, the moſt unpoliſhed of the three; and ſpoken in the mountainous parts of Aſſyria, and the villages of Irac or Babylonia. It has been generally believed, that no nation of equal antiquity had a more conſiderable trade than the Syrians: they are ſuppoſed to have firſt brought the commodities of Perſia and India into the weſt of Aſia; and they ſeem to have carried on an inland trade by engroſſing the navigation of the Euphrates, whilſt the Phœnicians traded to the moſt diſtant countries. Notwithſtanding theſe circumſtances, however, which might ſeem to favour the claim of the Syrians, the oldeſt characters they have are but about three centuries before Chriſt. Their letters are of two ſorts. 1. The Eſtrangelo, which is the more ancient; and, 2. The Eſhito, the ſimple or common character, which is the more expeditious and beautiful.

Of the Indians. We muſt next examine the claims of the Indians, whoſe pretenſions to antiquity yield to no other nation on earth. Mr Halhed, who has written a grammar of the Shanſcrit langurge, informs us, that it is not only the grand ſource of Indian literature, but the parent of almoſt every dialect from the Perſian gulf to the Chineſe ſeas, and which is ſaid to be a language of the moſt venerable antiquity. At preſent it is appropriated to religious records of the Bramins, and therefore ſhut up in their libraries; but formerly it appears to have been current over the greateſt part of the eaſtern world, as traces of its extent may be found in almoſt every diſtrict of Aſia. Alphabet.

Mr Halhed informs us, that "there is a great ſimilarity between the Shanſcrit words and thoſe of the Perſian and Arabic, and even of Latin and Greek; and theſe not in technical or metaphorical terms, but in the main ground-works of language; in monoſyllables, the names of numbers, and the appellations of ſuch things as would be firſt diſcriminated on the immediate dawn of civilization. The reſemblance which may be ſeen of the characters on the medals and ſignets of different parts of Aſia, the light they reciprocally throw upon one another, and the general analogy which they all bear to the grand prototype, affords another ample field for curioſity. The coins of Aſſam, Napaul, Caſhmiria, and many other kingdoms, are all ſtamped with Shanſcrit letters, and moſtly contain alluſions to the old Shanſcrit mythology. The ſame conformity may be obſerved in the impreſſions of ſeals from Boutan and Thibet."

The country between the Indus and Ganges ſtill preſerves the Shanſcrit language in its original purity, and offers a great number of books to the peruſal of the curious; many of which have been handed down from the earlieſt periods of human civilization.

There are ſeven different ſorts of Indian hand-writings, all compriſed under the general term of *Naagoree*, which may be interpreted *writing*. The Bramins ſay that letters were of divine original; and the elegant Shanſcrit is ſtyled *Daeb-naagoree*, or the writings of the Immortals, which might not improbably be a refinement from the more ſimple *Naagoree* of former ages. The Bengal letters are another branch of the ſame ſtock. The Bramins of Bengal have all their Shanſcrit books copied in their national alphabet, and they tranſpoſe into them all the Daeb-naagoree manuſcripts for their own peruſal. The Mooriſh dialect is that ſpecies of Hindoſtanic which we owe to the conqueſts of the Mahometans.

The Shanſcrit language contains about 700 radical words; the fundamental part being divided into three claſſes, viz. 1. *Dhaat*, or roots of verbs; 2. *Shubd*, or original nouns; 3. *Evya*, or particles. Their alphabet contains 50 letters; viz. 34 conſonants and 16 vowels. They aſſert that they were in poſſeſſion of letters before any other nation in the world; and Mr Halhed conjectures, that the long-boaſted original civilization of the Egyptians may ſtill be a matter of diſpute. The rajah of Kiſhinagur affirms, that he has in his poſſeſſion Shanſcrit books, where the Egyptians are conſtantly deſcribed as diſciples, not as inſtructors; and as ſeeking in Hindoſtan that liberal education, and thoſe ſciences, which none of their own countrymen had ſufficient knowledge to impart. Mr Halhed hints alſo, that the learning of Hindoſtan might have been tranſplanted into Egypt, and thus have become familiar to Moſes. Several authors, however, are of opinion, that the ancient Egyptians poſſeſſed themſelves of the trade of the Eaſt by the Red ſea, and that they carried

Alphabet. carried on a conſiderable traffic with the Indian nations before the time of Seſoſtris; whom they ſuppoſe to have been cotemporary with Abraham, though Sir Iſaac Newton conjectures him to have been the Shiſhak who took Jeruſalem in the time of Rehoboam.

In the year 1769, one of the ſacred books of the Gentoos called *Bagavadam*, tranſlated by Meridas Poule, a learned man of Indian origin, and chief interpreter to the ſupreme council of Pondicherry, was ſent by him to M. Berten in France. In his preface he ſays, that it was compoſed by Viaſſar the ſon of Brahma, and is of ſacred authority among the worſhippers of Viſchnow. This book claims an antiquity of 5000 years; but M. de Guines has ſhown, that its pretenſions to ſuch extravagant antiquity are entirely inconcluſive and unſatisfactory: whence we may conclude, ſays Mr Aſtle, that though a farther inquiry into the literature of the Indian nations may be laudable, yet we muſt by no means give too eaſy credit to their relations concerning the high antiquity of their manuſcripts and early civilization.

Letters not invented in Perſia; It is not pretended that the Perſians had any great learning among them till the time of Hyſtaſpes the father of Darius. The former, we are told, travelled into India, and was inſtructed by the Bramins in the ſciences for which they were famed at that time. The ancient Perſians deſpiſed riches and commerce, nor had they any money among them till after the conqueſt of Lydia. It appears by ſeveral inſcriptions taken from the ruins of the palace of Perſepolis, which was built near 700 years before the Chriſtian era, that the Perſians ſometimes wrote in perpendicular columns like the Chineſe. This mode of writing was firſt made uſe of on the ſtems of trees, pillars, or obeliſks. As for thoſe ſimple characters found on the weſt ſide of the ſtaircaſe of Perſepolis, ſome have ſuppoſed them to be alphabetic, ſome hieroglyphic, and others antediluvian. Dr Hyde pronounces them to have been mere whimſical ornaments, though the author of Conjectural Obſervations on Alphabetic Writing ſuppoſes them to be fragments of Egyptian antiquity brought by Cambyſes from the ſpoils of Thebes. The learned are generally agreed, that the Perſians were later in civilization than many of their neighbours; and they are not ſuppoſed to have any pretenſions to the invention of letters.

As the Arabians have been in poſſeſſion of the country they now inhabit for upwards of 3700 years, without being intermixed with foreign nations, or ſubjugated by any other power, their language muſt be very ancient. The two principal dialects of it were that ſpoken by the Hamyarites and other genuine Arabs; and that of the Koreiſh, in which Mahomet wrote the Alcoran. The former is named by oriental writers, the *Arabic of Hamyar*; the latter, *the pure* or *defecated Arabic*. Mr Richardſon obſerves, as a proof of the richneſs of this language, that it conſiſts of 2000 radical words.

nor by the Arabians.

The old Arabic characters are ſaid to have been of very high antiquity; for Ebn Haſhem relates, that an inſcription in it was found in Yaman as old as the days of Joſeph. Hence ſome have ſuppoſed, that the Arabians were the inventors of letters; and Sir Iſaac Newton is of opinion, that Moſes learned the alphabet from the Midianites, who were Arabians.

The alphabet of the Arabs conſiſts of 28 letters ſimilar to the ancient Cufic, in which the firſt copies of the Alcoran were written. The preſent Arabic characters were formed by Ebn Moklah, a learned Arabian who lived about 300 years after Mahomet. The Arabian writers themſelves inform us, that their alphabet is not very ancient, and that they received it only a ſhort time before the introduction of Iſlamiſm. Alphabet.

On this account of the pretenſions of different nations to the invention of letters, Mr Aſtle makes the following reflections: "The vanity of each nation induces them to pretend to the moſt early civilization; but ſuch is the uncertainty of ancient hiſtory, that it is difficult to determine to whom the honour is due. It ſhould ſeem, however, that the conteſt may be confined to the Egyptians, the Phœnicians, and the Chaldeans. The Greek writers, and moſt of thoſe who have copied them, decide in favour of Egypt, becauſe their information is derived from the Egyptians themſelves. The poſitive claim of the Phœnicians does not depend entirely upon the teſtimony of Sanchoniatho; the credit of his hiſtory is ſo well ſupported by Philo of Byblus his tranſlator, Porphyry, Pliny, Curtius, Lucan, and other ancient writers, who might have ſeen his works entire, and whoſe relations deſerve at leaſt as much credit as thoſe of the Egyptian and Greek writers. It muſt be allowed, that Sanchoniatho's hiſtory contains many fabulous accounts; but does not the ancient hiſtory of the Egyptians, the Greeks, and moſt other nations, abound with them to a much greater degree? The fragments which we have of this moſt ancient hiſtorian are chiefly furniſhed by Euſebius, who took all poſſible advantages to repreſent the Pagan writers in the worſt light, and to render their theology abſurd and ridiculous. Letters moſt probably invented in Phœnicia.

"The Phœnician and Egyptian languages are very ſimilar; but the latter is ſaid to be more large and full, which is an indication of its being of a later date. The opinion of Mr Wiſe, however, that the ancient Egyptians had not the knowledge of letters, ſeems to be erroneous; as they had commercial intercourſe with their neighbours the Phœnicians, they probably had the knowledge of letters, if their policy, like that of the Chineſe at this day, did not prohibit the uſe of them.

"The Chaldeans, who cultivated aſtronomy in the moſt remote ages, uſed ſymbols or arbitrary marks in their calculations; and we have ſhewn that theſe were the parents of letters. This circumſtance greatly favours their claim to the invention: becauſe Chaldea, and the countries adjacent, are allowed by all authors, both ſacred and profane, to have been peopled before Egypt; and it is certain, that many nations ſaid to be deſcended from Shem and Japheth, had their letters from the Phœnicians, who were deſcended from Ham.

"It is obſervable that the Chaldeans, the Syrians, Phœnicians, and Egyptians, all bordered upon each other; and as the Phœnicians were the greateſt as well as the moſt ancient commercial nation, it is very probable that they communicated letters to the Egyptians, the ports of Tyre and Sidon being not far diſtant from each other.

"Mr Jackſon is evidently miſtaken when he ſays that letters were invented 2619 years before the birth of Chriſt. The deluge recorded by Moſes was 2349 years

Alphabet. years before that event; and if letters were not invented till 550 years after, as he asserts, we must date their discovery only 1799 years before the Christian era, which is 410 years after the reign of Menes, the first king of Egypt, who, according to Syncellus and others, is said to have been the same person with the Misor of Sanchoniatho, the Mizraim of the Scriptures, and the Osiris of the Egyptians; but whether this be true or not, Egypt is frequently called in Scripture *the land of Mizraim*.

"This Mizraim, the second son of Amyn or Ham, seated himself near the entrance of Egypt at Zoan, in the year before Christ 2188, and 160 years after the flood. He afterwards built Thebes, and some say Memphis. Before the time that he went into Egypt, his son Taaut had invented letters in Phœnicia; and if this invention took place ten years before the migration of his father into Egypt, as Mr Jackson supposes, we may trace letters as far back as the year 2178 before Christ, or 150 years after the deluge recorded by Moses; and beyond this period, the written annals of mankind, which have been hitherto transmitted to us, will not enable us to trace the knowledge of them; though this want of materials is no proof that letters were not known until a century and a half after the deluge. As for the pretensions of the Indian nations, we must be better acquainted with their records before we can admit of their claim to the first use of letters; especially as none of their manuscripts of any great antiquity have as yet appeared in Europe. That the Arabians were not the inventors of letters, has appeared by their own confession. Plato somewhere mentions Hyperborean letters very different from the Greek; these might have been the characters used by the Tartars, or ancient Scythians.

Of Antediluvian writing. "It may be expected that something should be said concerning those books mentioned by some authors to have been written before the deluge. Amongst others, Dr Parsons, in his Remains of Japheth, p. 346, 359, supposes letters to have been known to Adam; and the Sabeans produce a book, which they pretend was written by Adam. But concerning these we have no guide to direct us any more than concerning the supposed books of Enoch; some of which, Origen tells us, were found in Arabia Felix, in the dominions of the queen of Saba. Tertullian affirms, that he saw and read several pages of them: and, in his treatise *De Habitu Mulierum*, he places those books among the canonical: but St Jerome and St Austin look upon them to be apocryphal. William Postellus pretended to compile his book, *De Originibus*, from the book of Enoch; and Thomas Bangius published at Copenhagen, in 1657, a work which contains many singular relations concerning the manner of writing among the Antediluvians, which contains several pleasant stories concerning the books of Enoch.

"With regard to this patriarch, indeed, St Jude informs us that he *prophesied*, but he does not say that he *wrote*. The writings, therefore, attributed to the Antediluvians, must appear quite uncertain; though it might be improper to assert that letters were unknown before the deluge recorded by Moses." Alphabet.

Our author proceeds to show, that all the alphabets in the world cannot be derived from one original; because there are a variety of alphabets used in different parts of Asia, which vary in name, number, figure, order, and power, from the Phœnician, ancient Hebrew, or Samaritan. In several of these alphabets also, there are marks for sounds peculiar to the languages of the East, which are not necessary to be employed in the notation of the languages of Europe. All the alphabets in the world cannot be proved to arise from one original.

None of the alphabets to the east of Persia have any connexion with the Phœnician or its derivatives, except where the Arabic letters have been introduced by the conquests of the Mahometans. The foundation of all the Indian characters are those called *Shanscrit* or *Sungscrit*. This signifies something brought to perfection, in contradistinction to *Prakrit*, which signifies vulgar or unpolished. Hence the refined and religious language and characters of India are called *Sungscrit*, and the more vulgar mode of writing and expression *Prakrit*. From this Shanscrit are derived the sacred characters of Thibet, the Cashmirian, Bengalese, Malabaric, and Tamoul; the Singalese, Siamese, Maharattan, Concanee, &c. From the same source we may derive the Tangutic or Tartar characters, which are similar in their great outlines to the Shanscrit; though it is not easily determined which is derived from the other. The common Tartar is generally read, like the Chinese, from top to bottom.

There are, however, several alphabets used in different parts of Asia, entirely different not only from the Shanscrit and all those derived from it, but also from the Phœnician and those which proceed from it. Some of these are the alphabet of Pegu, the *Batta* characters used in the island of Sumatra, and the *Barman* or *Boman* characters used in some parts of Pegu. The names and powers of the letters of which these alphabets are composed, differ entirely from the Phœnician, or those derived from them. It is impossible to assimilate their forms; and indeed it is by no means easy to conceive how the 50 letters of the Shanscrit language could be derived from the Phœnician alphabet, which consisted originally only of 13; though it is certain, that by far the greater number of alphabets now in use are derived from the ancient Hebrew, Phœnician, or Samaritan.

Mr Astle next proceeds to consider what alphabets are derived from the Phœnician. These he supposes to have been immediately the ancient Hebrew or Samaritan; the Chaldaic; the Bastulian (A) or Spanish Phœnician; the Punic, Carthaginian, or Sicilian; and the Pelasgian. From the ancient Hebrew proceeded the Chaldaic or square Hebrew; the round Hebrew; and what is called the *running hand of the Rabbins*. The Pelasgian gave birth to the Etruscan, Eugubian or Umbrian, Oscan, Samnic, and Ionic Greek, written from the left. From the Chaldaic or square Hebrew are derived the Syriac, and the ancient and modern Arabic. The Syriac is divided into the Estrangelo and Alphabets derived from the Phœnician.

(A) The Bastuli are said to have been a Canaanitish or Phœnician people who fled from Joshua, and settled afterwards in Spain.

Alphabet. and Mendæan, and the modern Arabic has given riſe to the Perſian and Turkiſh. From the ancient Arabic are derived the Cufic or Oriental, the Mauritanic or Occidental, the African or Saracen, and the Mooriſh. The Ionic Greek gave riſe to the Arcadian, Latin, ancient Gauliſh, ancient Spaniſh, ancient Gothic, Coptic, Ethiopic, Ruſſian, Illyrian, or Sclavonic, Bulgarian, and Armenian. From the Roman are derived the Lombardic, Viſigothic, Saxon, Gallican, Franco-Gallic or Merovingian, German, Caroline, Capetian, and modern Gothic.

The Punic letters are alſo called *Tyrian*, and were much the ſame with the Carthaginian or Sicilian. The Punic language was at firſt the ſame with the Phœnician; it is nearly allied to the Hebrew, and has an affinity with the Chaldee and Syriac. Some remains of it are to be met with in the Malteſe. To make a complete Punic, Carthaginian, or Sicilian alphabet, we muſt admit ſeveral pure Phœnician letters.

The Pelaſgi were likewiſe of Phœnician original; and, according to Sanchoniatho, the Dioſcuri and Cabiri wrote the firſt annals of the Phœnician hiſtory, by order of Taaut, the inventor of letters. They made ſhips of burthen; and being caſt upon the coaſt near Mount Caſius, about 40 miles from Peluſium, where they built a temple in the ſecond generation after the deluge related by Moſes, they were called *Pelaſgi*, from their paſſing by ſea, and wandering from one country to another. Herodotus informs us, that the Pelaſgi were deſcendants of the Phœnician Cabiri, and that the Samothracians received and practiſed the Cabiric myſteries from them. The Pelaſgic alphabet prevailed in Greece till the time of Deucalion, when the Pelaſgi were driven out of Theſſaly or Oenotria by the Hellenes; after which ſome of them ſettled at the mouth of the Po, and others at Croton, now *Cortona* in Tuſcany. Their alphabet conſiſted of 16 letters, and the Tyrrhenian alphabet, brought into Italy before the reign of that prince conſiſted of no more than 13. Deucalion is ſaid to have reigned about 820 years after the deluge, and 1529 before the Chriſtian era.

That the Tyrrheni, Tyrſeni or Hetruſci, ſettled in Italy long before this period, appears from the teſtimony of Herodotus, who informs us, that a colony went by ſea from Lydia into Italy under Tyrrhenus; and Dionyſius of Halicarnaſſus proves that many authors called them Pelaſgi. He then cites Hellanicus Leſbicus, an author ſomewhat more ancient than Herodotus, to prove, that they were firſt called *Pelaſgi Tyrrheni*; and when they paſſed into Italy, they ſettled in that part of it called *Etruria*. Their emigration took place about the year of the world 2011, or 1993 years before the Chriſtian era, which is 350 years before the Pelaſgi left Greece. Biſhop Cumberland adduces many proofs to ſhow that the Tyrrhenians originally came out of Lydia into Italy. Several Roman authors alſo ſpeak of this Lydian colony; and Horace compliments his patron Mæcenas upon his Lydian deſcent:

Lydorum quicquid Etruſcos
Incoluit fines, nemo generoſior eſt te.

The Etruſcan letters are Pelaſgic, and ſeveral of the Etruſcan inſcriptions are written in the Pelaſgic language. The Roman letters are Ionic. The Oſcan language was a dialect of the Etruſcan; their characters are nearer the Ionic or Roman than the Etruſcan. There is alſo very little difference between the Pelaſgian, Etruſcan, and moſt ancient Greek letters, which are placed from right to left. The Arcadians were ancient Greeks, and uſed the Ionic letters; but at what time they began to write from left to right is not known, as their chronology is very uncertain. The Etruſcan, Oſcan, and Samnite alphabets, are derived from the Pelaſgic; they differ from each other more in name than in form; but a far greater number are derived from the Ionic Greek, namely, the Arcadian, the Latin or Roman, and the others already enumerated.—The Runic is immediately derived from the Gothic. Alphabet.

According to Dionyſius of Halicarnaſſus, the firſt Greek colony which came into Italy conſiſted of Arcadians, under the conduct of Oenotrus, the ſon of Lycaon, and fifth in deſcent from Phoroneus, the firſt king of Argos, who reigned about 566 years before the taking of Troy, and 1750 years before the Chriſtian era. Theſe Oenotrians were called *Aborigines*; and after they had been engaged for many years in a war with the Siculi, entered into an alliance with a colony of the Pelaſgi, who came out of Theſſaly into Italy, after having been driven from the former country. About 1476 B. C. another colony of the Pelaſgi, who had been driven out of Theſſaly by the Curetes and Leleges, arrived in Italy, where they aſſiſted the Aborigines to drive out the Siculi, poſſeſſing themſelves of the greateſt part of the country between the Tiber and the Liris, and building ſeveral cities. Solinus and Pliny tell us, that the Pelaſgi firſt carried letters into Italy; and the latter diſtinguiſhes between the Pelaſgi and the Arcades; ſo the letters firſt carried into Italy were not the Ionic Greek, but thoſe more ancient Pelaſgic characters which the Pelaſgi carried with them before Deucalion and Cadmus are ſaid to have come into Bœotia and Theſſaly. The ſtory of Cadmus is much involved in fable; but it is agreed by moſt of the ancients, that the children of Agenor, viz. Cadmus, Europa, Phœnix, and Cilix, carried with them a colony, compoſed of Phœnicians and Syrians, into Aſia Minor, Crete, Greece, and Libya, where they introduced letters, muſic, poetry, and other arts, ſciences, and cuſtoms, of the Phœnicians.

Dionyſius enumerates the following Greek colonies which came into Italy: 1. The Aborigines under Oenotrus, from Arcadia. 2. The Pelaſgic colony, which came from Hœmonia or Theſſaly. 3. Another Arcadian colony, which came with Evander from Palantium. 4. Thoſe who came from Peloponneſus with Hercules; and, 5. Thoſe who came with Æneas from Troy. It is not eaſy to diſcover when the Ionic way of writing from left to right was introduced into Italy; but it is certain, that it did not univerſally prevail even in Greece till ſeveral ages after it was found out. The Athenians did not comply with it till the year of Rome 350; nor was it practiſed by the Samnites even in the 6th century of that city, or 230 years before Chriſt: for M. Gœbelin, vol. vi. Pl. 2. gives us the Samnite alphabet of that century, wherein the letters are placed from right to left; although the Ionic way of writing prevailed in ſome parts of Italy in the third century of Rome. "In time (ſays Pliny) the tacit conſent of all

Alphabet

nations agreed to uſe the Ionic letters. The Romans conſented to this mode about the time of Tarquinius Priſcus, their fifth king." The letters brought by Demaratus the Corinthian, the father of Tarquin, Mr Wiſe thinks, muſt have been the new or Ionic alphabet, and not the ſame with that brought by Evander 500 years before. After the Romans had eſtabliſhed the uſe of the Ionic letters, they ſeem not to have acknowledged the Pelaſgian and Etruſcan to have been Greek alphabets: the moſt learned of them knew none older than the Ionic, as appears from the Greek Farneſe inſcriptions of Herodes Atticus. This learned man, out of a regard to antiquity, cauſed the oldeſt orthography to be obſerved in the writing, and the letters to be delineated after the moſt antique forms that could be found; and they are plainly no other than the Ionic or right-handed characters.

See Plates XV. and XVI. for ſpecimens of the ancient alphabets here enumerated.

The ancient Gauliſh letters are derived from the Greek, and their writing approaches more nearly to the Gothic than that of the Romans: this appears by the monumental inſcription of Gordian, meſſenger of the Gauls, who ſuffered martyrdom in the third century, with all his family. Theſe ancient Gauliſh characters were generally uſed by the people before the conqueſt of Gaul by Cæſar; but after that time the Roman letters were gradually introduced. The ancient Spaniards uſed letters nearly Greek before their intercourſe with the Romans. The ancient Gothic alphabet was very ſimilar to the Greek, and is attributed to Ulphilas, biſhop of the Goths, who lived in Mæſia about 370 years after Chriſt. He tranſlated the Bible into the Gothic tongue. This circumſtance might have occaſioned the tradition of his having invented theſe letters; but it is probable that theſe characters were in uſe long before this time. The Runic alphabet is derived from the ancient Gothic.

The Coptic letters are derived immediately from the Greek. Some have confounded them with the ancient Egyptian; but there is a very material difference between them. The Ethiopic alphabet is derived from the Coptic.

The alphabet proceeding from that of the Scythians eſtabliſhed in Europe, is the ſame with what St Cyril calls the *Servien*. The Ruſſian, Illyrian, or Sclavonic, and the Bulgarian, are all derived from the Greek. The Armenian letters differ very much from the Greek, from which they are derived, as well as from the Latin.

Alphabets derived from the Latin.

With regard to the alphabets derived from the Latin, the Lombardic relates to the manuſcripts of Italy; the Viſigothic to thoſe of Spain; the Saxon to thoſe of England; the Gallican and Franco-Gallic or Merovingian to the manuſcripts of France; the German to thoſe of that country; and the Caroline, Capetian, and Modern Gothic, to all the countries of Europe who read Latin. The firſt ſix of theſe alphabets are before the age of Charlemagne, the laſt three poſterior to it. They are more diſtinguiſhed by their names than the forms of their characters; and the former indicate all of them to have been of Roman extraction. Each nation, in adopting the letters of the Romans, added a taſte and manner peculiar to itſelf; which obviouſly diſtinguiſhed it from the writings of all other people; whence aroſe the differences between the writings of the Lombards, Spaniards, French, Saxons, Germans, and Goths, and all the ſtrange terms obſervable in the writings of the Francic Gauls or Merovingians; and thoſe of the Carlovingians, their ſucceſſors, may be traced from the ſame ſource. From theſe diſtinctions the name of *national writing* was derived. Alphabet.

The writing of Italy was uniform till the irruption of the Goths, who diſfigured it by their barbarous taſte. In 569, the Lombards, having poſſeſſed themſelves of all Italy, excepting Rome and Ravenna, introduced that form of writing which goes under their name; and as the popes uſed the Lombardic manner in their bulls, the name of *Roman* was ſometimes given to it in the 11th century; and though the dominion of the Lombards continued no longer than 206 years, the name of their writing continued in Italy from the 7th to the 13th century, and then ceaſed; when learning having declined in that as well as in other countries, the manner of writing degenerated into the modern Gothic.

The Viſigoths introduced their form of writing into Spain, after having overrun that country; but it was aboliſhed in a provincial ſynod, held at Leon in 1091, when the Latin characters were eſtabliſhed for all public inſtruments, though the Viſigothic were uſed in private writings for three centuries afterwards.

The Gauls, on being ſubjected by the Romans, adopted their manner of writing; but by ſubſequent additions of their own, their characters were changed into what is called the *Gallican* or *Roman Gallic* mode. This was changed by the Franks into the *Franco-Gallic* or *Merovingian* mode of writing, being practiſed under the kings of the Merovingian race. It took place towards the cloſe of the ſixth century, and continued till the beginning of the ninth.

The German mode of writing was improved by Charlemagne; and this improvement occaſioned another diſtinction in writing, by introducing the alphabet named *Caroline*, which declined in the 12th century, and was ſucceeded in the 13th by the modern Gothic. In France it had degenerated by the middle of the 10th century, but was reſtored in 987 by Hugh Capet, whence it obtained the name of *Capetian*. It was uſed in England, as well as Germany and France.

The modern Gothic, which ſpread itſelf all over Europe in the 12th and 13th centuries, is improperly named, as not deriving its origin from the writing anciently uſed by the Goths. It is, however, the worſt and moſt barbarous way of writing, and originated among the ſchoolmen in the decline of the arts; being indeed nothing elſe than Latin writing degenerated. It began in the 12th century, and was in general uſe, eſpecially among monks and ſchoolmen, in all parts of Europe, till the reſtoration of arts in the 15th century, and continued longer in Germany and the northern nations. Our ſtatute books are ſtill printed in Gothic letters. The moſt barbarous writing of the ſeventh, eighth, and ninth centuries, was preferable to the modern Gothic. It is diverſified in ſuch a manner as can ſcarce admit of deſcription; and the abbreviations uſed by the writers were ſo numerous, that it became very difficult to read it; which was one of the great cauſes of the ignorance of thoſe times. Along with this, however,

Alphabet. however, the Lombardic, Gothic, Roman, Caroline, and Capetian modes of writing, were occaſionally uſed by individuals.

The idea that all the alphabets above mentioned are derived from the Roman, tends to prove the diſtinction of national writing, and is of great uſe in diſcovering the age of manuſcripts: for though we may not be able exactly to determine the time when a manuſcript was written, we may be able nearly to aſcertain its age. For example, if a writing is Merovingian, it may be declared not to be poſterior to the 9th, nor prior to the 5th, century. If another be Lombardic, it may be affirmed to be poſterior to the middle of the 6th, and prior to the 13th. Should it be Saxon, it cannot be of an earlier date than the 7th, nor later than about the middle of the 12th.

Letters could not take place but from a decompoſition of language.

Having conſidered whence the alphabets now in uſe throughout the various nations of the world are derived, it remains to ſay ſomething concerning them as the elements of words, or how far they are capable of expreſſing thoſe ſounds which, by proper combination and arrangement, conſtitute articulate language. The number of ſimple ſounds in any language cannot be very numerous; and it is plainly theſe ſimple ſounds alone that we have occaſion to repreſent by alphabetical characters. Hence the perſon who firſt invented letters muſt have been capable of analyzing language in a manner which ſeems by no means eaſy to do, and concerning which even the learned among ourſelves are not yet agreed. It is this difficulty which has produced the great diverſity in the number of alphabetical characters uſed by different nations; and where we ſee a vaſt number of them uſed, we may account the writing not the better, but much the worſe for it; and whoever the pretended inventor was, it is more reaſonable to ſuppoſe that he diſfigured an alphabet already invented, by unneceſſary additions, than that he was the author of one himſelf.

Probably not the reſult of a progreſſive revolution of the human powers.

When we conſider alphabetical characters as thus reſulting from an analyſis of language, it will by no means appear probable that it was derived from a gradual and progreſſive operation of the human mind through many ages. There is not the leaſt affinity betwixt repreſenting any object by a picture and finding out the ſounds which compoſe the word by which it is expreſſed: nor, though a nation had been in uſe to repreſent things either in this method, or by any kind of arbitrary marks, for thouſands of years, could the one ever have led to the other. Arbitrary marks muſt always be the ſame with pictures in this reſpect, that they muſt always be fixed to particular objects, and thus be increaſed *ad infinitum*. Letters, on the other hand, are indifferent to all objects; and therefore, by their combinations, which are more numerous than as many arbitrary marks as we could remember, may expreſs all the objects in nature. This might furniſh an argument of ſome ſtrength for the divine revelation of writing, were it not that other arts, ſeemingly as uſeful, and as difficult to be invented, had not been expreſsly aſcribed to particular perſons whom we cannot ſuppoſe to have been divinely inſpired. Thus metallurgy, muſic, the keeping of cattle, and uſe of tents, are all aſcribed to a ſingle family; and though writing be not expreſsly mentioned as an invention in Scripture, there is Alphabet. no reaſon to have recourſe to a revelation for it as long as the human faculties are known to have been ſufficient for the invention of it. Nevertheleſs, if we take a review of the different arts which mankind have invented, we ſhall find, that few of them reſulted from any gradual progreſs or evolution of the powers of the human mind, but rather by ſome ſudden and almoſt unaccountable turn of thought in an individual. Thus, the art of printing, little inferior in its utility to that of writing, lay hid for ages, and was at laſt invented we ſcarce know how; ſo that if one inclined to ſuppoſe this a divine revelation, he could be at little loſs for arguments to ſupport his hypotheſis. This was what all the inventions and evolutions of human powers ſince the creation had never been able to accompliſh; yet nobody believes that it required ſupernatural abilities to be the author of this art, becauſe we ſee plainly that it might have occurred to the human mind from various ſources, and are ſurpriſed that it did not occur long before. In like manner, the method of accounting for the celeſtial motions by the united forces of projection and gravitation, was no reſult of the progreſs that mankind had made in ſcience, but luckily occurred to Mr Horrox, without any thing that we know to direct him, or perhaps from cauſes almoſt unknown to himſelf. Thus, alſo, the ſteam engine, aeroſtation, &c. were ſuddenly invented only by a ſlight review of principles well known before, and which had been a thouſand times overlooked by thoſe who might have invented both. Alphabetic writing, therefore, might have been no deduction from hieroglyphic or picture writing, from which it is eſſentially different; and it ſeems to be ſome confirmation of this, that all nations who ever pretended to the invention of letters, have aſcribed it to the labours of one particular perſon, without taking notice of the progreſs made towards it in preceding ages.

Of the elementary ſounds of language.

The learned author of Hermes informs us, that to about 20 plain elementary ſounds we owe that variety of articulate voices which have been ſufficient to explain the ſentiments of ſuch an innumerable multitude as all the paſt and preſent generations of men. Mr Sheridan ſays, that the number of ſimple ſounds in our tongue is 28; while Dr Kenrick ſays, that we have only 11 diſtinct ſpecies of articulate ſounds, which even by contraction, prolongation, and compoſition, are increaſed only to the number of 16; every ſyllable or articulate ſound in our language being one of the number. Biſhop Wilkins and Dr William Holder ſpeak of 33 diſtinct ſounds.

After the analyſis or decompoſition of language into the elementary ſounds, the next ſtep towards the notation of it by alphabetical characters, would be the delineation of a ſeparate mark or letter to repreſent each ſound; which marks, though few in number, would admit of ſuch a variety of arrangements and combinations, as might be capable of producing that infinity of articulate ſounds which compoſe language. The ingenious Wachter, in his *Naturæ et Scripturæ Concordia*, p. 64. endeavours to ſhow, that ten marks or characters are ſufficient for this purpoſe. His ſcheme is as follows:

Alphabet.

Genus.	*Figura.*	*Poteſtas.*
Vocal.	O	a. e. i. o. u.
Guttural.	O |	k. c. ch. q. g. h.
Lingual.	<	l.
Lingual.	Z	d. t.
Lingual.	⊃	r.
Dental.	⊓	f.
Labial.	3	b. p.
Labial.	ᗰ	m.
Labial.	⊏	s. ph. v. w.
Naſal.	ᴬ	n.

If this is the caſe, then the moſt ſimple alphabet, which conſiſted only of 13 letters, muſt have been abundantly ſufficient to anſwer all the purpoſes of mankind, and much of our twenty-four letter alphabet may appear ſuperfluous. That able mathematician Tacquet has calculated the various combinations of the 24 letters, even without any repetition, to amount to no fewer than 620,448,401,733,239,439,360,000; while Clavius makes them only 5,852,616,738,497,664,000. Either of theſe numbers, however, is *infinite* to the human conceptions, and much more than ſufficient to expreſs all the ſounds that ever were articulated by man.

Number of letters in different alphabets.

As there are more ſounds in ſome languages than in others, it follows of courſe that the number of elementary characters or letters muſt vary in the alphabets of different languages. The Hebrew, Samaritan, and Syriac alphabets, have 22 letters; the Arabic 28; the Perſian, and Egyptian or Coptic, 32; the preſent Ruſſian 41; the Shanſcrit 50; while the Caſhmirian and Malabaric are ſtill more numerous. The following is the ſcheme of the Engliſh alphabet, as given by Mr Sheridan in his Rhetorical Grammar, p. 9.

Number of ſimple ſounds in our tongue 28.

	3	1	2	3	2	3	1	1	1
9 *Vowels*,	a	a	a	e	o	o	e	i	u

hall hat hate beer note nooſe bet fit but

w y

ſhort oo ſhort ee

19 *Conſonants*, { eb ed ef eg ek el em en ep er es et ev ez eth̄ eth eſh ezh ing.

2 *Superfluous*, *c*, which has the power of *ek* or *eſs*: *q*, that of *ek* before *u*.

2 *Compound*, *j*, which ſtands for *edzh*; *x*, for *ks* or *gz*.

1 *No letter*, *h*, merely a mark of aſpiration.

Conſonants divided into Mutes and Semivowels.

Alphabet.

6 *Mutes*, eb ed eg ek ep et.
3 *Pure Mutes*, ek ep et.
3 *Impure*, eb ed eg.

13 *Semivowels or liquids*, { ef el em en eſs ev ez eth̄ eth eſh ezh ing.

9 *Vocal*, el em en er ev ez eth ezh ing.
4. *Aſpirated*, ef eſs eth̄ eſh.

Divided again into

4 *Labial*, eb ep ev ef.
8 *Dental*, ed et eth̄ eth ez eſs ezh eſh.
4 *Palatine*, eg ek el er.
3 *Naſal*, em en ing.

Mr Sheridan obſerves, that our alphabet is ill calculated for the notation of the Engliſh tongue, as there are many ſounds for which we have no letters or marks: and there ought to be nine more characters or letters to make a complete alphabet, in which every ſimple ſound ought to have a mark peculiar to itſelf. The reaſon of the deficiency is, that the Roman alphabet was formerly adopted for the notation of the Engliſh language, though by no means ſuited to the purpoſe.

Imperfection in the Engliſh alphabet.

It now remains only to take ſome notice of the forms of the different letters; ſome knowledge of which is abſolutely neceſſary for aſcertaining the age and authenticity of inſcriptions, manuſcripts, charters, and ancient records. Many authors are of opinion, that letters derive their forms from the poſitions of the organs of ſpeech in their pronunciation. Van Helmont has taken great pains to prove, that the Chaldaic characters are the genuine alphabet of nature; becauſe, according to him, no letter can be rightly ſounded without diſpoſing the organs of ſpeech into an uniform poſition with the figure of each letter; and in ſupport of this ſyſtem, he has anatomized the organs of articulation.

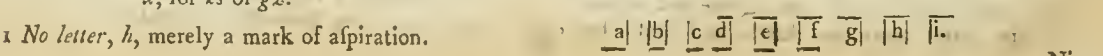
Of the forms of letters.

Mr Nelme has endeavoured to ſhow, that all elementary characters or letters derive their forms from the line and the circle. His alphabet conſiſts of 13 radical letters, four diminiſhed and four augmented.—The radicals are L, O, S, A, B, C, D, N, U, I, E, M, R. —H, according to him, is derived from A; P from B; T from D; and F from U: theſe are called diminiſhed letters. The augmented ones are, Z from S; G from C; W from U; and Y from I. He proves that his characters are very ſimilar to thoſe of the ancient Etruſcans: but all characters are compoſed either of lines and circles of the former, or of parts of the latter.—Mr Gebelin deduces them from hieroglyphic repreſentations; and has given ſeveral delineations of human figures, trees, &c. in confirmation of his hypotheſis.

One of the moſt ſimple alphabets has been formed by making two perpendicular and two horizontal lines:

a|b|c
d|e|f.
g|h|i.

Thus, From which may be deduced nine different characters or letters: Thus,



Nine

ALPHABETA ANTIQUISSIMA.

a dextra ad sinistram exarat. | *a sinistra ad dextram.*

	Phoenicium.	Hebr. ex Medal.	Bastulan.	Etruscum.	Graecum.	Graecum.	Latinum.	Runicum.	Gothicum.	Gallicum.	Teutonicum.
1 A											
2 B											
3 C											
4 D											
5 E											
6 V F											
/											
7 I											
8 K											
9 L											
10 M											
11 N											
12 O											
13 P											
14 R											
15 S											
16 T											
Q											

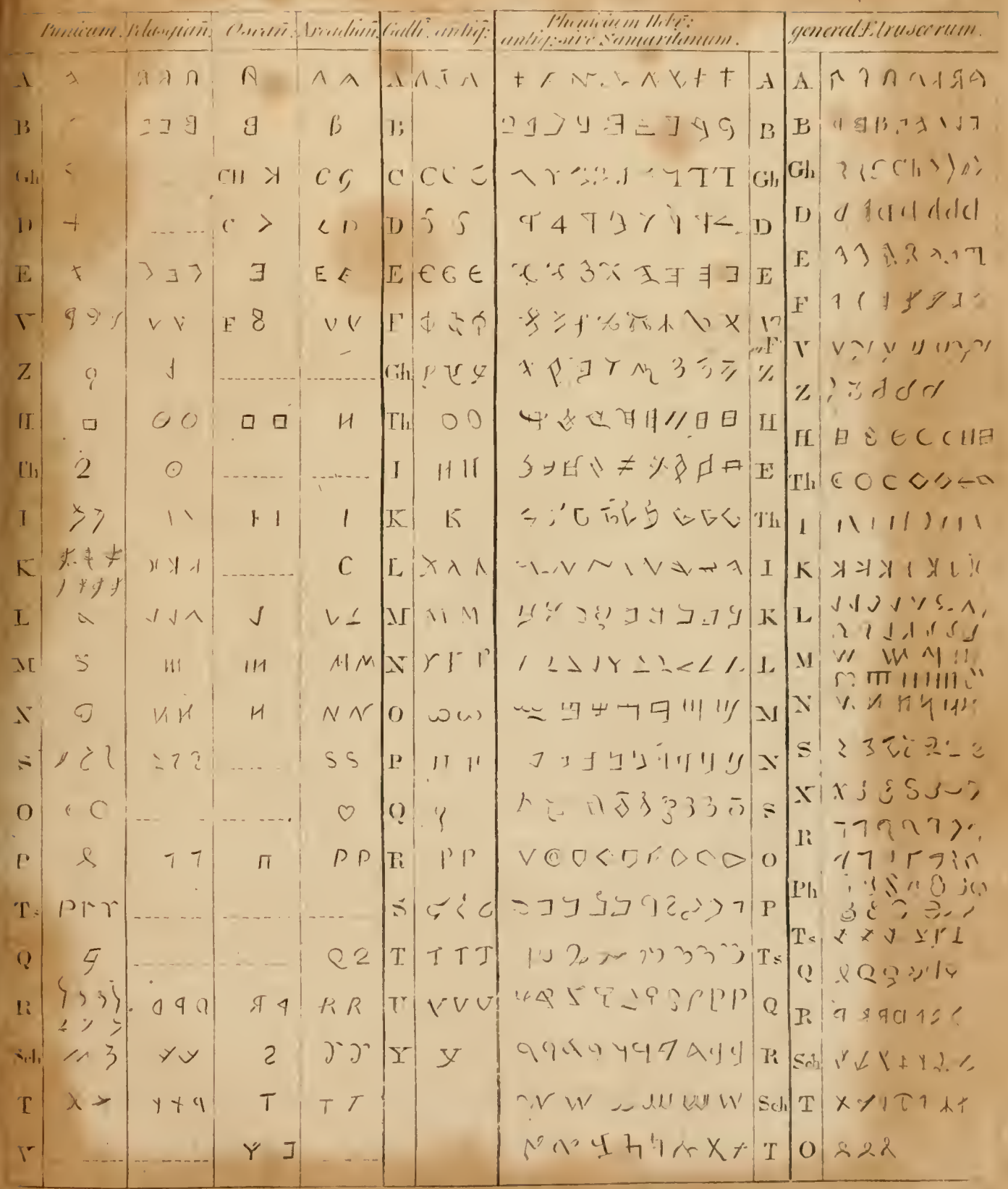
ALPHABETUM Phoenicium.

ALPHABETUM priscum Graecum.

Ex Marmore Oxon.

ALPHABETA ANTIQUA.

Plate XVI.



Alphænix, Alphery

Nine more may be made by adding a point to each,

k	l	m
n	o	p
q	r	s

; and as many more as may be ſufficient for the notation of any language, by adding two or more points to each character. Though theſe ſquare characters are not calculated for deſpatch; yet they may be made as expeditiouſly, or more ſo, than the Tartar, the Bramin, the Caſhmirian, or many others. Writing compoſed of theſe characters, is at firſt ſight ſomewhat like the Hebrew.—Mr Dow, author of the Hiſtory of Indoſtan, lately formed a new language and alphabet. This language, and the characters formed for its notation, were ſo eaſy, that a female of his acquaintance acquired the knowledge of them in three weeks, and correſponded with him therein during their intimacy.

New language invented by Mr Dow.

ALPHÆNIX, white barley-ſugar, to which is given an extraordinary name, to render it more valuable. This ſugar, which is thought good for colds, is made of common ſugar, which is boiled until it becomes eaſy to crack, when they pour it upon a marble table, greaſed with oil of ſweet almonds, and mould it into various figures with a braſs crotchet. It is eaſily falſified with ſtarch.

ALPHERY, Mikiphlr, an Engliſh divine, was born in Ruſſia, and of the imperial line. When that country was diſtracted by inteſtine commotions, in the latter end of the 16th century, and the royal houſe particularly was ſo ſeverely perſecuted by impoſtors, this gentleman and his two brothers were ſent over to England, and recommended to the care of Mr Joſeph Bidell a Ruſſia merchant. Mr Bidell, when they were of age fit for the univerſity, ſent them to Oxford, where the ſmallpox unhappily prevailing, two of them died of it. We know not whether this ſurviving brother took any degrees or not, but it is very probable he did, ſince he entered into holy orders; and in the year 1618, was preſented to the rectory of Wooley in Huntingdonſhire, a living of no very conſiderable value, being rated under 10l. in the king's books. Here he did his duty with great cheerfulneſs and alacrity; and although he was twice invited back to his native country by ſome who would have ventured their utmoſt to have ſet him on the throne of his anceſtors, he choſe rather to remain with his flock, and to ſerve God in the humble ſtation of a pariſh prieſt. Yet in 1643, he underwent the ſevereſt trials from the rage of the fanatics; who, not ſatisfied with depriving him of his living, inſulted him in the moſt barbarous manner; for, having procured a file of muſqueteers to pull him out of his pulpit, as he was preaching on a Sunday, they turned his wife and ſmall children into the ſtreet, into which alſo they threw his goods. The poor man in this diſtreſs raiſed a tent under ſome trees in the churchyard, over againſt his houſe, where he and his family lived for a week. One day having gotten a few eggs, he picked up ſome rotten wood and dry ſticks, and with theſe made a fire in the church porch, in order to boil them; but ſome of his adverſaries, to ſhow how far they could carry their rage againſt the church (for this poor man was ſo harmleſs they could have none againſt him), came and kicked about his fire, threw down his ſkillet, and broke his eggs. After this, having ſtill a little money, he made a ſmall purchaſe in that neighbourhoud, built a houſe, and lived there ſome years. He was encouraged to this by the Preſbyterian miniſter, who came in his room, who honeſtly paid him the fifth part of the annual income of the living, which was the allowance made by parliament to ejected miniſters, treated him with great humanity, and did him all the ſervices in his power. It is a great misfortune that this gentleman's name is not preſerved, his conduct in this reſpect being the more laudable, becauſe it was not a little ſingular. Afterwards, probably on the death or removal of this gentleman, Mr Alphery left Huntingdonſhire, and came and reſided at Hammerſmith till the Reſtoration put him in poſſeſſion of his living again. He returned on this occaſion to Huntingdonſhire, where he did not ſtay long; for being upwards of 80, and withal very infirm, he could not perform the duties of his function. Having, therefore, ſettled a curate, he retired to his eldeſt ſon's houſe at Hammerſmith, where ſoon after he died, much honoured and reſpected, and affording a remarkable inſtance of the viciſſitudes of the world.

Alpheus, Alphonſin.

ALPHEUS, (Strabo); Alphius, (Ptolemy); a noted and large river of the Peloponneſus; which, riſing in, and after ſeveral windings running through, Arcadia, and by Olympia in Elis, with a ſouth-weſt courſe, falls into the Sinus Chelonites, about ten miles to the ſouth of Olympia. It has a common ſpring with the Eurotas, at the foot of Mount Parthenius, near the village Aſea, (Strabo). The Alpheus and Eurotas mix and run together for 20 ſtadia; after which, they enter a ſubterraneous paſſage at Mantinea; then again emerge, the Eurotas in Laconia, and the Alpheus in the territory of Megalopolis, (Pauſanias). The poets fable ſtrange things of this river, particularly, that out of love to the nymph *Arethuſa*, it runs under the ſea to Sicily, and burſts out at the fountain of that name in Syracuſe, (Virgil). Its waters were reckoned good in the leproſy, which is called Αλφος by the Greeks; and hence the name *Alpheus*. On the banks of this river the Olympic games were celebrated, to which Pindar alludes.

> "Alpheus, thy immortal flood,
> On his lord's triumphant brows
> The Olympic wreath beſtow'd."
>
> West's Pindar.

Pauſanias adds, that the Eleans had a law, which condemned any woman to death that ſhould either appear at the Olympic games, or even croſs this river during that ſolemnity: and the Eleans add, that the only woman who tranſgreſſed it, had diſguiſed herſelf in the habit of a maſter or keeper of theſe games, and conducted her ſon thither; but when the ſaw him come off victorious, her joy made her forget her diſguiſe, ſo that her ſex was diſcovered. She was pardoned; but from that time a law was made that the keepers ſhould appear there naked.

ALPHONSIN, in *Surgery*, an inſtrument for extracting bullets out of gunſhot wounds. This inſtrument derives its name from the inventor Alphonſus Ferrier, a phyſician of Naples. It conſiſts of three branches, which are cloſed by a ring. When cloſed and introduced into the wound, the operator draws back the ring towards the handle, upon which the branches

Alphonſo. branches opening take hold of the ball; and then the ring is puſhed from the haft, by which means the branches graſp the ball ſo firmly as to extract it from the wound.

ALPHONSO I. king of Portugal, ſon of Henry of Burgundy, count of Portugal, grandſon of Don Alonſo king of Leon and Caſtile, who, as the dowry of his wife Thereſa, received part of the kingdom of Portugal. One Egas Munitz had the charge of his education from his father, the duties of which he executed with fidelity and ſucceſs. In the year 1112 his father died, leaving him a boy only three years of age, when the reins of government and the care of the infant ſon fell to his mother Thereſa. At the age of 18 he aſſumed the ſovereign authority by the advice of the nobles of Portugal, who were highly offended at the growing partiality of his mother for Don Ferdinand Perez, count of Traſtemara; for it was ſuſpected that ſhe intended to marry him. But Thereſa was little diſpoſed to reſign the reins of government. Her party raiſed an army which took the field to oppoſe the nobility who ſupported Alphonſo; but her adherents were defeated, herſelf taken priſoner, and kept in confinement during the remainder of her life. Not long after his acceſſion to the throne, his abilities both to govern and to conquer received a ſevere trial, in ſeveral arduous enterpriſes, as well againſt the king of Leon and Caſtile as againſt the Mooriſh princes, who then poſſeſſed great part of Spain and Portugal. The Mooriſh emperor in Barbary having ſent a ſtrong reinforcement to the princes, they were enabled to take the field with an army far ſuperior to that of Alphonſo's; yet he valiantly met them in the plains of Ourique, and totally defeated their forces. Thus Providence conferred ſuch a ſignal favour on the Chriſtian arms as procured a reſidence for Chriſtianity in thoſe parts. The ambitious king of Leon and Caſtile aſſumed the title of emperor of the Spaniards, and entered Portugal to waſte and deſtroy; but after the emperor had received a temporary check, the matter was accommodated, and he withdrew his army. In conſequence of the victory obtained on the plains of Ourique, Alphonſo was inſtantly proclaimed king; but the form and conſtitution of the monarchy was not ſettled until the nobility, prelates, and commons had aſſembled at Lamago for that purpoſe in the year 1145. The conqueſt of Santaren preceded this event, and was ſanctioned by the unanimous concurrence of the ſtates. The honour of crowning the king was conferred upon the archbiſhop of Braga; and it was legally provided, that the regal ſucceſſion ſhould deſcend with an uninterrupted ſucceſſion to the heirs male of Alphonſo. The prelates and nobility, with the concurrence of the people, inſtituted a code of laws conſiſting of 18 ſtatutes, for the government of the kingdom. It being propoſed whether it was their pleaſure that the king ſhould go to Leon and do homage to that prince or to any other, every man drawing his ſword, exclaimed, "We are free, and our king is free, and we owe our liberty to our courage; and if he ſhall at any time ſubmit to ſuch an act, he deſerves death, and ſhall not either reign over us or among us." The year after his coronation he was married to Matilda, daughter of Amadeus, count of Maurienne and Savoy; and he recovered Liſbon from the hands of the Moors, in the year 1147. A multitude of adventurers being aſſembled at the mouth of the Tagus in their progreſs to the Holy Land, greatly aſſiſted him in this conqueſt. After having added ſix other provinces to his dominions, he wiſely began with induſtrious activity to regulate the affairs of his kingdom. In all his great and benevolent deſigns he was vigorouſly ſeconded by Matilda, a princeſs equally celebrated for her great beauty, mental vigour, and ſingular piety. With the prudence of the ſtateſman, and the benevolence of the man, he laboured as much for the population of his acquired territories as for their increaſe. The conjugal felicity of this prince and princeſs was greatly enhanced by a numerous offſpring, which enabled him, by great alliances, to ſtrengthen his intereſts. His ſecond daughter was married to Don Ferdinand, king of Leon, who, notwithſtanding of this alliance, ungenerouſly made war on his father-in law, and took him priſoner in the field of battle; but releaſed him, on the humiliating condition of coming in perſon to do homage for his dominions at Leon. In the latter part of his reign, his ſon Don Sancho, who inherited all his father's military talents, took the lead on ſeveral occaſions; and in the year 1180, Joſeph, king of Morocco, and emperor of the Almohedes, advancing with an army as far as Santaren, he there gained a glorious victory over him. Such was the conſternation of the infidels, in conſequence of this defeat, that they left the Portugueſe at liberty to improve the interior part of the country, and to fortify their frontiers during the whole of the next year. Worn out with care and intenſe application, Alphonſo needed repoſe, and had retired to Coimbra, where, after a reign of 57 years, and in the 76th year of his age, he died. In the church of the holy croſs at Coimbra his remains were depoſited with great funeral ſolemnity. He was no leſs than ſeven feet high; and his gigantic ſize and his martial ardour have given occaſion to many abſurd and incredible ſtories concerning his military achievements, ſo that, in the annals of chivalry, as well as in the records of martial exertions, he ſuſtains a very high rank. Two orders of knighthood, that of the Wings, and that of the Avis, were inſtituted by him; and they ſtill continue to flouriſh in that kingdom. At the age of 31, when all the faculties of the human mind are in full vigour, Don Sancho, his ſon, ſucceeded him. (*Mod. Univ. Hiſt.*).

Alphonſo. ALPHONSO II. diſtinguiſhed by the ſurname of the *Fat*, was the third king of Portugal, and ſucceeded his father at the age of 27 years, in 1212. His accompliſhed education and his military and political talents were tarniſhed by his great neglect and hatred of his brothers and ſiſters, which involved him in many troubles. He, however, commenced his reign with two very popular actions. The one was, ſending a body of infantry to the aſſiſtance of the king of Caſtile, who fought with uncommon bravery in the renowned battle of Navas de Toloſa. The other was, his donation of the caſtle of Avis to the knights of that order, when the grand-maſter removed from Evora, and took up his habitation in that caſtle. During the life of his father, he diſcovered his averſion to the reſt of the family, which induced him to ſecure the right of his children from the effects of his reſentment

Alphonſo. as much as in his power, by conferring upon them large ſums of money and jewels, and ſome of the beſt parts of the kingdom. After the death of his father, however, Alphonſo ſtrenuouſly laboured to convince them that it was not in the power of his father to ſeparate or give away any part of his dominions; but all his urgent eloquence proving unſucceſsful, he had recourſe to arms. The two princeſſes, his ſiſters, who had received by the grant of their father very extenſive and valuable property, upon being attacked by their brother, implored the interference of the pope, and alſo applied to the king of Leon, to grant his protection, ſo that they made a very vigorous defence. The pope granted the requeſt of the young princeſſes, and threatened to excommunicate Alphonſo; and from Galicia, Don Ferdinand entered the dominions of Portugal to ravage and deſtroy; but the king prepared to defend himſelf againſt the arms of the king of Leon, and by ſpecious pretences to evade the excommunication of the pope.

Authors are not agreed with reſpect to the ſucceſs of this war, but it is generally ſuppoſed that, by the interference of theſe two powerful perſons, the domeſtic affairs of that houſe were reſtored to a certain degree of tranquillity; however, the departure of the infant Don Ferdinand to the court of Caſtile, and of Don Pedro to another place, ſtrongly indicate that the reconciliation was far from being perfect. The conduct of the king, however, produced much diverſity of opinion among the common people of Portugal. Some were induced, by the arguments of the king, to conclude that it was not in the power of Don Sancho, the late king, to diſmember his kingdom; and others very properly ſuſpected the kindneſs of a prince to his people who diſplayed ſuch uncommon and ſuch unjuſtifiable hatred to his own relations; at the ſame time, thoſe nobles whom the father had ſolemnly ſworn to carry his will into execution, regarded the ſacred nature of their oaths to ſuch a degree as induced them to operate againſt the reigning prince.

The diſpleaſure of the pope, however, was not to be endured. The mind of Alphonſo ſeemed indeed to be of that quality which little regarded the diſpleaſure or thunders of his holineſs; but the effects of his threatenings were very different upon the public mind, conſequently the king was conſtrained to ſeek the favour of the pope, to retain the obedience of his ſubjects. The king therefore ſent deputies to Rome, who argued, that the crown his father wore was the purchaſe of the blood and valour of the Portugueſe nation, and therefore not in his power to alienate; that it was a dangerous precedent, and obviouſly tended to ſubvert the ſovereignty of a ſtate; that the diſuniting of the kingdom would tend to promote the cauſe of the infidels; and, in fine, that his diſputes with his ſiſters had no connexion with eccleſiaſtical matters. The pope, however, was as well qualified to diſcern the nature of theſe ſpecious arguments as the prince was qualified to urge them, conſequently he remained unmoved; and Alphonſo, in order to have the ſentence of excommunication removed which had been pronounced upon him, was reluctantly induced to be reconciled to his ſiſters. His holineſs informed of the reconciliation, with great ceremony revoked his curſe and excommunication from the king and his ſubjects.

But the reign of this prince was deſtined to troubles; Alphonſo. for no ſooner was this domeſtic broil terminated, than the Moors ruſhed into the plain country in ſuch prodigious numbers, that the king found it very difficult to repel them, or to drive them back to their own country. A favourable occurrence, however, enabled him to complete his object, by the taking of a fortreſs ſeated on a rock which was deemed impregnable, in the following manner. The Germans and Flemings had equipped an immenſe fleet deſtined for the Holy Land, conſiſting of 300 ſail, with a numerous army on board. In conſequence of tempeſtuous weather, their fleet was ſo diſabled, that they were forced to put into the harbour of Liſbon to refit, juſt at the time when Alphonſo was preparing an army to attack the Moors. The king inſtantly ſent ſome of the moſt reſpectable men of his court to ſolicit their aid againſt the Moors, alleging, that it was perfectly conſiſtent with their vows to fight againſt the Moors in Portugal, as well as in the Holy Land. William earl of Holland, and many other generals, were convinced by this argument, and cheerfully engaged to join him againſt the infidels; but about a third part of the fleet refuſed to join, and proceeded on their voyage. It happened, however, that they were driven by a violent ſtorm into Italy, where they wintered. The greater part of the nobility and gentry landed under the conduct of William earl of Holland; and it was reſolved that they ſhould proceed by ſea, and block up Alcaçar-do-Sal, the fortreſs already mentioned, while the army of Alphonſo, reinforced by a conſiderable number, ſhould march by land; and thus attack the place both by land and ſea at once. The Moors, convinced of the importance of this place, brought an army into the field conſiſting of 50,000 men; but the Chriſtians raiſed the ſiege, gave them battle, and routed them with great ſlaughter; and ſome of the chiefs of the Moors fell in the field. The fortreſs ſurrendered on the 21ſt of October 1217, and was conferred upon the order of St James; but notwithſtanding of very urgent entreaties, the pope would not permit the army to winter in Portugal. He was deſirous of having theſe troops and their generals removed to a greater diſtance. The writers of that nation affirm that the ſoldiers experienced ſupernatural aid in this battle, and that the banner of the croſs was actually diſplayed by angels.

But civil animoſity ſucceeded to infidel war. The archbiſhop of Braga was highly offended that the clergy were forced to pay money and furniſh troops to carry on the war againſt the infidels; and the people ſeverely complained of the ſtrictneſs of the laws. To chaſtiſe the rebellious clergy, the king ſeized upon the revenues of the biſhop, and forced him to fly from his dominions. Enraged at this impious conduct, the pope excommunicated the king, and laid his kingdom under an interdict. The natural conſequence was, that all things were thrown into confuſion and conſternation, and perplexity univerſally prevailed; ſo that Alphonſo was obliged to conſult meaſures to quell the riſing diſcontent. It happened, however, that in the midſt of theſe negociations he was removed by death, and not only died under the papal malediction, but left his kingdom under the ſame curſe. He was interred without royal honours in the conventual church

Alphonſo. church of Alcobaça. His perſon was above the common ſize; he was brave and ſtrong, but not devoid of many qualities worthy of blame. *(Mod. Univ. Hiſt.)*.

Alphonſo.

Alphonſo III. *Don*, king of Portugal, ſucceeded his brother Don Sancho II. in the year 1248. In the courſe of a war with the Moors, which he engaged in at the beginning of his reign, he conſiderably extended the Portugueſe dominions. He took poſſeſſion of the city of Fara, the capital of the Mooriſh kingdom, in the province of Algarve. Loula, another Mooriſh town, which was carried by ſtorm, alſo fell into his hands. His power was thus extended abroad by the ſucceſs of his arms, and the adminiſtration of his affairs at home became proſperous and popular by his wiſdom and prudence. But the tranquillity and proſperity of the kingdom were ſomewhat diſturbed by an interdict which it was put under by Pope Alexander IV. whoſe diſpleaſure he had incurred by marrying Donna Beatrix, the natural daughter of Don Alonſo the Wiſe, king of Caſtile, while his firſt wife was living. In 1262, when his firſt queen died, the interdict was removed by Pope Urban, a diſpenſation was granted, and the children of Donna Beatrix were legitimated. Hitherto frequent diſputes had occurred between the kings of Portugal and Caſtile relating to the boundaries of the two kingdoms. To terminate all differences on this ſubject, and to prevent them in future, commiſſioners were appointed to define and ſettle the limits of their reſpective dominions; and theſe were agreed to and acknowledged by a ſolemn deed.

Encouraged by the proſperity of his kingdom, and by the ſucceſs which had attended his enterpriſes, Alphonſo made an attempt to extend the influence of the crown, by obliging the clergy to contribute to the welfare of the ſtate. But this meaſure, as might have been expected, was not quietly ſubmitted to. It occaſioned the revival of old diſputes, the pope interfered, and in 1268 the kingdom was again laid under an interdict. He ſucceeded, by the wiſdom of his negociations, in obtaining from Caſtile an exemption of all claims upon the crown of Portugal, and in procuring an acknowledgement that its monarchs were entirely relieved from the performance of every kind of homage. He died in the year 1279, in the 69th year of his age, and in the 31ſt of his reign. Before his death, he was reconciled to the pope and clergy, having made a full and ample ſubmiſſion. The prince was tall in ſtature, of a prepoſſeſſing aſpect, and of engaging manners. Alike removed from a diſpoſition to extravagant expence or ſordid avarice, in times of peace and proſperity, he could indulge in magnificence; but when his affairs required it, he failed not to regulate them by frugality and economy. To the poor he was a ſincere friend. In a time of ſcarcity, he pawned his crown to provide them with bread. His ſteady and vigorous adminiſtration ſecured to him the reſpect of the nobles and the obedience of the clergy. *(Mod. Univ. Hiſt.)*.

Alphonſo IV. king of Portugal, ſurnamed the *Brave*, was the ſon of King Denis. Inſtigated, it is ſaid, by the queen dowager of Caſtile, and moved with jealouſy againſt his natural brother Alphonſo Sanchez, he revolted againſt his father, and commenced a civil war. In this unnatural and baſe war, he was juſtly unſucceſsful; but although he was reduced to ſubjection, yet his haughty and ungovernable temper broke out in many occurrences, until he ſucceeded his father in 1324. Hunting was his favourite amuſement at the time when he aſcended the throne; and one day entertaining his counſellors with a narrative of his ſporting adventures during a month, one of them ventured to remonſtrate againſt his conduct, and even proceeded to threaten, that if the grievances of his ſubjects were not ſpeedily redreſſed, they would be forced to look out for a better king. Alphonſo was greatly enraged; but ſuddenly recollecting himſelf, he ſaid, "I perceive the truth of your remark; he cannot long have ſubjects who will not be a king. Remember that from this day, you have nothing to do with Alphonſo the ſportſman, but with Alphonſo the king of Portugal." To this reſolution he ſtrictly adhered, and exerciſing the power of a deſpot, he overawed his ſubjects, without conciliating their favour or procuring their eſteem. He diſplayed a conduct very ſingular in a young man, regarding thoſe who had ſo vigorouſly oppoſed him when at war with his father, as friends to the crown, although enemies to the young ambitious prince. He commenced his reign with deviſing plans for the ſecurity of his family in the government, and the good of the kingdom; he likewiſe manifeſted a ſtrong benevolence of heart, in his affection for his conſort Queen Beatrix, and his dutiful conduct towards his mother. Notwithſtanding all theſe amiable qualities, he perſecuted his brother Alonzo Sanchez, and wiſhed to inflict the puniſhment due to him as a proſcribed traitor; which drove the deſperate Alonzo to open rebellion. But, however, the natural good qualities of the heart of the king roſe ſuperior; ſo that his perſecuted brother was again received into favour. Not long after he engaged in war with Alonzo XI. king of Caſtile, and which, after ſeveral ſevere ſtruggles with various ſucceſs on both ſides, terminated in an alliance, and in effectual aſſiſtance againſt the Moors. The artful and cruel part which he acted towards Donna Agnes de Caſtro, the miſtreſs and concealed wife of his ſon, reflected the greateſt diſgrace upon his character. It is proper, however, to remark, that he was inſtigated to the murder of this princeſs by his courtiers. It was not therefore to be wondered at if his ſon was induced by this act to riſe up in open rebellion againſt him, but the arms of his father were too formidable; and after his ſubmiſſion, his father treated him with particular marks of attention. Inſtructed by the growing infirmities of years, he ſaw the termination of his reign and his life approaching. He began to compenſate for his paſt errors and faults, by eſtabliſhing acts of piety and benevolence, by redreſſing grievances, by reſtraining immorality through the eſtabliſhment of pious laws, by dictating ſalutary maxims for the government of the ſtate, by removing thoſe from the ſeats of power, who were the moſt likely to become the objects of reſentment after his death: he thus laboured to efface from the remembrance of his ſon the inſult which he had received. While concerting theſe conciliating meaſures, he died in May 1357, in the 32d year of his reign, and the 67th of his age, "with the character of an undutiful ſon, an unnatural brother, and a cruel father." But in many reſpects he deſerves the character "of a great man and a great king, brave and fortunate in war, but artful and indirect in his political meaſures, attached to his ſubjects,

Alphonſo. ſubjects, ſtrict in the adminiſtration of juſtice, attentive to the public welfare, and aſſiduous in encouraging induſtry, and enriching his people." But after all, it muſt be acknowledged, that though he was feared, and even eſteemed, he was not much honoured nor beloved, but was rather reverenced for a proper uſe of power, than relied upon as a public parent. His character is perhaps expreſſed in his device, which was an eagle on the wing, with the following motto, *altiora peto*, "I aim at higher things." Alphonſo.

ALPHONSO V. *Don*, king of Portugal, was born in 1432, and on account of his heroic deeds, obtained the ſurname of the *African*. At the age of ſix years, he ſucceeded his father King Edward. The adminiſtration of the affairs of the kingdom during his minority, was entruſted to his uncle Don Pedro, who, although his public conduct met with general approbation, was perſecuted as a traitor at the expiration of his regency, and with ſeveral perſons who were attached to his intereſt, and involved in his misfortunes, was put to death. The young king had married the daughter of the regent; but even his influence, which was overpowered by the regent's enemies, could not ſave him from perſecution. Afterwards indeed he did juſtice to his memory, and diſcovered an unuſual mark of reſpect and attachment to his queen, by abſtaining from all connexion with the ſex after her death, which happened in 1455, and it has been ſuppoſed, was occaſioned by poiſon, adminiſtered by the enemies of her father.

Alphonſo aſpired to the acquiſition of military glory. In the year 1458, he made great preparations to attack the Moors in Barbary. He aſſembled an army of 20,000 men, and equipped a fleet of 200 ſail. He firſt directed his arms againſt Alcazer, which ſoon fell into his hands; and to maintain the footing which he had gained, he furniſhed this place with a ſtrong garriſon. For 12 years he proſecuted the war in Barbary with various ſucceſs, in that time reduced Arzila and Tangier, and in 1740 returned to Portugal loaded with honours. It was then he obtained the ſurname of *African*, and to the titles which he derived from his anceſtors, added that of *lord of the coaſts on both ſeas*. And with a view to perpetuate the memory of theſe exploits and conqueſts, he cauſed a repreſentation of them to be wrought in tapeſtry, a monument ſurely conſtructed of very frail materials, but not leſs durable than many which have been erected by ambition and vanity. During the war in Africa, a military order denominated *the knights of the ſword* was founded.

Alphonſo was leſs ſucceſsful in ſupporting the claim of his niece Donna Joanna to the crown of Caſtile againſt Ferdinand and Iſabella. Finding his own reſources unequal to the conteſt in which he was engaged, he took a journey to France to ſolicit the aid of Lewis XI. But his ſolicitations proved fruitleſs; and the mortification which he experienced from this faithleſs monarch, filled him with melancholy, and induced him to reſign his crown for the purpoſe of making a pilgrimage to the Holy Land. The adminiſtration of affairs during his abſence, was committed to the hands of his ſon Don Juan, who governed the kingdom with great ability. When the king returned, he was joyfully received by the prince, and reinſtated in his authority. But the mind of Alphonſo had loſt its wonted vigour, and was unfit to reſume the arduous duties of government. Oppreſſed ſtill with a deep melancholy, he determined at length to withdraw from the cares of a kingdom, and to end his days in the repoſe and quiet of a monaſtery. But on his journey to the place of his retirement, he was ſeized with the plague at Cintra, where he died in the year 1481, in the 43d year of his reign, and the 49th of his age. The moderation, the prudence and wiſdom which this prince exhibited in his public conduct, were not more powerful in conciliating the love and veneration of his ſubjects, and of all good men, than were the amiable virtues of his private character. He was diſtinguiſhed for his affability and condeſcenſion, his benignity and bounty, and eſpecially for his unbounded charity. In the exerciſe of this latter virtue, he was honoured with the title of *redeemer of the captives*, in conſequence of his having procured the freedom of many priſoners, whoſe ranſom he cheerfully paid. Nor was he leſs eminent for his chaſtity and temperance, his attachment to letters, and his love and encouragement of learning. The firſt library in the palace of the kings of Portugal was founded in his time. He eſtabliſhed and vindicated againſt the pretenſions and hoſtile attempts of the Spaniards, a very profitable trade on the coaſt of Guinea, which country was diſcovered during his reign, under the auſpices of his uncle Don Henry, a celebrated character of that age. (*Mod. Univ. Hiſt.*). Alphonſo.

ALPHONSO VI. *Don Enriquez*, king of Portugal, aſcended the throne when only a child of thirteen years of age. It is not eaſy to conceive a kingdom in a more perilous ſituation than this at the death of Don John. The young king was remarkable for weakneſs of body, and imbecility of mind; the regency in the hands of a woman, and that woman a Caſtilian; the nation involved in war, and this reſpecting the title to the crown; many of the nobility engaged in feuds and contentions with each other, and ſome of them ſecretly diſaffected to the reigning family; ſo that the queen ſcarcely knew to whom ſhe could truſt, or by whom ſhe was to be obeyed. A very indecent joy was manifeſted by the people on the king's death, as if his death was the diſſolution of government: but the great abilities of the queen, and the vigorous meaſures which ſhe adopted, ſoon changed the face of affairs. For her own ſafety, and the proſperity of the kingdom, ſhe appointed Don Franciſco de Faro, count of Odemira, of the houſe of Braganza, governor to the king, and one of her principal miniſters of ſtate; and ſhe made choice of Don Antonio de Meneſes, count de Caſtenheda, to be his coadjutor. The former was a perſon in high repute among the nobility, in great favour with the people, entirely devoted to the intereſts of the queen, poſſeſſed of a large eſtate, and far advanced in years; the latter was alſo an aged man of great talents, and equally capable to preſide in the cabinet, and to command in the field. As might naturally be expected, theſe men ſometimes differed in opinion; but this difference never hurt the cauſe of the queen. Seconded, protected, and counſelled by ſuch able men, the nation began to feel the effects of the queen's firmneſs and ſuperior talents.

The firſt important exertion of the queen was, to

Alphonſo. ſend expreſs orders to the count de San Lorenzo, who commanded on the frontiers, to act offenſively; but the meaſure, though prudent in itſelf, was not attended with the deſired ſucceſs. About this time, however, the duke de St Germain, an Italian officer in the ſervice of Spain, entered Portugal, beſieged and took Olivenza and the caſtle of Moran. In conſequence of this, the general was diſmiſſed, and his place was filled by Juan Mendez Vaſconcelles, a man in great favour with the troops, and univerſally popular. He engaged to act alſo upon the offenſive, but being unſucceſsful, he was only ſaved from puniſhment, by his ſimple and candid defence; in which he ſays, "that he had undertaken the ſiege in obedience to the order of the queen, and for the honour of the nation; and that he had raiſed it without orders, for the preſervation of the army; that he knew the hazard he run when he did it, but that it gave him pleaſure to think, that at the hazard, or even the loſs, of his reputation and life, the troops of Portugal had been ſaved." He was declared innocent and worthy of the queen's favour, by the council of war who preſided. Don Sancho Manuel, who commanded in Elvas, and defended it with equal bravery and conduct, ſhowed himſelf to be an officer of a conſiderable degree of judgement, by his hazarding nothing more when he had performed his ſervice, upon which the very being of the ſtate depended; but it was the count de Caſtanheda who raiſed that ſiege, and forced the army of Spain in their lines. After ſome other political meaſures, ſome of them more and ſome of them leſs importance; the queen regent finiſhed in a manner, her adminiſtration, with the marriage of her only daughter, the princeſs Catharine, once intended for Lewis XIV. with Charles II. king of Great Britain, one of the moſt fortunate events that ever happened for Portugal; ſince it immediately procured them the protection of the Engliſh fleets, reinforcements of ſome thouſands of horſe and foot; beſides adding much reputation to their affairs throughout Europe; which was the reaſon that the Spaniſh court oppoſed it with ſo much heat, or rather paſſion. By the vigorous exertions and fortunate victories of Monteſclaros, the war was ſoon terminated to the honour of Portugal. The ſixth and laſt victory in the courſe of 28 years, was obtained by the Marquis de Marialva, which was chiefly owing to unforeſeen accidents, and the determined courage of foreign troops, and to the great abilities of Schomberg. This victory determined the fate of the kingdom, though not of the ſovereign; and it was eaſy to be ſeen by the more intelligent ſort of people in Portugal, that the king would ſooner or later be depoſed.

Alphonſo being ſtruck with the palſy while a child, rendered it neceſſary to treat him with indulgence, on account of his weak ſtate of health; conſequently, as he roſe to maturity, his want of parts, and the defects in his education, were very perceptible. It is alleged that a greater affection was ſhown by the queen his mother, to the infant Don Pedro, and that ſhe endeavoured at the time of their father's deceaſe, to inſinuate into the nobles an idea of preferring him; but they univerſally declined to make a breach in the ſucceſſion, declaring it was difficult to make an eſtimate of the powers of a king who was then only a child. The queen yielded, and endeavoured by every proper means to make him worthy of a crown, which, by Alphonſo. birth, he was entitled to wear. The count de Odemira, who was charged with his education, found it a very difficult taſk to manage the young prince, who, forgetful of his birth and deſtination, was prone only to thoſe amuſements which the youth of his age were accuſtomed to. His guardian and preceptor ſtruggled with this diſpoſition, and even ventured to take ſome pretty ſevere meaſures; but to his great mortification, it proved entirely abortive. Education can only improve, but can never confer mental abilities. Yet he was quick enough to perceive he was a king, which proved very fatal to him. Thoſe who approached his perſon complied with his follies, and, even commended the moſt abſurd actions; and thoſe who were independent of the court inveighed againſt him in the ſtrongeſt terms, and, becauſe guilty of ſome childiſh actions, they aſcribed to him all the cruel and fooliſh accidents which happened in Liſbon. Unfortunately, however, for his adverſaries, many of theſe actions, ſuch as fighting of dogs, ſcouring the ſtreets, encountering three men alone, running at a bull, and ſuch like, indicate no want of ſtrength or courage. A variety of facts that might be mentioned, are ſufficient evidence that his natural diſpoſitions were weak, wild, refractory, and unteacheable; and that although he was born to reign, yet he was deſtitute of the qualities abſolutely neceſſary in a prince. The direful conſequences of this having been for ſome time experienced by the nation, the nobles at laſt were driven to the reſolution of depoſing the king, and exalting Don Pedro to the regency. In the morning of the next day after the determination, the marquis de Caſcaes, at the head of the council, went to the palace to propoſe the reſignation to the king. The king was in bed and faſt aſleep: the marquis ordered him to be awakened, and knocked violently at the door for that purpoſe; and when he had obtained admiſſion, he is ſaid to have upbraided him in very coarſe terms for his lazineſs and inattention to public affairs at ſo critical a conjuncture; adding, that ſince he muſt be ſenſible of his want of abilities to govern a kingdom, the wiſeſt method he could adopt was, to reſign it in favour of his brother. The king abſolutely refuſed to conſent; but not long after, Don Pedro coming to the palace, ordered him to be confined in his apartment, where one of his favourites perſuaded him, in the hope of being ſet at liberty, to make a ſhort renunciation of the crown in favour of his brother Don Pedro, and his lawful iſſue, reſerving the houſe of Braganza and its dependencies, together with 100,000 crowns out of the revenue of the crown. Nor was this deemed ſufficient: for a paper was preſented to him, making him avow, that for want of conſummation, his marriage was null. This he at firſt declined; but, by the advice of ſome divines, he was prevailed on to ſubſcribe the deed. When evening drew on, the unhappy king then perceived he was a priſoner; upon which he ſent to requeſt his brother to let him have John, who managed his dog-kennel, to keep him company. When Don Pedro heard it, loſing his uſual calmneſs, he burſt into a violent fit of paſſion, and inſtantly gave orders, that thoſe who were the moſt agreeable to him, ſhould remain in his apartment. Such was the ſituation of affairs until the meeting of the ſtates. But

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Alphonſo. in the mean time, the unfortunate Don Alonzo died, after he had been a priſoner near fifteen years, ſuddenly in the caſtle of Cintra, on the 12th of September, when he had borne the title of king almoſt twenty-ſeven, and had lived about forty, years. It is reported, that he ſaid in his laſt agonies, "I am now going; but it will not be long before the queen ſhall follow me, to give an account, at the moſt awful tribunal, of the wrongs ſhe has done me." (*Mod. Univ. Hiſt.*)

Alphonſo.

Alphonso III. the Great, king of Aſturias, was born in 847, and ſucceeded his father Ordogno in 865. In conſequence of the rebellion of Don Frolia, not long after his acceſſion to the throne, he was forced to leave his kingdom; but that uſurper being aſſaſſinated, with univerſal applauſe he returned to his throne. In many ſucceſsful enterpriſes againſt the Moors, in which he greatly enlarged his territories, he ſoon diſplayed the talents of a warlike and able prince. He formed a powerful alliance againſt the Moors, by marrying Ximene or Chimene, deſcended from the houſe of Navarre, which paved the way for a long ſeries of victories. The great attention which he paid to the comfort and welfare of the common people, greatly diſguſted his haughty nobles; which excited them to revolt againſt him in the advanced part of his life. Enjoying a ſmall interval of tranquillity from the diſtraction and tumults of war, he called a general council of the clergy and nobility, enacted ſome uſeful regulations, and directed their attention to ſeveral other ſubjects, which contributed to the honour and happineſs of his kingdom. Whilſt he was buſily occupied in repairing ſome of thoſe towns which he had taken from the Moors, he was ſuddenly interrupted by them, and was under the neceſſity of defending himſelf with a conſiderable army, which he did with ſuch ſucceſs, that they were defeated with great loſs. The unnatural rebellion of his ſon Don Garcias, at this time, greatly diſturbed his government; but by the diligence of the father, this unnatural rebellion was ſoon quelled. The confinement of Garcias, and the new impoſition of taxes, produced general murmurs among the people; which induced Alphonſo, now worn out with years and inceſſant contentions, to aſſemble the ſtates, and reſign the reins of government into the hands of his ſon Don Garcias. He gave to his other ſon Don Ordogno the province of Galicia. The ambitious and military ſpirit which Don Garcias diſcovered in his father's reign, ſoon diſplayed itſelf in an attack on the Moors. By the advice of his father, to which he prudently liſtened, he was taught that theſe new conqueſts tended more to enrich the ſoldiers, than to the advantage of the crown. Alphonſo, although far advanced in years, took upon himſelf the command of the army raiſed for new operations, and returned to Zamora loaded with ſpoils, and with increaſed reputation and fame, in the year 912. He died December 20. 912, two years after his abdication, 49 years from the time of his being aſſociated with his father in the government, and when he was about 63 or 65 years of age. His great learning, and the patronage he gave to literature, his diſtinguiſhed piety and virtue, and other princely qualities, raiſed this king high in the eſtimation of mankind. Some writers affirm that he compoſed a chronicle of the Spaniſh affairs, from the death of Receſuintho, to that of his own father Don Ordogno, which has been incorrectly publiſhed by Sandovel, and the later editions have ſuſtained conſiderable injury. The biſhop of Orenſa, at whoſe requeſt it was originally compoſed, publiſhed it in his own name to the world. (*Gen. Biog.*)

Alphonſo.

Alphonso X. the Wiſe, king of Leon and Caſtile, ſucceeded his father Ferdinand in the year 1252. He obtained the appellation of wiſe, not for his political knowledge as a king, but his erudition as a philoſopher. In conſequence of the general opinion of his princely qualities, and his uncommon generoſity, he aſcended the throne with univerſal approbation. The ill concerted projects of his ambition, however, diſturbed the proſperity of his reign. Pretending a better right than Henry III. of England to that territory, he directed his firſt attempt againſt Gaſcony. The arms of England, however, proved too formidable; and he was compelled to renounce his claim, on condition that Henry's ſon, afterwards King Edward I. ſhould marry his ſiſter Eleonora. At an expence which drained his treaſures, and obliged him to debaſe his coin, he prepared for an expedition againſt the Moors in Barbary; but his maternal right to the duchy of Swabia, which he was called to defend, diverted him from it. Thus he formed a connexion with the German princes; and became a competitor, with Richard earl of Cornwall, for the imperial crown, in queſt of which they both expended immenſe ſums of money. The claims of ſeveral of the princes of the blood, gave exerciſe to his military talents; and he was ſucceſsful both in oppoſing and defeating them. He formed the romantic deſign of viſiting Italy in the year 1268; but the ſtates firmly remonſtrating, he was obliged to relinquiſh it. But, although he abandoned the deſign, yet it produced ſuch diſcontents both among the common people and conſpiracy among the nobles, that it required conſiderable exertion before the king could allay the ferment. Alphonſo, ſtill anxious of aſcending the imperial throne, attempted it after the death of Richard earl of Cornwall, and even after Rodolph of Hapſburg was actually elected emperor of Germany, and for that purpoſe took a journey to Beaucaire to obtain an interview with the pope, in order to prevent him from confirming the election. The Moors, ever ready to draw the ſword againſt him, took this opportunity of entering his dominions for the purpoſe of ravaging them. This ambitious journey, undertaken at ſo vaſt an expence, and productive of ſo much confuſion in his kingdom, proved unſucceſsful: for the pope would not realize his claim, or alter the former election. But his exceſſive ambition was ſoon puniſhed by domeſtic calamity; for his eldeſt ſon died in this interval, and his ſecond ſon Don Sanchez, having obtained great reputation in oppoſing the infidels, to the prejudice of his brother's children, laid claim to the crown. This claim was admitted by the ſtates of the kingdom; but Philip king of France, ſupporting the cauſe of the children, whoſe mother was his ſiſter Blanche of France, involved Alphonſo in a war; and it occaſioned the retreat of his own queen Yolande or Violante to the court of her father, the king of Arragon. While thus haraſſed with diſſenſions, he proclaimed war againſt France, and by the authority of the pope he renewed the war with the Moors, which proved ſo unfortunate, that he reluctantly concluded a truce with them, and engaged in a conteſt

Alphonſo. with the king of Granada. Theſe various meaſures exhauſted his treaſure, taxes were multiplied, and the affairs of the kingdom were in ſuch confuſion, that he was under the diſagreeable neceſſity of calling an aſſembly of the ſtates, which was held at Seville in the year 1281, where, on the king's propoſal, the ſtates conſented to give a currency to copper money. In conſequence of the intrigues of Don Sanchez his ſon, another aſſembly of the ſtates was held at Valladolid, A. D. 1282, which deprived Alphonſo of the regal dignity, and appointed Sanchez regent. Reduced to almoſt inſurmountable difficulties, Alphonſo ſolemnly curſed and diſinherited his ſon, and by his laſt will, in the year 1283, confirmed the act of excluſion, and appointed, for the ſucceſſion, the infants de la Cerda, and upon the failure of their heirs the kings of France; and at the ſame time ſupplicated the aſſiſtance of the king of Morocco againſt the power of his ſon. At the commencement of the next year, when Alphonſo received information from Salamanca, that Sanchez was dangerouſly ill, his heart relented. He pardoned his ſon, revoked his curſes, and then died on the 4th of April 1284 in the 81ſt year of his age. His remains were interred in the cathedral of Seville; and he left behind him the character of a learned man, but a weak king. Alphonſo has been charged with irreligion and impiety, chiefly on account of a well-known ſaying of his, viz. "if he had been of God's privy-council when he created the world he could have adviſed him better." The various contradictory accounts, given by different writers, render the truth of this doubtful; but if ever ſuch a horrible ſaying dropt from his lips, it muſt unqueſtionably be declared inconſiſtent with the character of an enlightened philoſopher, and that reverence of the Creator which an enlarged contemplations of his works naturally inſpires.

"An indevout aſtronomer is mad." YOUNG.

He was an eminent proficient in ſcience, and a patron of literature. He concluded that book of laws, known by the title of *Las Partides*, which his father had begun; and in that work diſplayed the abilities of a politician as well as thoſe of a legiſlator. By obliging his ſubjects to uſe their own language, he redreſſed the confuſion in law proceedings occaſioned by intermixing Latin with the vulgar tongue. Under his patronage a general hiſtory of Spain was compoſed, which he took great pains in poliſhing; he alſo corrected many errors in the ſtatutes of the univerſity of Salamanca. Aſtronomy being his favourite ſtudy, he chiefly directed his attention to the improvement of that ſcience; ſo that, even during the life of his father, he aſſembled at Toledo a number of the moſt celebrated aſtronomers of his time, Chriſtians, Jews, and Arabians, from all parts of Europe, for the purpoſe of examining the aſtronomical tables of Ptolemy, and correcting their errors. The completion of theſe tables employed them about four years, and in 1252, the firſt year of Alphonſo's reign, they were completed; and they were called *Alphonſine Tables* from the name of this prince, who encouraged the conſtruction of them by his unbounded liberality. It is reported that 400,000 ducats were expended on them, or, according to others, 40,000. Some have aſcribed the principal management of this work to the Jewiſh Rabbi Iſaac Aben-Said; others, pretending to derive information from the MSS. of Alphonſo, refer it to Aben-Ragee and Alcabitius. The other aſtronomers who were employed on this occaſion were Aben-Muſa Mohammed, Joſeph Ben-Ali, and Jacob Abuena, Arabians: if there were any Chriſtians, their names are unknown. The 30th of May 1252, which was the day of his acceſſion to the throne, was fixed as the epoch of theſe tables. A book, entitled "The Treaſure," is alſo aſcribed to him, containing treatiſes of rational philoſophy, phyſics, and ethics. He is likewiſe ſaid to have been well acquainted with aſtrology and chemiſtry; in which laſt ſcience, he is ſaid to have compiled two volumes in cipher, which are extant, and to be found ſtill in his Catholic majeſty's library. But this work muſt be more curious than uſeful, if we conſider the ſtate of this ſcience at that period. (*Gen. Biog.*) Alphonſo

ALPHONSO V. king of Arragon and Naples, ſucceeded his father in the year 1416. As the father had formerly been honoured with the appellation of *Juſt*, ſo the ſon was honoured with that of *Magnanimous*. The conſpiracy of ſome of his own nobles againſt his life, together with the inſolence of Pope Benedict XIII. greatly diſturbed the tranquillity of his reign. Fortunately this conſpiracy was diſcovered juſt when it was about to be carried into execution; and inſtead of proceeding with rigour againſt the conſpirators, he generouſly tore a paper containing their names without reading, and added, "that he would at leaſt force them to acknowledge, that he had a greater regard for their lives than they had for his." After quelling a diſturbance in Sardinia, he was juſt making preparations to advance to Sicily, when Joan of Naples offered, if he would aſſiſt her againſt the pope, the duke of Anjou, and the conſtable Sforza, who had formed a confederacy to depoſe her, to adopt him as her ſon and heir. He readily accepted the propoſal, and with a powerful army ſoon raiſed the ſiege of Naples, and was immediately declared heir apparent of her kingdom, and duke of Calabria. But as the queen was unfaithful, and did not fulfil her engagements, Alphonſo took poſſeſſion of Naples, and expelled her from it; but when the duke of Anjou again entered her territories, and made himſelf maſter of great part of them, ſhe was obliged to renew her ſolicitations to Alphonſo; who, in the year 1434, involved himſelf in a quarrel with the duke of Milan and the republic of Genoa, by beſieging Gæta in a ſecond attempt to conquer Naples. The Genoeſe fleet engaged Alphonſo; and all his ſhips were diſperſed or deſtroyed, and himſelf taken priſoner. But ſuch was the addreſs of this prince, that when carried to Milan a priſoner, he there ingratiated himſelf ſo much into the duke's favour, that he became his friend and ally, and ſoon roſe to greater power than formerly.

He got poſſeſſion of Naples in 1443; and in an aſſembly of the ſtates held at Beneventum, and then transferred to Naples, his ſovereignty was recognized, and his ſon, Don Ferdinand, declared ſucceſſor to the throne, and in conſequence of this elevation he was deemed the ſole arbiter of peace and war through all Italy. Naples became the reſidence of Alphonſo during the remainder of his life; but his declining years were much diſquieted by political diſſenſions and intrigues. The natural attendant of jealous old age at laſt

Alphonſo, Alphonſus.

laſt ſeized him; and in conſternation and dread, he was removed from one caſtle of Naples to another, until he breathed his laſt on the 22d of June 1468, bequeathing to his natural ſon Ferdinand the kingdom of Naples, and to his brother Don Juan, king of Navarre, the kingdoms of Arragon, Valencia, Majorca, Sardinia, Sicily, and the principality and dependencies of Catalonia. Alphonſo was not only deemed the ableſt ſtateſman, and the moſt renowned military commander in that age, but alſo the greateſt prince that ever occupied the throne of Arragon. He was a diſtinguiſhed patron of learning, and opened an aſylum for the Greek literati expelled from Conſtantinople. His device was an open book. He frequently uttered this expreſſion, "That an unlettered prince was but a crowned aſs." He was brave and liberal; and in all his negotiations he diſdained the mean artifices of intrigue and diſſimulation. It is reported that his peruſal of Quintus Curtius cured him of a diſorder with which he was attacked at Capua. Such was his familiar intercourſe with his ſubjects, and his affection towards them, that he walked unarmed and unaccompanied in his capital; and was wont to ſay, "that a father has nothing to fear in the midſt of his children." While he was beſieging Gæta he diſmiſſed the women and children that were turned out of the town without any injury, ſaying, "That he had rather loſe any city in his dominions than loſe the reputation of humanity." He leaped into a ſhallop for the relief of one of his galleys, which with its whole crew and ſoldiers was juſt about to periſh, exclaiming, "I had rather ſhare than witneſs their calamity." Such was his generoſity, that upon hearing an officer who ſaw his treaſurer bringing him 10,000 ducats, exclaiming, "I ſhould only wiſh that ſum to make me happy." "You ſhall be ſo," ſaid Alphonſo, and gave him the money in a preſent. He deemed dancing a certain degree of madneſs; but was ſtrongly addicted to women, which involved him in many diſhonourable intrigues, and juſtly entailed upon him the diſgrace of an unfaithful huſband to a kind and affectionate queen. (*Mod. Univ. Hiſt.*)

ALPHONSUS TOSTATUS, biſhop of Avila, a learned and voluminous Spaniſh writer. He flouriſhed about the middle of the 15th century, and by his uncommon abilities roſe to the higheſt offices both in the civil and eccleſiaſtical departments of the ſtate. At the age of 22 years he finiſhed his ſtudies at the univerſity of Salamanca, having made great progreſs in every branch of learning then in eſtimation. He was preſent at the council of Baſil, and was afterwards promoted to the biſhopric of Avila. He died at the age of 40 years, in 1454, and was buried in the church of Avila. The following epitaph, expreſſive of his great erudition, was inſcribed on his tomb.

Hic ſtupor eſt mundi qui ſcibile diſcutit omne.

"This is the wonder of the world who treated of every thing that could be known."

The numerous productions of Alphonſus are ſufficient proofs of his laborious induſtry: during his life he wrote no leſs than 27 volumes in folio, of which 24 are commentaries on the Scriptures; the reſt are on theological ſubjects. By the order of Cardinal Ximenes they were printed at Venice in 1530, and in 1596; and at Cologne in 1612. Several of his pieces on eccleſiaſtical hiſtory, ſcience, and literature in general, were ſeparately printed at Salamanca in 1506, and alſo his commentary upon the Chronicon of Euſebius. Although high encomiums have been beſtowed upon his works, they have nevertheleſs in the current of time and human improvement fallen into oblivion. (*Dupin.*)

Alpini.

ALPINI, PROSPERO, in Latin, *Proſper Alpinus*, a celebrated phyſician and botaniſt, was born at Maroſtica in the republic of Venice in November 1553. In his early years his inclination led him to the profeſſion of arms, and he ſerved ſome time in the Milaneſe. By the encouragement and perſuaſion of his father, who was a phyſician, he retired from the army, and devoted his attention to literature. To proſecute his ſtudies with more advantage, he went to the univerſity of Padua, where he was ſoon after elected deputy to the rector and ſyndic to the ſtudents. But in the diſcharge of his official duties which was diſtinguiſhed by prudence and addreſs, he was not prevented from purſuing the ſtudy of phyſic which he had choſen. He continued his medical ſtudies with zeal and ſucceſs; and after having acquired the neceſſary qualifications, he was admitted to the degree of doctor of medicine in 1578. Soon after he left the univerſity, and ſettled as a phyſician in conſequence of an invitation from the citizens in Campo San Pietro, a ſmall town in the Paduan territory.

In the courſe of his ſtudies he had paid particular attention to plants, and had become an enthuſiaſt in botanical ſcience. The ſphere of his preſent practice was too limited to afford him much opportunity of proſecuting his favourite ſtudy. He wiſhed particularly to extend his knowledge of exotic plants; and the only means to attain this, he thought, was to ſtudy their economy and habits in their native ſoil. And to gratify this laudable curioſity an opportunity ſoon preſented itſelf. George Emo, the conſul for the Venetian republic in Egypt, appointed Alpini his phyſician. They ſailed from Venice in September 1580; and after having experienced a tedious and dangerous voyage, arrived at Grand Cairo in the beginning of July the following year. Alpini ſpent three years in Egypt, and, by his induſtry and aſſiduity, greatly improved his botanical knowledge. With this view he travelled along the banks of the Nile, viſited every place, and conſulted every perſon from whom he expected any new information. From a practice in the management of date trees which he obſerved in this country, Alpini ſeems to have deduced the doctrine of the ſexual difference of plants which was adopted as the foundation of the celebrated ſyſtem of Linnæus. He ſays, "That the female date trees, or palms, do not bear fruit, unleſs the branches of the male and female plants are mixed together; or, as is generally done, unleſs the duſt found in the male ſheath, or male flowers, is ſprinkled over the female flowers."

When Alpini returned to Venice in 1586 he was appointed phyſician to Andrea Doria prince of Melfi, and during his reſidence at Genoa, acquired ſo great a name as to be eſteemed the firſt phyſician of his age. The Venetians became jealous that the Genoeſe ſtate ſhould number among its citizens a perſon of ſuch diſtinguiſhed merit and reputation, whoſe ſervices might be

Alpini
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Alps.

be eſſentially beneficial, and whoſe fame might be highly honourable, to his native country. In the year 1593, he was recalled to fill the botanical chair in the univerſity of Padua, with a ſalary of 200 florins, which was afterwards augmented to 750. He diſcharged the duties of his profeſſorſhip for many years with great reputation, till his declining health interrupted his labours. He died in the year 1617, in the 64th year of his age, and was ſucceeded as botanical profeſſor by one of his ſons. Alpini wrote the following works in Latin: 1. *De Medicina Ægyptiorum, libri* iv. "Of the Phyſic of the Egyptians, in four books;" printed at Venice, 1592, in 4to. 2. *De Plantis Ægypti liber:* "A treatiſe concerning the plants of Egypt;" printed at Venice, 1592, in 4to. 3. *De Balſamo Dialogus:* "A dialogue concerning the Balm of Gilead;" printed at Venice, 1592, in 4to. 4. *De Præſagienda vita et morte ægrotantium libri* vii: "Seven books concerning the method of forming a judgment of the life or death of patients;" printed at Venice, 1691, in 4to. 5. *De Medicina methodica, libri* xiii: "Thirteen books concerning methodical Phyſic;" Padua, 1611, folio; Leyden, 1719, in 4to. 6. *De Rhapontico Diſputatio:* "A diſputation held in the ſchool at Padua concerning the Rhaponticum;" Padua, 1612, and 1629, in 4to. 7. *De Plantis Exoticis, libri* ii: "Of exotic plants, in two books;" Venice, 1699, in 4to. He left ſeveral other works, which have never been printed; particularly, 8. The fifth book concerning the phyſic of the Egyptians. 9. Five books concerning the natural hiſtory of things obſerved in Egypt, adorned with figures of plants, ſtones, and animals. (*Biog. Dict.*)

ALPINIA. See BOTANY *Index*.

ALPINUS. See ALPINI.

ALPISTE, or ALPIA, a ſort of ſeed uſed to feed birds with, eſpecially when they are to be nouriſhed for breeding. The alpiſte ſeed is of an oval figure, of a pale yellow, inclining to an iſabel colour, bright and gloſſy. It is an article of the corn-chandlers and ſeedſmen's trade.

ALPS, in *Ancient Geography*, a range of high mountains, ſeparating Italy from Gaul and Germany, in the form of a creſcent. They take their riſe from the Vada Sabatia, or Savona; and reach to the Sinus Flanaticus (now Golfo di Carnaro of the Adriatic), and the ſprings of the river Colapis (now the Kulpe); extending, according to Livy, 2000 ſtadia in length, or 250 miles: they are divided into ſeveral parts, and accordingly have different names. From Savona to the ſprings of the Varus, where the Alps lie againſt the ſea of Genoa, they are called *Maritime*, now *le Montagne di Tenda*. Theſe extend from ſouth to north, between Gaul to the weſt, and Genoa to the eaſt, beginning at Monaco on the Mediterranean; then running out through the eaſt of the county of Nice, and between that and the marquiſate of Saluzzo, terminate at length at Mount Viſo, between Dauphiné and Piedmont. Hence to Suſa run the *Alpes Cottiæ* (Sueton.) *Cottanæ* (Tacitus); mountains extremely high, ſeparating Dauphiné from Piedmont, and extending from Mount Viſo to Mount Cenis, between the *Alpes Maritimæ* to the ſouth, and the *Graiæ* to the north. The *Alpes Graiæ* (Pliny), ſo called from the paſſage of Hercules, begin from Mount Cenis, where the *Cottiæ* terminate; and run out between Savoy and the Tarenteſe to the weſt, and Piedmont and the duché d'Aouſte to the eaſt, quite to the Great St Bernard, where the *Alpes Penninæ* begin. They are alſo called by ſome *Graiæ Alpes*, and *Graius Mons* (Tacitus); which extend from weſt to eaſt, between St Bernard and the Adula, or St Gothard; and thus they run out between the Valaiſe to the north, and the Milaneſe to the ſouth. With theſe are continued the *Alpes Rheticæ*, to the head of the river Piave; a part of which are the *Alpes Tridentina*, to the north of Trent. To theſe join the *Alpes Noricæ*, reaching to Doblach in Tyrol, to the north of the river Tajamento: thence begin the *Alpes Carnicæ*, or of *Carniola*, extending to the ſprings of the Save: and the laſt, called *Alpes Pannonicæ*, and *Juliæ*, extend to the ſprings of the Kulpe. Some, however, extend the Alps to the north of Dalmatia; others, again, to Thrace and the Euxine. But their termination at the Kulpe, as above, is more generally received. They were formerly called *Albia*, and *Alpionia* (Strabo). Through theſe mountains Hannibal forced his paſſage into Italy, by pouring vinegar on the rocks, heated by burning large piles of wood on them, by which means they became crumbled, (Livy). They are covered with perpetual ſnow. Alps.

The Alps are the higheſt mountains in Europe; being, according to ſome geometricians, about two miles in perpendicular height. They begin at the Mediterranean; and ſtretching northward, ſeparate Piedmont and Savoy from the adjacent countries; whence directing their courſe to the eaſt, they form the boundary between Switzerland and Italy, and terminate near the extremity of the Adriatic ſea, north-eaſt of Venice. It was over the weſtern part of thoſe mountains, towards Piedmont, that Hannibal forced his paſſage into Italy.

The proſpect from many parts of this enormous range of mountains is extremely romantic, eſpecially towards the north-weſt. One of the moſt celebrated is the Grande Chartreuſe, where is a monaſtery founded by St Bruno about the year 1084. From Echelles, a little village in the mountains of Savoy, to the top of the Chartreuſe, the diſtance is ſix miles. Along this courſe, the road runs winding up, for the moſt part not ſix feet broad. On one hand is the rock, with woods of pine trees hanging over head; on the other a prodigious precipice almoſt perpendicular; at the bottom of which rolls a torrent, that, ſometimes tumbling among the fragments of ſtone which have fallen from on high, and ſometimes precipitating itſelf down vaſt deſcents with a noiſe like thunder, rendered yet more tremendous by the echo from the mountains on each ſide, concurs to form one of the moſt ſolemn, the moſt romantic, and moſt aſtoniſhing ſcenes in nature. To this deſcription may be added the ſtrange views made by the crags and cliffs, and the numerous caſcades which throw themſelves from the very ſummit down into the vale. On the top of the mountain is the convent of St Bruno, which is the ſuperior of the whole order. The inhabitants conſiſt of 100 fathers, with 300 ſervants, who grind their corn, preſs their wine, and perform every domeſtic office, even to the making of their clothes. In the Album of the fathers is an admired alcaic ode, written by the late ingenious Mr Gray when he viſited the Chartreuſe, and which has ſince been publiſhed among his works.

The glaciers of Savoy are alſo juſtly reckoned among the

Alps. the moſt ſtupendous works of nature. Theſe are immenſe maſſes of ice, lodged upon the gentler declivities amidſt the Alps, and exhibiting repreſentations beyond conception fantaſtic and picturesque. In the extraordinary narrative of M. Bourrit's journey hither, we meet with the following account of the Prieuré, in the valley of Chamouni. "We had (ſays he) the magnificent proſpect of a chain of mountains, equally inacceſſible, and covered with ice: and above the reſt that of Mount Blanc, whoſe top ſeemed to reach, and even pierce, the higheſt region of the clouds. The chain upon which this mountain looks down like a giant, is compoſed of maſſes of rocks, which terminate in pikes or ſpires, called the *Needles*, and which are ranged like tents in a camp. Their ſides appear lighter and more airy, from the ornament of ſeveral hollow breaks and furrows fretted in the rock itſelf, as well as from the different ſtreaks and panes of ice and ſnow, which, without changing the general character of their form, or the majeſty of their appearance, give them a picturesque variety. Lower down, the eye ſurveys with raviſhment, the gills of ice, and the ſeveral glaciers, extending almoſt into the plain, whilſt this appears like an artificial garden, embelliſhed with the mixture of a variety of colours. We have a picturesque oppoſition to this chain, which is formed by innumerable mountains at the diſtance of near 50 leagues, between whoſe tops we have a glimpſe of thoſe ſeveral plains which they environ."

M. de Sauſſure, who had viſited thoſe mountains about two months before M. Bourrit, felt himſelf naturally electrified in this place. This extraordinary phenomenon ſeems not to have been experienced by the latter or his company; but they heard a long-continued rumbling noiſe like that of thunder, which was rendered more awful by the ſilence of the place where they ſtood. This noiſe proceeded from the ſubſequent cauſes, viz. the avalanches of ſnow, which ſeparated from the tops of the mountains, and rolled down to the bottom; conſiderable fragments of the rocks which followed them, overturning others in their fall; and maſſy blocks of ice, which precipitated from the ſummits.

The valley of Montanvert appears to be peculiarly romantic. "Here (ſays M. Bourrit) we beheld a ſpacious icy plain entirely level. Upon this there roſe a mountain all of ice, with ſteps aſcending to the top, which ſeemed the throne of ſome divinity. It likewiſe took the form of a grand caſcade, whoſe figure was beyond conception beautiful; and the ſun, which ſhone upon it, gave a ſparkling brilliance to the whole. The valley on our right hand was ornamented with prodigious glaciers, that, ſhooting up to an immeaſurable height between the mountains, blend their colours with the ſkies, which they appear to reach."

Alps, beſides its proper ſignification, by which it denotes a certain chain of mountains which ſeparate Italy from France and Germany, is frequently uſed as an appellative to denote any mountains of extraordinary height or extenſive range. In this ſenſe, Auſonius and others call the Pyrenean mountains *Alps;* and Gellius the Spaniſh Alps, *Alpini Hiſpani*.

Hence alſo we ſay, the *Britiſh Alps*, the *Aſiatic Alps*, the *Alps of America*.

The *Scottiſh Alps* terminate in a moſt ſublime and abrupt manner, at the great promontory, the *Alta Ripa* of Ptolemy, the *Ord* or *Aird*, i. e. the *Height of Caithneſs*. The upper part is covered with gloomy heath; the lower is a ſtupendous precipice, excavated into vaſt caverns, the haunt of ſeals and different ſea fowl. On the eaſtern ſide of the kingdom, this is the ſtriking termination of the vaſt mountains of Scotland which form its Highlands, the habitation of the original inhabitants, driven from their ancient ſeats by the anceſtors of Lowland Scots, deſcendants of Saxons, French, and Normans; congenerous with the Engliſh, yet abſurdly and invidiouſly diſtinguiſhed from them. Language, as well as ſtriking natural boundaries, mark their place. Their mountains face on the weſt the Atlantic ocean; wind along the weſt of Caithneſs; among which Morven and Scaraben, Ben Hop, and Ben Lugal, ariſe pre-eminent. Sutherland is entirely alpine, as are Roſsſhire and Inverneſsſhire. Their *Summæ Alpes* are, Meal-Fourvounich, the Coryariſh, Benewich, and Beneviſh near Fort William; the laſt of which is reported to be 1450 yards in height. Great part of Aberdeenſhire lies in this tract. It boaſts of another Morven, ſoaring far beyond the others. This is the centre of the Grampian hills, and perhaps the higheſt from the ſea of any in Great Britain. They again comprehend the eaſtern part of Perthſhire, and finiſh on the magnificent ſhores of Lochlomond; on the weſtern ſide of which Benlomond riſes, diſtinguiſhed among its fellows. From hence the reſt of North Britain forms a chain of humbler hills; but in Cumberland, part of Weſtmorland, Yorkſhire, Lancaſhire, and Derbyſhire, the Alps reſume their former majeſty. A long and tame interval ſucceeds. The long ſublime tract of Wales ariſes, the ancient poſſeſſion of the ancient Britiſh race. From the Ord, the great mountains recede inland, and leave a vaſt flat between their baſes and the ſea, fronting the waves with a ſeries of lofty rocky precipices, as far as the little creek of Staxigo; the whole a bold, but moſt inhoſpitable ſhore for ſhipping. Wick and Staxigo have indeed their creeks, or rather chaſms, which open between the cliffs, and may accidentally prove a retreat, unleſs in an eaſtern gale.

The *Aſiatic Alps* are deſcribed under the articles *ALTAIC Chain* and *WERTURIAN Mountains*.

The *American Alps* are, the ANDES or *Cordilleras*, in South America; and the APALACHIAN or *Allegany* mountains in North America.

The higheſt ground in North America is placed by Captain Carver in lat. 47°, W. Long. from London 98°, between a lake from which the Oregon flows, and another called *White-bear Lake*, from which ariſes the Miſſiſſippi.

This exalted ſituation is part of the Shining Mountains, which are branches of the vaſt chain which pervades the whole continent of America. It may be fairly taken from the ſouthern extremity, where Staten Land and Terra del Fuego riſe out of the ſea as inſulated links to an immenſe height, black, rocky, and marked with rugged ſpiry tops, frequently covered with ſnow. New Georgia may be added as another horribly congenial, riſing detached farther to the eaſt. The mountains about the ſtraits of Magellan ſoar to an amazing height, and infinitely ſuperior to thoſe of the northern hemiſphere under the ſame degree of latitude. From the north ſide of the ſtraits of Magellan;

Alps. lan, they form a continued chain through the kingdoms of Chili and Peru, preſerving a courſe not remote from the Pacific ocean. The ſummits, in many places, are the higheſt in the world. There are not leſs than 12, which are from 2400 toiſes high to above 3000. Pichincha, which impends over Quito, is about 35 leagues from the ſea; and its ſummit is 2430 toiſes above the ſurface of the water. Cayambe, immediately under the equator, is above 3000; and Chimborazo higher than the laſt by 200. Moſt of them have been volcanic, and in different ages marked with eruptions far more horrible than have been known in other quarters of the globe. They extend from the equator through Chili; in which kingdom is a range of volcanoes, from lat. 26. ſouth, to 45. 30. and poſſibly from thence into Terra del Fuego itſelf; which, forming the ſtraits of Magellan, may have been rent from the continent by ſome great convulſion, occaſioned by their labourings, and New Georgia forced up from the ſame cauſe. An unparalleled extent of plain appears on their eaſtern ſide. The river of Amazons runs along a level clothed with foreſts, after it burſts from its confinement at the Pongo of Borjas, till it reaches its ſea-like diſcharge into the Atlantic ocean.

In the northern hemiſphere, the Andes paſs through the narrow iſthmus of Darien into the kingdom of Mexico, and preſerve a majeſtic height and their volcanic diſpoſition. The mountain Popocatepec made a violent eruption during the expedition of Cortez, which is moſt beautifully deſcribed by his hiſtorian Antonio de Solis. This is probably the ſame with the volcano obſerved by the Abbé d'Auteroche, in his way from Vera Cruz to Mexico; which, from the nakedneſs of the lavas, he conjectured to have been but lately extinguiſhed. From the kingdom of Mexico, this chain is continued northward, and to the eaſt of California; then verges ſo greatly towards the weſt, as to leave a very inconſiderable ſpace between it and the Pacific ocean; and frequently detached branches jut into the ſea, and form promontories; which, with parts of the chain itſelf, were often ſeen by our navigators in the courſe of their voyages. Some branches, as we have before obſerved, extend towards the eaſt, but not to any great diſtance. A plain, rich in woods and ſavannahs, ſwarming with biſons or buffaloes, ſtags, and Virginian deer, with bears, and a great variety of game, occupies an amazing tract, from the great lakes of Canada, as low as the gulf of Mexico; and eaſtward to the other great chain of mountains, the Apalachian, which are the Alps of that ſide of northern America. Its commencement is ſuppoſed to be about Lake Champlain and Lake George, with branches pointing obliquely to the river St Lawrence eaſtward, and riſing on its oppoſite coaſts; others extending as far as Nova Scotia, but in their progreſs eaſtward diminiſh in height. The main chain paſſes through the province of New York, where it is diſtinguiſhed by the name of the *Highlands*, and lies within 40 miles of the Atlantic. From thence it recedes from the ſea, in proportion as it advances ſouthward; and near its extremity in South Carolina is 300 miles diſtant from the water. It conſiſts of ſeveral parallel ridges divided by moſt enchanting valleys, and generally clothed with variety of woods. Theſe ridges riſe gradually from the eaſt, one above the other, to the central; from which they gradually fall to the weſt, into the vaſt plains of the Miſſiſſippi. The middle ridge is of an enormous bulk and height. The whole extends in breadth about 70 miles; and in many places leaves great chaſms for the diſcharge of the vaſt and numerous rivers which riſe in the boſoms of the mountains, and empty themſelves into the Atlantic ocean, after yielding a matchleſs navigation to the provinces they water. Alps. Alpuxarras

Beyond the branch of the Apalachian mountains called *The Endleſs*, is another of amazing extent, nearly as high as the mountains themſelves. This plain (called the *Upper Plain*) is exceedingly rich land; begins at the Mohocks river; reaches to within a ſmall diſtance of Lake Ontario; and to the weſtward forms part of the extenſive plains of the Ohio, and reaches to an unknown diſtance beyond the Miſſiſſippi. Vaſt rivers take their riſe, and fall to every point of the compaſs; into Lake Ontario, into Hudſon's river, and into the Delaware and Suſquehanna. The tide of Hudſon's river flows through its deep-worn bed far up, even to within a ſmall diſtance of the head of the Delaware; which, after a furious courſe down a long deſcent, interrupted with rapids, meets the tide not very remote from its diſcharge into the ocean.

Lower ALPS, *Department of*, in France. This department is one of four into which the former Provence is divided. It is bounded on the north by the department of the Upper Alps; on the eaſt by Piedmont, and the department of the Maritime Alps; on the ſouth, by the department of the Var, and the north-eaſt extremity of that of the Mouths of the Rhone; and on the weſt, by the departments of Vaucluſe and the Drome: the chief town is Digne; its ſuperficies is about 1,459,699 ſquare acres; population 144,436 individuals. It is divided in five communal diſtricts.

Upper ALPS, *Department of*. This department makes a part of Dauphiné, which contains three. It is bounded on the north by the departments of Mont Blanc and Iſere; on the eaſt by Piedmont; on the ſouth, by the department of the Lower Alps; on the weſt, by that of the Drome, and part of that of Iſere: Embrun is the principal town; its ſuperficies is about 1,084,614 ſquare acres; population 116,764 individuals. It is divided into three communal diſtricts.

Maritime ALPS, *Department of*. This department is formed of the county of Nice. It is bounded on the north by the Apennines and the department of the Lower Alps; on the eaſt, by the republic of Genoa: on the ſouth, by the Mediterranean; and on the weſt, by the departments of the Var and Lower Alps: the principal town is Nice; its ſuperficies is about 632,619 ſquare acres; population 93,366 ſouls. It is divided into three communal diſtricts.

ALPUXARRAS, or ALPAXARES, mountains of Spain, in the province of Granada, on the coaſt of the Mediterranean ſea. They are about 17 leagues in length and 11 in breadth, reaching from the city of Velez to Almeria. They are inhabited by Moors, who are the remains of the diſperſion and ruin of their empire. They embraced the Chriſtian religion; but preſerve their own manner of living, and their language, though much corrupted. Here is a rivulet between

Alquier || Alface.

Pitros and Portugos, which dyes linen that is dipped in it black in an inſtant. Near this rivulet is a cavern, from which proceeds ſo malignant a ſteam, that it deſtroys ſuch animals as come near it. The Moriſcos cultivate the ſoil extremely well, and plant fruit trees; ſome of which grow to a prodigious height and thickneſs, and give the mountains a very agreeable aſpect.

ALQUIER, a liquid meaſure uſed in Portugal to meaſure oil, two of which make an almond. See ALMOND.

ALQUIFOU, or ARQUIFOU, is a ſort of lead ore, which, when broken, looks like antimony. It is uſed by the potters to give a green varniſh to their works, and thence is called *potters ore*. It is met with in Cornwall, &c. The potters mix a ſmall portion of manganeſe with the alquifou, and then the varniſh or glazing on their ware is of a blackiſh hue.

ALREDUS, ALURED, or ALUREDUS, of Beverley, one of the moſt ancient Engliſh hiſtorians, was born at Beverley in Yorkſhire. He wrote in the reign of Henry I. There are no circumſtances of his life known with any degree of certainty. It is generally believed that he was educated at Cambridge, and that he afterwards became one of the canons and treaſurer of St John's at Beverley. And we learn in a note of Biſhop Tanner's, that, for the ſake of improvement, he travelled through France and Italy; and at Rome became domeſtic chaplain to Cardinal Othoboni. He died in the year 1128 or 1129, leaving behind him the following works: 1. The Annals of Alured of Beverley; which was publiſhed at Oxford in 1716, by Mr Hearne, from a manuſcript which belonged to Thomas Rawlinſon, Eſq. It contains an abridgment of our hiſtory from Brutus to Henry I. written in Latin, and with great accuracy, elegance, and perſpicuity. 2. *Libertates eccleſiæ S. Johannis de Beverlac*, &c. a manuſcript in the Cottonian library. It is a collection of records relative to the church of Beverley, tranſlated from the Saxon language. Theſe are the only works which were written by Alredus. (*Biog. Dict.*).

ALRESFORD, a town of Hampſhire, ſeated on the road from London to Southampton, cloſe by the river Itching, which feeds a great pond to the left of the town. Part of a Roman highway runs from hence to Alton. It conſiſts of about 200 houſes; has one church, and two principal ſtreets, which are large and broad; and has a ſmall manufacture of linens. It is 57 miles diſtant from London.

ALSA, in *Ancient Geography*, a river of Carniola (Pliny), now the *Auſa*, running by Aquileia, with a ſhort courſe from north to ſouth, into the Adriatic; where Conſtantine, the ſon of Conſtantine the Great, fighting againſt Conſtans his brother, loſt his life.

ALSACE, formerly a province of France, bounded on the eaſt by the Rhine, on the ſouth by Switzerland, on the weſt by Lorraine, and on the north by the palatinate of the Rhine. It was formerly a part of Germany, but was given to France by the treaty of Munſter. It is one of the moſt fruitful and plentiful provinces of Europe, abounding in corn, wine, wood, flax, tobacco, pulſe, fruits, &c. The mountains which divide it from Lorraine are very high; and generally covered with fir, beech, oak, and hornbeam. Thoſe on the ſide of Switzerland are leſs high; and furniſhed with all ſorts of wood, as well for fuel as building. The country itſelf is diverſified with riſing hills and fertile vales, beſides large foreſts; but that between the rivers Ill, Hart, and the Rhine, as far as Straſburg, is inferior to the reſt, on account of the frequent overflowing of the Rhine. In High Alſace there are mines of ſilver, copper, and lead. They however work none but thoſe of Giromany, from which are annually drawn 1600 marks of ſilver, each mark being eight ounces; and 24,000 pounds of copper: but the expence of working them is almoſt equal to the profit. There are iron works in ſeveral parts of Alſace, and particularly at Betford. There is a mineral ſpring at Sultſbach, near Munſter, in High Alſace; which is in great reputation for the palſy, weakneſs of the nerves, and the gravel.—The original inhabitants of Alſace are honeſt and good-natured, but wedded to their own manners and cuſtoms. The fruitfulneſs of their country renders them indolent and inactive; for the Swiſs make their hay and reap their corn, as well as manage the vintage of High Alſace, which ſends a great deal of money out of the province. The common language is the German; but the better ſort of people in the towns ſpeak French; and, even in the country, they ſpeak French well enough to be underſtood. Alface.

The number of inhabitants was formerly computed at about half a million, who are moſtly Lutherans and Roman Catholics. By the late diviſion of France this province forms two departments, viz. thoſe of the Upper and Lower Rhine; the capital of the former being Colmar, and that of the latter Straſburg; but formerly it was divided into Upper and Lower Alſace, the former contained 32 large and ſmall towns, and the latter 39, and in both there are upwards of 1000 market towns and villages. The Rauraci, Sequani, and Mediomatrici, were the ancient inhabitants of this province. Under the Merovingian kings its name firſt occurs in the hiſtory of France, and it moſt probably is derived from the river Ell or Ill, the inhabitants on the borders of which were called *Elſaſſon*, from whom the country itſelf was afterwards denominated *Elſas*, in Latin *Eliſatia*, *Aliſatia*, and *Alſatia*. The Romans wreſted it from the Celtæ; from them it paſſed into the hands of the Germans; and after the famous battle of Tolbiac, gained by Clovis in 496, it paſſed into the poſſeſſion of the Franks. It was incorporated at a future period with the kingdom of Auſtraſia; and, in 1752, it was ſubjected, like the reſt of the monarchy, to the laws of Pepin and his ſucceſſors. Lotharius, the eldeſt ſon of Lewis Debonnaire, at the deceaſe of his father in 840, obtained it and united it to that part of the empire of the Franks which fell to him, and was generally known by the name of *Lotharingia*, or *Lorraine*. Afterwards it fell to his youngeſt ſon Lotharius by inheritance, and after him, in 869, it became a province of Germany, and was governed by dukes.

About a century before the title of dukes was aboliſhed, the provincial counts who governed under them in Alſace, aſſumed the title of *Landgraves*, and the countries over which they preſided, obtained the name of *Landgravates*, the one ſuperior and the other inferior. The beſt part of the inferior was conveyed to the biſhops of Straſburg in 1375, who aſſumed the

Alſen
||
Alſirat.

title of *Landgrave of Alſace*. In after times, the government was given by the emperors to ſeveral families, until at laſt Ferdinand I. beſtowed it upon the German line of his own family, and conſequently it remained in the houſe of Auſtria. The property of the town of Briſac, the landgravate of the Upper and Lower Alſace, Sundgau, and the diſtricts of the ten united imperial cities in Alſace, with the whole ſovereignty belonging to them, was for ever ceded by the emperor to the crown of France, at the peace of Munſter in 1648. The perpetual ſovereignty of the city of Straſburg, together with all its dependencies on the left of the Rhine, were ceded to France by the peace of Ryſwick in 1697.

ALSEN, an iſland of Denmark, ſituated in the Leſſer Belt, or entrance into the Baltic ſea, between Sleſwick and Funen, 100 miles weſt of Copenhagen. It extends in length ſix leagues, and about two in breadth. The ſoil is fertile, producing abundance of fruit and variety of grain, with large crops of aniſeeds, a carminative much uſed in ſeaſoning the food and mixing with the bread all over the Daniſh dominions. E. Long. 10. 12. N. Lat. 55. 12.

ALSFIELD, a town of Germany, in the landgravate of Heſſe Caſſel, ten miles north-weſt of Marpurg, and 35 ſouth of Heſſe Caſſel. It is an ancient town, and well built; and the inhabitants were the firſt of this country who embraced the Reformation. E. Long. 9. 5. N. Lat. 50. 40.

ALSHASH, a very beautiful city in Buckharia, ſuppoſed to be the ſame with that which is now called *Taſhcant*, the capital of the eaſtern part of Turkeſtan, poſſeſſed by the Kaſſats. It is ſituated on the river *Sihun*, now *Sir*, and had a well watered garden for every houſe; but was ruined by Jenghiz Khan, who took the city, and cauſed a great number of its inhabitants to be maſſacred.

ALSHEDA, a pariſh in the province of Smaland, in Sweden, where a gold mine was diſcovered in 1738.

ALSINA, in *Botany*, a ſynonyme of the theligonum. See THELIGONUM. BOTANY *Index*.

ALSINASTRUM, in *Botany*, the trivial name of the elatine. See ELATINE, BOTANY *Index*.

ALSINE, or CHICKWEED. See BOTANY *Index*.

The common chickweed affords a remarkable inſtance of what is called the *ſleep of plants*; for, every night, the leaves approach in pairs, ſo as to include within their upper ſurfaces the tender rudiments of the new ſhoots; and the uppermoſt pair but one at the end of the ſtalk are furniſhed with longer leaf-ſtalks than the others; ſo that they can cloſe upon the terminating pair, and protect the end of the branch.

ALSIRAT, in the *Mahometan Theology*, denotes a bridge laid over the middle of hell, finer than a hair, and ſharper than the edge of a ſword, over which people are to paſs, after their trial, on the day of judgement. To add to the difficulty of the paſſage, Mahomet aſſures, that the alſirat, narrow as it is, is beſet with briars and thorns; none of which, however, will be any impediment to the good, who ſhall fly over it like the wind, Mahomet and his Muſſulmans leading the way; whereas the wicked, by the narrowneſs of the path, the entangling of the thorns, and extinction of the light which directed the former to paradiſe, will ſoon miſs their footing, and tumble headlong into hell, which is gaping beneath to receive them.

Alſium,
Alſop.

ALSIUM, in *Ancient Geography*, a city of ancient Etruria, occupying (according to Cluverius) the ſpot on which *Pala* now ſtands. We are told by Dionyſius Halicarnaſſenſis, that Alſium was built by the Aborigines, long before the Tyrrhenians invaded Italy. In this caſe it muſt have been founded not long after the diſperſion in the days of Peleg. Its founder is ſaid to have been one *Alæſus*, *Aleſus*, or *Aliſa*; whom ſome conjecture to have been Aliſah, or Eliſha, the ſon of Javan, mentioned in Scripture.

ALSOP, ANTHONY, an Engliſh divine and poet, was educated at Weſtminſter ſchool, and from thence elected to Chriſt-church, Oxford, where he took the degree of M. A. in March 1696, and of B. D. in December 1706. On his coming to the univerſity, he was very ſoon diſtinguiſhed by Dean Aldrich, and publiſhed *Fabularum Æſopicarum Delectus*, Oxon. 1698, 8vo, with a poetical dedication to Lord Viſcount Scudamore, and a preface in which he took part againſt Dr Bentley in the famous diſpute with Mr Boyle. He paſſed through the uſual offices in his college to that of cenſor with conſiderable reputation; and for ſome years had the principal noblemen and gentlemen belonging to the ſociety committed to his care. In this employment he continued till his merit recommended him to Sir Jonathan Trelawney, biſhop of Winchelſer, who appointed him his chaplain, and ſoon after gave him a prebend in his own cathedral, together with the rectory of Brightwell in the county of Berks, which afforded him ample proviſion for a learned retirement, from which he could not be drawn by the repeated ſolicitations of thoſe who thought him qualified for a more public character and a higher ſtation. In 1717 an action was brought againſt him by Mrs Elizabeth Aſtrey of Oxford, for a breach of a marriage contract; and a verdict obtained againſt him for 2000l. which probably occaſioned him to leave the kingdom for ſome time. His death, which happened June 10. 1726, was occaſioned by his falling into a ditch that led to his garden door. A quarto volume was publiſhed in 1752, under the title of *Antonii Alſopi, Ædis Chriſti olim Alumni, Odarum libri duo*. Four Engliſh poems of his are in Dodſley's Collection, one in Pearch's, ſeveral in the early volumes of the Gentleman's Magazine, and ſome in "The Student." Mr Alſop is reſpectfully mentioned by the facetious Dr King of the Commons (Vol. i. p. 236), as having enriched the commonwealth of learning, by "Tranſlations of Fables from Greek, Hebrew, and Arabic;" and not leſs detractingly by Dr Bentley, under the name of "Teny Alſop, a late editor of the Æſopean Fables." (*Biog. Dict.*)

ALSOP, *Vincent*, an Engliſh nonconformiſt divine, was born in Northamptonſhire, and educated at St John's college, Cambridge, where he took the degree of Maſter of Arts. When he received deacon's orders, he went to Rutlandſhire, and ſettled at Oakham, where he was an aſſiſtant to the maſter of the free-ſchool. As he was a man of a ſprightly turn, he fell into indifferent company; but was reclaimed by the frequent admonitions of the Reverend Mr Benjamin King. He afterwards married that gentleman's daughter, and becoming a convert to his principles, receiv-

ed

Alſop, Alſtedius.

ed ordination in the Preſbyterian way, not being ſatisfied with that which he had from the biſhop. He was ſettled at Wilbec in the county of Northampton, whence he was ejected in 1662, for nonconformity. After this he ventured to preach ſometimes at Oakham, and at Wellingborough where he lived, and was once ſix months in priſon for praying by a ſick perſon. A book he wrote againſt Dr Sherlock in a humorous ſtyle, made him well known to the world, and induced Mr Cawton, an eminent nonconformiſt in Weſtminſter, to recommend him to his congregation for his ſucceſſor. On receiving this call he quitted Northamptonſhire, and came to London, where he preached conſtantly, and wrote ſeveral pieces which were extremely well received by the public. His living in the neighbourhood of the court expoſed him to many inconveniences; but theſe ended with the reign of Charles II. or at leaſt in the beginning of the next reign, when Mr Alſop's ſon engaging in treaſonable practices was freely pardoned by King James. After this our divine went frequently to court, and is generally ſuppoſed to have been the perſon who drew the Preſbyterians addreſs to that prince for his general indulgence. After the Revolution, Mr Alſop gave public teſtimonies of his attachment to government; yet upon all occaſions he ſpoke very reſpectfully of King James, and retained a very high ſenſe of his clemency in ſparing his only ſon. The remainder of his life he ſpent in the exerciſe of his miniſtry, preaching once every Lord's day; beſides which he had a Thurſday lecture, and was one of the lecturers at Pinner's hall. He lived to a great age, and preſerving his ſpirits to the laſt, died in May 1703. On grave ſubjects he wrote with a becoming ſeriouſneſs: but where wit might properly be ſhown, he diſplayed it to great advantage. His funeral ſermon was preached by Mr Slater, and his memory will be always preſerved by his own learned and elegant writings. Of theſe the moſt remarkable, beſides his ſermons, are, 1. *Antiſozzo;* in vindication of ſome great truths onpoſed by Dr William Sherlock, 8vo, 1675. 2. *Melius Inquirendum;* in anſwer to Dr Goodman's Compaſſionate Inquiry, 8vo, 1679. 3. The Miſchief of Impoſitions; in anſwer to Dr Stillingfleet's Miſchief of Separation, 1680. 4. A faithful Reproof to a Falſe Report, with reference to the Differences among the United Miniſters in London, 8vo. (*Biog. Brit.*).

ALSTEDIUS, John Henry, a German Proteſtant divine, and one of the moſt indefatigable writers of the 17th century. He was ſome time profeſſor of philoſophy and divinity at Herborn in the county of Naſſau: From thence he went into Tranſylvania, to be profeſſor at Alba Julia; where he continued till his death, which happened in 1638, in the 50th year of his age. His *Encyclopædia* has been much eſteemed even by the Roman Catholics; it was printed at Lyons, and ſold very well throughout all France. His *Theſaurus Chronologicus* is by ſome conſidered as one of his beſt works, and has gone through ſeveral editions. He alſo wrote *Triumphus Biblicus*, to ſhow that the principles of all arts and ſciences are to be found in the ſcriptures. He was a Millenarian; and publiſhed, in 1627, a treatiſe *De mille annis*, in which he aſſerted that the reign of the ſaints on earth was to begin in 1694.

ALSTON, Charles, M. D. a botanical and medical writer, was born in the weſt of Scotland in the year 1683. He began his ſtudies at the univerſity of Glaſgow, and about this period he had the good fortune to be taken under the patronage of the ducheſs of Hamilton, which afforded him an opportunity of purſuing the bent of his inclination, by attaching himſelf to the ſtudy of phyſic. About the age of 33, along with his friend and companion the celebrated Alexander Monro, he went to Leyden, and ſtudied three years under Boerhaave. On their return to their native country, they, in conjunction with Rutherford, Sinclair, and Plummer, undertook departments in the college of Edinburgh, and by their abilities and induſtry, laid the foundation of that ſchool of phyſic. The branches of botany and materia medica, were long the favourite ſtudies of his life, conſequently he undertook that department, and continued to lecture on them with increaſing reputation until his death, which happened in November 1760, at the age of 77 years. His talents appear to have been naturally ſtrong, which he improved and ſtrengthened with great aſſiduity and induſtry, and employed them ſucceſsfully in the ſervice of ſcience. In the year 1753, his diſſertation on the ſexes of plants, in which he combats the doctrine of Linnæus, was publiſhed in the firſt volume of the Edinburgh Phyſical and Literary Eſſays. The general plan of the work is conducted with much ingenuity, ſupported by ſome ſtrong experiments, and although in the opinion of the learned, it has failed in its principal deſign, yet it muſt be acknowledged to be one of the beſt argued pieces on that ſide of the queſtion. An aſperity of language is ſometimes uſed, very unſuitable to a ſcientific topic; but however, it is proper to remark, that Linnæus had given ſome reaſons for this conduct by the nature of ſome of his deſcriptions. In the fifth volume of the Edinburgh Medical Eſſays, we have a ſhort paper by Dr Alſton on the efficacy of the powder of tin, to deſtroy or expel worms from the bowels. He informs us, that he received the preſcription from an empyric, who was renowned for his ſkill in curing perſons afflicted with that diſeaſe. The patient received the firſt morning one ounce of tin reduced to powder, and half an ounce each of the two following mornings, and was then purged with the infuſion of ſenna and manna. He ſpeaks with great certainty upon the efficacy of this medicine, which certainly has conſiderable power in theſe caſes, and may be given to the moſt delicate ſubjects with perfect ſafety. Dr Alſton alſo engaged in a chemical controverſy reſpecting quicklime with Dr Whytt. But the moſt valuable of all his works, are his lectures on the Materia Medica, which were publiſhed in the year 1770, in two volumes 4to. The number of curious and uſeful facts contained in this book, will tend to ſecure its reputation, although conſiderable additions and improvements have been made, ſince that period, in this branch of ſcience. (*Gen. Biog.*).

Alſton ‖ Alſtonia.

ALSTON-MOOR, a town in Cumberland, ſeated on a hill, at the bottom of which runs the river Tyne, with a ſtone bridge over it. Near this place is plenty of lead ore. W. Long. 2. 4. N. Lat. 54. 45.

ALSTONIA. See Botany *Index*.

Alſtroemeria ALSTROEMERIA. See BOTANY *Index*.

ALT, in *Muſic*, a term applied to the high notes in the ſcale.

Altar. ALTAI MOUNTAINS, an extenſive range of mountains in the northern parts of Aſia. It begins at the vaſt mountain Bogdo, paſſes above the head of the Irtiſch, and then takes a courſe rugged, precipitous, clothed with ſnow, and rich in minerals, between the Irtiſch and Oby; then proceeds by the lake Telezkoi, the riſe of the Oby; after which it retires, in order to comprehend the great rivers which form the Jeneſei, and are locked up in theſe high mountains; finally under the name of the *Sainnes*, it is uninterruptedly continued to the lake of Baikal. A branch inſinuates itſelf between the ſources of the rivers Onon and Ingoda, and thoſe of Ichikoi, accompanied with very high mountains, running without interruption to the north-eaſt, and dividing the river Amur, which diſcharges itſelf into the eaſt, in the Chineſe dominions, from the river Lena and lake Baikal. Another branch ſtretches along the Oleema, croſſes the Lena below Jakouſk, and is continued between the two rivers Tonguſka to the Jeneſei, where it is loſt in wooded and moraſſy plains. The principal chain, rugged with ſharp-pointed rocks, approaches and keeps near the ſhores of the ſea of Ockhotz, and paſſing by the ſources of the rivers Outh, Aldan, and Maia, is diſtributed in ſmall branches, which range between the eaſtern rivers which fall into the Icy ſea; beſides two principal branches, one of which, turning ſouth, runs through all Kamtſchatka, and is broken, from the Cape Lopatka, into the numerous Kurile iſles, and to the eaſt forms another marine chain, in the Aleutian iſlands which range from Kamtſchatka to America; moſt of them, as well as Kamtſchatka itſelf, diſtinguiſhed by volcanoes, or the traces of volcanic fires. The laſt chain forms chiefly the great Cape Tſchutſki, with its promontories and rocky broken ſhores.

The ſummits of the higheſt of the Altai mountains are covered with perpetual ſnow. The loftieſt range of this extenſive chain, is compoſed of granite. Another range of inferior height conſiſts of thiſtus, which lies on the ſides of the granite mountains. Beſide theſe rocks, there are ſtrata of chalkſtone, limeſtone, and marble. The Altai mountains abound in metallic ores. Gold, ſilver, and lead mines, have been diſcovered in them, with great abundance of copper and iron. The two latter have been wrought to a conſiderable extent, and have been found productive.

ALTAMONT, a very handſome town of Italy, in the kingdom of Naples, and in Calabria Citerior, 15 miles north-weſt of Baſigniano. E. Long. 16. 22. N. Lat. 39. 40.

ALTAMURA, a town of Naples, in the territory of Bari, with the title of a principality, ſeated on the foot of the Apennine mountains. E. Long. 16. 54. N. Lat. 41. 0.

ALTAR, a place upon which ſacrifices were anciently offered to ſome deity.

The heathens at firſt made their altars only of turf; afterwards they were made of ſtone, of marble, of wood, and even of horn, as that of Apollo in Delos.

Altars differed in figure as well as in materials. Some were round, others ſquare, and others triangular. All of them were turned towards the eaſt, and ſtood lower than the ſtatues of the gods; and were generally adorned with ſculpture, repreſenting either the gods to whom they were erected, or their ſymbols. See the PAGAN ALTARS repreſented on Plate XVII. Upon the ſides of fig. 1. a trident and two dolphins are exhibited, which denote it to have been dedicated to Neptune. Fig. 2. a four-ſquare altar, was dedicated to the Nymphs, as the inſcription imports. Fig. 3. exhibits a Bacchanal holding a thyrſus in his hand, a mark of the altar's being built to Bacchus; it had two other ſides, which made it appear triangular. Of fig. 4. which was alſo triangular, each face or ſide exhibited a genius, one of whom (on the ſide repreſented) carries an oar upon his neck, which ſeems to denote it an altar of Neptune. Fig. 5. an altar of a round ſhape, is inſcribed *Ara Neptuni*: the god himſelf is there repreſented, all naked, ſaving the pallium upon his ſhoulder; and holding in his left hand a trident, and in his right a dolphin. Altar.

The height of altars alſo differed according to the different gods to whom they ſacrificed. According to Servius, thoſe altars ſet apart for the honour of the celeſtial gods, and gods of the higher claſs, were placed on ſome pretty tall pile of building; and for that reaſon were called *altaria*, from the words *alta* and *ara*, "a high elevated altar." Thoſe appointed for the terreſtrial gods were laid on the ſurface of the earth, and called *aræ*. And, on the contrary, they dug into the earth and opened a pit for thoſe of the infernal gods, which they called βοθροι λακκοι, *ſcrobiculi*. But this diſtinction is not everywhere obſerved: the beſt authors frequently uſe *ara* as a general word, under which are included the altars of the celeſtial and infernal, as well as thoſe of the terreſtrial gods. Witneſs Virgil, Ecl. 5.

——*En quatuor aras*,

where *aræ* plainly includes *altaria*; for whatever was make of Daphnis, Phœbus was certainly a celeſtial god. So Cicero, pro Quint. *Aras delubraque Hecates in Græcia vidimus*. The Greeks alſo diſtinguiſhed two ſorts of altars; that whereon they ſacrificed to the gods was called βωμος, and was a real altar, different from the other whereon they ſacrificed to the heroes, which was ſmaller, and called εσχαρα. Pollux makes this diſtinction of altars in his Onomaſticon; he adds, however, that ſome poets uſed the word εσχαρα for the altar whereon ſacrifice was offered to the gods. The Septuagint verſion does ſometimes alſo uſe the word εσχαρα for a ſort of little low altar, which may be expreſſed in Latin by *craticula*; being a hearth rather than an altar.

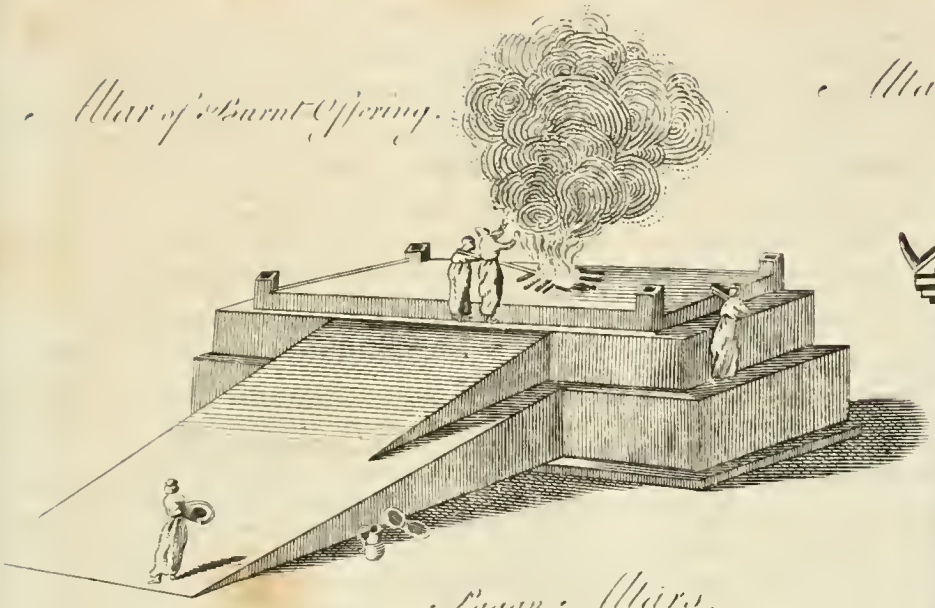
Before temples were in uſe, altars were erected ſometimes in groves, ſometimes in the highways, and ſometimes on the tops of mountains; and it was a cuſtom to engrave upon them the name, enſign, or character of the deity to whom they were conſecrated.

In the great temples of ancient Rome there were ordinarily three altars: The firſt was placed in the ſanctuary, at the foot of the ſtatue of the divinity, upon which incenſe was burnt and libations offered; the ſecond was before the gate of the temple, and upon it they ſacrificed the victims; and the third was a portable altar, upon which were placed the offering and the ſacred veſſels.

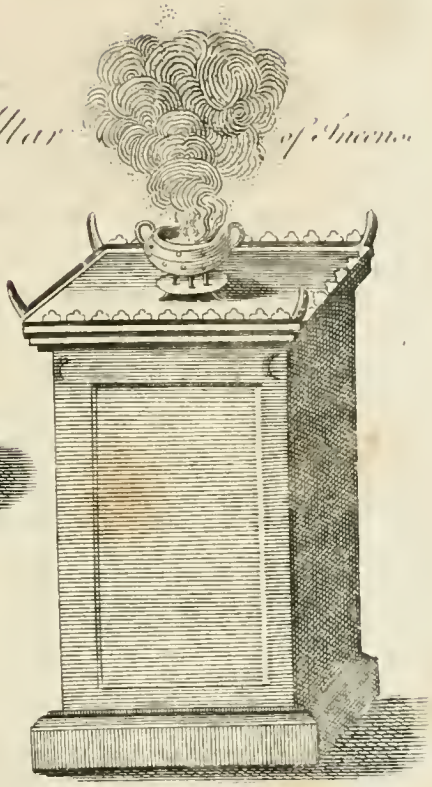
Beſides

Jewish Altars.

Altar of Burnt Offering.



Altar of Incense.



Pagan Altars.

Fig. 1.

Fig. 2.

Fig. 3.

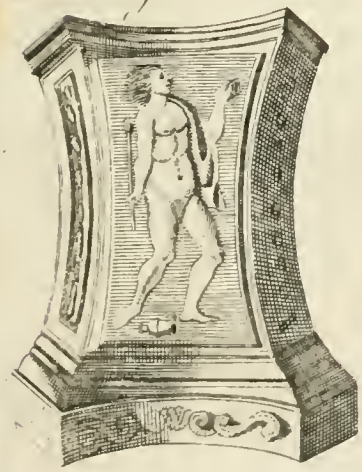


Fig. 4.

Fig. 5.

Altar. Beſides theſe uſes of altars, the ancients ſwore upon them, and ſwore by them, in making alliances, confirming treaties of peace, and other ſolemn occaſions. Altars alſo ſerved as places of refuge to all thoſe who fled to them, whatever crime they had committed.

Altars are doubtleſs as ancient as ſacrifices themſelves; conſequently their origin is not much later than that of the world, Gen. ch. iv. Some attribute their origin to the Egyptians; others to the Jews; others to the patriarchs before the flood. Some carry them as far back as Adam, whoſe altar is much ſpoken of by Jewiſh, and even Chriſtian writers. Others are contented to make the patriarch Enoch the firſt who conſecrated a public altar. Be this as it will, the earlieſt altars we find any expreſs teſtimony of are thoſe erected by Abraham.

Altars, in the patriarchal times, were very rude. The altar which Jacob ſet up at Bethel was nothing but a ſtone, which ſerved him inſtead of a bolſter; that of Gideon, a ſtone before his houſe: and the firſt which God commanded Moſes to erect was probably of earth or unpoliſhed ſtones, without any iron; for if any uſe was made of that metal, the altar was declared impure.

The principal altars of the Jews were, The altar of *incenſe*; that of *burnt-offering*; and the *altar*, or *table*, *for the ſhew bread*.

The *altar of incenſe* was a ſmall table of ſhittim wood, covered with plates of gold, of one cubit in length, another in width, and two in height. At the four corners were four kinds of horns, and all round a little border or crown over it. This was the altar hidden by Jeremiah before the captivity; and upon it the officiating prieſt offered, every morning and evening, incenſe of a particular compoſition. See Plate XVII.

The *altar of burnt-offerings* was made of ſhittim wood, and carried upon the ſhoulders of the prieſts by ſtaves of the ſame wood overlaid with braſs. In the time of Moſes, this altar was five cubits ſquare and three high; but in Solomon's temple it was much larger, being 20 cubits ſquare and 10 in height. It was covered with braſs; and at each corner was a horn or ſpire, wrought out of the ſame wood with the altar, to which the ſacrifices were tied. Within the hollow was a grate of braſs, on which the fire was made; through it fell the aſhes, which were received in a pan below. At the four corners of the grate were four rings and four chains, which kept it up at the horns. This altar was placed in the open air, that the ſmoke of the burnt-offerings might not ſully the inſide of the tabernacle. See Plate XVII.

The *altar* or *table* for the *ſhew-bread* was likewiſe of ſhittim wood, covered with plates of gold, having a little border round it, adorned with ſculpture. It was two cubits long, one wide, and one and a half in height. Upon this table, which ſtood in the holy of holies, were put, every Sabbath day, 12 loaves, with ſalt and incenſe.

The Jewiſh altars, after their return from the captivity, and the building of the ſecond temple, were in ſome reſpects different from thoſe deſcribed above. That of burnt-offerings was a large pile, built of unhewn ſtone, 32 cubits ſquare at the bottom, and 24 ſquare at the top. The aſcent was by a gentle riſing, 32 cubits in length, and 16 in breadth.

ALTAR, is alſo uſed among Chriſtians for the communion-table. Altar || Altenberg.

In the primitive church, the altars were only of wood; as being frequently to be removed from place to place. But the council of Paris, in 509, decreed that no altar ſhould be built but of ſtone. At firſt there was but one altar in each church; but the number ſoon increaſed; and from the writings of Gregory the Great, who lived in the ſixth century, we learn, that there were ſometimes in the ſame church twelve or thirteen. In the cathedral of Magdeburg there are no leſs than 49 altars.

The altar is ſometimes ſuſtained on a ſingle column, as in the ſubterraneous chapels of St Cecilia, at Rome, &c.; and ſometimes by four columns, as the altar of St Sebaſtian of Crypta Arenaria; but the cuſtomary form is, to be a maſſive of ſtone work, ſuſtaining the altar table. Theſe altars bear a reſemblance to tombs: to this purpoſe, we read in church-hiſtory, that the primitive Chriſtians chiefly held their meetings at the tombs of the martyrs, and celebrated the myſteries of religion upon them: for which reaſon, it is a ſtanding rule to this day in the church of Rome, never to build an altar, without incloſing the relics of ſome ſaint in it.

ALTAR-THANE, or ALTARIST, in old law-books, an appellation given to the prieſt or parſon of a pariſh, to whom the altarage belonged. See ALTARAGE.

ALTARAGE, in *Law*, altars erected in virtue of donations, before the Reformation, within a parochial church, for the purpoſe of ſinging of maſs for deceaſed friends.

ALTARAGE likewiſe ſignifies the profits ariſing to the prieſt on account of the altar.

AL-TAYEFF, a town of Hejaz, a diſtrict of Arabia Felix. It is ſituated about 60 miles eaſt of Mecca, behind Mount Gazwan, where the cold is more intenſe than in any other part of the diſtrict, but the air very wholeſome. Its territory abounds in fountains, and produces excellent raiſins. The town is ſurrounded with a wall, but is not very large.

ALTDORF, a large handſome town in Switzerland, and the chief of the canton of Uri. It is ſituated below the lake of the Four Cantons, in a plain, at the foot of a mountain whoſe paſſages are difficult, and ſerve inſtead of fortifications. It has four churches and two convents; St Martin's church and that of the Holy Croſs are the fineſt. The town-houſe and the arſenal are alſo worth ſeeing. E. Long. 8. 30. N. Lat. 46. 50.

ALTEA, a ſea-port town of Valencia in Spain. It was taken in 1705, in favour of the archduke Charles; but loſt after the battle of Almanza. W. Long. 0. 15. N. Lat. 46. 34.

ALTEMBURG, a town of Tranſylvania, 17 miles ſouth-weſt of Wiſemburg, and 35 ſouth of Clauſenbourg. E. Long. 23. 5. N. Lat. 46. 25.

ALTENA, or ALTONA, a ſea-port town of Germany, in the duchy of Holſtein in Lower Saxony. It is a modern town, built by the king of Denmark, and was burnt by the Swedes in 1712; but has ſince been beautifully rebuilt. The merchandiſe brought from Aſia by the Daniſh Eaſt India Company is ſold here. E. Long. 10. 0. N. Lat. 53. 51.

ALTENBERG, an ancient town of Germany, ſituated

Altenburg || Alternate.

situated on the river Pleiſs, with a good caſtle placed on a rock, in Miſnia, in the circle of Upper Saxony. It was formerly an imperial city, but at preſent belongs to the houſe of Saxony. Here is a college which has always been in a flouriſhing condition. In 1705, there was a nunnery founded for women of a high rank, who are Proteſtants. E. Long. 15. 8. N. Lat. 50. 59.

ALTENBURG, a ſmall fortified town of Hungary, in the territory of Moſon, near the Danube, about fifty-five miles from Vienna. E. Long. 35. 30. N. Lat. 48. 15.

ALTENBURG, or OWAR, a ſmall but ſtrong town of Hungary, ſeated in a marſh, with wide ſtreets. It is near the river Danube, and is ſurrounded with deep ditches. It is 15 miles ſouth of Preſburg, 40 ſouth-eaſt of Vienna, and 65 ſouth-weſt of Buda. E. Long. 17. 56. N. Lat. 44. 0.

ALTERANTS, or *ALTERATIVE Medicines*, ſuch as correct the bad qualities of the blood and other humours, without occaſioning any ſenſible evacuation.

ALTERATION, in *Phyſics*, the act of changing the circumſtances and manner of a thing; its general nature and appearance remaining the ſame. Or, it is an accidental and partial change in a body; without proceeding ſo far as to make the ſubject quite unknown, or to take a new denomination thereupon. Or, it may be defined, the acquiſition or loſs of ſuch qualities as are not eſſential to the form of the body. Thus, a piece of iron, which before was cold, is ſaid to be *altered*, when it is made hot; ſince it may ſtill be perceived to be iron, is called by that name, and has all the properties thereof. By this *alteration* is diſtinguiſhed from *generation* and *corruption*; thoſe terms expreſſing an acquiſition or loſs of the eſſential qualities of a thing. The modern philoſophers, after the ancient chemiſts and corpuſcularians, hold all *alteration* to be effected by means of local motion. According to them, it always conſiſts either in the emiſſion, acceſſion, union, ſeparation, or tranſpoſition, of the component particles.

ALTERCATION, a debate or conteſt between two friends or acquaintance. The word comes from *altercari*, which anciently ſignified to converſe or hold diſcourſe together. Thus we ſay, They never come to an open quarrel, but there is continually ſome little *altercation* or other.

ALTERN-BASE, in *Trigonometry*, a term uſed in contradiſtinction to the true baſe. Thus in oblique triangles, the true baſe is either the ſum of the ſides, and then the *difference* of the ſides is called the *altern baſe*; or the true baſe is the difference of the ſides, and then the *ſum* of the ſides is called the *altern baſe*.

ALTERNATE, in a general ſenſe, a term applied to ſuch perſons or things as ſucceed each other by turns. Thus, two who command each his day, are ſaid to have an alternate command, or to command alternately.

ALTERNATE, in *Heraldry*, is ſaid in reſpect of the ſituation of the quarters. Thus the firſt and fourth quarters, and the ſecond and third, are uſually of the ſame nature, and are called *alternate quarters*.

ALTERNATE, in *Botany*, when the leaves or branches of plants ariſe higher on oppoſite ſides alternately.

Alternatic || Aiting.

ALTERNATION, in its primary ſenſe, denotes a ſucceſſion by turns.

ALTERNATION is ſometimes uſed to expreſs the different changes or alterations of orders in any number of things propoſed. This is alſo called *permutation*, &c. and is eaſily found by a continual multiplication of all the numbers, beginning at unity. Thus, if it be required to know how many changes or alternations can be rung on ſix bells, multiply the numbers 1, 2, 3, 4, 5, 6, continually into one another; and the laſt product gives the number of changes.

ALTERNATIVE, is particularly uſed for the choice of two things propoſed. In this ſenſe we ſay, to take the *alternative* of two propoſitions.

ALTHÆA, MARSHMALLOW. See BOTANY *Index*.

ALTHÆA Frutex. See HIBISCUS, BOTANY *Index*.

ALTIMETRY, the art of meaſuring altitudes or heights, whether acceſſible or inacceſſible. See GEOMETRY.

ALTIN, a money of account in Muſcovy, worth three *copecs*; 100 of which make a ruble, worth about 4s. 6d. ſterling.

ALTIN, a lake in Siberia, from whence iſſues the river Ob, or Oby, in N. Lat. 52. 0. E. Long. 85. 55. This lake is called by the Ruſſians *Teloſkoi Oſero*, from the Teleſſi, a Tartarian nation, who inhabit the borders of it, and who give it the name of *Altin-Kul*. By the Calmucks it is called *Altinnor*. It is near 90 miles long and 50 broad, with a rocky bottom. The north part of it is ſometimes frozen ſo hard as to be paſſable on foot, but the ſouthern part is never covered with ice. The water in the Altin lake, as well as in the rivers which run through the adjacent places, only riſes in the middle of ſummer, when the ſnows on the mountains are melted by the heat of the ſun.

ALTINCAR, among mineraliſts, a ſpecies of factitious ſalt uſed in the fuſion and purification of metals.

The altincar is a ſort of flux powder. Divers ways of preparing it are given by Libavius.

ALTING, HENRY, a German divine, was born at Embden, in 1583. His father was miniſter of the church of Embden, and early deſtined his ſon to the ſame profeſſion. In the year 1602, after a grammatical courſe he was ſent to the univerſity of Herborn: there he ſtudied with ſo much aſſiduity and ſucceſs, that he ſoon had the honour of being a preceptor. Qualified by the vigorous exertions of his talents, he was appointed tutor to the three young counts of Naſſau, Solms, and Iſenburg, who ſtudied with the elector prince palatine, firſt at Sedan, and afterwards at Heidelberg. A proper diſcharge of the duties of a lower ſtation generally paves the way for a higher. For he was appointed preceptor to the prince in 1608: and in conſequence of his aſſiduity and ſucceſs, he was choſen to accompany the elector into England. Among the number of celebrated men to whoſe acquaintance he was introduced in England, was the famous Dr Abbot, archbiſhop of Canterbury. In 1613, Alting returning to Heidelberg after the marriage of the elector with the princeſs of England, received his degree of doctor of divinity, and was appointed director of the college of Wiſdom. The increaſed knowledge and invigorated talents of Alting, were always receiving renewed opportunities of exertion; thus his elo-

quence

Alting. quence and learning obtained full ſcope in the ſynod of Dort, to which he had been deputed by the Palatinate, along with two other divines.

It was but reaſonable for Alting to expect high preferment and high advantages from the avowed patronage of the elector; but in this he was greatly diſappointed, and he had only to participate in his misfortunes. In 1622, Count Tilly took the city of Heidelberg, and devoted it to plunder. In order to eſcape the fury of the ſoldiers, Alting endeavoured to paſs by a back door into the chancellor's houſe, which was put under a ſtrong guard; but the officer who guarded the houſe, as he was entering ſaid to him, "With this battle-axe I have to-day killed ten men, and Alting, if I knew where to find him, ſhould be the eleventh: who are you?" Alting with a ſingular preſence of mind returned an evaſive anſwer, which ſaved his life. "I am (ſaid he) a teacher in the college of Wiſdom." The officer took him under his protection, but the Jeſuits unfortunately taking poſſeſſion of the houſe, the next day, left the generous officer no time at his departure to take care of the teacher of the college of Wiſdom. Alting evaded the hands of the Jeſuits, by hiding himſelf in a garret, and a cook of the electoral court ſupplied him with food, who happened to be employed by Count Tilly in the kitchen occupied by him in the chancellor's houſe. In this perilous ſituation he remained until an opportunity offered of making his eſcape to Heilbron, whither his family had been conducted before.

But eccleſiaſtical intolerance haraſſed Alting, as much as he was formerly endangered by military hoſtility. With the permiſſion of the duke of Wirtemberg he retired for a few months to Schorndorf after the deſolation of the Palatinate by the victorious forces of Count Tilly. It was reaſonable to expect that a welcome and hoſpitable reception might have been given, among Proteſtants, to one who had juſt eſcaped the flames of a Popiſh war. But the doctrine of mutual forbearance and candour ſeems to have been little attended to by the Proteſtants at this period, whatever was their progreſs in the knowledge of the other doctrines of Chriſtianity. The palatinate being in the vicinity of the duchy of Wirtemberg, the profeſſors of Tubingen and Heidelberg frequently attacked each other in polemic writings and theological diſputations. The natural conſequence was, that a ſettled jealouſy and enmity exiſted between the two ſchools and their reſpective vicinities. The injuries which Alting had ſuffered from the common enemy were not ſufficient to ſecure him a friendly reception among the Lutheran miniſters of Schorndorf, who were involved in theſe feuds, and therefore murmured at the permiſſion which the duke had given to a profeſſor of Heidelberg to reſide there. The miſchievous effects of religious diſſenſions have been univerſally felt.

In 1623, Alting retired with his family to Embden, and afterwards followed to the Hague his late pupil, now king of Bohemia. Such was the unfeigned attachment of his maſter to him, that he ſtill retained him as a preceptor to his eldeſt ſon; and prevented him from accepting the charge of the church at Embden, and likewiſe of a profeſſorſhip at the univerſity of Franeker. In 1627 his importunity prevailed upon his patron, and he obtained leave to remove to Groningen, and there aſcended the divinity chair; and continued to lecture with increaſing reputation until the day of his death. The ardent deſire and repeated endeavours of ſeveral univerſities to appropriate to themſelves the honour and benefit of his ſervices, is the moſt unequivocal proof of the general eſteem in which his character was held. The ſtates of Groningen poſitively refuſed to give their conſent to his removal, when the univerſity of Leyden ſolicited him to come and labour among them. But ſome time after, the proſpect of extenſive uſefulneſs in re-eſtabliſhing the univerſity of Heidelberg, and reſtoring the churches of the Palatinate, determined him to accept the office of profeſſor of divinity and eccleſiaſtical ſenator, preſented to him by Prince Lewis Philip. In the year 1634, amidſt numerous hardſhips, to which the exiſting war expoſed him, he ſet out for Heidelberg, and purſued his journey as far as Francfort; when the battle of Norlingen, in which the imperialiſts were victorious, rendered his farther progreſs impracticable, and therefore with great difficulty he returned to Groningen. Alting.

Domeſtic affliction and perſonal ſufferings embittered the remaining years of this excellent man's life. Deprived of his eldeſt daughter by death, ſuch was his great affection for her that it brought on a ſettled melancholy, attended with a bodily diſeaſe which was with great difficulty removed; but after an interval of four years a ſettled and irrecoverable melancholy ſeized him, in conſequence of the loſs of an amiable and beloved wife, which, together with the return of his bodily diſeaſe, in a few months put a period to his uſeful life in the year 1644.

Alting was a man of eminent talents and extenſive learning, poſſeſſed of amiable diſpoſitions, which induced him to be more ſolicitous to ſerve the public than to benefit himſelf. The amiable character and extenſive learning of Alting, cannot fail deeply to intereſt every reader, in conſequence of his misfortunes. He was averſe to quarrels and diſputes about trifles, although no friend to the innovations introduced at this period by the Socinians. According to his own judgment, adhering to the plain doctrine of Scripture, he was equally deſirous to avoid fanatical ſcrupuloſity and ſophiſtical ſubtility. The productions of his pen are: *Notæ in Decadem Problematum Johannis Behm*, Heidelbergæ, 1618; "Notes on a Decad of Jacob Behmen's Problems." *Loci Communes*; "Common places." *Problemata*; "Problems." *Explicatio Catacheſeos Palatinat.*; "Explanation of the Palatine Catechiſm." *Exegeſis Auguſtanæ Confeſſionis*, &c. Amſt. 1647; "Commentary on the Auguſtan Confeſſion." *Methodus Theologiæ Didacticæ et Catacheticæ*, Amſt. 1650; "A method of Didactic and Catechetic Theology." The *Medulla Hiſtoriæ Prophanæ*, "Marrow of Profane Hiſtory," publiſhed under the name of Paræus, was written by Alting. (*Gen. Biog.*)

Alting, *James*, ſon of Henry Alting, was born at Heidelberg in 1618. After the uſual courſe of grammatical ſtudies he became a ſtudent, and ſoon after profeſſor of divinity in the univerſity of Groningen. The Oriental languages were his favourite ſtudies at an early period of his life; and in 1638 he put himſelf under the tuition of a Jewiſh rabbi at Embden. Determining to take up his reſidence in England, he arrived there in 1640, and was admitted to clerical orders by Doctor Prideaux biſhop of Worceſter. By an

Alting. Altitude.

an offer of the Hebrew profeſſorſhip in the univerſity of Groningen, he was ſoon induced to alter his plan of life, and conſequently again returned to Germany in 1643. His active aſſiduity in theſe languages, and his knowledge in other ſciences, procured him univerſal eſteem, and great reputation as a ſcholar. About this time he received many academic honours; he was admitted doctor of philoſophy, academic preacher, and at laſt, in conjunction with a colleague, Samuel des Marets, was choſen profeſſor of divinity. Theſe profeſſors followed different methods of teaching, and adopted different ſyſtems. Des Marets was an admirer and follower of the ſubtilities of the ſcholaſtics; and by the ingenuity with which he purſued the ſcholaſtic plan of inſtruction had acquired great reputation and conſiderable influence. Alting ſpent his time in the ſtudy of the Scriptures, and in the purſuit of Rabbinical learning; and he delivered a courſe of lectures on divinity, which gained him great popularity. As it might naturally be expected, a mutual jealouſy aroſe between the two profeſſors; and their reſpective partiſans in the univerſity carried their animoſity to an undue height. Eſtabliſhed opinion, and the weight of authority, marſhalled on the ſide of Des Marets. By the permiſſion of the curators of the univerſity he appeared as public accuſer of Alting, and produced a long liſt of erroneous propoſitions to the divines of Leyden for their opinion. The judgment of the divines upon the diſpute ſhows a great degree of moderation and good ſenſe: they pronounced Alting innocent of hereſy, but imprudently fond of innovation; and they declared Des Marets deficient in modeſty and candour. If the ſuperiors had not prohibited the farther diſcuſſion of theſe ſubjects in the conſiſtories, claſſes, and ſynods, they would have occaſioned as much miſchief as they had excited general attention. Such was the protection given to Alting, that whenever any of the order of eccleſiaſtics propoſed any further meaſures againſt him, they were immediately rejected by the civil power; nay, the penalty of deprivation was decreed againſt thoſe clergy who ſhould revive the *Mareſio-Altingian* controverſy. Whatever might be the advantages reſulting to Alting from this protection, the magiſtrates certainly did wrong in proceeding ſo far in prohibiting a free diſcuſſion from the preſs, either for or againſt the judgments of the divines of Leyden. Although a kind of reconciliation was attempted by their common friends while Des Marets lay upon his death-bed, yet the breach between Des Marets and Alting was never perfectly healed. Dr Alting died of a fever in 1679. The fondneſs which he ſhewed for Rabbinical learning gave birth to the general report, that he was inclined to become a Jew. His opinions which ſeem to have excited more general attention than they deſerve, may be ſeen at large in his writings, which were collected a few years after his death, and publiſhed in five volumes folio by his couſin Menſo Alting, who wrote a good deſcription of the Low Countries, under the title of *Notitia Germaniæ Inferioris*. (*Gen. Biog.*)

ALTITUDE, acceſſible and inacceſſible. See GEOMETRY.

The method of taking conſiderable terreſtrial altitudes, of which thoſe of mountains are the greateſt, by means of the barometer, is very eaſy and expeditious. It is done by obſerving, on the top of the mountain, how much the mercury has fallen below what it was at the foot of the mountain. See BAROMETER.

Altitude || Alton

ALTITUDE of the Eye, in *Perſpective*, is a right line let fall from the eye, perpendicular to the geometrical plane.

ALTITUDE, in *Aſtronomy*, is the diſtance of a ſtar, or other point, in the mundane ſphere, from the horizon.

This altitude may be either *true* or *apparent*. If it be taken from the rational or real horizon, the altitude is ſaid to be true or real; if from the apparent or ſenſible horizon, the altitude is apparent. Or rather, the apparent altitude is ſuch as it appears to our obſervation; and the *true* is that from which the refraction has been ſubtracted.

The true altitudes of the ſun, fixed ſtars, and planets, differ but very little from their apparent altitudes; becauſe of their great diſtance from the centre of the earth, and the ſmallneſs of the earth's ſemidiameter, when compared thereto. But the difference between the true and apparent altitude of the moon is about 52. This ſubject is further explained under ASTRONOMY.

ALTITUDE Inſtrument, or *Equal Altitude Inſtrument*, is that uſed to obſerve a celeſtial object when it has the ſame altitude on the eaſt and weſt ſides of the meridian. See ASTRONOMY.

ALTKIRK, a town of France, in the department of the Upper Rhine, ſituated on the river Ill, in N. Lat. 47. 40. E. Long. 7. 15.

ALTMORE, a town of Ireland, in the county of Tyrone, and province of Ulſter, ſituated in N. Lat. 54. 34. W. Long. 7. 2.

ALTON, a town in Hampſhire, ſeated on the river Wey; W. Long. 0. 46. N. Lat. 51. 5. It is governed by a conſtable; and conſiſts of about 300 houſes, indifferently built, chiefly laid out in one pretty broad ſtreet. It has one church, a Preſbyterian, and a Quaker meeting, a famous free ſchool, a large manufacture of plain and figured baragons, ribbed druggets, and ſerges de Niſmes; and round the town is a large plantation of hops.

ALTON, or AVELTON, a village in Staffordſhire, five miles north of Utoxeter. There are the ruins of a caſtle here, which ſome would have to be built before the Norman conqueſt; but Dr Plott is pretty certain that it was erected by Theobald de Verdun, in the beginning of the reign of Edward II. A great part of the walls are ſtill ſtanding, but they are in a very ruinous condition.

ALTO *et* BASSO, or *in* ALTO *et in* BASSO, in *Law*, ſignifies the abſolute reference of all differences, ſmall and great, high and low, to ſome arbitrator or indifferent perſon. *Pateat univerſis per præſentes, quod Willielmus Tylar de Yetton, et Thomas Gower de Almeſtre, poſuerunt ſe in* Alto *et in* Baſſo, *in arbitrio quatuor hominum; viz. de quadam querela pendente inter eos in curia. Nos et terram noſtram* altè *et* baſsè *ipſius domini Regis ſuppoſuimus voluntati.*

ALTO-Relievo. See RELIEVO.

ALTO Repieno, in *Muſic*, the tenor of the great chorus, which ſings and plays only now and then in ſome particular places.

ALTORF, a town of the circle of Franconia, in Germany.

Alt ranſtadt
ll
Alvar

Germany. It has a botanical garden, with a great variety of plants, an anatomical theatre, and a handſome library. It is ſubject to the houſe of Brandenburg; and is ſeated on the confines of Bavaria, 15 miles from Nuremberg. E. Long. 11. 7. N. Lat. 49. 25.

ALT-RANSTADT, a town in Saxony, famous for the treaty between Charles XII. king of Sweden and Auguſtus elector of Saxony, in 1706, wherein the latter reſigned the kingdom of Poland.

ALTRINGHAM, a town of Cheſhire in England, upon the borders of Lancaſhire, ſeven miles from Mancheſter. W. Long. 1. 30. N. Lat. 53. 25.

ALTZEG, a town of Germany in the Lower Palatinate, the capital of a territory of the ſame name, with an old caſtle. W. Long. 7. 25 N. Lat. 49. 44.

ALVA DE TORMES, a conſiderable town in Spain, in the kingdom of Leon, and territory of Salamanca, with a very handſome caſtle. It is ſeated on the north bank of the river Tormes. W. Long. 6. 1. N. Lat. 41. 0.

ALVA, *Ferdinand Alvarez of Toledo, duke of*, was born in 1508, and deſcended from one of the moſt illuſtrious families of Spain. His grandfather, Frederick de Toledo, was his preceptor in the military and political arts, and he diſplayed his valour at the battle of Pavia and at the ſiege of Tunis. The ambitious Charles V. ſelected Alva as a proper inſtrument for conducting his military enterpriſes, and he made him his general in 1538; and, after ſeveral operations, in which he both diſplayed his valour and military knowledge, in 1542 he ſucceſsfully defended Perpignan againſt the dauphin of France.

In 1546, Alva was made general in chief of the army which marched againſt the German Proteſtants, who were marſhalled under the banners of the elector of Saxony. Francis, the king of France, died at Rambouillet, and by his death a conſiderable change was made in the ſtate of Europe. Inſtantly, therefore, Charles began his march from Egra on the borders of Bohemia, and entered the ſouthern frontier of Saxony, and attacked Altorf upon the Elſter. Inceſſantly puſhing forward, he arrived the evening of the 23d of April on the banks of the Elbe, oppoſite to Muhlberg. The river, at that place, was three hundred paces in breadth, about four feet in depth; its current rapid; and the bank poſſeſſed by the Saxons was higher than that which he occupied. In oppoſition to the opinion of the duke of Alva and his other officers, Charles, with undaunted courage, and with inexpreſſible difficulties, led his army through the river, and engaged the Saxons. The elector diſplayed great perſonal courage and military knowledge, but having received a wound in the face, he at laſt ſurrendered himſelf priſoner. When he approached the emperor, he ſaid, "The fortune of war has made me your priſoner, moſt gracious emperor, and I hope to be treated"—— Here Charles harſhly interrupted him, "And am I then at laſt acknowledged to be emperor; Charles of Ghent was the only title you lately allowed me. You ſhall be treated as you deſerve." The elector made no reply; but, with an unaltered countenance, which diſcovered neither aſtoniſhment nor dejection, accompanied the Spaniſh ſoldiers appointed to guard him. The emperor proceeded towards Wittemberg, whither the remains of the Saxon army had fled, carrying along with him the captive prince, as a ſpectacle of conſternation and amazement to his own ſubjects. But when he approached the town, he found it defended by the vigorous efforts of the elector's wife, along with the inhabitants. He ſummoned Sibylla once and a ſecond time to open the gates, informing her, that if ſhe perſiſted in her obſtinacy, the elector ſhould anſwer for it with his head. Accordingly he brought his priſoner to an immediate trial. The proceedings againſt him were as irregular as the ſtratagem was barbarous. Inſtead of conſulting the ſtates of the empire, or remitting the cauſe to any court, which, according to the German conſtitution, might have legally taken cognizance of the elector's crime, he ſubjected the greateſt prince in the empire to the juriſdiction of a court martial. The emperor ſelected the unrelenting duke of Alva as a proper inſtrument to carry into effect any meaſure of violence and oppreſſion, and therefore made him preſident of that court, compoſed of Spaniſh and Italian officers. Moved more by the intreaties of his wife than by a ſenſe of his own danger, the elector ſubmitted to all the rigorous and unjuſt meaſures that were propoſed in order to ſave his life; but when it was added, that he ſhould alſo renounce the Proteſtant faith and become a Roman Catholic, he refuſed to act in oppoſition to his conſcience, and bravely fell a ſacrifice to the cauſe of truth.

Alva.

In 1552, Alva was intruſted with the command of the army intended to invade France, and was conſtrained by the opinion and authority of the emperor to lay ſiege to Metz, in oppoſition to his own military knowledge; but notwithſtanding all his valour and abilities, the duke of Guiſe ſucceſsfully defended the place. In conſequence of the ſucceſs of the French arms in Piedmont, he was made commander in chief of all the emperor's forces in Italy, and at the ſame time inveſted with unlimited power. Succeſs did not, however, attend his firſt attempts, and after ſeveral unfortunate attacks, he was obliged to retire into winter quarters. The next year he was ſent into the pope's territories, and, had he not been reſtrained by his maſter, he would have taken poſſeſſion of all his fortified places, and deterred Henry from entering into any new connexion with him, and have thereby prevented the renewal of the war. Philip was ſtrongly inclined to peace, but Alva was inclined to ſevere meaſures: he, however, yielded to the inſtructions of his maſter, until being deluded, and ſometimes haughtily anſwered, he at length ſent Pino de Loffredo with a letter to the college of cardinals, and another to Paul, in which, after enumerating the various injuries which his maſter had received, and renewing his former offers of peace and friendſhip, he concluded with proteſting that, if his offers were again rejected, the pope ſhould be chargeable with all the calamities that might follow. The pope threw Loffredo into priſon; and, had not the college of cardinals interpoſed, he would have even put him to death; and on account of Philip's failing to pay tribute for Naples, he deprived him of the ſovereignty of that kingdom. This violent conduct of Paul gave great offence throughout all Europe, and greatly leſſened his influence in Italy; but Philip, though a young, ambitious, powerful monarch, and of a temper of mind impatient of injuries and affronts,

Alva. moved with a religious veneration, discovered an amazing reluctance against proceeding to extremities. After much time spent in negotiation, Philip was at last forced to give orders for Alva to take the field. He cheerfully obeyed, and began his march in the beginning of September 1556, with a well-disciplined army, which reducing several towns in the Campagna di Roma, he pursued his conquests to the very gates of Rome. The circumstances, however, in which Alva found his army, induced him to make a truce of 40 days, and, after several negotiations, he yielded to peace. One of its terms was, that the duke of Alva should in person ask forgiveness of the haughty pontiff whom he had conquered. Proud as the duke was by nature, and accustomed to treat with persons of the highest dignity, yet such was the superstitious veneration then entertained for the papal character, that he confessed his voice failed him at the interview, and his presence of mind forsook him. Not long after this, he was sent at the head of a splendid embassy to Paris, to espouse, in the name of his master, Elizabeth, daughter of Henry king of France.

Philip II. his new master, being strongly devoted to the Roman see, and determined to reclaim rebels to his government, and dissenters from his faith, by the most unrelenting severity and unbounded cruelty, he pitched upon Alva as the fittest person to carry this system into practice: with this design, therefore, he was sent into the Low Countries in 1567. Having received his orders, armed with such power as left only the shadow of authority to the natural governor, and provided with 10,000 veterans, he marched towards that devoted country. When he arrived, he soon shewed how much he merited the confidence which his master reposed in him, and instantly erected a bloody tribunal, to try all persons who had been engaged in the late commotions which the civil and the religious tyranny of Philip had excited. The depraved enormities of the mind of Alva raged with unexampled violence. He imprisoned the counts Egmont and Horn, the two popular leaders of the Protestants, and soon brought them to an unjust trial, and condemned them to death. In a little time he totally annihilated every privilege of the people, and with uncontrolled fury and cruelty, put multitudes of them to death. Beholding herself deprived of all authority, and her subjects devoted to destruction, the duchess of Parma resigned her office, disdaining to hold the nominal, while the actual reins of power were in the hands of Alva. This event increased the general tide of wretchedness, and every place was filled with scenes of horror and dismay. Unable for the present to administer the least aid, the prince of Orange saved his life by flight. This noble prince suddenly collected an army in Germany, and returned to the relief of his countrymen; and at the same time Prince Lewis, his brother, marched with an army into Friesland. Although success at first attended Lewis, yet the activity and experience of Alva prevailed, and he was totally defeated. The prince of Orange proved a more formidable foe; and it gave exertion to the united talents of Alva, and his son Frederick of Toledo, to prevent the prince from making a descent upon the Netherlands. But notwithstanding all the address and military skill of the prince of Orange, this was effected; and the glory remained to Alva to baffle that great leader, and to compel him, after great loss of men, to disband the remainder of his army. Now the cruelty of Alva had unrestrained vent. Instantly the executioner was employed in removing all those friends of freedom whom the sword had spared. Uncontrolled, the base and unrelenting heart of Alva began to reduce all the provinces to utter slavery, and to extirpate Protestantism in that country. In most of the considerable towns, Alva built citadels. He erected a statue of himself, which was no less a monument of his vanity than his tyranny, in the city of Antwerp: he was figured trampling on the necks of two smaller statues, representing the two estates of the Low Countries. By his unusual and arbitrary requisition of new supplies from the states, he greatly aggravated this haughty insult. The human mind displays unusual vigour when rendered desperate by oppression. The exiles from the Low Countries, roused to action, fitted out a kind of piratical fleet, and, after strengthening themselves by successful depredations, ventured upon the bold exploit of seizing the town of Briel. Thus, unintended by him, the cruelty of Alva was the instrument of the future independence of the seven Dutch provinces. The fleet of the exiles having met the Spanish fleet, totally defeated it, and reduced North Holland and Mons; and numbers of cities hastened to throw off the yoke; while the states-general assembling at Dordrecht, openly declared against Alva's government, and marshalled under the banners of the prince of Orange. This situation of affairs opened the eyes of Alva to behold the instability of a power founded on terror and oppression; he therefore began in vain to use more lenient measures. He prepared, however, with vigour to oppose the gathering storm, and afterwards recovered Mons, Mechlin, and Zutphen, under the conduct of his son Frederick, where his soldiers more than retaliated upon the prince of Orange. With the exception of Zealand and Holland, he regained all the provinces; and at last his son stormed Waerden, and, massacring its inhabitants with the most savage cruelty, he then proceeded to invest the city of Haerlem. Fully convinced of the miseries that waited their surrender, this city stood an obstinate siege; and nothing less than the inflexible and persevering spirit of Alva could have opposed difficulties almost insurmountable. Despairing of success, Frederick was at one time disposed to raise the siege, but the stern reproaches of his father urged him on; and at length the inhabitants, overcome with fatigue and resistance, surrendered. The victorious Frederick gave tolerable conditions to the town; but his cruel father arriving on the third day after the surrender, sacrificed numerous victims, who had been led to expect mercy, and satiated his vengeance to the full. Their next attack was upon Alkmaar; but the spirit of desperate resistance was raised to such a height in the breasts of the Hollanders, that the Spanish veterans were repulsed with great loss, and Frederick constrained reluctantly to retire. Alva now resolved to try his fortune by sea, and with great labour and expence fitted out a powerful fleet, and proceeded to attack the Zealanders, but was entirely defeated, and the commander taken prisoner. About the same period, the prince of Orange proceeded to attack the town of Gertruydenburg. Alva's feeble Alva.

state

Alva. state of health and continued disasters induced him to solicit his recal from the government of the Low Countries; a measure which, in all probability, was not displeasing to Philip, who was now resolved to make trial of a milder administration. In December 1573, that devoted country was freed from the presence and oppressions of the duke of Alva, who, accompanied by his son, returning home, gave out the inglorious boast, that he had, during the course of six years, besides the multitudes destroyed in battle and massacred after victory, consigned 18,000 persons to the executioner. Requesens, who succeeded him in the command, in his first act of administration, pulled down his insolent effigies at Antwerp, so that nothing might remain of him in that much injured country but the remembrance of his injustice and cruelty.

Returning from this scene of oppression and blood, he was treated for some time with great distinction by his master. Justice, however, soon overtook the crimes of Alva: for his son having debauched one of the king's attendants, under promise of marriage, he was committed to prison; and being aided in his escape by his father, and married by him to a cousin of his own, this procured Alva's banishment from court, and confinement in the castle of Uzeda. He remained two years in this disgraceful situation, until the success of Don Antonio, in assuming the crown of Portugal, determined Philip to turn his eyes towards a person, in whose fidelity and abilities he could on this occasion most confide. A secretary was instantly dispatched to Alva, to make inquiries concerning the state of his health, and whether or not it was sufficiently vigorous to undertake the command of an army. The aged chief returned an answer full of loyal zeal, and was immediately appointed to the supreme command in Portugal. It is a singular fact, however, that the enlargement and elevation of Alva was not followed by forgiveness. It is a characteristic mark of the unrelenting temper of Philip, and, at the same time, a noble testimony to the honour and loyalty of Alva, that although placed in this important trust, he did not procure his pardon. In 1581, Alva entered Portugal, defeated Antonio, drove him from the kingdom, and soon reduced the whole under the subjection of Philip. Entering Lisbon, he seized an immense treasure; and with their accustomed violence and rapacity, he suffered his soldiers to sack the suburbs and vicinity. It is reported, that Alva being requested to give an account of the money expended on that occasion, he sternly replied, "If the king asks me for an account, I will make him a statement of kingdoms preserved or conquered, of signal victories, of successful sieges, and of sixty years service." Philip deemed it proper to make no farther inquiries. Alva, however, did not enjoy the honours and rewards of his last expedition, for in 1582, at the age of 74, he was removed by death to the impartial tribunal of heaven, to receive the just rewards of his iniquitous life.

The actions already enumerated give such an ample idea of his character, that little more is necessary to complete it. In him a variety of extremes concentred. Some of the best qualities of a commander were blended with some of the worst that ever exalted in a man or in a general. The Spanish severity, little tempered by the spirit of generosity, appeared in all its horrible deformity in Alva. A strict impartial discipline was his greatest military virtue, and vanity was his greatest weakness. In consequence of this strict discipline, he sometimes punished the unlicensed barbarities of his soldiers; and there is an instance recorded, that when his favourite son Frederick, thinking he could attack the prince of Orange with advantage, sent a request to his father for permission, he received a stern reprimand, for presuming to exercise his judgment on a point already determined by his superior, with a threatening in case of repetition. (*Gen. Biog.*)

Alvah, Alvares.

ALVAH, the wood wherewith Moses sweetened the waters of Marah, Exod. ch. xv. ver. 25.—The name of this wood is not found in Scripture; but the Mahometans give it that of *alvah*, and pretend to trace its history from the patriarchs before the flood. Josephus, on the contrary, says, that Moses used the wood which he found next lying before him.

ALVARES DE LUNA, treasurer, and a great favourite of John II. king of Castile, was famous for the prodigious ascendency he gained over this prince, and for the punishment which at length overtook him. He was a natural son of Don Alvaro de Luna, lord of Canete in Arragon, and of a woman of infamous character. He was born in 1388, and named Peter; but Pope Benedict XIII. who was charmed with his wit though yet a child, changed Peter to Alvares. He was introduced to court in 1408, and made a gentleman of the bedchamber to King John, with whom he grew into the highest favour. In 1427 he was obliged to retire: the courtiers exerted all their endeavours to ruin him: they complained, that a man of no military skill, of no virtues whatever, should by mere artifice and dissimulation, be advanced to the highest authority; and they could not bear, that by the assistance of a few upstart men, whom he had raised and fixed to his interest, he should reign as absolutely as if he were king.

They prevailed against him, and Alvares was banished from court a year and a half: but this was the greatest affliction imaginable to the king; who showed all marks of distress the moment he was removed from his presence, and now thought and spoke of nothing but Alvares. He was therefore recalled; and, being invested with his usual authority, revenged himself severely upon his enemies, by persuading the king to banish them. Of the 45 years he spent at court, he enjoyed for 30 of them so entire an ascendency over the king, that nothing could be done without his express orders: nay, it is related by Mariana, that the king could not change an officer or servant, or even his clothes or diet, without the approbation of Alvares. In short he wanted nothing to complete his grandeur but the name of king: he had all the places in the kingdom at his disposal; he was master of the treasury, and by bounties had so gained the hearts of the subjects, that the king, though his eyes were now opened, and his affections sufficiently turned against him, durst not complain.

But the day of reckoning was approaching, and at length he was seized; yet not directly, openly, and violently, but with some of that management which upon a similar occasion was formerly employed by Tiberius against Sejanus. During his confinement, he made

Alvares. Alvarez. several attempts to speak to the king in perſon; but not being able to effect this, he ſent the following letter, from which, as well as from the reſt of Alvares's hiſtory, all court favourites may draw abundant matter for edification and inſtruction. "Sir, It is five "and forty years ſince I was admitted into your ſer- "vice. I do not complain of the rewards I have "received: they were greater than my merits or ex- "pectation, as I ſhall not deny. There was but one "thing wanting to complete my happineſs; and that "was, to have fixed proper limits in time to this great "fortune of mine. While, inſtead of chooſing retire- "ment, after the example of the greateſt men, I ſtill "continued in the employment, which I thought not "only my duty, but neceſſary for your intereſt, I fell "into this misfortune. It is very hard that I ſhould "be deprived of liberty, when I have riſked life and "fortune more than once to reſtore it to you. Grief "prevents me from ſaying more. I know that the "Deity is provoked againſt me by my ſins; but it will "be ſufficient for me, if his anger is appeaſed by the "calamities I now ſuffer. I can no longer bear that "prodigious maſs of riches, which it was wrong in "me to have heaped together. I ſhould willingly "reſign them, but that every thing I have is in your "power; and I am denied the opportunity of ſhowing "mankind, that you have raiſed a perſon to the height "of greatneſs, who can contemn wealth as well as pro- "cure it, and give it back to him from whom he re- "ceived it. But I deſire you in the ſtrongeſt terms, "that, as I was obliged, by the lowneſs of the trea- "ſury, to raiſe 10,000 or 12,000 crowns by methods "I ought not to have taken, you will reſtore them to "the perſons from whom they were extorted. If you "will not grant this on account of the ſervices I have "done, yet I think it neceſſary to be done from the rea- "ſon of the thing."

This letter, however, produced no effect in his favour: Alvares was tried, and condemned to loſe his head. After condemnation, he was removed to Vailadolid; and having confeſſed himſelf, and received the ſacrament, he was carried upon a mule to the market-place, in the middle of which a large ſcaffold was erected. Mounting the ſcaffold, he paid reverence to the croſs, and preſently gave his hat and ſignet to his page, ſaying, "Theſe are the laſt gifts you will ever receive from me." He then ſubmitted himſelf to the axe with the utmoſt intrepidity.

ALVAREZ, Francis, a Portugueſe prieſt, and almoner to Emanuel, king of Portugal, flouriſhed about the beginning of the 16th century. He was ſent ambaſſador from Portugal to David prince of Abyſſinia; and after a reſidence of ſix years in that country, returned with letters of friendſhip from David to Juan, who had ſucceeded Emanuel, and of ſubmiſſion to Pope Clement VII. At Bologna, in the year 1523, he gave a narrative of his expedition to the pope, in the preſence of the emperor Charles V. In the year 1540, he publiſhed the relation of his journey in one volume folio, in the Portugueſe language. He gives a plain and accurate deſcription of this empire; and we are indebted to him for the firſt of the kind that ever was publiſhed. This work was tranſlated into Latin, under the title of *De Fide, Regione, Moribus Ethiopum*, by Damien Goez, a Portugueſe gentleman; and it has often been reprinted and tranſlated into other languages. The information of Alvarez is not, however, to be received with implicit credit, becauſe he does not always ſpeak from his own obſervation, and he frequently exaggerates. (*Dict. Hiſt.*)

Aludels. Alviano.

ALUDELS, in the older and more complicated chemical apparatus, were earthen pots without bottoms, inſerted into each other, and uſed in ſublimations.

ALVEARIUM, in *Anatomy*, the bottom of the *concha*, or hollow of the outer ear.

Alvearium alſo ſignifies a bee-hive. The word is formed of *alveus*, "a channel or cavity," in alluſion to the *alveoli* or cells in bee-hives.

Some of the ancients uſe alſo the word *alvearium* for a bee-houſe, more uſually called among us *apiary*.

Alvearium is ſometimes alſo uſed figuratively, to denote a collection; in which ſenſe, *alvearium* amounts to much the ſame with what we otherwiſe called *theſaurus*, *cornucopia*, or the like. Vinc. Boreus has publiſhed an alvearium of law.

ALVEOLUS, in *Natural Hiſtory*, the name of the waxen cells in bee-hives. Alſo the name of a ſea foſſil of a conic figure, compoſed of a number of cells like bee-hives, joined into each other with a pipe of communication.

Alveolus, in *Anatomy*, the ſockets in the jaws wherein the teeth are fixed. Some writers ſpeak of teeth growing without alveoli. Pliny mentions a perſon who had a tooth in his palate. Euſtachius relates, that he ſaw a man at 60 had a tooth growing out of the middle of his fauces. Haller gives an inſtance of a perſon whoſe teeth were of a piece with his jaws, without any inſertion into alveoli.

ALVIANO, Bartholomew, a Venetian general, flouriſhed in the beginning of the 16th century. His talents were well calculated for the conduct of military affairs, and in an early part of his life, raiſed him to great reputation. In the year 1508, he gained ſuch ſignal victories over the emperor Maximilian, that he was decreed triumphal honours by the republic. During the famous league of Venice, he was ſecond in command along with Count Pitigliano. It was, however, unfavourable to the cauſe in which they had engaged, that the tempers of the two commanders were very different. The commander in chief was heſitating and cautious; the other was bold and intrepid. Alviano commanded the rear-guard at the famous battle of Aignadel, and after diſplaying the greateſt exertions of valour, was wounded, overpowered, and at laſt taken priſoner. An increaſing tribute was paid to the military talents of Alviano; for after the Venetians had become the allies of France, he was intruſted with the command of their army. When the emperor attacked Padua, he defended it againſt him, and diſplayed numerous acts of valour in repulſing the imperial troops. But the current of human life runs not equally ſmooth on its attendance upon any character; for he loſt the great battle of La Motte, in which, however, his exertions were ſo conſpicuous, that the ſenate gave him the moſt honourable aſſurance of the continuance of their eſteem. Fortune, however, ſoon became propitious to this great man, and he defeated the enemy in Friuli. In the deſperate battle of Marignano, he afforded ſuch timely aid to Francis I. that it greatly contributed to his ſucceſs. But the moſt vigorous

Alum. gorous conſtitution muſt one day yield to the force of conſtant exertions, and the moſt inceſſant fatigue; he had incurred ſuch hardſhips in ſuperintending the works at the ſiege of Breccia, that he was ſeized with a fever, of which he died at the advanced age of 62. His character ſtands high in the annals of military fame. By a ſtrict obſervance of diſcipline, and a profuſe liberality to his ſoldiers, he ſecured their eſteem. As an unequivocal proof of this, they kept his body unburied twenty-five days, carrying it about with them during their marches, with all funeral pomp. His loſs was deeply regretted by the ſtate, and, as a proof thereof, his body was buried at the public charge, his unprovided family was ſupported by a liberal penſion, and his daughters were portioned by the ſtate. (*Gen. Biog.*).

ALUM, in *Chemiſtry*, a clear and tranſparent ſaline matter, uſually ſold in large maſſes, of a very auſtere and aſtringent taſte, uſeful in medicine and in various arts.

Moſt of the alum to be met with is artificially prepared by the methods related in their proper place under the article CHEMISTRY, or by others ſimilar to them: though ſometimes a ſmall quantity is produced naturally. This native alum is mixed with heterogeneous matters, or efflorefces in various forms upon the ores during calcination. It rarely occurs in a cryſtallized ſtate, though thus it is ſaid to be met with in Egypt, Sardinia, Spain, Bohemia, and other places. It is alſo found in waters impregnated with fixed airs, but very ſeldom in fountains or hot medicated waters.

There are ſeveral kinds of alum to be met with; but theſe differ from one another only in being mixed with ſome ſalts which are not of the aluminous kinds. That called the Roman alum has been conſidered as preferable to any other. This is uſually met with in ſmall cryſtals, and has a reddiſh colour, moſt probably owing to a ſmall quantity of calx of iron, which, however, does not in the leaſt impair its qualities. The other kinds of alum contain a portion either of vitriolated tartar or ſal ammoniac, according to the nature of the alkali uſed in its preparation. Mr Bergman informs us, that the vegetable alkali, if pure, does not hurt the alum, though it be added in the preparation; but that the volatile alkali, by adulterating it with a portion of vitriolic ſal ammoniac, renders it unfit for ſome purpoſes. The alum, made by adding a portion of clay to the liquor at the beginning of the boiling, he conſiders as equal, if not ſuperior, to Roman alum. He informs us alſo, that a kind of alum ſome time ago began to be manufactured at Brunſwick, which was equal in quality to the Roman alum. On a chemical analyſis of this alum he found it mixed with cobalt.

This ſalt is extremely uſeful in the art of dyeing; as by means of it a great number of colours are fixed and rendered permanent upon cloth, which otherwiſe would either not adhere in any degree, or only for a very ſhort time. In what manner this is accompliſhed, we are very much ignorant; the conjectures and theories on this ſubject are related under the article DYEING. It conſtitutes the baſis of crayons, which generally conſiſt of the earth of alum finely powdered and tinged for the purpoſe. In the preparation of Pruſſian blue, it prevents the baſis of martial vitriol, which is ſoluble in acids, from being precipitated by the ſuperfluous alkali employed in the preparation of that pigment; that is, the alkali which is not coloured by the ſaturating matter. As this baſis adheres more ſtrongly than the clay to the vitriolic acid, and would form a green by the mixture of its yellowneſs, the white earth of alum likewiſe according to its quantity, dilutes the darker colours, even black itſelf, and produces an infinite number of ſhades. It is alſo of uſe in the making of candles: for, being mixed with the tallow, it gives it a hardneſs and conſiſtence which it has not naturally. Wood ſufficiently ſoaked in a ſolution of alum does not eaſily take fire; and the ſame is true of paper impregnated with it; which, for that reaſon, is very properly employed in preſerving gunpowder, as it alſo excludes the moiſture of the air. Paper impregnated with alum is uſeful in whitening ſilver, and ſilvering braſs without heat. Alum is alſo of uſe in tanning, where it aſſiſts in reſtoring the coheſion of the ſkins almoſt entirely deſtroyed by the lime. Vintners fine down their wines, &c. with alum; fiſhers uſe it to dry cod fiſh with; and bakers have mixed it with the flour to make their bread compact and white: to this laſt uſe of it great objections have been made; but unjuſtly, for it is entirely innocent. It is now ſeldom uſed.

In medicine it is of conſiderable uſe as an aſtringent and tonic. It is reckoned particularly ſerviceable for reſtraining hemorrhages, and immoderate ſecretions from the blood: but leſs proper in inteſtinal fluxes. In violent hemorrhages, it may be given in doſes of 15 or 20 grains, and repeated every hour or half hour till the bleeding abates: in other caſes, ſmaller doſes are more adviſable; large ones are apt to nauſeate the ſtomach, and occaſion violent conſtipations of the bowels. It is uſed alſo externally, in aſtringent and repellent lotions and collyria. Burnt alum taken internally has been highly extolled in caſes of colic. In ſuch inſtances, when taken to the extent of a ſcruple for a doſe, it has been ſaid gently to move the belly, and give very great relief from the ſevere pain. Its officinal preparations are, for internal uſe, *pulvis ſtypticus*, and *aqua ſtyptica*; for external applications, the *aqua aluminis*, and *coagulum aluminis* and *alumen uſtum*; which laſt is no other than the alum dried by fire, or freed from the watery moiſture, which, like other ſalts, it always retains in its cryſtalline form. By this loſs of its water it becomes ſharper, ſo as to act as a ſlight eſcharotic; and it is chiefly with this intention that it is employed in medicine, being very rarely taken internally. For theſe preparations, ſee PHARMACY.

ALUM Mines are ſaid to have been firſt found in Italy in the year 1460; and in 1506 King Henry VII. made a monopolizing grant of this commodity to Auguſtine Chigi, a merchant of Sienna. In the year 1608, the manufacture of alum was firſt invented, and ſucceſsfully practiſed in England, meeting with great encouragement in Yorkſhire, where it was firſt made, from Lord Sheffield, and the other gentlemen of that county. King James I. by advice of his miniſtry, aſſumed the monopoly of it to himſelf, and therefore prohibited the importation of foreign alum; and in 1625 the importation of it was further prohibited by the proclamation of Charles I.

ALUM Works, places where alum is prepared, and manufactured in quantities for ſale. They differ from

alum

Aluntium ‖ Alypius.

alum mines, as in the former an artificial alum, and in the latter natural alum, is produced.

ALUNTIUM, ALONTIUM, in *Ancient Geography*, a town in the north of Sicily, situated on a steep eminence, at the mouth of the Chydas; said to be as old as the war of Troy. It is now in ruins; and from these has arisen the hamlet *St Philadelfo*, in the Val di Demona. The inhabitants were called *Haluntini*.

ALVUS, in *Anatomy*, a term used for the belly in general, but more frequently applied to the bowels.

ALWAIDII, a sect of Mahometans who believe all great crimes to be unpardonable.—The Alwaidii stand in opposition to the Morgii. They attribute less efficacy to the true belief in the salvation of men than the rest of the Mussulmans.

ALYPIUS of Antioch, a geographer of the fourth century. He was sent deputy-governor by the emperor Julian into Britain; and after he remained in this situation for some time, he received orders from the emperor to rebuild the temple of Jerusalem. Ammianus Marcellinus, the Roman historian, informs us, that during the progress of the work, whilst it was proceeding with great rapidity, huge balls of fire issued forth in the vicinity of the foundations, which interrupted the men at their labour, and even sometimes consumed them with its violence. Thus the place being rendered inaccessible, they were reluctantly constrained to desist from their undertaking. Different sentiments have been entertained of this phenomenon; but the reader may consult, for his own satisfaction, what has been written by Lardner and Gibbon concerning it. In the evening of his life, after he had retired from the service of the public, Alypius, in conjunction with several other persons, was formally accused of the crime of practising magic. In consequence of which, he was punished with banishment and confiscation of property, and Hierocles his son was condemned to capital punishment. Ammianus Marcellinus, whilst he mentions that the crime for which they suffered, was that of administering poison to others, at the same time freely delivers his opinion, that they were the victims of the general injustice and oppression which reigned at that period, and extended their sway even to the most retired habitations. The emperor Julian himself honoured Alypius with his confidence, and speaks of him with great respect. "As to your conduct in public affairs (says the emperor), it gives me pleasure to observe the assiduity and humanity which appear in all your transactions; for so to temper lenity and moderation with firmness and fortitude, that the good may experience the benefit of the former, and the bad may be corrected by the latter, requires no small share of ability and virtue." Alypius composed a geographical work which is said to have gained the approbation of the emperor, but this work has shared the same fate as many other productions of antiquity. Some have ascribed the work which Godfrey published under the title of "A Description of the Old World;" printed in 4to, at Geneva, to Alypius; but since that author speaks of Britain, not merely from report, but his own observation; this, together with the testimony of some writers, leads to the conclusion, that this "Description" is an anonymous work, published in the reigns of Constantius and Constans. *(Gen. Biog.)*.

Alypius.

ALYPIUS, one of the seven Greek writers on music, which Meibomius has industriously collected and published, with a commentary and explanatory notes. The time in which he flourished cannot be precisely ascertained. He is said to have wrote before Euclid and Ptolemy: and Cassiodorus arranges his work, entitled, "Introduction to Music," between that of Nicomachus and Gaudentius. In this work is to be found the most complete nomenclature of all the sounds of the different scales and modes of the ancient Greek music, which have escaped the wreck of time. So complex was the science of music in Greece at this period, that the characters used for sounds were 1620 in number. The 24 letters of the alphabet furnished these notes, sometimes in an entire, sometimes in a mutilated, and sometimes in an altered form; and numerous discriminations of these took place by means of the accents and varied positions of letters.

From the MS. of Joseph Scaliger, Meursius first published this tract in 1616; but according to the testimony of Fabricius, it is by no means correct. Extracts have been published from Alypius, by Kircher, in his Musurgia, 1650, alleging that he translated the whole into Latin; but this table of ancient musical notation is so inaccurate, which he has inserted from him, that Meibomius, who consulted not only the Greek MS. of Scaliger, but that of Belejanus, Barocus, Barberitti, and Selden, affirms, that he found in it more than 200 errors. The learned Meibomius, with incredible industry, decyphered those characters, which previous to his time were so much confounded, disfigured, and corrupted, either through the ignorance or inattention of the transcribers of ancient MSS. This advantage resulted to the science of music, chiefly by his commentaries on Greek musicians, and particularly on the works of Alypius.

ALYPIUS of Tagasta, a Christian divine who flourished in the fourth century. In the year 388, he was baptized along with Augustine, and, in consequence of a similarity of dispositions and religious sentiments, they became strongly attached to each other. In quest of information and improvement, he took a journey into Palestine; and returning home, he soon acquired such general esteem, that he was appointed bishop of his native city. He had adopted in the early part of his life the opinions of the Manichees; but in consequence of farther information and matured experience, he became a powerful advocate for the Catholic faith. The Donatists flourished about this period, and arrogantly claimed the exclusive honour of being the true church; but he, along with his friend Augustine, united his exertions in opposing the tenets of that sect. In the council of Carthage in the year 403, the erudition and talents of Alypius, along with several other eminent divines, were unsuccessfully employed in endeavouring to reclaim them, and to bring them again into the bosom of the church. In 411 Alypius was one of the seven who held a friendly and theological conference with seven of the Donatist bishops. But all the eloquence and strength of argument made use of by these divines, although seconded by the penal decrees of the emperor Honorius, were unsuccessful in producing a recantation of their errors, or a peaceful union with their brethren. In support of the Catholic faith, Alypius appears to have vigorously exerted

Alyſſum ‖ Amadabat.

erted his talents; and it is much to be regretted that the means he employed for that purpoſe were not at all times the moſt honourable; for in the violence of his zeal he went as deputy from the churches of Africa to the emperor Honorius, in order to obtain ſevere decrees againſt the ſect of the Pelagians. Although Alypius failed in his attempts to reclaim the Donatiſts from error, yet he was ſucceſsful with the emperor in obtaining penal decrees againſt the Pelagians; in conſequence of which their miniſters were baniſhed, their churches demoliſhed, and their aſſemblies diſcontinued. Alypius died about the year 430, and his diſpoſitions appear to have participated more of the violence of zeal, than of the meekneſs of charity. *(Gen. Biog.)*

ALYSSUM, ALYSSON, or ALYSOIDES, *Madwort*; (from *αλυσσω*, *to be mad*; becauſe it was believed to have the property of curing madneſs). See BOTANY *Index*.

ALYTARCHA, a prieſt of Antioch in Syria, who, in the games inſtituted in honour of the gods, preſided over the officers who carried rods to clear away the crowd and keep order.

In the Olympic games, the alytarches had the ſame command, and obliged every perſon to preſerve order and decency.

ALZIRA, a town of Spain, in the kingdom of Valencia, ſeated on the river Xucar. E. Long. 0. 20. N. Lat. 39. 10.

AMA, in eccleſiaſtical writers, denotes a veſſel wherein wine, water, or the like, were held, for the ſervice of the euchariſt. In this ſenſe the word is alſo written amula; ſometimes alſo hama, and hamula.

AMA is ſometimes alſo uſed for a wine meaſure, as a caſk, pipe, or the like.

AMABYR, a barbarous cuſtom which formerly prevailed in ſeveral parts of England and Wales, being a ſum of money paid to the lord when a maid was married within his lordſhip. The word is old Britiſh, and ſignifies "the price of virginity."

AMACK. See AMAK.

AMADABAT, a corruption from AHMED ABAD, or *Ahmed's city* (ſo called from a king of that name); a large and populous city of Indoſtan, and the capital of the province of Guzerat. It is ſituated in E. Long. 72. 12. N. Lat. 23. 0. Amadabat was formerly called *Guzerat*; and by Shah Jehân nicknamed *Gherd-abâd*, or "the habitation of duſt," becauſe it was much incommoded therewith. It was the ſeat of the Guzerat kings, as it is now of the Mogul governor. The city ſtands in a beautiful plain, and is watered by the little river Sabremetti, which, though not deep, in time of rains overflows the plains prodigiouſly. The walls are built with ſtone and brick, flanked at certain diſtances with great round towers and battlements. It has twelve gates; and, including the ſuburbs, is about four miles and a half long. The ſtreets are wide. The *meydân ſhâh*, or king's ſquare, is 700 paces long, and 400 broad, planted round with trees. On the weſt ſide is the caſtle, well walled with freeſtone, and as ſpacious as a little city; but its inward appearance is not conformable to it's external magnificence. The caravanſera is on the ſouth of the ſquare, and its chief ornament. Near the meydan alſo is the king's palace, whoſe apartments are richly ornamented: and in the midſt of the city is the Engliſh factory, where they purchaſe fine chintz, callicoes, and other Indian merchandiſe. The place is ſo full of gardens ſtored with fruit trees, that from an eminence it looks like a wood. The Hindoos have here an hoſpital for ſick beaſts, and another for ſick birds, which they take great care of. According to ſome late accounts, this city is little inferior to the beſt in Europe, and is thought to yield ten times as much revenue as Surat.

Amadan ‖ Amadeus.

AMADAN, or HAMADAN, a town of Perſia, between Taurus and Iſpahan. E. Long. 47. 4. N. Lat. 35. 15. It is ſeated at the foot of a mountain, where there are a great many ſprings, which water the adjacent country. The extent of the city is very large; but there are a great many waſte ſpots within it, as well as cultivated land. The houſes are built of brick hardened in the ſun, and have but a very indifferent aſpect. There is but one tolerable ſtreet; and that is where ſtuffs, garments, and the like, are expoſed to ſale: it is ſtraight, long, and wide; and the ſhops are very well furniſhed. The adjacent parts are fruitful in corn and rice, inſomuch that the neighbouring provinces are ſupplied from hence. It is ſaid to enjoy a very ſalubrious air; but the cold in winter is intenſe. The Armenians have a church in this town; but it is a very ill contrived ſtructure. The Jews have a ſynagogue near a tomb, where they pretend Eſther and Mordecai lie interred. To this place they come in pilgrimage from ſeveral parts of the Levant. About a league from Amadan, there is a mountain called *Nalbana*, which abounds with all ſorts of curious herbs. In the ſpring, people flock to this mountain from all parts to recover their health, by ſucking in the ſalutary effluvia with their breath.

Amadan is a very ancient city. It is ſaid to have been deſtroyed by Nebuchadnezzar, and rebuilt by Darius, who brought hither all his riches. The kings of Perſia frequently retired to this place on account of its delightful ſituation; for which reaſon it obtained the name of the *Royal City*. It was conquered by the caliph Othman, and narrowly eſcaped being deſtroyed by Jenghiz Khan in 1220. It had then ſtrong walls and a good caſtle, which are now in ruins. Its preſent beauty conſiſts in its gardens and ſprings.

AMADANAGER, a town in the hither peninſula of India, in the province of Decan. E. Long. 74. 15. N. Lat. 18. 10. It was taken by the Moguls in 1598, after a ſiege of ſix months; being at that time defended by a ſtrong caſtle, ſituated on an eminence, and ſurrounded with deep ditches, into which ſeveral ſprings diſcharged their waters.

AMADEUS V. count of Savoy, aroſe to that dignity in the year 1285. In him it appeared, that mental excellence can riſe ſuperior to riches or extent of territory; for although his dominions were by no means extenſive, nor his riches great, yet, in conſequence of his wiſdom and ſucceſs, he obtained the ſurname of *Great*. The cautious prudence of Amadeus, however, enabled him greatly to increaſe his territory by means of marriage, purchaſe, and donations. In this ſituation, with extended dominion, and diſtinguiſhed for wiſdom and prudence, he roſe to ſuch eminence among the European powers, that he was conſtituted their umpire to ſettle their differences; and in that ſtation acquitted himſelf with much reputation and gene-

ral

Amadeus. neral utility. But in his character valour and wiſdom were combined; for when the Turks attempted to retake the iſle of Rhodes from the knights of St John of Jeruſalem, he boldly defended it, and acquired great renown. A Malteſe croſs with the letters F. E. R. T. in future became the arms of Amadeus and his ſucceſſors, in memory of this ſignal victory. The explanation of this motto is ſaid to be *Fortitudo ejus Rhodum tenuit* —" His valour kept Rhodes." For this important ſervice the grandmaſter conferred on him the grant of a palace at Lyons. Andronicus the emperor of the eaſt had married his daughter; and in order to promote the views of his ſon-in-law, Amadeus took a journey to Avignon to perſuade Pope John XXII. to preach a cruſade in favour of Andronicus. In the year 1323 the famous Amadeus died at that place. Deep penetration, keen diſcernment, conſummate prudence, great valour, together with no ſmall portion of the religious ſuperſtition of his time, appear to have been the reigning features in his character. (*Mod. Univ. Hiſt.*)

Amadeus VIII. count of Savoy, in 1391, ſucceeded his father Amadeus VII. With the large ſum of 45,000 florins of gold he purchaſed the country of Genevois from its laſt earl. Anxious to extend his territories, he purchaſed the city of Rumilli, upon the lake of Geneva, from the widow of the count of Genevois, and thus the houſe of Savoy became ſo illuſtrious that the emperor Sigiſmund erected Savoy into a duchy in the year 1426. Hiſtorians relate, that he aſſiſted John Paleologus againſt the duke of Milan, who endeavoured to wreſt from him the duchy of Montferrat. Deeply ſenſible of the ſervices which he had received, Paleologus not only reſigned to the duke, Chivas, Brandis, and ſeveral other eſtates, but ſubmitted to hold all the marquiſate of Montferrat as a fief from the houſe of Savoy. Theſe fortunate acquiſitions of territory were not yet limited; for upon the marriage of his daughter with Philip Maria, duke of Milan, he received Vercelli, and about the ſame time the count of Creſcentino ſubmitted to become his feodary. In his ambitious purſuit, he laid claim to the ſovereignty of the city of Geneva; but that claim, though enforced by the pope, was rejected by the citizens with diſdain, and the emperor Sigiſmund taking it under his protection, declared it an imperial city. After ſuch an extenſive acquiſition of dominion, and amaſſing ſuch ſums of money, he formed the ſingular ſcheme of abandoning his throne and family; and for that purpoſe retired to a religious houſe at a place called *Ripaille*. But although he reſigned the dukedom of Savoy to his eldeſt ſon Lewis, and made his youngeſt ſon Philip, count of Genevois; yet their honours were merely nominal, for he conſtrained them to live on a very ſcanty allowance, while he in his retirement received all the revenues, and collected ſuch ſums of money, that he is ſaid to have purchaſed the papal honours. During the previous part of his life, having adopted great ſanctity of manners, the motives for his retirement were generally reckoned religious; but what was the aſtoniſhment of mankind to behold the ſeat of his hermitage become the habitation of every rare delicacy, and of the moſt refined luxury. The local ſituation of the place was truly delightful, and was enriched with every thing that could afford gratification to the ſenſes; and his retinue conſiſted of ſome of his moſt intimate friends, along with 20 faithful ſervants, who were the guardians of his voluptuous ſecrets. Neither did he aſſume a religious habit, but wore purple robes, and upon his mantle was embroidered a golden croſs. His table groaned under the weight of luxurious daintics, and the moſt excellent muſic cheered the daily feaſt; in ſhort, ſuch was the voluptuouſneſs of that place, that in the French language the phraſe, *faire ripailles*, ſignifies to make exquiſite good cheer. Amadeus.

He inſtituted a ſecular knighthood in that place under the appellation of St Maurice. The brethren aſſumed the name of hermits, wore beards, and excluded women from their community; and in other reſpects compoſed the character of decent epicures.

When he obtained the papal dignity, and was crowned by the cardinal of Arles at Baſil, all Europe was filled with aſtoniſhment in conſequence of his elevation; for he had never entered into holy orders. But he had found means to remove every objection, the council confirmed his election, and with pretended reluctance he put on the pontifical ornaments, and was conſecrated in the church of St Maurice. It ſeemed good to Amadeus to aſſume the title of Felix V. As might naturally be expected in ſuch circumſtances, the papal dignity was ſeverely conteſted between him and Eugenius; and notwithſtanding all the importunities of the council, the emperor refuſed to acknowledge his elevation. This religious diſpute involved all Europe in contention. Hiſtorians relate that Germany remained neutral, and France, England, Italy, Spain, and Hungary, declared for Eugenius; but Arragon, Poland, and Bretagne, recogniſed the council only; at the ſame time that Savoy, Switzerland, Baſil, Straſburg, Pomerania, and one of the duchies of Bavaria, recogniſed Felix. The emperor Frederick III. held a council at Frankfort, before which both the popes urged their reſpective rights by means of deputies. This attempt, however, to regain peace to Europe was unſucceſsful; therefore the emperor repaired to the vicinity of Baſil, and had a perſonal interview with Felix. The mind of Amadeus was now ſo confirmed in the enjoyment of pleaſure, that he had again returned to his favourite retreat; and after the fathers of the council had frequently ſolicited him in vain to reſide at Baſil, he prevailed upon them to remove to Lyons, which was near the ſeat of his pleaſures. During the conteſt, Eugenius had excommunicated Felix, the council, and ſeveral of the German princes, ſo that the whole church was then filled with confuſion and diſorder. The death of Eugenius, however, terminated the ſtruggle; for upon his death the cardinals at Rome elected Thomas de Sarzan, who aſſumed the name of Nicholas V. In this ſituation of affairs, Amadeus deemed it prudent to enter into a negotiation for the reſignation of his papal crown. In this tranſaction he diſplayed the profoundeſt policy and addreſs, which induced Nicholas to annul all that Eugenius had done to his diſhonour, or that of his aſſociates; to confirm the determination of the council of Baſil to appoint him perpetual apoſtolical legate in Savoy, Piedmont, and the other places of his own dominions, and even added to theſe the honour of being biſhop of Baſil, Lauſanne, Amadeus.

Amadeus II. Amadow.

Strafburg, and Conſtance. Nor did his vanity forſake him even in this political tranſaction, for he provided that he ſhould continue to wear the pontifical dreſs unleſs in a very few particulars. In order to gratify the ſame haughty diſpoſition, he ſtipulated that he ſhould not be obliged to go to Rome, to attend any general council; and that when he had occaſion to approach the pope, he ſhould riſe to receive him, and inſtead of kiſſing his toe, he ſhould be permitted to kiſs his cheek. Amadeus retired to Lauſanne, and died there at the age of 60, in the year 1451.

As the time in which he lived is fertile in memorable events, ſo the character of Amadeus was one of the moſt diſtinguiſhed of his time. The verſatility of his genius has led writers to differ in the delineation of his character. Some have repreſented him as a perſon of ſingular ſanctity of manners, and poſſeſſed of uncommon moderation and virtue; others have repreſented him as a confirmed bigot, and a violent enthuſiaſt; and a third claſs of authors have magnified his talents far above the general ſtandard, and extolled him as one of the moſt accompliſhed princes in Europe. His real character appears to be a compound of extravagancies, in which virtue, genius, caprice, and vanity were blended. (*Mod. Univ. Hiſt.*).

Amadeus IX. count of Savoy, ſucceeded his father Lewis, in his dominion and honours. The prince who exerts his talents to promote the happineſs of his ſubjects, is worthy of more fame than the prince who increaſes the number of his ſubjects by unjuſt and unneceſſary wars. In this view Amadeus IX. deſerves a place in the annals of his nation. His bodily conſtitution was weak, and he was afflicted with the falling-ſickneſs, yet, in conſequence of his piety, virtue, benevolence, and juſtice, he was ſurnamed the *Happy*. The clemency of his temper was ſuch that he readily pardoned thoſe who offended him, and in few inſtances was he induced to puniſh. In his character, however, the virtue of benevolence ſhone with peculiar ſplendour among the other virtues of the Chriſtian. A foreign miniſter one day uſed the freedom to inquire at Amadeus, if he kept any hounds. The duke replied, "a great number, and you ſhall ſee them to-morrow at noon." The miniſter attended at that hour in expectation of ſeeing a numerous pack of hounds; but the duke led him to a window which looked into an extenſive ſquare, and directing his view to a multitude of poor people eating and drinking, he exclaimed, "Theſe are my hounds with whom I go in chaſe of heaven." In all theſe pious and benevolent labours he was ſeconded by his wife Iolande of France. When one of his parſimonious courtiers reminded him that he would ſpend all his revenues, he generouſly replied, "Here is the collar of my order, let them ſell it and relieve my people." In the ſeventh year of his reign, and the thirty-ſeventh of his life, he died univerſally lamented by all his loyal ſubjects, in the year 1472. In high eſteem for his virtuous qualities, his ſubjects conferred on him the appellation of *The Bleſſed*. (*Mod. Univ. Hiſt.*).

AMADIA, a trading town of Aſia, in Curdiſtan, belonging to the Turks; ſeated on a high mountain. E. Long. 43. 1. N. Lat. 36. 25.

AMADOW, a kind of black match, tinder, or touchwood, which comes from Germany. It is made of a ſort of large muſhrooms or ſpongy excreſcences, which commonly grow on old trees, eſpecially oaks, aſh, and firs. This ſubſtance being boiled in common water, and afterwards dried and well beaten, is then put into a ſtrong ley prepared with ſaltpetre, after which it is again put to dry in an oven. The druggiſts ſell this match wholeſale in France, and ſeveral hawkers retail it. Some give to the amadow the name of *pyrotechnical ſponge*, becauſe of its aptneſs to take fire.

Amadowry II. Amalaric.

AMADOWRY, a kind of cotton which comes from Alexandria by the way of Marſeilles.

AMAIN, in the ſea language, a term importing to lower ſomething at once. Thus, *to ſtrike amain*, is to lower or let fall the topſails; *to wave amain*, is to make a ſignal, by waving a drawn ſword, or the like, as a demand that the enemy ſtrike their topſails.

AMAK, a ſmall iſland in the Baltic ſea, near Copenhagen, from which it is ſeparated by a canal over which there is a drawbridge. Amak is about four miles long and two broad; and is chiefly peopled by the deſcendants of a colony from Eaſt Frieſland, to whom the iſland was conſigned by Chriſtian II. at the requeſt of his wife Elizabeth, ſiſter of Charles V. for the purpoſe of ſupplying her with vegetables, cheeſe, and butter. From the intermarriages of theſe coloniſts with the Danes, the preſent inhabitants are chiefly deſcended; but as they wear their own dreſs, and enjoy peculiar privileges, they appear a diſtinct race from the natives. The iſland contains about ſix villages, and between 3000 and 4000 ſouls. It has two churches, in which the miniſters preach occaſionally in Dutch and Daniſh. The inhabitants have their own inferior tribunals; but in capital offences are amenable to the king's court of juſtice at Copenhagen. The old national habit, brought by the original colony when they firſt migrated to the iſland, is ſtill in uſe amongſt them. It reſembles the habit of the ancient Quakers, as repreſented in the pictures of the Dutch and Flemiſh painters. The men wear broad-brimmed hats, black jackets, full glazed breeches of the ſame colour, looſe at the knee, and tied round the waiſt. The women were dreſſed chiefly in black jackets and petticoats, with a piece of blue glazed cloth bound on their heads. The iſland is laid out in gardens and paſtures; and ſtill, according to the original deſign, ſupplies Copenhagen with milk, butter, and vegetables. E. Long. 12. 10. N. Lat. 55. 20.

AMAL, a town of Sweden, in the province of Daland, ſeated on the river Weſer. It has a good harbour, and carries on a great trade, eſpecially in timber, deals, and tar. E. Long. 12. 40. N. Lat. 58. 50.

AMALARIC, was the ſon of Alaric II. and king of the Viſigoths. Deprived of his father when an infant, he would have been bereft of his crown, had not his grandfather Theodoric king of the Oſtrogoths interpoſed in his behalf. In defence of the royal infant, he expelled from the throne his natural brother, who had uſurped the government and ruled the kingdom during his life, and preſerved the crown to the natural heir. In 526 the grandfather died, and Amalaric aſſumed the royal authority. In 517 he married Clotilda, the daughter of Clovis, an amiable lady, who inherited both the piety and orthodoxy of her mother, who was of the ſame name. The Catholic hiſto-

Amalaric, Amalafontha.

rians relate, that the king being violently attached to the Arian cauſe, uſed means to compel his queen to embrace the ſame opinions; which participated more of cruelty than piety. With all the firmneſs of a great mind, and the amiable patience of a Chriſtian, ſhe endured her wrongs for a conſiderable period; but at length, worn out with injurious treatment, ſhe was forced to apply to her brothers for aſſiſtance, and ſent them a handkerchief ſtained with her blood in proof of her cruel uſage. In order to relieve their ſiſter, one of them, Childebert king of Paris, entered the territories of Amalaric, who then reſided with his court at Narbonne; and their different forces having joined battle, the troops of Amalaric were totally defeated, and the king himſelf forced to ſave his life by flying into Spain, A. D. 531. It is reported that, when endeavouring to regain Narbonne, he was ſlain either by an aſſaſſin, employed by Theudis his ſucceſſor, or that he fell in battle. Some hiſtorians again ſay, that he died in Barcelona. (*Gen. Biog.*).

AMALASONTHA, youngeſt daughter of Theodoric the Great, king of the Oſtrogoths, was born about the year 498. The ſiſter of Clovis was her mother, and in 515, ſhe married Eutharic the only remaining heir of the legal race of the Amali. Her father having formed the deſign of making him his ſucceſſor, he ſent to bring him from Spain for that purpoſe. But he never arrived at the deſtined honour; for Eutharic died previous to his father-in-law, and his only ſon Athalaric, was alſo bereft of his grandfather at the age of eight years. The well known abilities of Amalaſontha induced Theodoric to place Athalaric, to whom he had left the kingdom of Italy, under the care of his mother. This princeſs inherited an ample ſhare of her father's talents; and her father had been exceedingly careful to improve theſe natural endowments by means of a liberal education. She became a great proficient in the philoſophy and morals of that age, and with equal elegance and grace ſhe could converſe in the Greek, Latin, and Gothic languages. Nor were her talents merely qualified to adorn private life: ſhe diſplayed them in the adminiſtration of public juſtice, and political diſcuſſion. Her firſt efforts were in behalf of the injured children of Boethius and Symmachus, whom ſhe reinſtated in the poſſeſſion of their inheritance. When the chiefs of the Goths were ſtrongly inclined to treat the Romans as a conquered people, ſhe mildly reſtrained their violent oppreſſion and their ungovernable rapacity. Adorning the female character ſhe relieved her ſubjects from ſome of the ſeverer impoſitions of her father; but carefully retained all his laws, magiſtrates, and political inſtitutions. Having herſelf taſted of the ſweets of literature, and experienced its advantages, ſhe patronized learning with an aſſiduous care, by regularly paying the ſalaries of public teachers, and giving every encouragement to the improvement of genius. Her peaceable deportment towards the neighbouring princes forms an amiable feature in her character. Both with the imperial court, and with all the other powers, ſhe lived upon agreeable terms, and thus univerſal honour and proſperity prevailed. Both in conſequence of maternal affection and the high cultivation of her mind, ſhe exerted all her ingenuity in the education of her orphan ſon. Unfortunately, however, both for the mother and the ſon, neither the general character of the Gothic nation, nor the wayward inclinations of the boy, ſeconded her laudable endeavours. The Gothic nobles had juſt commenced their murmurings againſt the ſoft effeminate manner in which their prince was educating, when, upon a certain day, the youth having undergone ſome kind maternal chaſtiſement, ruſhed into the room where ſome of the nobles were aſſembled, with the tears ſtreaming from his eyes. Informed of the cauſe of his diſtreſs, the wrath of the nobles ſuddenly aroſe, and in a violent burſt of paſſion they inſiſted upon the immediate releaſe of their prince from the bondage of learning and from the reſtraints of a mother. The unfortunate youth was thus dragged from the habitation of learning, prudence, and virtue; and plunged into all the extravagancies of diſſolute pleaſure, and his mind inſpired with contempt and averſion to his virtuous mother.

Amalaſontha, Amalek.

It was impoſſible for humanity to bear this inſult and high injury without oppoſition; therefore, in the firſt effuſions of her reſentment ſhe ſeized three of the principal perſons concerned in this tranſaction, and confined them in one of the remoteſt parts of Italy. But the efforts of one, or of a few individuals, are never adequate to the taſk of counteracting the general efforts of a nation, for the party whoſe ſentiments were oppoſed to hers, grew daily in magnitude and ſtrength, to ſuch a degree that Amalaſontha formed ſerious reſolutions of ſheltering herſelf under the protection of Juſtinian. After a correſpondence had been carried on to prepare for this event, and when ſhe was about to ſail for that place, ſhe determined to make one bold effort to regain her abſolute power. With this view, ſhe cauſed the three perſons who were in confinement to be ſecretly aſſaſſinated; and this action re-eſtabliſhed her authority, although it augmented the public hatred. But another cauſe of diſquiet ſoon aroſe. At the early age of ſixteen, her ſon fell a victim to his debaucheries and follies, and ſhe was left devoid of any legal claim to the crown. The accompliſhed and ambitious Amalaſontha ſpurned the idea of retiring to a private ſtation, and formed the bold deſign of ſharing the throne with Theodotus her couſin. She had ſufficient penetration to perceive that the diſpoſitions of that youth were indolent and weak, and conſequently ſhe hoped ſtill to remain at the helm of government. But the future fortune of that accompliſhed woman, demonſtrates to poſterity the danger of confiding in human weakneſs, where the principles of honour and juſtice and virtue are wanting. Theodotus iſſued an order for her confinement in an iſland in the lake Bolſena; and in the year 535 ſhe was ſtrangled in the bath. Some hiſtorians aſcribe this action to the influence of the empreſs Theodora, who was ſeized with jealouſy in conſequence of the reſpect ſhown her by Juſtinian. (*Gen. Biog.*).

AMALEK, the ſon of Eliphaz, by Timna his concubine, and the grandſon of Eſau, Gen. xxxvi. 12. and 1 Chr. i. 36. Amalek ſucceeded Gatam in the government of Edom. He was the father of the Amalekites; a powerful people who dwelt in Arabia Petræa, between the Dead ſea and the Red ſea, or between Havila and Shûr (1 Sam. xv 7); ſometimes in one canton and ſometimes in another. It does not appear that they

Amalek. they had cities; for there is no mention of any but one in the Scriptures (*id. ib.* 5.); they living generally in hamlets, caves, or tents.

The Iſraelites had ſcarcely paſſed the Red ſea on their way to the wildnerneſs before the Amalekites came to attack them in the deſerts of Rephidim (Ex. xvii. 8. &c.); and put thoſe cruelly to the ſword who were obliged, either through fatigue or weakneſs, to remain behind. Moſes, by divine command, directed Joſhua to fall upon this people; to record the act of inhumanity which they had committed in a book, in order to have it always before their eyes; and to revenge it in the moſt remarkable manner. Joſhua therefore fell upon the Amalekites and defeated them, while Moſes was upon the mountain, with Aaron and Hur in company. Moſes, during the time of the engagement, held up his hands, to which the ſucceſs of the battle was owing; for as often as he let them down, Amalek prevailed. But Moſes's hands being tired, Aaron and Hur ſupported his arms, and held them extended, while the battle laſted, which was from morning till the approach of night, when the Amalekites were cut in pieces. This happened in the year of the world 2513, before Chriſt 1491.

The ground of the enmity of the Amalekites againſt the Iſraelites is generally ſuppoſed to have been an innate hatred, from the remembrance of Jacob's depriving their progenitor both of his birthright and bleſſing. Their falling upon them, however, and that without any provocation, when they ſaw them reduced to ſo low a condition by the fatigue of their march, and the exceſſive drought they laboured under, was an inhuman action, and juſtly deſerved the defeat which Joſhua gave them. Under the Judges (v. 3.), we ſee the Amalekites united with the Midianites and Moabites, in a deſign to oppreſs Iſrael; but Ehud delivered the Iſraelites from Eglon king of the Moabites (Judges iii.), and Gideon (chap. viii.) delivered them from the Midianites and Amalekites. About the year of the world 2930, Saul marched againſt the Amalekites, advanced as far as their capital, and put all the people of the country to the ſword; but ſpared the beſt of all the cattle and moveables, contrary to a divine command; which act of diſobedience was the cauſe of Saul's future misfortunes.

After this war, the Amalekites ſcarcely appear any more in hiſtory. However, about the year of the world 2949, a troop of Amalekites came and pillaged Ziklag, which belonged to David (1 Sam. xxx.), where he had left his two wives Ahinoam and Abigail; but he returning from an expedition which he had made in the company of Achiſh into the valley of Jezreel, purſued them, overtook and diſperſed them, and recovered all the booty which they had carried off from Ziklag.

The Arabians maintain Amalek to have been the ſon of Ham, and grandſon of Noah; that he was the father of Ad, and grandfather of Schedad. Calmet thinks that this opinion is by no means to be rejected, as it is not very probable that Amalek, the ſon of Eliphaz, and grandſon of Eſau, ſhould be the father of a people ſo powerful and numerous as the Amalekites were when the Iſraelites departed out of Egypt. Moſes in the book of Geneſis (xiv. 7.) relates, that in Abraham's time, long before the birth of Amalek the ſon of Eliphaz, the five confederate kings carried the war into Amalek's country, about Kadeſh; and into that of the Amorites, about Hazezon-tamar. The ſame Moſes (Num. xxiv. 20.) relates, that the diviner Balaam, obſerving at a diſtance the land of Amalek, ſaid, in his prophetic ſtyle, "Amalek is the firſt, the head, the original of the nations; but his latter end ſhall be, that he periſh for ever." Our commentator obſerves, that this epithet of the firſt of nations cannot certainly agree with the Amalekites deſcended from the ſon of Eliphaz, becauſe the generation then living was but the third from Amalek. Beſides, Moſes never reproaches the Amalekites with attacking their brethren the Iſraelites; an aggravating circumſtance, which he would not have omitted were the Amalekites deſcended from Eſau; in which caſe they had been the brethren of the Iſraelites. Laſtly, We ſee the Amalekites almoſt always joined in the Scripture with the Canaanites and Philiſtines, and never with the Edomites; and when Saul made war upon the Amalekites, and almoſt utterly deſtroyed them, we do not find that the Edomites made the leaſt motion towards their aſſiſtance, nor to revenge them afterwards. Thence it is thought probable, that the Amalekites, who are ſo often mentioned in Scripture, were a free people deſcended from Canaan, and devoted to the curſe as well as the other Amorites, and very different from the deſcendants of Amalek, the grandſon of Eſau. Amalek, Amalfi.

The accounts which the Arabians give us of the Amalekites deſtroyed by Saul are as follow: Amalek was the father of an ancient tribe in Arabia, exterminated in the reign of Saul. This tribe contained only the Arabians who are called *Pure*; the remains whereof were mingled with the poſterity of Joktan and Adnan, and ſo became Moſarabes or Moſtaarabes; that is to ſay, Arabians blended with foreign nations. They further believe, that Goliath, who was overcome by David, was king of the Amalekites; and that the giants who inhabited Paleſtine in Joſhua's time were of the ſame race. That at laſt part of the Amalekites retired into Africa while Joſhua was yet living, and ſettled upon the coaſts of Barbary, along the Mediterranean ſea. The ſon of Amalek was Ad, a celebrated prince among the Arabians. Some make him the ſon of Uz, and grandſon of Aram the ſon of Shem. Let this be as it will, the Mahometans ſay that Ad was the father of an Arabian tribe called *Adites*; who were exterminated, as they tell us, for not hearkening to the patriarch Eber, who preached the unity of God to them. Ad had two ſons, Schedad and Schedid.

AMALFI, an ancient city of Italy, ſituated in E. Long. 15. 20. N. Lat. 40. 35. It is ſaid to have derived its origin from a number of Roman families, who, about the middle of the fourth century, either from private views of emolument, or in conſequence of compulſory orders from the emperor, had left Rome, and embarked for Conſtantinople; but meeting with ſtorms on their paſſage, were caſt away on the ſhores of Salerno, and deprived of the means of purſuing their voyage. In this ſtate of perplexity they long remained; but at laſt came to the reſolution of ſettling on the preſent ſite of Amalfi, where they expected to enjoy ſecurity, and ſufficient plenty of the neceſſaries of life. The earlieſt notice of them in this ſettlement dates no higher than the latter end of the ſixth century. Im-

Amalfi. pervious mountains and inacceſſible coaſts preſerved their infant ſtate from the firſt fury of the Lombards, who ſeldom attempted the conqueſt of a maritime people.

In the year 825, when this little republic had, under the patronage of the eaſtern emperors, attained a degree of wealth and reputation ſufficient to excite the ambition of its neighbours, Sico, prince of Salerno, marched a body of troops by night, ſurpriſed Amalfi; and, carrying off the greateſt part of the inhabitants, compelled them to fix at Salerno, which had lately ſuffered a great loſs of people by an epidemical diſorder. But before the fourth year of their captivity was expired, the Amalfitans took advantage of the abſence of the Salernitan chiefs, who were then carrying on a war with the Beneventans; armed themſelves; and, after burning and plundering Salerno, marched in triumph back to their own country.

Here they framed a better ſyſtem of government, and reformed many abuſes in their former legiſlation; adopting various meaſures, that were likely to promote internal concord, and defeat the evil intentions of foreign enemies. Their firſt plan was to veſt the ſupreme authority in a temporary prefect; but the experience of a few years cauſed them to prefer lodging that power in the hands of a duke elected for the term of his natural life. Under theſe governors Amalfi attained the ſummit of her military and commercial glory. It extended its territory, which reached eaſtward from Vico Vecchio, and weſtward to the promontory of Minerva, including likewiſe the iſland of Caprea, and the two iſlands of the Galli. Towards the north, it comprehended the cities of Lettere, Gragnans, Pimontio, and Capule di Franchi; towards the ſouth, thoſe of Scala, Ravelli, Minori, Majuri, Atrani, Tramonti, Agerula, Citara, Prajano, and Roſilano.

Leo IV. found the Amalfitans an uſeful ally in his wars with the Infidels, and honoured the commonwealth with the title of *Defender of the Faith*. The Neapolitans, with whom, as Greek vaſſals, they were united in ſtrict bonds of friendſhip, experienced many ſignal favours at their hands; and the Muſſulmans themſelves found it expedient to court their alliance, and to enter into treaty with them. Their ſituation had from the beginning given them a turn to commerce, and their attention to naval affairs ſo much conſequence in the eyes of their protector, the emperor of Conſtantinople, that by his orders a court was eſtabliſhed at Amalfi, for the deciſion of all controverſies ariſing in maritime tranſactions. Its code and reports became the general rule in thoſe caſes throughout this part of Europe; its precedents and decrees were allowed to be good authority to found judgment upon even in foreign tribunals. To crown the mercantile and naval glory of the republic, it was reſerved to the lot of an Amalfitan to make, or at leaſt to perfect, the moſt important diſcovery ever made for the improvement of navigation. Paſitano, a village which ſtands on the ſhore a few miles weſt of Amalfi, boaſts of having given birth to Flavius Gioia, the inventor of the mariner's compaſs.

The merchants of this town engroſſed the trade of the Levant, and tranſacted the commercial buſineſs of the world in a lucrative and excluſive manner. The Piſans, Venetians, and Genoeſe, roſe upon their ruin; and, after monopolizing the emoluments of trade for ſome ages, made way for the more comprehenſive and daring ſpirit of the preſent maritime powers. Amalgam || Amalthæa.

At preſent Amalfi is ſubject to Naples, and is the ſee of an archbiſhop. It is but a ſhadow of what it was in its flouriſhing ſtate, when it extended over the ſtupendous rocks that hang on each ſide, ſtill crowned with battlemented walls and ruined towers. Its buildings, Mr Swinburne ſays, are not remarkable for elegance or ſize; and contain at moſt 4000 inhabitants, who ſeem to be in a poor line of life. The cathedral is an uncouth building. Under the choir is the chapel and tomb of the apoſtle St Andrew; to whoſe honour the edifice was dedicated, when Cardinal Capuano, in 1208, brought his body from Conſtantinople.

AMALGAM, mercury united with ſome metal.

AMALGAMATION, the operation of making an amalgam, or mixing mercury with any metal.

For the combination of one metal with another, it is generally ſufficient that one of them be in a ſtate of fluidity. Mercury being always fluid, is therefore capable of amalgamation with other metals without heat; nevertheleſs, heat conſiderably facilitates the operation.

To amalgamate without heat requires nothing more than rubbing the two metals together in a mortar; but the metal to be united with the mercury ſhould be previouſly divided into very thin plates or grains. When heat is uſed (which is always moſt effectual, and with ſome metals indiſpenſably neceſſary), the mercury ſhould be heated till it begins to ſmoke, and the grains of metal made red hot before they are thrown into it. If it be gold or ſilver, it is ſufficient to ſtir the fluid with an iron rod for a little while, and then throw it into a veſſel filled with water. This amalgam is uſed for gilding or ſilvering on copper, which is afterwards expoſed to a degree of heat ſufficient to evaporate the mercury.

Amalgamation with lead or tin is effected by pouring an equal weight of mercury into either of theſe metals in a ſtate of fuſion, and ſtirring with an iron rod. Copper amalgamates with great difficulty, and iron not at all.

AMALTHÆA, the name of the Cumæan Sibyl, who offered to Tarquinius Superbus nine books, containing the Roman deſtinies, and demanded 300 pieces of gold for them. He derided her; whereupon ſhe threw three of them into the fire; and returning, aſked the ſame price for the other ſix; which being denied, ſhe burnt three more; and returned, ſtill demanding the ſame price. Upon which Tarquin conſulting the pontiffs, was adviſed to buy them. Theſe books were in ſuch eſteem, that two magiſtrates were created to conſult them upon extraordinary occaſions.

AMALTHÆA, in *Pagan Mythology*, the daughter of Meliſſus, king of Crete, and the nurſe of Jupiter, whom he fed with goats milk and honey. According to others, Amalthæa was a goat, which Jupiter tranſlated into the ſky, with her two kids, and gave one of her horns to the daughters of Meliſſus, as a reward for the pains they had taken in attending him. This horn had the peculiar property of furniſhing them with whatever they wiſhed for; and was thence called the *cornucopiæ* or horn of plenty.

AMALTHÆUS,

Amalthæus ‖ Amand.

AMALTHÆUS, Jerome, John Baptista, and Corneille, three celebrated Latin poets of Italy, who flouriſhed in the 16th century. Their compoſitions were printed at Amſterdam in 1685. One of the prettieſt pieces in that collection is an epigram on two children, whoſe beauty was very extraordinary, though each of them was deprived of an eye:

Lumine Acon dextro, capta eſt Leonilla ſiniſtro:
Et poterat forma vincere uterque Deos,
Parve puer, lumen quod habes concede ſorori;
Sic tu cæcus Amor, ſic erit illa Venus.

AMAMA, Sixtinus, profeſſor of the Hebrew tongue in the univerſity of Franeker, a man of great learning, was born in Frieſland, and had ſtudied under Druſius. He publiſhed a criticiſm upon the tranſlation of the Pentateuch; collated the Dutch tranſlation of the Bible with the original and the moſt accurate tranſlations; and wrote a cenſure of the Vulgate tranſlation of the hiſtorical books of the Old Teſtament, Job, the Pſalms, and Canticles. It is impoſſible to anſwer the reaſons whereby he ſhows the neceſſity of conſulting the originals. This he recommended ſo earneſtly, that ſome ſynods, being influenced by his reaſons, decreed, that none ſhould be admitted into the miniſtry, but ſuch as had a competent knowledge of the Hebrew and Greek text of the Scriptures. He died in 1629.

AMANCE, a town in the duchy of Lorraine, upon a rivulet of the ſame name. E. Long. 6. 10. N. Lat. 48. 45.

AMAND, Mark Anthony Gerard, Sieur de St, a French poet, was born at Rouen in Normandy in 1594. In the epiſtle dedicatory to the third part of his works, he tells us, that his father commanded a ſquadron of ſhips in the ſervice of Elizabeth queen of England for 22 years, and that he was for three years priſoner in the Black Tower at Conſtantinople. He mentions alſo that two brothers of his had been killed in an engagement againſt the Turks. His own life was ſpent in a continual ſucceſſion of travels, which was of no advantage to his fortune. There are miſcellaneous poems of this author, the greateſt part of which are of the comic or burleſque, and the amorous kind. Though there are many blemiſhes in his poems, yet he had the talent of reading them in ſo agreeable a manner, that every one was charmed with them. In 1650, he publiſhed *Stances ſur la groſſeſſe de la reine de Pologne et de Suede.* There are ſix ſtanzas of nine verſes each. In 1653, he printed his *Moiſe ſauve, idyle heroique.* This poem had at firſt many admirers; M. Chapelein called it a *ſpeaking picture;* but it has ſince fallen into contempt. Amand wrote alſo a very devout piece, entitled, *Stances à M. Corneille, ſur ſon imitation de Jeſus Chriſt*, which was printed at Paris in 1656. M. Broiſette ſays, that he wrote alſo a poem upon the moon, wherein he paid a compliment to Lewis XIV. upon his ſkill in ſwimming, in which he uſed often to exerciſe himſelf when he was young, in the river Seine; but the king could not bear this poem to be read to him, which is ſaid to have affected the author to ſuch a degree, that he did not ſurvive it long. He died in 1661, being 67 years of age. He was admitted a member of the French academy, when it was firſt founded by Cardinal Richelieu, in the year 1633; and Mr Peliſſon informs us, that in 1637, at his own deſire, he was excuſed from the obligation of making a ſpeech in his turn, on condition that he would compile the comic part of the dictionary which the academy had undertaken, and collect the burleſque terms. This was a taſk well ſuited to him; for it appears by his writings, that he was extremely converſant in theſe terms, of which he ſeems to have made a complete collection from the markets, and other places where the lower people reſort.

Amand ‖ Amarante.

Amand, *Saint*, a city of France, in the department of Cher, formerly Bourbonois, on the confines of Berry, ſeated on the river Cher. It was built in 1410, on the ruins of Orval. E. Long. 9. 30. N. Lat. 46. 32.

Amand, *Saint*, a city of France, in the department of the North, ſeated on the river Scarpe. It contains about 600 houſes, and 3000 or 4000 inhabitants. The abbot of the place is the temporal lord, and diſpoſes of the magiſtracy. It was given to France by the treaty of Utrecht. E. Long. 2. 35. N. Lat. 50. 27.

AMANICÆ PYLÆ (Ptolemy); Amanides Pylæ. (Strabo); Amani Portæ (Pliny); ſtraits or defiles in Mount Amanus, through which Darius entered Cilicia; at a greater diſtance from the ſea than the Pylæ Ciliciæ or Syriæ, through which Alexander paſſed.

AMANTEA, a ſea-port town and biſhop's ſee of the kingdom of Naples, ſituated near the bay of Euphemia, in the province of Calabria, in E. Long. 16. 20. N. Lat. 39. 15.

AMANUS, a mountain of Syria, ſeparating it from Cilicia; a branch of Mount Taurus (Cicero, Strabo, Pliny); extending chiefly eaſtward, from the ſea of Cilicia to the Euphrates: Now called *Monte Negro*, or rather *Montagna Neres*, by the inhabitants; that is, the watery mountain, as abounding in ſprings and rivulets.

AMAPALLA, a city and port town of North America, in the province of Guatimala, ſeated on the gulf of the ſame name, in the Pacific ocean. W. Long. 63. 20. N. Lat. 12. 30.

AMARANTE, an order of knighthood, inſtituted in Sweden by Queen Chriſtina, in 1653, at the cloſe of an annual feaſt, celebrated in that country, called *Wirtſchaft*. This feaſt was ſolemnized with entertainments, balls, maſquerades, and the like diverſions, and continued from evening till the next morning.—That princeſs, thinking the name too vulgar, changed it into that of the *feaſt of the gods*, in regard each perſon here repreſented ſome deity as it fell to his lot. The queen aſſumed the name of *Amarante;* that is, unfading, or immortal. The young nobility, dreſſed in the habit of nymphs and ſhepherds, ſerved the gods at the table. At the end of the feaſt, the queen threw off her habit, which was covered with diamonds, leaving it to be pulled in pieces by the maſques; and in memory of ſo gallant a feaſt, founded a military order, called in Swediſh *Geſchilfſchaft*, into which all that had been preſent at the feaſt were admitted, including 16 lords and as many ladies, beſides the queen. Their device was the cypher of *Amarante*, compoſed of two A's, the one erect, the other inverted, and interwoven together; the whole encloſed by a laurel crown, with this motto, *Dolce nella memoria.*

Bulſtrode

Amaranthoides || Amafis.

Bulſtrode Whitlock, the Engliſh ambaſſador from Cromwell to the court of Sweden, was made a knight of the order of *Amarante*: on which account it ſeems to be, that we ſometimes find him ſtyled *Sir Bulſtrode Whitlock*.

AMARANTHOIDES, in *Botany*, the trivial name of a ſpecies of illecebrum. See ILLECEBRUM, BOTANY *Index*.

AMARANTHUS (of α privative, and μαραινω, *to wither*, becauſe the flower of this plant, when cropped, does not ſoon wither), AMARANTH, or FLOWER GENTLE. See BOTANY *Index*.

AMARGURA, an iſland in the Southern Pacific ocean, diſcovered by Maurell in 1781. It is quite barren, and inacceſſible even to boats. S. Lat. 17. 57. W. Long. 175. 17.

AMARYLLIS, LILY-ASPHODEL. See BOTANY *Index*.

AMARYNTHUS, in *Ancient Geography*, a hamlet of Eretrias, in the iſland of Eubœa, about ſeven ſtadia diſtant from its walls. Here Diana was worſhipped in an annual ſolemnity, at which thoſe of Caryſtus aſſiſted; hence the title of the goddeſs was *Amarynthis* and *Amarysia*.

AMASIA, in *Ancient Geography*, now *Marpurg*, a city in the landgravate of Heſſe, on the Lahn. According to others, it is Embden in Weſtphalia.

AMASIA, an ancient town of Turkey, in Natolia, remarkable for the birth of Strabo the geographer. It is the reſidence of a baſhaw, and gives its name to the province it ſtands in, where there are the beſt wines and the beſt fruits in Natolia. It is ſeated near the river Iris or Caſalmack; and was anciently the reſidence of the king of Cappadocia. E. Long. 36. 10. N. Lat. 39. 33.

AMASIA, the name of the northern diviſion of Leſſer Aſia, lying on the ſouth ſhore of the Euxine ſea, in Natolia. It takes its name from Amaſia the capital, mentioned in the preceding article.

AMASIS, king of Egypt, aſcended the throne B. C. 569, and commenced his reign with the death of his former maſter Apries. King Apries having ſent an army to the aſſiſtance of the Libyans, which was totally routed, and great multitudes put to death, the common people conceived the idea, that the tyrannical prince had ſent them to the field of battle, for no other purpoſe but to deſtroy great numbers of them, that ſo he might reign over the remainder with uncontrolled oppreſſion. The conſequence was, that a general inſurrection aroſe, and all the multitude were in an uproar. Informed of this tumult, Apries ſent Amaſis, whom he deemed one of his moſt faithful adherents; but inſtead of endeavouring to reconcile the diſaffected people to their prince, he ſecured them to his own intereſt; and while he was pretending to reproach their diſloyalty, and endeavouring to recal them to duty, a ſoldier ſtepped in behind him, and, placing a helmet upon his head, ſaluted him king of Egypt. Amaſis inſtantly took the field againſt his royal maſter, and prepared to drive him from his throne. Appriſed of the treachery of Amaſis, he ſent another in whom he confided, to bring Amaſis before him, to give an account of his conduct. This meſſenger met him on horſeback, and having delivered his meſſage, Amaſis after ſome inſolent behaviour, replied, that he was preparing to viſit the king, but thought it proper to bring a ſuitable equipage to attend him. When the meſſenger haſtened back to inform his maſter, that he might conſult for himſelf, his only reward was to have his ears and noſe cut off, by the order of the tyrant, becauſe he brought not Amaſis along with him. In this, as in numerous other inſtances, tyranny procured its own deſtruction; for the reſt of the nobles who ſtill remained obedient to the king, ſeeing the barbarous manner in which he had treated the meſſenger, they all went over to the ſtandard of the uſurper. Now all the nation was in commotion. The uſurper on the one hand, with the whole body of the natives marſhalled under his banner, and the tyrant on the other hand, with a body of foreigners and mercenaries, which he had engaged in his ſervice. The two armies met in a field in the vicinity of Memphis, and the tyrant was made captive and his forces defeated. The uſurper treated the captive tyrant with great lenity and reſpect, and aſſigned him the palace of Saïs for his confinement. But the hatred of the people was too violent towards their old king, to permit him to live; Amaſis was therefore forced to deliver him into their hands, and they inſtantly put him to death by ſtrangling him. Amaſis.

The plebeian extraction of Amaſis deprived him for ſome time of that reſpect, to which he was entitled as a prince; but obſerving this, he contrived a ſtratagem to induce them to pay him ſuitable honour. He ordered a golden ciſtern, in which his viſitants were accuſtomed to waſh their feet, to be melted and caſt in the form of a god, and ſet it up in the moſt frequented part of the city, and all the inhabitants did it homage. He then called an aſſembly of the people, and reminded them, that the gold they now venerated in the form of a god, was once a ciſtern, and conſequently that although he was formerly a perſon of low rank, yet now that he was their king, they ought to give him the reſpect and homage due to his ſtation.

Having by this means provided for the gratification of his vanity, he began to exert himſelf to act for the general good of his people. It was his conſtant practice to attend to buſineſs in the mornings, and in the evenings he indulged in amuſement and pleaſure; but in theſe he ſometimes tarniſhed the dignity of a king. Indeed Amaſis loved his wine and his companion ſo much, previous to his elevation, that it is reported that he lived by theft, and when denying upon detection, he was carried to the oracle of the place, who ſometimes condemned and ſometimes acquitted him. Recollecting the conduct of the oracles after he aſcended the throne, he conceived a diſreſpect for them, becauſe they were not able at all times to detect his robberies.

To prevent the evil conſequences of an indolent populace, he enacted a law, that every perſon, under the penalty of capital puniſhment, ſhould appear before the governor of his reſpective province, and declare by what occupation he acquired his ſubſiſtence. Thus, under the prudent government of Amaſis, Egypt enjoyed for many years, great fertility and extenſive population. He alſo employed his induſtry in the erection of ſeveral public works; among which were a portico to the temple of Minerva at Saïs, and the removal of a houſe, all of one ſtone, to the temple. He

Amaſis ‖ Amatorii.

alſo built the great temple of Iſis at Memphis. He likewiſe erected a coloſſus before the temple of Vulcan, 75 feet in length, reſting on its back, and on the baſis he erected two ſtatues, each 20 feet high, cut out of the ſame ſtone. Beſides theſe he raiſed ſeveral monuments in Greece.

The liberality and reſpect for ſcience which Amaſis diſplayed, and the encouragement he gave to learned ſtrangers, particularly to the Greeks, to viſit his country, manifeſted an enlightened mind. And to encourage Grecian ſtrangers to remain in Egypt, he marked out ſettlements for them on the ſea-coaſt, permitted them to build temples, and to obſerve all the rites of their religion unmoleſted. Solon, the celebrated lawgiver, condeſcended to viſit Amaſis. In a ſhort time, the fame of Amaſis for his generoſity and humanity was ſo extenſive, that when the Delphians were going about from city to city, collecting ſums to enable them to rebuild their conſumed temple, they applied to Amaſis, who gave them 1000 talents. Either to gratify the vanity, or ſecure the alliance of the Greeks, he married a Grecian lady, named Laodice, the daughter of Battus. But in the evening of his reign his proſperity was greatly clouded, by the report of the vaſt preparations that Cambyſes was making to invade Egypt. Phanes, who was captain of the Greek auxiliaries in the ſervice of Amaſis, being offended at his maſter, deſerted his cauſe, and went over to Cambyſes. A ſtrong affection had long ſubſiſted betwixt Polycrates, the tyrant of Samos, and Amaſis; yet he, deſerting his cauſe, became his enemy. Whether the forebodings of the impending ſtorm tended to impair his health or not is not related; but about this time he died, in 525 B. C. after a reign of 44 years. It is reported that, after interment, his body was dug up by his enemies, and conſumed by fire, which, according to the ſuperſtition of the Egyptians, conſtituted a ſingular calamity. (*Anc. Univ. Hiſt.*).

AMASONIA. See Botany *Index*.

AMATHUS, a very ancient town in the ſouth of Cyprus (Strabo, Ptolemy): ſo called from Amathus the founder; or, according to others, from Amath, a Phœnician town ſacred to Venus, with a very ancient temple of Adonis and Venus: and hence Venus is denominated *Amathuſia* (Tacitus). According to Ovid, it was a place rich in copper ore, and where the inhabitants became *Ceraſtæ*, or horned. Now called *Limiſſo*.

Amathus, in *Ancient Geography*, a town of the tribe of Gad, beyond Jordan; but whether at a greater or leſs diſtance from it, is not ſo eaſy to determine. Euſebius places it in the lower Peræa; Reland, in Ramoth Gilead. Gabinius, proconſul of Syria, eſtabliſhed five juridical conventions in Judæa; two of which were on the other ſide Jordan; one at Gadara, the other at Amathus (Joſephus).

AMATIQUES, a ſea-port town, in the province of Vera Paz in Mexico, at the mouth of the river Guanacos, which flows into the gulf of Honduras. The inhabitants are chiefly employed in cutting logwood. N. Lat. 15. 23. W. Long. 89. 0.

Amatorii muſculi, in *Anatomy*, a term ſometimes uſed for the obliquus ſuperior and obliquus inferior muſcles of the eye, as theſe muſcles aſſiſt in oggling or drawing the eye ſidewiſe.

AMATRICE, a city of the kingdom of Naples in the farther Abruzzo, upon the confines of the pope's territories, and the marquiſate of Ancona.

Amatrice ‖ Amaziah.

AMATTA Foa, an iſland in the Southern Pacific ocean, which was diſcovered by Captain Cook in 1774. It is about five leagues in circumference, and conſiderably elevated; it is inhabited, but not very fertile; and it lies about twelve leagues diſtant, and north north-weſt from Anamooka.

AMAUROSIS, in *Medicine*, a deprivation of ſight, the eye remaining fair and ſeemingly unaffected. A perfect amauroſis is when the blindneſs is total; when there is ſtill a power of diſtinguiſhing light from darkneſs, the diſeaſe is called by M. de St Ives an *imperfect amauroſis*. There is a periodical ſort which comes on inſtantaneouſly, continues for hours, or days, and then diſappears.

AMAZIAH, one of the kings of Judah, aſcended the throne of his father Joaſh in the 25th year of his age. His mother's name was Jehoddan, a native of Jeruſalem. In conſequence of his wavering virtue, and his mingling foreign idolatry with the worſhip of the true God, he is ſaid, according to Scripture, to have done that which was right in the ſight of the Lord, but "not with a perfect heart." His father had been ungenerouſly murdered by his own ſervants, therefore his ſon, on his elevation to the throne, put to death the murderers of his father. In this act of remunerative juſtice, however, he ſhowed a becoming reſpect to the law of Moſes, which prohibited the puniſhing of the children for the crimes of their guilty fathers. He gave early proofs of his military talents, by making a general muſter of all his ſubjects able to bear arms; and likewiſe hired a numerous army from the neighbouring kingdom of Iſrael; and with this increaſed multitude he haſtened to attack Edom. The two kindred armies met together in the valley of Salt, and, after an obſtinate engagement, the Edomites were put to flight; and Amaziah from thence proceeded to take the town of Selah. But the ſpirit of jealouſy aroſe between the two armies, ſo that Amaziah thought it prudent not to make uſe of the arms of the Iſraelitiſh auxiliaries, conſequently iſſued an order for their returning home; but this treatment rouſed the martial ſpirit and indignant temper of the Iſraelites to ſuch a height, that, on their return, they turned their arms againſt the cities of Judah, and ravaged and deſtroyed them. The imperfection of the heart of Amaziah was fully diſplayed on this occaſion; for he is related to have brought home the gods of the children of Seir, who were unable to protect their own votaries, and in the folly of his heart to have paid them divine honours. Fluſhed with the ſucceſs of his arms in the valley of Salt, he ſent a hoſtile challenge to Jehoaſh king of Iſrael, expreſſed in the phraſeology of thoſe times, that they ſhould "look one another in the face. Pride goeth before deſtruction, and a haughty ſpirit before a fall." In vain the prudent and peaceful ſpirit of Jehoaſh endeavoured to perſuade him from his bold attempt. They ſaw one another in the face at Bethſhemeth, and Amaziah was made priſoner, and the men of Judah put to flight. Jehoaſh advanced to the capital, carrying the vanquiſhed king along with him; and he entered the city by breaking a large portion of the wall; and, after plundering the temple and the

King's

Amazonia. king's palace, he returned home in triumph to Samaria. This misfortune seems to have damped the military ardour of Amaziah; for, although he swayed the sceptre over Judah for many years after, yet he never engaged in any hostile contentions with his neighbours. Whether, through the oppressive conduct of Amaziah or whatever cause, it is certain that a conspiracy was formed against him in Jerusalem, which compelled him to fly to the city of Lachish for shelter; but the confederacy was so strong and numerous, that his enemies pursued him thither; and there he fell by their hands, in the 29th year of his reign. (2 Kings xiv. 2. Chron. xxv.).

AMAZONIA, or the country of the American Amazons, is situated between 50 and 70 degrees of west longitude; and between the equator and 15 degrees of south latitude; being bounded on the south by La Plata, on the west by Peru, on the north by the province of Terra Firma, and on the east by Brazil.

With respect to the Amazons said to have given name to this territory, they have been represented as governed and led to war only by their queen. No men were suffered to live among them; though those of some neighbouring nations were suffered to visit them, at a certain season, for the sake of procreation. The females issuing from this commerce were bred up with care, and instructed in what relates to war and government; as to the males, they were sent away into the country of their fathers. But no such nation is at present to be found, any more than the giants and cannibals mentioned by the first adventurers thither.

Amazonia is generally a flat region, abounding in woods, lakes, rivers, bogs, and morasses. The chief river, and one of the largest in the world, is that called the river of Amazons, or the Orellana, which is formed by two large rivers, the one rising in the province of Quito, a little south of the equator, in 73 degrees of west longitude, and the other, named *Xauxa*, rising in the lake of Bourbon, near the Andes, in 10 degrees of south latitude. These two rivers uniting on the confines of Peru and Amazonia, in three degrees odd minutes of south latitude, assume the name of Amazon; whence running eastward upwards of 200 miles, and afterwards inclining to the north, they fall into the Atlantic ocean by 84 channels, which in the rainy season overflow the adjacent country. Besides the two streams mentioned, a multitude of others, both on the north and south side, contribute to the formation of this extraordinary river. As it runs almost across the broadest part of South America, it is computed to be between 4000 and 5000 miles in length, including all its windings. Its channel from Junta de los Reyos, about 60 degrees from its head, to the river Maragnon, is from one to two leagues broad; it then widens from three to four, and becomes gradually broader as it approaches the ocean. Between the places last mentioned, its depth is from five to ten fathoms; but from Maragnon to Rio Negro it increases to 20 fathoms; after which it is sometimes 30, and sometimes 50 fathoms, or more, till it comes near the end of its course. It has no sand banks, nor does the shore shelve so as to render it dangerous for vessels. The manatu and tortoise abound both upon the banks of this and the other rivers; and the fishermen must be upon their guard against the crocodiles, alligators, and water serpents, which also swarm here. Amazoni Amazon

The air, as in the countries under the same parallel, is observed to be nearly as cool under the equator as about the tropics, on account of the rains continuing longer, and the sky in that season being clouded. Besides, an easterly wind sets from the Atlantic up the river so strong, that vessels are carried by it against the stream.

The produce of the country is Indian corn and the cassava root, of which they make flour and bread; tobacco, cotton, sugar, sarsaparilla, yams, potatoes, and other roots. They have also plenty of venison, fish, and fowl. Among the latter are vast flocks of parrots of all colours, the flesh of which serves for food and the feathers for ornament. All the trees here are evergreens; and fruits, flowers, and herbage, are in perfection all the year round. The principal fruits are cocoa nuts, ananas or pine apples, guavas, bananas, and such others as are usually found between the tropics. The forest and timber trees are cedar, Brazil wood, oak, ebony, logwood, ironwood, so called from its weight and hardness, and several sorts of dyeing wood.

The natives are of the common stature, with good features, a copper complexion, black eyes and hair. It is computed that there are of them about 150 different tribes or nations, and the villages are so numerous as to be within call of one another. Among those the Homagues, a people near the head of the river, are famous for their cotton manufactures; the Jurines, who live between five and ten degrees of latitude, for their joiners work; and the Wrofiffares for their earthen ware. The Topinambes, who inhabit a large island in the river, are remarkable for their strength. Some of those nations frequently make war upon each other. Their armour consists of darts, javelins, bows and arrows; and they wear targets of cane or fish-skin. They make slaves of their prisoners, whom they otherwise use very well. Every tribe is governed by its respective chief or king, the marks of whose dignity are a crown of parrots feathers, a chain of lions teeth or claws hung round his neck, or girt about his waist, and a wooden sword which he carries in his hand.

Most of those nations, except the Homagues, go naked. The women thrust pieces of cane through their ears and under lips, as well as through the skin of the pudenda. At the gristle of their noses they also hang glass beads, which wag to and fro when they speak. They are such skilful markmen, that they will shoot fish as they swim; and what they catch they eat without either bread or salt. They worship images, which they always carry with them on their expeditions; but they neither have temples nor any order of priests; and permit both polygamy and concubinage.

The country affords neither gold nor silver mines; only a small quantity of the former is found in the rivulets which fall into the Amazon near its sources in Peru. When the Spaniards imagined that it contained those metals, they made great efforts from Peru to reduce this territory to subjection; till being at length undeceived, they abandoned the design.

AMAZONS, in antiquity, a nation of female warriors, who founded an empire in Asia Minor, upon the river Thermodoon, along the coasts of the Black sea. They

Amazons. They are said to have formed a state, out of which men were excluded. What commerce they had with that sex, was only with strangers; they killed all their male children; and they cut off the right breasts of their females, to make them more fit for the combat. From which last circumstance it is that they are supposed to take their name, viz. from the privative α, and μαζος, *mamma*, "breast." But Dr Bryant, in his Analysis of Ancient Mythology, explodes this account as fabulous; and observes, that they were in general Cuthite colonies from Egypt and Syria, who formed settlements in different countries, and that they derived their name from ωον, "the sun," which was the national object of worship, vol. iii. p. 463. It has indeed been controverted, even among ancient writers, whether ever there really was such a nation as that of the Amazons. Strabo, Palæphatus, and others, deny it. On the contrary, Herodotus, Pausanias, Diodorus Siculus, Trogus Pompeius, Justin, Pliny, Mela, Plutarch, &c. expressly assert it.

M. Petit, a French physician, published a Latin dissertation in 1685, to prove that there was really a nation of Amazons. It contains abundance of curious inquiries relating to their habit, their arms, the cities built by them, &c. Others of the moderns also maintain, that their existence is sufficiently proved by the testimony of such of the historians of antiquity as are most worthy of credit; by the monuments which many of them have mentioned; and by medals, some of which are still remaining; and that there is not the least room to believe that what is said of them is fabulous.

The Amazons are mentioned by the most ancient of the Greek writers. In the third book of the Iliad, Homer represents Priam speaking of himself as having been present in the earlier part of his life, in a battle with the Amazons; and some of them afterwards came to the assistance of that prince during the siege of Troy.

The Amazons are particularly mentioned by Herodotus. That historian informs us, that the Grecians fought a battle with the Amazons on the river Thermodoon, and defeated them. After their victory, they carried off all the Amazons they could take alive in three ships. But whilst they were out at sea, these Amazons conspired against the men, and killed them all. Having, however, no knowledge of navigation, nor any skill in the use of the rudder, sails, or oars, they were driven by wind and tide till they arrived at the precipices of the lake Mæotis, in the territories of the Scythians. Here the Amazons went ashore, and, marching into the country, seized and mounted the first horses they met with, and began to plunder the inhabitants. The Scythians at first conceived them to be men; but after they had had skirmishes with them, and taken some prisoners, they discovered them to be women. They were then unwilling to carry on hostilities against them; and by degrees a number of the young Scythians formed connexions with them, and were desirous that these gentle dames should live with them as wives, and be incorporated with the rest of the Scythians. The Amazons agreed to continue their connexion with their Scythian husbands, but refused to associate with the rest of the inhabitants of the country, and especially with the women of it. They afterwards prevailed upon their husbands to retire to Sarmatia, where they settled. "Hence," says Herodotus, "the wives of the Sarmatians still continue their ancient way of living. They hunt on horseback in the company of their husbands, and sometimes alone. They march with their armies, and wear the same dress with the men. The Sarmatians use the Scythian language, but corrupted from the beginning, because the Amazons never learned to speak correctly. Their marriages are attended with this circumstance: no virgin is permitted to marry till she has killed an enemy in the field; so that some always grow old before they can qualify themselves as the law requires." Amazons.

Diodorus Siculus says, "There was formerly a nation who dwelt near the river Thermodoon, which was subjected to the government of women, and in which the women, like men, managed all the military affairs. Among these female warriors, it was said, was one who excelled the rest in strength and valour. She assembled together an army of women, whom she trained up in military discipline, and subdued some of the neighbouring nations. Afterwards, having by her valour increased her fame, she led her army against the rest; and being successful, she was so puffed up, that she styled herself the daughter of Mars, and ordered the men to spin wool, and do the work of the women within doors. She also made laws, by which the women were enjoined to go to the wars, and the men to be kept at home in a servile state, and employed in the meanest offices. They also debilitated the arms and thighs of those male children who were born of them, that they might be thereby rendered unfit for war. They seared the right breasts of their girls, that they might be no interruption to them in fighting: whence they derived the name of Amazons. Their queen, having become extremely eminent for skill and knowledge in military affairs, at length built a large city at the mouth of the river Thermodoon, and adorned it with a magnificent palace. In her enterprises she adhered strictly to military discipline and good order; and she added to her empire all the adjoining nations, even to the river Tanais. Having performed these exploits, she at last ended her days like a hero, falling in a battle, in which she had fought courageously. She was succeeded in the kingdom by her daughter, who imitated the valour of her mother, and in some exploits excelled her. She caused the girls from their very infancy to be exercised in hunting, and to be daily trained up in military exercises. She instituted solemn festivals and sacrifices to Mars and Diana, which were named Tauropoli. She afterwards carried her arms beyond the river Tanais, and subdued all the people of those regions, even unto Thrace. Returning then with a great quantity of spoils into her own kingdom, she caused magnificent temples to be erected to the deities before mentioned; and she gained the love of her subjects by her mild and gentle government. She afterwards undertook an expedition against those who were on the other side of the river, and subjected to her dominion a great part of Asia, extending her arms as far as Syria."

Diodorus also mentions another race of Amazons who dwelt in Africa; and whom he speaks of as being of greater antiquity than those who lived near the river Thermodoon. "In the western parts of Libya,"

Amazons. says he, "upon the borders of those tracts that are habitable, there was anciently a nation under the government of women, and whose manners and mode of living were altogether different from ours. It was the custom of those women to manage all military affairs; and for a certain time, during which they preserved their virginity, they went out as soldiers into the field. After some years employed in this manner, when the time appointed for this purpose was expired, they associated themselves with men, in order to obtain children. But the magistracy, and all public offices, they kept entirely in their own hands. The men, as the women are with us, were employed in household affairs, submitting themselves wholly to the authority of their wives. They were not permitted to take any part in military affairs, or to have any command, or any public authority, which might have any tendency to encourage them to cast off the yoke of their wives. As soon as any child was born, it was delivered to the father, to be fed with milk, or such other food as was suitable to its age. If females were born, they seared their breasts, that they might not be burdensome to them when they grew up; for they considered them as great hinderances in fighting.

Justin represents the Amazonian republic to have taken its rise in Scythia. The Scythians had a great part of Asia under their dominion upwards of 400 years, till they were conquered by Ninus, the founder of the Assyrian empire. After his death, which happened about 1150 years before the Christian era, and that of Semiramis and their son Ninyas, Ilinus and Scolopites, princes of the royal blood of Scythia, were driven from their country by other princes, who like them aspired to the crown. They departed with their wives, children, and friends; and being followed by a great number of young people of both sexes, they passed into Asiatic Sarmatia, beyond Mount Caucasus, where they formed an establishment, supplying themselves with the riches they wanted, by making incursions into the countries bordering on the Euxine sea. The people of those countries, exasperated by the incursions of their new neighbours, united, surprised, and massacred the men.

The women then resolving to revenge their death, and at the same time to provide for their own security, resolved to form a new kind of government, to choose a queen, enact laws, and maintain themselves, without men, even against the men themselves. This design was not so very surprising as at first sight appears: for the greatest number of the girls among the Scythians had been inured to the same exercises as the boys; to draw the bow, to throw the javelin, to manage other arms; to riding, hunting, and even the painful labours that seem reserved for men; and many of them, as among the Sarmatians, accompanied the men in war. Hence they had no sooner formed their resolution, than they prepared to execute it, and exercised themselves in all military operations. They soon secured the peaceable possession of the country; and not content with showing their neighbours that all their efforts to drive them thence or subdue them were ineffectual, they made war upon them, and extended their own frontiers. They had hitherto made use of the instructions and assistance of a few men that remained in the country; but finding at length that they could stand their ground, and aggrandize themselves, without them, they killed Amazons. all those whom flight or chance had saved from the fury of the Sarmatians, and for ever renounced marriage, which they now considered as an insupportable slavery. But as they could only secure the duration of their new kingdom by propagation, they made a law to go every year to the frontiers, to invite the men to come to them; to deliver themselves up to their embraces, without choice on their part, or the least attachment; and to leave them as soon as they were pregnant. All those whom age rendered fit for propagation, and were willing to serve the state by breeding girls, did not go at the same time in search of men: for in order to obtain a right to promote the multiplication of the species, they must first have contributed to its destruction; nor was any thought worthy of giving birth to children till she had killed three men.

If from this commerce they brought forth girls, they educated them; but with respect to the boys, if we may believe Justin, they strangled them at the moment of their birth: according to Diodorus Siculus, they twisted their legs and arms, so as to render them unfit for military exercises; but Quintus Curtius, Philostratus, and Jordanus, say, that the less savage sent them to their fathers. It is probable, that at first, when their fury against the men was carried to the greatest height, they killed the boys; that when this fury abated, and most of the mothers were filled with horror at depriving the little creatures of the lives they had just received from them, they fulfilled the first duties of a mother; but, to prevent their causing a revolution in the state, maimed them in such a manner as to render them incapable of war, and employed them in the mean offices which these warlike women thought beneath them. In short, that, when their conquests had confirmed their power, their ferocity subsiding, they entered into political engagements with their neighbours; and the number of the males they had preserved becoming burdensome, they, at the desire of those who rendered them pregnant, sent them the boys, and continued still to keep the girls.

As soon as the age of the girls permitted, they took away the right breast, that they might draw the bow with the greater force. The common opinion is, that they burnt that breast, by applying to it, at eight years of age, a hot brazen instrument, which insensibly dried up the fibres and glands; some think that they did not make use of so much ceremony, but that when the part was formed they got rid of it by amputation: some again, with much greater probability, affirm, that they employed no violent measures; but, by a continual compression of that part from infancy, prevented its growth, at least so far as to hinder its ever being incommodious in war.

Plutarch, treating of the Amazons in his life of Theseus, considers the accounts which had been preserved concerning them as partly fabulous and partly true. He gives some account of a battle which had been fought between the Athenians and the Amazons at Athens; and he relates some particulars of this battle which had been recorded by an ancient writer named Clidemus. He says, "That the left wing of the Amazons moved towards the place which is yet called Amazonium, and the right to a place called Pnyx, near Chrysa; upon which the Athenians, issuing from behind

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hind the temple of the Muſes, fell upon them; and that this is true, the graves of thoſe that were ſlain, to be ſeen in the ſtreets that lead to the gate Piraica, by the temple of the hero Chalcodue, are a ſufficient proof. And here it was that the Athenians were routed, and ſhamefully turned their backs to women, as far as to the temple of the Furies. But freſh ſupplies coming in from Palladium, Ardettus, and Lyceum, charged their right wing, and beat them back into their very tents; in which action a great number of the Amazons were ſlain." In another place he ſays, "It appears that the paſſage of the Amazons through Theſſaly was not without oppoſition; for there are yet to be ſeen many of their ſepulchres near Scotuſſæa and Cynocephalæ." And in his life of Pompey, ſpeaking of the Amazons, Plutarch ſays, "They inhabit thoſe parts of Mount Caucaſus that look towards the Hyrcanian ſea (not bordering upon the Albanians, for the territories of the Getæ and the Leſgæ lie betwixt): and with theſe people do they yearly, for two months only, accompany and cohabit, bed and board, near the river Thermodoon. After that they retire to their own habitations, and live alone all the reſt of the year."

Quintus Curtius ſays, "The nation of the Amazons is ſituated upon the borders of Hyrcania, inhabiting the plains of Thermiſcyra, near the river Thermodoon. Their queen was named Thaleſtris, and ſhe had under her ſubjection all the country that lies between Mount Caucaſus and the river Phaſis. This queen came out of her dominions, in conſequence of an ardent deſire ſhe had conceived to ſee Alexander; and being advanced near the place where he was, ſhe previouſly ſent meſſengers to acquaint him, that the queen was come to have the ſatisfaction of ſeeing and converſing with him. Having obtained permiſſion to viſit him, ſhe advanced with 300 of her Amazons, leaving the reſt of her troops behind. As ſoon as ſhe came within ſight of the king, ſhe leaped from her horſe, holding two javelins in her right hand. The apparel of the Amazons does not cover all the body, for their left ſide is naked down to the ſtomach; nor do the ſkirts of their garments, which they tie up in a knot, reach below their knees. They preſerve their left breaſt entire, that they may be able to ſuckle their female offſpring; and they cut off and ſear their right, that they may draw their bows, and caſt their darts, with the greater eaſe. Thaleſtris looked at the king with an undaunted countenance, and narrowly examined his perſon; which did not, according to her ideas, come up to the fame of his great exploits: For the barbarians have a great veneration for a majeſtic perſon, eſteeming thoſe only to be capable of performing great actions on whom nature has conferred a dignified appearance. The king having aſked her whether ſhe had any thing to deſire of him, ſhe replied, without ſcruple or heſitation, that ſhe was come with a view to have children by him, ſhe being worthy to bring him heirs to his dominions. Their offſpring, if of the female ſex, ſhe would retain herſelf; and if of the male ſex, it ſhould be delivered to Alexander. He then aſked her, whether ſhe would accompany him in his wars? But this ſhe declined, alleging, That ſhe had left nobody to take care of her kingdom. She continued to ſolicit Alexander, that he would not ſend her back without conforming to her wiſhes; but it was not till after a delay of 13 days that he complied. She then returned to her own kingdom." Amazons

Juſtin alſo repeatedly mentions this viſit of Thaleſtris to Alexander; and in one place he ſays, that ſhe made a march of 25 days, in order to obtain this meeting with him. The interview between Alexander and Thaleſtris is likewiſe mentioned by Diodorus Siculus. The learned Goropius, as he is quoted by Dr Petit, laments, in very pathetic terms, the hard fate of Thaleſtris, who was obliged to travel ſo many miles, and to encounter many hardſhips, in order to procure this interview with the Macedonian prince; and, from the circumſtances, is led to conſider the whole account as incredible. But Dr Petit, with equal erudition, with equal eloquence, and with ſuperior force of reaſoning, at length determines, that her journey was not founded upon irrational principles, and that full credit is due to thoſe grave and venerable hiſtorians by whom this tranſaction has been recorded.

The Amazons are repreſented as being armed with bows and arrows, with javelins, and alſo with an axe of a particular conſtruction, which was denominated the axe of the Amazons. According to the elder Pliny, this axe was invented by Penthefilea, one of their queens. On many ancient medals are repreſentations of the Amazons, armed with theſe axes. They are alſo ſaid to have had bucklers in the ſhape of a half moon.

The Amazons are mentioned by many other ancient authors, beſides thoſe which have been enumerated; and if any credit be due to the accounts concerning them, they ſubſiſted through ſeveral ages. They are repreſented as having rendered themſelves extremely formidable; as having founded cities, enlarged the boundaries of their dominions, and conquered ſeveral other nations.

That at any period there ſhould have been women, who, without the aſſiſtance of men, built cities and governed them, raiſed armies and commanded them, adminiſtered public affairs, and extended their dominion by arms, is undoubtedly ſo contrary to all that we have ſeen and known of human affairs, as to appear in a very great degree incredible; but that women may have exiſted ſufficiently robuſt, and ſufficiently courageous, to have engaged in warlike enterpriſes, and even to have been ſucceſsful in them, is certainly not impoſſible, however contrary to the uſual courſe of things. In ſupport of this ſide of the queſtion, it may be urged, that women who have been early trained to warlike exerciſes, to hunting, and to a hard and laborious mode of living, may be rendered more ſtrong, and capable of more vigorous exertions, than men who have led indolent, delicate, and luxurious lives, and who have ſeldom been expoſed even to the inclemencies of the weather. The limbs of women, as well as of men, are ſtrengthened and rendered more robuſt by frequent and laborious exerciſe. A nation of women, therefore, brought up and diſciplined as the ancient Amazons are repreſented to have been, would be ſuperior to an equal number of effeminate men, though they might be much inferior to an equal number of hardy men, trained up and diſciplined in the ſame manner.

That much of what is ſaid of the Amazons is fabulous, there can be no reaſonable doubt; but it does not

Amazons. therefore follow, that the whole is without foundation. The ancient medals and monuments on which they are repreſented are very numerous, as are alſo the teſtimonies of ancient writers. It ſeems not rational to ſuppoſe that all this originated in fiction, though it be much blended with it. The abbé Guyon ſpeaks of the hiſtory of the Amazons as having been regarded by many perſons as fabulous, "rather from prejudice than from any real and ſolid examination;" and it muſt be acknowledged, that the arguments in favour of their exiſtence, from ancient hiſtory, and from ancient monuments, are extremely powerful. The fact ſeems to be, that truth and fiction have been blended in the narrations concerning theſe ancient heroines.

Inſtances of heroiſm in women have occaſionally occurred in modern times, ſomewhat reſembling that of the ancient Amazons. The times and the manners of chivalry, in particular, by bringing great enterpriſes, bold adventurers, and extravagant heroiſm, into faſhion, inſpired the women with the ſame taſte. The women, in conſequence of the prevailing paſſion, were now ſeen in the middle of camps and of armies. They quitted the ſoft and tender inclinations, and the delicate offices of their own ſex, for the toils and the toilſome occupations of ours. During the cruſades, animated by the double enthuſiaſm of religion and of valour, they often performed the moſt romantic exploits; obtained indulgencies on the field of battle, and died with arms in their hands, by the ſide of their lovers or of their huſbands.

In Europe, the women attacked and defended fortifications; princeſſes commanded their armies, and obtained victories. Such was the celebrated Joan de Montfort, diſputing for her duchy of Bretagne, and fighting herſelf. Such was that ſtill more celebrated Margaret of Anjou, that active and intrepid general and ſoldier, whoſe genius ſupported a long time a feeble huſband; which taught him to conquer; which replaced him upon the throne; which twice relieved him from priſon; and, oppreſſed by fortune and by rebels, which did not bend till after ſhe had decided in perſon twelve battles.

The warlike ſpirit among the women, conſiſtent with ages of barbariſm, when every thing is impetuous becauſe nothing is fixed, and when all exceſs is the exceſs of force, continued in Europe upwards of 400 years, ſhowing itſelf from time to time, and always in the middle of convulſions, or on the eve of great revolutions. But there were eras and countries in which that ſpirit appeared with particular luſtre. Such were the diſplays it made in the 15th and 16th centuries in Hungary, and in the iſlands of the Archipelago and the Mediterranean, when they were invaded by the Turks.

Among the ſtriking inſtances of Amazonian conduct in modern ladies, may be mentioned that of Jane of Belleville, widow of Monſ. de Cliſſon, who was beheaded at Paris in the year 1343, on a ſuſpicion of carrying on a correſpondence with England and the count de Montfort. This lady, filled with grief for the death of her late huſband, and exaſperated at the ill treatment which ſhe conſidered him as having received, ſent off "her ſon ſecretly to London; and when her apprehenſions were removed with reſpect to him, ſhe ſold her jewels, fitted out three ſhips, and put to ſea, to revenge the death of her huſband upon all the French with whom ſhe ſhould meet. This new corſair made ſeveral deſcents upon Normandy, where ſhe ſtormed caſtles; and the inhabitants of that province were ſpectators more than once, whilſt their villages were all in a blaze, of one of the fineſt women in Europe, with a ſword in one hand and a torch in the other, urging the carnage, and eyeing with pleaſure all the horrors of war." Amazons.

We read in Mezeray (under the article of the Croiſade, preached by St Bernard in the year 1147), "That many women did not content themſelves with taking the croſs, but that they alſo took up arms to defend it, and compoſed ſquadrons of females, which rendered credible all that has been ſaid of the proweſs of the Amazons."

In the year 1590, the League party obtained ſome troops from the king of Spain. Upon the news of their being diſembarked, Barri de St Aunez, Henry IV.'s governor at Leucate, ſet out to communicate a ſcheme to the duke de Montmorenci, commander in that province. He was taken in his way by ſome of the troops of the League, who were alſo upon their march with the Spaniards towards Leucate. They were perſuaded, that by thus having the governor in their hands, the gates of that place would be immediately opened to them, or at leaſt would not hold out long. But Conſtantia de Cecelli, his wife, after having aſſembled the garriſon, put herſelf ſo reſolutely at their head, pike in hand, that ſhe inſpired the weakeſt with courage; and the beſiegers were repulſed wherever they preſented themſelves. Shame, and their great loſs, having rendered them deſperate, they ſent a meſſenger to this courageous woman, acquainting her, that if ſhe continued to defend herſelf, they would hang her huſband. She replied, with tears in her eyes, "I have riches in abundance: I have offered them, and I do ſtill offer them, for his ranſom; but I would not ignominiouſly purchaſe a life which he would reproach me with, and which he would be aſhamed to enjoy. I will not diſhonour him by treaſon againſt my king and country." The beſiegers having made a freſh attack without ſucceſs, put her huſband to death, and raiſed the ſiege. Henry IV. afterwards ſent to this lady the brevet of governeſs of Leucate, with the reverſion for her ſon.

The famous maid of Orleans, alſo, is an example known to every reader.

The abbé Arnaud, in his memoirs, ſpeaks of a counteſs of St Balmont, who uſed to take the field with her huſband, and fight by his ſide. She ſent ſeveral Spaniſh priſoners of her taking to Marſhal Feuquiers; and, what was not a little extraordinary, this Amazon at home was all affability and ſweetneſs, and gave herſelf up to reading and acts of piety.

Dr Johnſon ſeems to have given ſome credit to the accounts which have been tranſmitted down to us concerning the ancient Amazons; and he has endeavoured to ſhow, that we ought not haſtily to reject ancient hiſtorical narrations becauſe they contain facts repugnant to modern manners, and exhibit ſcenes to which nothing now occurring bears a reſemblance. "Of what we know not (ſays he) we can only judge by what we know. Every novelty appears more wonderful, as it is more remote from any thing with which

experience

Amazons

experience or teſtimony have hitherto acquainted us; and, if it paſſes farther, beyond the notions that we have been accuſtomed to form, it becomes at laſt incredible. We ſeldom conſider that human knowledge is very narrow; that national manners are formed by chance; that uncommon conjunctures of cauſes produce rare effects; or, that what is impoſſible at one time or place may yet happen in another. It is always eaſier to deny than to inquire. To refuſe credit confers for a moment an appearance of ſuperiority which every little mind is tempted to aſſume, when it may be gained ſo cheaply as by withdrawing attention from evidence, and declining the fatigue of comparing probabilities. Many relations of travellers have been ſlighted as fabulous, till more frequent voyages have confirmed their veracity; and it may reaſonably be imagined that many ancient hiſtorians are unjuſtly ſuſpected of falſehood, becauſe our own times afford nothing that reſembles what they tell. Few narratives will, either to men or women, appear more incredible than the hiſtories of the Amazons; of female nations, of whoſe conſtitution it was the eſſential and fundamental law, to exclude men from all participation, either of public affairs or domeſtic buſineſs; where female armies marched under female captains, female farmers gathered the harveſt, female partners danced together, and female wits diverted one another. Yet ſeveral ages of antiquity have tranſmitted accounts of the Amazons of Caucaſus; and of the Amazons of America, who have given their name to the greateſt river in the world, Condamine lately found ſuch memorials as can be expected among erratic and unlettered nations, where events are recorded only by tradition, and new ſwarms ſettling in the country from time to time confuſe and efface all traces of former times.

No author has taken ſo much pains upon this ſubject as Dr Petit. But, in the courſe of his work, he has given it as his opinion, that there is great difficulty in governing the women even at preſent, though they are unarmed and unpractiſed in the art of war. After all his elaborate inquiries and diſcuſſions, therefore, this learned writer might probably think, that it is not an evil of the firſt magnitude that the race of Amazons now ceaſes to exiſt.

Rouſſeau ſays, "The empire of the woman is an empire of ſoftneſs, of addreſs, of complacency. Her commands are careſſes, her menaces are tears." But the empire of the Amazons was certainly an empire of a very different kind. Upon the whole, we may conclude with Dr Johnſon: "The character of the ancient Amazons was rather terrible than lovely. The hand could not be very delicate that was only employed in drawing the bow, and brandiſhing the battleaxe. Their power was maintained by cruelty, their courage was deformed by ferocity; and their example only ſhows, that men and women live beſt together."

AMAZONS, *the river of*, in America. See AMAZONIA.

AMAZONIAN Habit, in *Antiquity*, denotes a dreſs formed in imitation of the Amazons. Marcia the famous concubine of the emperor Commodus, had the appellation of *Amazonian*, becauſe ſhe charmed him moſt in a habit of this kind. Hence alſo that prince himſelf engaged in combat in the amphitheatre in an Amazonian habit; and of all titles the *Amazonius* was one of thoſe he moſt delighted in. In honour either of the gallant or his miſtreſs, the month December was alſo denominated *Amazonius*. Some alſo apply *Amazonian* habit to the hunting-dreſs worn by many ladies among us.

Amba ‖ Ambarvalia.

AMBA, an Abyſſinian or Ethiopic word, ſignifying a *rock*. The Abyſſinians give names to each of their rocks, as *Amba-Dorho*, the rock of a hen, &c. Some of theſe rocks are ſaid to have the name of *Aorni*; and are of ſuch a ſtupendous height, that the Alps and Pyrenees are but low hills in compariſon of them. Amongſt the mountains, and even frequently in the plains, of this country, ariſe ſteep and craggy rocks of various forms, ſome reſembling towers, others pyramids, &c. ſo perpendicular and ſmooth on the ſides, that they ſeem to be works of art; inſomuch, that men, cattle, &c. are craned up by the help of ladders and ropes: and yet the tops of theſe rocks are covered with woods, meadows, fountains, fiſh-ponds, &c. which very copiouſly ſupply the animals ſeated thereon with all the conveniencies of life. The moſt remarkable of theſe rocks is called *Amba-Geſhen*. It is prodigiouſly ſteep, in the form of a caſtle built of freeſtone, and almoſt impregnable. Its ſummit is about half a Portugueſe league in breadth, and the circumference at the bottom about half a day's journey. The aſcent at firſt is eaſy; but grows afterwards ſo ſteep, that the Abaſſine oxen, which will otherwiſe clamber like goats, muſt be craned up, and let down with ropes. Here the princes of the blood were formerly confined, in low cottages amongſt ſhrubs and wild cedars, with an allowance barely ſufficient to keep them alive. There is, according to Kircher, in this country, a rock ſo curiouſly hollowed by nature, that at a diſtance it reſembles a looking-glaſs; and oppoſite to this another, on the top of which nothing can be ſo ſoftly whiſpered but it may be heard a great way off. Between many of theſe rocks and mountains are vaſt abyſſes, which appear very dreadful to the eye.

AMBACHT, is a word which denotes a kind of juriſdiction or territory, the profeſſor whereof has the adminiſtration of juſtice, both in *alto* and *baſſo*; or of what is called, in the Scots law, *a power of pit and gallows*, i. e. a power of drowning and hanging. In ſome ancient writers, ambacht is particularly uſed for the juriſdiction, government, or chief magiſtracy of a city. The word is very ancient, though uſed originally in a ſenſe ſomewhat different. Ennius calls a mercenary, or ſlave hired for money, *ambactus*; and Cæſar gives the ſame appellation to a kind of dependents among the Gauls, who, without being ſlaves, were attached to the ſervice of great lords.

AMBAGES. See CIRCUMLOCUTION.

AMBARVALIA, in *Antiquity*, a ceremony among the Romans, when, in order to procure from the gods a happy harveſt, they conducted the victims thrice round the corn fields in proceſſion, before ſacrificing them.—*Ambarvalia* were either of a private or public nature: the private were performed by the maſter of a family, and the public by the prieſts who officiated at the ſolemnity, called *fratres ovales*. The prayer preferred on this occaſion, the formula of which we have in Cato *de Re Ruſtica*, cap. cxlii. was called *carmen ambervale*. At theſe feaſts they ſacrificed to Ceres a ſow, a ſheep, and a bull or heifer, whence they took

the

Ambaſſador || Amber.

the name of *ſuovetaurilia*. The method of celebrating them was, to lead a victim round the fields, while the peaſants accompanied it, and one of their number, crowned with oak, hymned forth the praiſes of Ceres, in verſes compoſed on purpoſe. This feſtival was celebrated twice a-year; at the end of January, according to ſome, or in April, according to others; and for the ſecond time, in the month of July.

AMBASSADOR, or EMBASSADOR, a public miniſter ſent from one ſovereign prince, as a repreſentative of his perſon, to another.

Ambaſſadors are either ordinary or extraordinary. Ambaſſador *in ordinary*, is he who conſtantly reſides in the court of another prince, to maintain a good underſtanding, and look to the intereſt of his maſter. Till about two hundred years ago, ambaſſadors in ordinary were not heard of: all, till then, were ambaſſadors *extraordinary*; that is, ſuch as are ſent on ſome particular occaſion, and who retire as ſoon as the affair is deſpatched.

By the law of nations, none under the quality of a ſovereign prince can ſend or receive an ambaſſador. At Athens, ambaſſadors mounted the pulpit of the public orators, and there opened their commiſſion, acquainting the people with their errand. At Rome, they were introduced to the ſenate, and delivered their commiſſions to the fathers.

Ambaſſadors ſhould never attend any public ſolemnities, as marriages, funerals, &c. unleſs their maſters have ſome intereſt therein: nor muſt they go into mourning on any occaſions of their own, becauſe they repreſent the perſon of their prince. By the civil law, the moveable goods of an ambaſſador, which are accounted an acceſſion to his perſon, cannot be ſeized on, neither as a pledge, nor for payment of a debt, nor by order or execution of judgement, nor by the king's or ſtate's leave where he reſides, as ſome conceive; for all actions ought to be far from an ambaſſador, as well that which toucheth his neceſſaries, as his perſon: if therefore, he hath contracted any debt, he is to be called upon kindly; and if he refuſes, then letters of requeſt are to go to his maſter. Nor can any of the ambaſſador's domeſtic ſervants that are regiſtered in the ſecretaries of ſtate's office be arreſted in perſon or goods; if they are, the proceſs ſhall be void, and the parties ſueing out and executing it ſhall ſuffer and be liable to ſuch penalties and corporal puniſhment as the lord chancellor or either of the chief juſtices ſhall think fit to inflict. Yet ambaſſadors cannot be defended when they commit any thing againſt that ſtate, or the perſon of the prince, with whom they reſide; and if they are guilty of treaſon, felony, &c. or any other crime againſt the law of nations, they loſe the privilege of an ambaſſador, and may be ſubject to puniſhment as private aliens.

AMBE, in *Surgery*, the name of an inſtrument for reducing diſlocated bones. In *Anatomy*, a term for the ſuperficial jutting out of a bone.

AMBER (*Succinum*), in *Natural Hiſtory*, a ſolid, hard, ſemipellucid, bituminous ſubſtance of a particular nature, of uſe in medicine and in ſeveral of the arts. It has been called *ambra* by the Arabians, and *electrum* by the Greeks.

Amber has been of great repute in the world from the earlieſt times. Many years before Chriſt it was in eſteem as a medicine; and Plato, Ariſtotle, Herodotus, Æſchylus, and others, have commended its virtues. In the times of the Romans, it became in high eſteem as a gem; and in the luxurious reign of Nero, immenſe quantities of it were brought to Rome, and uſed for ornamenting works of various kinds. Amber.

The moſt remarkable property of this ſubſtance is, that when rubbed it draws or attracts other bodies to it: and this, it is obſerved, it does even to thoſe ſubſtances which the ancients thought it had an antipathy to; as oily bodies, drops of water, human ſweat, &c. Add, that, by the friction it is brought to yield light pretty copiouſly in the dark; whence it is reckoned among the native phoſphori.

The property which amber poſſeſſes of attracting light bodies was very anciently obſerved. Thales of Miletus, 600 years before Chriſt, concluded from hence, that it was animated. But the firſt perſon who expreſsly mentions this ſubſtance is Theophraſtus, about the year 300 before Chriſt. The attractive property of amber is likewiſe occaſionally taken notice of by Pliny and other later naturaliſts, particularly by Gaſſendus, Kenelm Digby, and Sir Thomas Brown; but it was generally apprehended that this quality was peculiar to amber and jet, and perhaps agate, till Gilbert publiſhed his treatiſe *de Magnete*, in the year 1600. From ηλεκτρον, the Greek name for amber, is derived the term *Electricity*, which is now very extenſively applied, not only to the power of attracting light bodies inherent in amber, but to other ſimilar powers, and their various effects in whatever bodies they reſide, or to whatever bodies they may be communicated.

Amber aſſumes all figures in the ground; that of a pear, an almond, a pea, &c. In amber there have been ſaid to be letters found very well formed; and even Hebrew and Arabic characters.—Within ſome pieces, leaves, inſects, &c. have likewiſe been found included; which ſeems to indicate either that the amber was originally in a fluid ſtate, or that having been expoſed to the ſun it was once ſoftened, and rendered ſuſceptible of the leaves, inſects, &c. which came in its way. The latter of theſe ſuppoſitions ſeems the more agreeable to the phenomenon; becauſe thoſe inſects, &c. are never found in the centre of the pieces of amber, but always near the ſurface. It is obſerved by the inhabitants of thoſe places where amber is produced, that all animals, whether terreſtrial, aerial, or aquatic, are extremely fond of it, and that pieces of it are frequently found in their excrements. The bodies of inſects, found buried in amber, are viewed with admiration by all the world; but of the moſt remarkable of theſe, many are to be ſuſpected as counterfeit, the great price at which beautiful ſpecimens of this kind ſell, having tempted ingenious cheats to introduce animal bodies in ſuch artful manners, into ſeemingly whole pieces of amber, that it is not eaſy to detect the fraud.

Of thoſe inſects which have been originally incloſed in amber, ſome are plainly ſeen to have ſtruggled hard for their liberty, and even to have left their limbs behind them in the attempt; it being no unuſual thing to ſee, in a maſs of amber that contains a ſtout beetle, the animal wanting one, or perhaps two of its legs; and thoſe legs left in different places, nearer that part of the maſs from which it has travelled. This alſo may account for the common accident of finding legs

Amber. or wings of flies, without the reſt of their bodies, in pieces of amber; the inſects having, when entangled in the yet ſoft and viſcid matter, eſcaped, at the expence of leaving theſe limbs behind them. Drops of clear water are ſometimes alſo preſerved in amber. Theſe have doubtleſs been received into it while ſoft, and preſerved by its hardening round them. Beautiful leaves of a pinnated ſtructure, reſembling ſome of the ferns, or maidenhairs, have been found in ſome pieces; but theſe are rare, and the ſpecimens of great value. Mineral ſubſtances are alſo found at times lodged in maſſes of amber. Some of the pompous collections of the German princes boaſt of ſpecimens of native gold and ſilver in maſſes of amber; but as there are many ſubſtances of the marcaſite, and other kinds, that have all the glittering appearance of gold and ſilver, it is not to be too haſtily concluded, that theſe metals are really lodged in theſe beds of amber. Iron is found in various ſhapes immerſed in amber; and as it is often ſeen eroded, and ſometimes in the ſtate of vitriol, it is not impoſſible but that copper, and the other metals, may be alſo ſometimes immerſed in it in the ſame ſtate; hence the bluiſh and greeniſh colours, frequently found in the recent pieces of amber, may be owing, like the particles of the gem colours, to thoſe metals; but as the gems, by their denſe texture, always retain their colours, this lighter and more lax bitumen uſually loſes what it gets of this kind by keeping ſome time. Small pebbles, grains of ſand, and fragments of other ſtones, are alſo not unfrequently found immerſed in amber.

Naturaliſts have been greatly divided as to the origin of this ſubſtance, and what claſs of bodies it belongs to; ſome referring it to the vegetable, others to the mineral, and ſome even to the animal kingdom. Pliny deſcribes it as "a reſinous juice, oozing from aged pines and firs (others ſay from poplars, whereof there are whole foreſts on the coaſts of Sweden), and diſcharged thence into the ſea, where undergoing ſome alteration, it is thrown, in this form, upon the ſhores of Pruſſia, which lie very low: he adds, that it was hence the ancients gave it the denomination *ſuccinum*; from *ſuccus*, juice.

Some ſuppoſe amber a compound ſubſtance. Pruſſia, ſay they, and the other countries which produce amber, are moiſtened with a bituminous juice, which mixing with the vitriolic ſalts abounding in thoſe places, the points of thoſe ſalts fix its fluidity, whence it congeals; and the reſult of that congelation makes what we call amber; which is more or leſs pure, tranſparent, and firm, as thoſe parts of ſalt and bitumen are more or leſs pure, and are mixed in this or that proportion.

Mr Brydone, in his tour to Sicily and Malta, ſays, that the river Gearetta, formerly celebrated by the poets under the name of Simetus, throws up near its mouth great quantities of amber. He mentions alſo a kind of artificial amber, not uncommon there, made, as he was told, from copal, but very different from the natural.

According to Hartman, amber is formed of a bitumen, mixed with vitriol and other ſalts. But though this were allowed him in regard to the foſſil amber, many diſpute whether the ſea amber be ſo produced. It is, however, apparent, that all amber is of the ſame origin, and probably that which is found in the ſea has been waſhed thither out of the cliffs; though Hartman thinks it very poſſible, that ſome of it may be formed in the earth under the ſea, and be waſhed up thence. The ſea amber is uſually finer to the eye than the foſſil; but the reaſon is, that it is diveſted of that coarſe coat with which the other is covered while in the earth. Amber.

Upon the whole, it ſeems generally agreed upon, that amber is a true bitumen of a foſſil origin. In a late volume of the *Journal de Phyſique*, however, we find it aſſerted by Dr Girtanner to be an animal product, a ſort of honey or wax formed by a ſpecies of large ant called by Linnæus *formica rufa*. Theſe ants, our author informs us, inhabit the old pine foreſts, where they ſometimes form hills about ſix feet in diameter: and it is generally in theſe ancient foreſts, or in places where they have been, that foſſil amber is found. This ſubſtance is not hard as that which is taken up in the ſea at Pruſſia, and which is well known to naturaliſts. It has the conſiſtence of honey or of half melted wax, but it is of a yellow colour like common amber; it gives the ſame product by chemical analyſis, and it hardens like the other when it is ſuffered to remain ſome time in a ſolution of common ſalt. This accounts for the inſects that are ſo often found incloſed in it. Among theſe inſects ants are always the moſt prevailing; which tends farther, Mr Girtanner thinks, to the confirmation of his hypotheſis. Amber, then, in his opinion, is nothing but a vegetable oil rendered concrete by the acid of ants, juſt as wax is nothing but an oil hardened by the acid of bees; a fact inconteſtably proved, we are told, ſince Mr Metherie has been able to make artificial wax by mixing oil of olives with the nitrous acid, and which wax is not to be diſtinguiſhed from the natural.

There are ſeveral indications which diſcover where amber is to be found. The ſurface of the earth is there covered with a ſoft ſcaly ſtone: and vitriol in particular always abounds there, which is ſometimes found white, ſometimes reduced into a matter like melted glaſs, and ſometimes figured like petrified wood.

Amber of the fineſt kind has been found in England. It is frequently thrown on the ſhores of Yorkſhire, and many other places, and found even in our clay pits; the pits dug for tile-clay between Tyburn and Kenſington gravel pits, and that behind St George's Hoſpital at Hyde-park corner, have afforded fine ſpecimens.

Poland, Sileſia, and Bohemia, are famous for the amber dug up there at this time. Germany affords great quantities of amber, as well dug up from the bowels of the earth, as toſſed about on the ſhores of the ſea and rivers there. Saxony, Miſnia, Sweden, and many other places in this tract of Europe, abound with it. Denmark has afforded, at different times, ſeveral quantities of foſſil amber; and the ſhores of the Baltic abound with it. But the countries lying on the Baltic afford it in the greateſt abundance of all; and of theſe the moſt plentiful country is Pruſſia, and the next is Pomerania. Pruſſia was, as early as the time of Theodoric the Goth, famous for amber; for this ſubſtance coming into great repute with this prince, ſome natives of Pruſſia, who were about his court, offered their ſervice to go to their own country, where that

Amber. that ſubſtance, they ſaid, was produced, and bring back great ſtores of it. They accordingly did ſo; and from this time Pruſſia had the honour to be called the country of amber, inſtead of Italy, which had before undeſervedly that title. This article alone brings his Pruſſian majeſty a revenue of 26,000 dollars annually. The amber of Pruſſia is not only found on the ſea coaſts, but in digging; and though that of Pomerania is generally brought from the ſhores, yet people who dig, on different occaſions, in the very heart of the country, at times find amber.

Junker deſcribes, after Neumann, the Pruſſian amber mines, which are the richeſt known. Firſt, At the ſurface of the earth is found a ſtratum of ſand. Immediately under this ſand is a bed of clay, filled with ſmall flints of about an inch diameter each. Under this clay lies a ſtratum of black earth or turf, filled with foſſil wood, half decompoſed and bituminous: this ſtratum is extended upon a bank of minerals, containing little metal except iron, which are conſequently pyrites. Laſtly, Under this bed the amber is found ſcattered about in pieces, or ſometimes accumulated in heaps.

Amber has a ſubacrid reſinous taſte, and fragrant aromatic ſmell, eſpecially when diſſolved. It differs from the other bituminous ſubſtances in this, that it yields by diſtillation a volatile acid ſalt, which none of the others do; otherwiſe it affords the ſame ſort of principles as them, viz. an acid phlegm, an oil which gradually becomes thicker as the diſtillation is continued; and when the operation is finiſhed, there remains a black caput mortuum in the retort. When boiled in water, it neither ſoftens nor undergoes any ſenſible alteration. Expoſed to the fire in an open veſſel, it melts into a black maſs very like a bitumen: It is partly ſoluble in ſpirit of wine, and likewiſe in ſome eſſential oils; but it is with difficulty that the expreſſed ones are brought to act upon it. The ſtronger ſorts of fixed alkaline lixivia almoſt totally diſſolve it.

This ſubſtance is principally of two colours, white and yellow. The white is the moſt eſteemed for medicinal purpoſes, as being the moſt odoriferous, and containing the greateſt quantity of volatile ſalt; though the yellow is moſt valued by thoſe who manufacture beads and other toys with it, by reaſon of its tranſparency.

Amber is the baſis of all varniſhes, by ſolution in the ways deſcribed under the article VARNISH.

Amber, when it has once been melted, irrecoverably loſes its beauty and hardneſs. There have been ſome, however, who pretended they had an art of melting ſome ſmall pieces of amber into a maſs, and conſtituting large ones of them: but this ſeems ſuch another undertaking as the making of gold; all the trials that have yet been made by the moſt curious experimenters, proving, that the heat which is neceſſary to melt amber is ſufficient to deſtroy it. (*Phil. Tranſ.* N° 248. p. 25.)

Could amber indeed be diſſolved without impairing its tranſparency, or one large maſs be made of it by uniting ſeveral ſmall ones, it is eaſy to ſee what would be the advantages of ſuch a proceſs. The art of embalming might poſſibly be alſo carried to a great height by this, if we could preſerve the human corpſe in a tranſparent caſe of amber, as the bodies of flies, ſpiders, graſhoppers, &c. are to a great perfection.— Something of a ſubſtitute of this kind we have in fine roſin; which being diſſolved by heat, and the bodies of ſmall animals ſeveral times dipped in it, they are thus coated with colophony, that in ſome degree reſembles amber; but this muſt be kept from duſt. Amber-tree ‖ Ambergris

Amber in ſubſtance has been much recommended as a nervous and cordial medicine; and alleged to be very efficacious in promoting the menſtrual diſcharge, and the excluſion of the fœtus and ſecundines in labour: but as in its crude ſtate it is quite inſoluble by our juices, it certainly can have very little effect on the animal ſyſtem, and therefore it is now ſeldom given in ſubſtance. The forms in which amber is prepared are, a tincture, a ſalt, and an oil; the preparations and uſes of which are deſcribed in the proper place under the article PHARMACY.

AMBER-Tree, the Engliſh name of a ſpecies of ANTHOSPERMUM.

AMBERG, a city of Germany, the capital of the palatinate of Bavaria, with a good caſtle, ramparts, baſtions, and deep ditches. It is ſeated near the confines of Franconia, on the river Wils. It has a great trade in iron and other metals, which are found in the neighbouring mountains. E. Long. 12. 0. N. Lat. 49. 25.

AMBERG, a lofty mountain of Eaſt Gothland in Sweden. Near the Wetter lake on this mountain, antimony has been found. On its top is the burying place of one of the ancient kings of the country. The ſpot is marked by a flat ſtone.

AMBERGRIS, AMBERGREASE, or GRAY-AMBER, in *Natural Hiſtory*, is a ſolid, opaque, aſh-coloured, fatty, inflammable ſubſtance, variegated like marble, remarkably light, rugged, and uneven in its ſurface, and has a fragrant odour when heated. It does not effervеſce with acids: it melts freely over the fire into a kind of yellow roſin; and is hardly ſoluble in ſpirit of wine.

It is found ſwimming upon the ſea, or the ſea coaſt, or in the ſand near the ſea coaſt; eſpecially in the Atlantic ocean, on the ſea coaſt of Brazil, and that of Madagaſcar; on the coaſt of Africa, of the Eaſt Indies, China, Japan, and the Molucca iſlands: but moſt of the ambergris which is brought to England comes from the Bahama iſlands, from Providence, &c. where it is found on the coaſt. It is alſo ſometimes found in the abdomen of whales by the whale fiſhermen, always in lumps of various ſhapes and ſizes, weighing from half an ounce to a hundred and more pounds. The piece which the Dutch Eaſt India Company bought from the king of Tydore, weighed 182 pounds. An American fiſherman from Antigua found ſome years ago, about fifty-two leagues ſouth-eaſt from the Windward iſlands, a piece of ambergris in a whale which weighed about a hundred and thirty pounds, and ſold for 500l. ſterling.

There have been many different opinions concerning the origin of this ſubſtance.

It has been ſuppoſed to be a foſſil bitumen or naphtha, exuding out of the bowels of the earth in a fluid form, and diſtilling into the ſea, where it hardens and floats on the ſurface. But having been frequently found in the bellies of whales, it has by others been conſidered as entirely an animal production.

Cluſius aſſerted it to be a phlegmatic recrement, or indurated

Ambergris. indurated indigeſtible part of the food, collected and found in the ſtomach of the whale, in the ſame manner as the BEZOARS are found in the ſtomachs of other animals.

In an account communicated by Paul Dudley, Eſq. in the 23d volume of the Philoſophical Tranſactions, the ambergris found in whales is repreſented as a kind of animal product, like muſk, and caſtoreum, &c. ſecreted and collected in a particular bag or bladder, which is furniſhed with an excretory duct or canal, the ſpout of which runs tapering into and through the length of the penis; and that this bag, which lies juſt over the teſticles, is almoſt full of a deep orange-coloured liquor, not quite ſo thick as oil, of the ſame ſmell as the balls of ambergris, which float and ſwim looſe in it; which colour and liquor may alſo be found in the canal of the penis; and that therefore ambergris is never to be found in any female, but in the male only. But theſe circumſtances are not only deſtitute of truth, but alſo contrary to the laws of the animal economy: For, in the firſt place, ambergris is frequently found in females as well as males; although that found in females is never in ſuch large pieces, nor of ſo good a quality, as what is found in males. Secondly, No perſon who has the leaſt knowledge in anatomy or phyſiology, will ever believe that organized bodies, ſuch as the beaks of the ſepia, which are ſo conſtantly found in ambergris taken out of the whale, can have been abſorbed from the inteſtines by the lacteals or lymphatics, and collected with the ambergris in the precluded bag above mentioned.

Kæmpfer, who has given us ſo many other faithful accounts in natural hiſtory, ſeems to come nearer the truth with regard to the origin of ambergris, when he ſays, that it is the dung of the whale; and that the Japaneſe for this reaſon call it *kuſura no fuu*, i. e. whale's dung. This account, howevever, though founded on obſervation, has never obtained credit; but has been conſidered rather as a fabulous ſtory, with which the Japaneſe impoſed upon him, who had himſelf no direct obſervation to prove the fact.

This matter, therefore, remained a ſubject of great doubt; and it was generally thought to be more probable, that ambergris, after having been ſwallowed and ſomehow or other changed in the ſtomach and bowels of the whale, was found among its excrements.

But the moſt ſatisfactory account of the real origin of ambergris, is that given by Dr Swediaur in the 73d volume of the Philoſophical Tranſactions, art. 15.

We are told by all writers on ambergris, that ſometimes claws and beaks of birds, feathers of birds, parts of vegetables, ſhells, fiſh, and bones of fiſh, are found in the middle of it, or variouſly mixed with it. Of a very large quantity of pieces, however, which the Doctor examined, he found none that contained any ſuch thing; though he allows that ſuch ſubſtances may ſometimes be found in it: but in all the pieces of any conſiderable ſize, whether found on the ſea or in the whale, he conſtantly found a conſiderable quantity of black ſpots, which, after the moſt careful examination, appeared to be the beaks of the *Sepia Octopodia*; and theſe beaks, he thinks, might be the ſubſtances which have hitherto been always miſtaken for claws or beaks of birds, or for ſhells.

The preſence of theſe beaks in ambergris proves evidently, that all ambergris containing them is in its origin, or muſt have been once, of a very ſoft or liquid nature, as otherwiſe thoſe beaks could not ſo conſtantly be intermixed with it throughout its whole ſubſtance. Ambergris.

That ambergris is found either upon the ſea and ſea-coaſt, or in the bowels of whales, is a matter of fact univerſally credited. But it has never been examined into and determined whether the ambergris found upon the ſea and ſea-coaſt, is the ſame as that found in the whale, or whether they are different from one another; whether that found on the ſea or ſea-coaſt has ſome properties or conſtituent parts which that found in the whale has not; and laſtly, whether that found in the whale is ſuperior or inferior in its qualities and value to the former.

It is likewiſe a matter of conſequence to know, whether ambergris is found in all kinds of whales, or only in a particular ſpecies of them; whether it is conſtantly and always to be met with in thoſe animals; and, if ſo, in what part of their body it is to be found?

All theſe queſtions we find very ſatisfactorily diſcuſſed by Dr Swediaur.

According to the beſt information that he could obtain from ſeveral of the moſt intelligent perſons employed in the ſpermaceti whale fiſhery, and in procuring and ſelling ambergris, it appears, that this ſubſtance is ſometimes found in the belly of the whale, but in that particular ſpecies only which is called the *ſpermaceti whale*, and which, from its deſcription and delineation, appears to be the *PHYSETER Macrocephalus* Linnæi.

The New England fiſhermen, according to their account, have long known that ambergris is to be found in the ſpermaceti whale; and they are ſo convinced of this fact, that whenever they hear of a place where ambergris is found, they always conclude that the ſeas in that part are frequented by that ſpecies of whale.

The perſons who are employed in the ſpermaceti whale fiſhery, confine their views to the phyſeter macrocephalus. They look for ambergris in all the ſpermaceti whales they catch, but it ſeldom happens that they find any. Whenever they hook a ſpermaceti whale, they obſerve, that it conſtantly not only vomits up whatever it has in its ſtomach, but alſo generally diſcharges its fæces at the ſame time; and if this latter circumſtance takes place, they are generally diſappointed in finding ambergris in its belly. But whenever they diſcover a ſpermaceti whale, male or female, which ſeems torpid and ſickly, they are always pretty ſure to find ambergris, as the whale in this ſtate ſeldom voids its fæces upon being hooked. They likewiſe generally meet with it in the dead ſpermaceti whales, which they ſometimes find floating on the ſea. It is obſerved alſo, that the whale in which they find ambergris often has a morbid protuberance, or, as they expreſs it, a kind of gathering in the lower part of its belly, in which, if cut open, ambergris is found. It is obſerved, that all thoſe whales in whoſe bowels ambergris is found, ſeem not only torpid and ſick, but are alſo conſtantly leaner than others; ſo that, if we may judge from the conſtant union of theſe two circumſtances, it would ſeem that a larger collection of ambergris in the belly of the whale is a ſource of diſeaſe, and probably ſometimes the cauſe of its death. As ſoon as they

Ambergris. hook a whale of this deſcription, torpid, ſickly, emaciated, or one that does not dung on being hooked, they immediately either cut up the above-mentioned protuberance, if there be any, or they rip open its bowels from the orifice of the anus, and find the ambergris ſometimes in one ſometimes in different lumps, of generally from three to twelve and more inches in diameter, and from one pound to twenty or thirty pounds in weight, at the diſtance of two, but moſt frequently of about ſix or ſeven feet from the anus, and never higher up in the inteſtinal canal; which, according to their deſcription, is in all probability the inteſtinum cæcum, hitherto miſtaken for a peculiar bag made by nature for the ſecretion and collection of this ſingular ſubſtance. That the part they cut open to come at the ambergris is no other than the inteſtinal canal is certain, becauſe they conſtantly begin their inciſion at the anus, and find the cavity everywhere filled with the fæces of the whale, which from their colour and ſmell it is impoſſible for them to miſtake. The ambergris found in the inteſtinal canal is not ſo hard as that which is found on the ſea or ſea coaſt, but ſoon grows hard in the air: when firſt taken out it has nearly the ſame colour, and the ſame diſagreeable ſmell, though not ſo ſtrong, as the more liquid dung of the whale has; but on expoſing it to the air, it by degrees not only grows grayiſh, and its ſurface is covered with a grayiſh duſt like old chocolate, but it alſo loſes its diſagreeable ſmell, and, when kept for a certain length of time, acquires the peculiar odour which is ſo agreeable to moſt people.

The gentlemen the Doctor converſed with confeſſed, that if they knew not from experience that ambergris thus found will in time acquire the above-mentioned qualities, they would by no means be able to diſtinguiſh ambergris from hard indurated fæces. This is ſo true, that whenever a whale voids its fæces upon being hooked, they look carefully to ſee if they cannot diſcover among the more liquid excrements (of which the whale diſcharges ſeveral barrels) ſome pieces floating on the ſea, of a more compact ſubſtance than the reſt. Theſe they take up and waſh, knowing them to be ambergris.

In conſidering whether there be any material difference between the ambergris found upon the ſea or ſea-coaſt, and that found in the bowels or among the dung of the whale, the Doctor refutes the opinion, that all ambergris found in whales is of an inferior quality, and therefore much leſs in price. Ambergris, he obſerves, is only valued for its purity, lightneſs, compactneſs, colour, and ſmell. There are pieces of ambergris found on different coaſts, which are of a very inferior quality; whereas there are often found in whales pieces of it of the firſt value; nay, ſeveral pieces found in the ſame whale, according to the above-mentioned qualities, are more or leſs valuable. All ambergris found in whales has at firſt, when taken out of the inteſtines, very near the ſame ſmell as the liquid excrements of that animal have; it has then alſo nearly the ſame blackiſh colour: they find it in the whale ſometimes quite hard, ſometimes rather ſoftiſh, but never ſo liquid as the natural fæces of that animal. And it is a matter of fact, that after being taken out and kept in the air, all ambergris grows not only harder and whiter, but alſo loſes by degrees its ſmell, and aſſumes ſuch an agreeable one, as that in general has which is Ambergr found ſwimming upon the ſea; therefore the goodneſs of ambergris ſeems rather to depend on its age. By being accumulated after a certain length of time in the inteſtinal canal, it ſeems even then to become of a whiter colour, and leſs ponderous, and to acquire its agreeable ſmell. The only reaſon why ambergris found floating on the ſea generally poſſeſſes the above-mentioned qualities in a ſuperior degree is, becauſe it is commonly older, and has been longer expoſed to the air. It is more frequently found in males than females; the pieces found in females are in general ſmaller, and thoſe found in males ſeem conſtantly to be larger and of a better quality; and therefore the high price in proportion to the ſize is not merely imaginary for the rarity's ſake, but in ſome reſpects well founded, becauſe ſuch large pieces appear to be of a greater age, and poſſeſs the above-mentioned qualities in general in a higher degree of perfection, than ſmaller pieces.

It is known, that the ſepia octopodia, or cuttle-fiſh, is the conſtant and natural food of the ſpermaceti whale, or phyſeter macrocephalus. Of this the fiſhers are ſo well perſuaded, that whenever they diſcover any recent relics of it ſwimming on the ſea, they conclude that a whale of this kind is, or has been, in that part. Another circumſtance which corroborates the fact is, that the ſpermaceti whale, on being hooked, generally vomits up ſome remains of the ſepia. Hence it is eaſy to account for the many beaks, or pieces of beaks, of the ſepia, found in all ambergris. The beak of the ſepia is a black horny ſubſtance, and therefore paſſes undigeſted through the ſtomach into the inteſtinal canal, where it is mixed with the fæces; after which it is either evacuated with them, or if theſe latter be preternaturally retained, forms concretions with them, which render the animal ſick and torpid, and produce an obſtipation, which ends either in an abſceſs of the abdomen, as has been frequently obſerved, or becomes fatal to the animal; whence, in both the caſes, on the burſting of its belly, that hardened ſubſtance known under the name of *ambergris*, is found ſwimming on the ſea or thrown upon the coaſt.

From the preceding account, and his having conſtantly found the above-mentioned beaks of the ſepia in all pieces of ambergris of any conſiderable ſize, Dr Swediaur concludes with great probability, that all ambergris is generated in the bowels of the phyſeter macrocephalus or ſpermaceti whale; and there mixed with the beaks of the ſepia octopodia, which is the principal food of that whale. He therefore defines ambergris to be the preternaturally hardened dung or fæces of the phyſeter macrocephalus, mixed with ſome indigeſtible relics of its food.

The opinion of Dr Swediaur, with regard to the origin of ambergris, has been confirmed by the information of Captain J. Coffin, maſter of a ſhip employed in the ſouthern whale fiſhery, given to a committee of privy council in the year 1791. According to Mr Coffin's information, American ſhips had ſometimes found ſmall quantities of ambergris; but none, that he knew of, had ever been found by Britiſh ſhips. The quantity which he had brought home amounted to 362 ounces; and it was taken from the body of a female ſpermaceti whale on the coaſt of Guinea, which

was

Ambergris. was lean, ſickly, and old; and yielded but a ſmall proportion of oil. While the people were employed in cutting up the blubber, ambergris was diſcovered coming from the fundament of the whale, and a piece of it was ſeen floating on the ſurface of the ſea. More was obſerved in the ſame paſſage, and the reſt was found in a bag a little below the paſſage and communicating with it. Mr Coffin ſuppoſes, that the ſpermaceti whale feeds almoſt wholly on the ſepia or *ſquid*: for when the whale is dying, a quantity of this fiſh, ſometimes whole, ſometimes in pieces, is thrown up. The bills of the ſquid were found, ſome on the outſide adhering to it, and ſome mixed with it. The ſpermaceti whale, when ſtruck, generally voids her excrement, and if ſhe does not, Mr Coffin conjectures, that ſhe has no ambergris; for he ſuppoſes, that the production of it is the cauſe or the effect of ſome diſorder; and that it is moſt likely to be found in a ſickly fiſh. The ambergris of the whale taken by Mr Coffin was moſtly ſold at 19s. 9d. per ounce; and a ſmall part of it, when it was ſcarce, at 25s. It was bought partly for home conſumption, and partly for exportation to Turkey, Germany, and France. (*Phil. Tranſ.* vol. lxxxi.)

The uſe of ambergris in Europe is now nearly confined to perfumery, though it has formerly been recommended in medicine by ſeveral eminent phyſicians. Hence the Eſſentia Ambræ Hoffmanni, Tinctura Regia Cod. Pariſini, Trochiſci de Ambra Ph. Wurtemberg, &c.

If we wiſh to ſee any medicinal effects from this ſubſtance, the Doctor obſerves, we muſt certainly not expect them from two or three grains, but give rather as many ſcruples of it for a doſe; though even then, he thinks, there would not be reaſon to expect much effect from it, as he had himſelf taken of pure unadulterated ambergris in powder 30 grains at once without obſerving the leaſt ſenſible effect from it. A ſailor, however, who had the curioſity to try the effect of recent ambergris upon himſelf, took half an ounce of it melted upon the fire, and found it a good purgative; which proves that it is not quite an inert ſubſtance.

In Aſia and part of Africa ambergris is not only uſed as a medicine and a perfume; but conſiderable uſe is alſo made of it in cookery, by adding it to ſeveral diſhes as a ſpice. A great quantity of it is alſo conſtantly bought by the pilgrims who travel to Mecca; probably to offer it there, and make uſe of it in fumigations, in the ſame manner as frankincenſe is uſed in Catholic countries. The Turks make uſe of it as an aphrodiſiac. Our perfumers add it to ſcented pillars, candles, balls, bottles, gloves, and hairpowder; and its eſſence is mixed with pomatums, for the face and hands, either alone or mixed with muſk, &c. though its ſmell is to ſome perſons extremely offenſive.

Ambergris may be known to be genuine by its fragrant ſcent when a hot needle or pin is thruſt into it, and its melting like fat of an uniform conſiſtence; whereas the counterfeit will not yield ſuch a ſmell, nor prove of ſuch a fat texture. One thing, however is very remarkable, that this drug, which is the moſt ſweet of all the perfumes, ſhould be capable of being reſembled in ſmell by a preparation of one of the moſt odious of all ſtinks. Mr Homberg found, that a veſſel in which he had made a long digeſtion of human faeces, acquired a very ſtrong and perfect ſmell of ambergris, inſomuch that any one would have thought a great quantity of eſſence of ambergris had been made in it. The perfume was ſo ſtrong and offenſive, that the veſſel was forced to be removed out of the laboratory. Ambert ‖ Ambient.

AMBERT, a ſmall town of France, in the department of Puy de Dome, formerly Lower Auvergne. It is the chief place of a ſmall territory called *Livradois*. Paper and playing cards, camblets, and woollen ſtuffs are manufactured here. E. Long. 5. 15. N. Lat. 45. 58.

AMBETTUWAY, a barbarous name of a tree, the leaves of which, when boiled in wine, are ſaid to create an appetite, and are uſed by the people in Guinea with that intention.

AMBIANI, or AMBIANENSIS CIVITAS, now *Amiens*, a city of Picardy. It is called *Samarobriva* by Cæſar and Cicero: which, according to Valeſius, ſignifies the bridge of the *Samara*, or *Somme*. *Ambiani* is a later name, taken from that of the people, after the uſual manner of the lower age. This people, according to Cæſar, furniſhed 5000 men for the ſiege of Aleſia.

AMBIDEXTER, a perſon who can uſe both hands with the ſame facility, and for the ſame purpoſes, that the generality of people do their right hands. As to the natural cauſe of this faculty, ſome, as Hœfer, attribute it to an extraordinary ſupply of blood and ſpirits from the heart and brain, which furniſhes both hands with the neceſſary ſtrength and agility; others, as Nicholas Maſſa, to an erect ſituation of the heart, inclining neither to the right hand nor left; and others to the right and left ſubclavian arteries being of the ſame height, and the ſame diſtance from the heart, by which the blood is propelled with equal force to both hands. But theſe are only conjectures, or rather chimeras. Many think, that were it not for education and habit, all mankind would be ambidexters; and in fact, we frequently find nurſes obliged to be at a good deal of pains before they can bring children to forego the uſe of their left hands. How far it may be an advantage to be deprived of half our natural dexterity, may be doubted. It is certain, there are infinite occaſions in life, when it would be better to have the equal uſe of both hands. Surgeons and oculiſts are of neceſſity obliged to be ambidexters; bleeding, &c. in the left arm or left ancle, and operations on the left eye, cannot be well performed but with the left hand. —Various inſtances occur in hiſtory, where the left hand has been exerciſed preferably to the right. But by the laws of the ancient Scythians, people were enjoined to exerciſe both hands alike; and Plato enjoins ambidexterity to be obſerved and encouraged in his republic.

AMBIDEXTER, among *Engliſh Lawyers*, a juror or embracer, who accepts money of both parties, for giving his verdict: an offence for which he is liable to be impriſoned, for ever excluded from a jury, and to pay ten times the ſum he accepted.

AMBIENT, a term uſed for ſuch bodies, eſpecially

Ambierle || Ambitus.

fluids, as encompaſs others on all ſides: thus, the air is frequently called an ambient fluid, becauſe it is diffuſed round the earth.

AMBIERLE, a town of France, in the department of the Rhone and Loire. It is the chief place of a canton in a diſtrict of Roanne.

AMBIGENÆ OVES, in the *Heathen Sacrifices*, an appellation given to ſuch ewes as, having brought forth twins, were ſacrificed, together with their two lambs, one on each ſide. We find them mentioned among other ſacrifices to Juno.

AMBIGENAL HYPERBOLA, a name given by Sir Iſaac Newton to one of the triple hyperbolas of the ſecond order, having one of its infinite legs falling within an angle formed by the aſſymptotes, and the other without.

AMBIGUITY, a defect of language, whereby words are rendered ambiguous. See the next article.

AMBIGUOUS, a term applied to a word or expreſſion which may be taken in different ſenſes. An anonymous writer has publiſhed a dictionary of ambiguous words: *Lexicon Philoſophicum de Ambiguitate Vocabulorum*, Francof. 1597, 4to.—The reſponſes of the ancient oracles were always ambiguous.

AMBIT, in *Geometry*, is the ſame with what is otherwiſe called the perimeter of a figure. See PERIMETER.

AMBIT was particularly uſed, in antiquity, to denote a ſpace of ground to be left vacant betwixt one building and another. By the laws of the twelve tables, houſes were not to be built contiguous, but an ambit or ſpace of 2½ feet was to be left about each for fear of fire.—The ambitus of a tomb or monument denoted a certain number of feet, in length and breadth, around the ſame, within which the ſanctity aſſigned to it was limited. The whole ground wherein a tomb was erected was not to be ſecreted from the common uſes; for this reaſon, it was frequent to inſcribe the ambit on it, that it might be known how far its ſanctity extended: thus, *in fronte pedes tot, in agrum pedes tot.*

AMBITION (*ambitio*) is generally uſed in a bad ſenſe, for an immoderate or illegal purſuit of power.

In the ſtrict meaning, however, of the word, it ſignifies the ſame with the *ambitus* of the Romans. See the next article.

Ambition, in the former and more uſual ſenſe, is one of thoſe paſſions that is never to be ſatisfied. It ſwells gradually with ſucceſs; and every acquiſition ſerves but as a ſpur to further attempts.

"If a man (it has been well obſerved) could at once accompliſh all his deſires, he would be a miſerable creature; for the chief pleaſure of this life is to wiſh and deſire. Upon this account, every prince who aſpires to be deſpotic aſpires to die of wearineſs. Searching every kingdom for the man who has the leaſt comfort in life, Where is he to be found?—In the royal palace.—What! his Majeſty? Yes, eſpecially if he be deſpotic."

AMBITUS, in *Roman Antiquity*, the ſetting up for ſome magiſtracy or office, and formally going round the city to ſolicit the intereſt and votes of the people.

Ambitus differed from *ambition*, as the former lies in the act, the latter in the mind.

Ambitus was of two kinds; one lawful, the other infamous. The firſt, called alſo *ambitus popularis*, was when a perſon offered his ſervice to the republic frankly, leaving it to every body to judge of his pretenſions as they found reaſonable. The means and inſtruments here made uſe of were various. 1. *Amici*, or friends, under different relations, including *cognati*, *affines*, *neceſſarii*, *familiares*, *vicini*, *tributes*, *clientes*, *municipes*, *ſodales*, *collegæ*. 2. *Nomenclatura*, or the calling and ſaluting every perſon by his name; to which purpoſe, the candidates were attended by an officer, under the denomination of *interpres*, or *nomenclator*. 3. *Blanditia*, or obliging perſons, by ſerving them, or their friends, patrons, or the like, with their vote and intereſt on other occaſions. 4. *Preníatio*, the ſhaking every perſon by the hand, offering him his ſervice, friendſhip, &c. The ſecond kind was that wherein force, cajoling, money, or other extraordinary influence, was made uſe of. This was held infamous, and ſeverely puniſhed, as a ſource of corruption and other miſchiefs.

Ambitus was practiſed, not only at Rome, and in the forum, but in the meetings and aſſemblies of other towns in Italy, where numbers of citizens were uſually found, on account of trade and buſineſs. The practice ceaſed in the city from the time of the emperors, by reaſon poſts were not then to be had by courting the people, but by favour from the prince.

Perſons who had cauſes depending practiſed the ſame, going about among the judges to implore their favour and mercy. They who practiſed this were called *Ambitioſi*. Hence we alſo meet with *ambitioſa decreta*, and *ambitioſa juſta*, uſed for ſuch ſentences and decrees as were thus procured from the judges, contrary to reaſon and equity, either gratuitouſly or for money.

AMBLE, in *Horſemanſhip*, a peculiar pace by which a horſe's two legs of the ſame ſide move at the ſame time. See HORSEMANSHIP.

Amble || Ambo.

AMBLESIDE, a town in Weſtmorland, ſeated at one end of Winandermeer. W. Long. 0. 49. N. Lat. 54. 30.

AMBLETEUSE, a ſea-port town of France, in the department of the Straits of Calais, in the Engliſh Channel, twelve miles ſouth-weſt from Calais, and eight north from Boulogne. At this port Cæſar embarked his cavalry when he invaded England; and James II. when he abdicated the crown landed. It is defended with a battery of cannon. E. Long. 1. 37. N. Lat. 50. 48.

AMBLYGON, in *Geometry*, denotes an obtuſe-angled triangle, or a triangle one of whoſe angles conſiſts of more than 90 degrees.

AMBLYOPY, among *Phyſicians*, ſignifies an obſcuration of the ſight, ſo that objects at a diſtance cannot be clearly diſtinguiſhed.

AMBO, or AMBON, a kind of pulpit or deſk, in the ancient churches, where the prieſts and deacons ſtood to read or ſing part of the ſervice, and preach to the people; called alſo *Analogium*. The term is derived from ἀναβαίνειν, "to mount." The ambo was mounted upon two ſides; whence ſome alſo derive the appellation from the Latin *ambo*, "both."

The ambo was aſcended by ſteps; which occaſioned that

Ambohitsmene || Amboise.

that part of the office performed there to be called the *Gradual*. See GRADUAL.

Beſides the goſpel, which was read at the top of the ambo, and the epiſtle, which was read a ſtep lower, they likewiſe publiſhed from this place the acts of the martyrs, the commemoration of departed ſaints, and the letters of peace and communion ſent by one church to another: here, too, converts made a public profeſſion of their faith; and biſhops their defence, when accuſed: treaties alſo were ſometimes concluded, and the coronations of emperors and kings performed, in the ſame place.

The modern reading-deſks and pulpits have been generally ſubſtituted for the ancient ambos; though, in ſome churches remains of the ambos are ſtill ſeen. In that of St John de Lateran at Rome, there are two moveable ambos.

AMBOHITSMENE, or VOHITSANGHOMBE, a province of the iſland of Madagaſcar, ſo called from ſome red mountains of the ſame name, lying in S. Lat. 20°. Theſe mountains are very high, reſembling the Tafelberg of the Cape of Good Hope. On one ſide of this ridge the ſea extends into the country for fifteen leagues; on the other is a flat country, abounding in ponds and marſhes. Here is alſo a lake of 15 leagues in length, and the ſame in breadth, containing many ſmall iſlands. The inhabitants of the mountains are called *Zaferahongs*; and have plenty of gold, iron, cattle, ſilk, &c.

AMBOISE, a town of France, in the former province of Touraine, now the department of the Indre and Loire, ſeated at the confluence of the rivers Loire and Maſſe. The town is the capital of a diſtrict, and has been rendered famous in hiſtory by the conſpiracy of the Proteſtants in 1560, which opened the fatal wars of religion in France. The caſtle is ſituated on a craggy rock, extremely difficult of acceſs, and the ſides of which are almoſt perpendicular. At its foot flows the Loire, which is divided into two ſtreams by a ſmall iſland. To this fortreſs the duke of Guiſe, when he expected an inſurrection among the Huguenots, removed Francis II. as to a place of perfect ſecurity. Only two detached parts of the ancient caſtle now remain, one of which was conſtructed by Charles VIII. and the other by Francis I. The former of theſe princes was born and died at Amboiſe. The town is ſituated in E. Long. 1. 10. N. Lat. 47. 25.

AMBOISE, *D'*, *Francis*, ſon of a ſurgeon to Charles IX. of France. He very early obtained the patronage of that prince, and was ſupported by his liberality in the proſecution of his ſtudies at the univerſity of Navarre, where he devoted his talents to rhetoric and philoſophy with great aſſiduity and ſucceſs. His eloquence and extenſive information raiſed him in 1572 to the place of ſolicitor of the French nation. He afterwards applied to the ſtudy of the law, and became one of the moſt accompliſhed advocates of the parliament of Paris. He was next advanced to be counſellor in the parliament of Bretagne, and next to be a maſter of requeſts and counſellor of ſtate. He viſited different countries, and publiſhed the hiſtory of his travels, with ſeveral poetical pieces. He prefixed an apologetical preface to the edition of Abelard's works in 1616, and with much induſtry collected many of his manuſcripts. His brother Adrian roſe to conſiderable conſequence in the church; and his brother James was not leſs eminent as a phyſician. *(Gen. Dict.)*. Amboiſe.

AMBOISE, *D'*, *George*, a French cardinal and miniſter of ſtate, was born in the year 1462. His father was a deſcendant of the renowned houſe of Amboiſe, and, through the influence of his powerful connexions, he beheld the path of church preferment open before his ſon; therefore he deſtined him to the clerical order. In theſe ſanguine expectations he was not diſappointed; for he had ſufficient influence to procure for him the biſhopric of Montauban at the early age of fourteen. Louis XI. appointed him one of his almoners; and in the courſe of political events, he became ſtrongly attached to the duke of Orleans, and ſuffered impriſonment in his cauſe. When this prince, however, had regained his favour at court, he was elevated to the archbiſhopric of Narbonne. After he had remained there for ſome time, he changed that ſtation for the archbiſhopric of Rouen. When the duke of Orleans was governor of Normandy, he made him lieutenant general; and in that ſituation he was of eſſential ſervice to the province, in reſtoring juſtice and order. When the duke of Orleans became Louis XII. Amboiſe was ſuddenly raiſed to the elevated ſtation of firſt miniſter and one of the cardinals. The ſame regard to equity, which characterized his conduct when lieutenant general induced him to diminiſh the impoſts, which rendered him very popular as firſt miniſter of France. In 1499, by his advice, the king undertook the conqueſt of the Milaneſe, and, on their revolt, the firſt miniſter was ſent to quell the rebellion. The great confidence which Louis had repoſed in him, induced the pope to make him his legate in France; and, in that ſtation, he piouſly laboured to reform the eccleſiaſtical orders. He enforced his doctrine by precept, not only in ſetting them an example of holding no more benefices than one at a time, but alſo by devoting two-thirds of the revenue of the ſame to the poor, and to the repair of religious edifices. According to his own account he was ambitious of the papal chair, "merely for the purpoſe of effecting the reformation of abuſes and the correction of manners." It is reported that, upon the death of Pius III. he would have been elected pope had he not been deceived by the Italian cardinals. Diſappointed in his views with regard to the papal honours, he perſuaded his maſter to declare war againſt the Venetians, to whoſe influence he ſuppoſed his failure was owing. But this imprudent undertaking was ſuddenly interrupted; for in the proſecution of his journey for the Venetian war, he was ſeized with an illneſs, and confined in the city of Lyons. Affliction rouſes the reflecting powers of the mind, and calls to remembrance the paſt actions of life. From the conſciouſneſs of his paſt errors and faults he was induced to expreſs his contrition to a brother of the infirmary who attended him at the convent of the Celeſtines. In the year 1510, and in the 50th of his age, he breathed his laſt in that place. Induſtry, ſteadineſs, and good intention, characterized his conduct as a prime miniſter. He ſhone with peculiar brightneſs as a man of literature. By his liberality and patronage, the arts and ſciences flouriſhed under his adminiſtration. It may be proper to add, that, aſſiſted by ſome

of

Amboule, Amboyna. of the ableſt lawyers in the kingdom, he formed a code of laws to reform the reigning abuſes in the nation. Thus, by ſteadily purſuing the general welfare, he obtained the appellation of the "father of the people." (*Gen. Biog.*).

AMBOULE, a province of Madagaſcar, ſomewhat to the northward of S. Lat. 23°. It is a fertile and agreeable country, watered by the river Manampani, whoſe mouth lies in S. Lat. 23. 30. The country produces plants and fruits in plenty. Iron mines are alſo found here. The black cattle are extremely fat, and their fleſh excellent. In this province ſtands a large town of the ſame name; near which is a fountain of hot water, within 20 feet of a ſmall river whoſe ſand is almoſt burning. The water of the fountain is ſaid to boil an egg hard in two hours; and the inhabitants affirm it to be a ſovereign remedy againſt the gout. The people here are employed in different preparations of iron and ſteel, which they have from their own mines, and forge ſeveral inſtruments with tolerable ſkill. Their governor is honoured with the title of *Rabertau*, or *Great Lord*. He exerciſes ſovereign authority and abſolute power; but is frequently, in times of diſtreſs, ſurpriſed by his ſubjects, who aſſemble in great numbers, ſeize his perſon, and threaten him with death unleſs they are relieved. To extricate himſelf from this dilemma he is inſtantly obliged to iſſue orders for diſtributing proviſions among them; but is uſually repaid with intereſt, a quadruple return being made in a plentiful harveſt. The people of Amboule live in great licentiouſneſs with their ſuperiors, and their country is generally a retreat for the roguiſh and lazy.

AMBOYNA, one of the Molucca iſlands in the Eaſt Indies. It lies in S. Lat. 3. 36. and E. Long. 126. 20. and is remarkable for being the centre of the commerce for nutmegs and cloves, which is entirely monopolized by the Dutch Eaſt India Company. It is about 24 leagues in circumference. Beſides cloves, it likewiſe abounds in moſt of the tropical fruits and fiſh; nor is there here any deficiency of good water; but fleſh is very ſcarce. This ſcarcity, however, proceeds more from the policy of the Dutch than either the intemperature of the climate, or the barrenneſs of the ſoil: For, excepting cloves, they have in Amboyna, as well as the Moluccas, induſtriouſly diſcouraged the cultivation of every eſculent commodity, with the view of withholding ſubſiſtence from thoſe who might be tempted to invade them.

Of the natives, the men wear large whiſkers, but leave little hair upon the chin; and have only a ſlight piece of ſtuff wrapped round their middle. The women tie their hair in knots: the maids are bought of their fathers before they are married; and if the wife proves barren, the marriage is diſſolved. Some of the natives are Mahometans, and ſome Chriſtians: but they are all ſaid to be lazy, deceitful, and treacherous. They make war with ſmall ſwift veſſels, in ſhape like dragons with regard to the head and tail. Their houſes are built of bamboo canes and ſago trees. They ſleep on mats. Their weapons are bows and arrows, javelins, ſcimitars, and targets.

Amboyna was firſt diſcovered by the Portugueſe, who built a fort upon it, which was taken from them by the Dutch in 1605. They did not, however, become maſters of the whole iſland at once. The Engliſh had here five factors, who lived under the protection of the Dutch caſtle; holding themſelves ſafe, in reſpect of the friendſhip between the two nations. Great differences had ariſen between the Dutch and Engliſh coloniſts in this part of the world; till at laſt, the Engliſh Eaſt India Company applying to King James, a treaty was concluded in 1619, by which the concerns both of the Engliſh and Dutch were regulated, and certain meaſures agreed upon for preventing future diſputes. This was an additional ſecurity to the Engliſh; and, by virtue of the treaty, they continued two years in Amboyna, trading with the Dutch. During this time, however, ſeveral diſputes happened; which occaſioning mutual diſcontents, the complaints were ſent to Jacatra, in the iſland of Java Major, to the council of defence of both nations reſident there: but they not agreeing, a ſtate of the matter was ſent over to Europe, to be decided by the Eaſt India Companies of both nations; or, in caſe they could not agree, by the king of England and the ſtates of Holland, according to an article in the treaty of 1619.—But before theſe diſputes could be decided in a legal way, the Dutch, in order to give the more ſpecious colouring to the violent ſeizure which they meditated of the iſland of Amboyna, made uſe of the ſtale pretext of a conſpiracy being formed by the Engliſh and Japaneſe to diſpoſſeſs them of one of their forts in this place. The plot, it was alleged, had been confeſſed by a Japaneſe and Portugueſe in the Engliſh ſervice, who were moſt inhumanly tortured till they ſhould anſwer in the affirmative ſuch interrogatories as might favour the ſecret deſign of thoſe cruel inquiſitors. Upon the injurious evidence of this conſtrained declaration, they immediately accuſed the Engliſh factors of the pretended conſpiracy. Some of them they impriſoned, and others they loaded with irons, and ſent on board their ſhips; ſeizing at the ſame time all the Engliſh merchandiſe, with their writings and books. Amboyna.

Theſe acts of violence were followed by a ſcene of horror unexampled in the puniſhment of the moſt atrocious offenders. Some of the factors they tortured, by compelling them to ſwallow water till their bodies were diſtended to the utmoſt pitch; then taking the miſerable victims down from the boards to which they had been faſtened, and cauſing them to diſgorge the water: if they did not acknowledge the imputed guilt, the proceſs of torture was repeated. Others of the Engliſh they conſumed by burning them gradually from the feet upwards, in order to extort the confeſſion of a conſpiracy, which was only pretended by the infernal policy of thoſe ſavage tormentors. Some had the nails of the fingers and toes torn off; and in ſome they made holes in their breaſts, filling the cavities with inflammable materials, to which they afterwards put fire. Thoſe who did not expire under the agonies of torture were conſigned to the hands of the executioner.

The allegation of this pretended conſpiracy was equally void of probability and truth. The Dutch had a garriſon of 300 men in the fort, beſides the burghers in the town, and ſeveral other forts and garriſons in the iſland, while the number of the Engliſh did not amount to 20 men; nor were even thoſe provided with arms or ammunition to effect ſuch a deſign as that with which they were charged. There likewiſe was not one

Engliſh

Amboyna. English veſſel in the harbour, whereas the Dutch had eight ſhips riding near the town: neither, when the Dutch broke open the deſks and trunks of the factors, was there found a ſingle paper or letter which could be conſtrued into the moſt diſtant relation to any conſpiracy. Add to all this, that ſuch of the unhappy ſufferers as could ſpeak to be heard, declared in the moſt ſolemn manner their innocence of the plot with which they were charged.

The whole of the tranſaction affords the moſt irrefragable teſtimony, that it was founded entirely upon a political fiction of the Hollanders, who had themſelves formed the deſign of monopolizing the trade of the Spice Iſlands; for the accompliſhment of which they perpetrated, about the ſame time, a ſimilar tragedy at Pooleron, where they put to the torture 162 of the natives, whom they likewiſe charged with a pretended conſpiracy. It may juſtly be reckoned ſingular in the fortune of this commercial republic, that they have ever ſince been permitted to enjoy in peace thoſe invaluable iſlands, which were originally obtained by ſuch atrocious infringements of humanity and the laws of nations, as will ſtain the Dutch annals, to the lateſt ages, with indelible infamy.

The more effectually to preſerve this trade, the Dutch have had all the clove trees in the adjacent iſlands grubbed up. Sometimes alſo, when the harveſt is very large, part of the produce of Amboyna itſelf is burnt.—To prevent the rearing of cloves in any of the neighbouring iſlands, or the inhabitants from ſelling them to ſtrangers, the governor of Amboyna makes the tour of his government with a fleet of curricurries, conſiſting ſometimes of 20, and at others of 30, 40, or 50 ſail. This expedition is made with all the pomp imaginable, in order to gratify the pride and folly of the Indian chiefs. The true reaſon of their taking all this pains is, becauſe experience has ſhown, that no contracts, however ſolemn, can prevent the inhabitants of thoſe iſlands from ſelling their ſpice to ſtrangers: and even now, frauds are ſo frequently practiſed by the Dutch themſelves, though the Company is inexorable in puniſhing them, that the common people call the cloves *galken-kruid*, that is, the gallows ſpice.

Beſides the cloves, coffee is alſo cultivated here by the Dutch, and a gold mine has been lately found out. This was diſcovered by the quantities of gold duſt that were waſhed from ſome mountains by the torrents. Here alſo grow ſeveral kinds of valuable wood, of which they make tables, chairs, eſcrutoires, &c. for the principal perſons in the government; and the reſt is ſold all over the Indies at a very extravagant rate.

Amboyna is divided into two parts, viz. a greater and leſſer peninſula. The former, called *Hiton*, is 12 leagues in length, and two and a half broad. In this the Dutch have no leſs than five forts, or rather ſtrong redoubts, mounted with cannon. The other is called *Leytimor*, five leagues in length, and one and a half broad, which is the ſouthern part of the iſland; on this ſtands the fort of Victoria, which is the reſidence of the governor and his council, compoſed of 15 gentlemen or merchants. The fortreſs is a ſquare, the ramparts mounted with 60 pieces of braſs cannon, and the garriſon uſually compoſed of 600 men. It is ſo ſtrong by nature and art, as to be in a manner impregnable; and ſo effectually does it command the harbour, that no veſſel could come in or go out without being ſunk by the cannon, if the governor choſe. The inhabitants of Amboyna are computed at 70,000 or 80,000, of whom but a ſmall number are Dutch: and this obliges the latter to be continually upon their guard, and to keep a competent number of troops in each of their forts, particularly in that of Middleburgh, which ſtands upon the iſthmus that connects theſe peninſulas. There are alſo redoubts and garriſons in all the iſlands of this government. Amboyna, Ambracia.

AMBRACIA, one of the moſt conſiderable cities of ancient Epirus, ſituated on the river Arachthus, at a ſmall diſtance from the ſea. At firſt it was a free city; but was afterwards reduced by the Æacidæ kings of Epirus, who choſe it for the place of their reſidence. In proceſs of time, the Ætolians made themſelves maſters of it, and held it till the year before Chriſt 189, when it fell into the hands of the Romans.

At this time Ambracia was a place of great ſtrength. It was defended on one ſide by the river Arachthus, and on the other by ſteep and craggy hills; and ſurrounded with a high and thick wall, above three miles in compaſs. The Roman conſul Fulvius began the ſiege by forming two camps, ſeparated by the river, but with a communication between them; the Romans were poſted in one, and the Epirots their allies in the other. He then threw up two lines, one of circumvallation, the other of contravallation; and built a wooden tower in form of a caſtle, over againſt the citadel, which ſtood on a hill. The Ætolians, however, before the lines were quite finiſhed, found means to throw about 1000 men into the place.

The lines being completed, the city was attacked in five different places at once. The battering rams ſhook the wall on all ſides: and the Romans, from their moveable towers, pulled down the battlements with a kind of ſcythes, which they faſtened to long beams. The beſieged made a vigorous defence. They were night and day on the walls, and indefatigable in preventing the effects of the rams and ſcythes. The ſtrokes of the former they deadened, by letting down beams, large ſtones, lumps of lead, &c. by means of pulleys, upon them when they were in motion: the others they rendered uſeleſs, by pulling the beams to which they were faſtened into the city with hooks contrived for the purpoſe.

While Fulvius was carrying on the ſiege, Nicander the Ætolian prætor, found means to throw 500 men into the city, under the command of one Nicodamus, with whom Nicander agreed to attack the Roman camp in the night-time; not doubting, that, if the garriſon from within, and the army from without, fell upon them at the ſame time, they would be obliged to raiſe the ſiege. Nicodamus narrowly watched the time at which he was ordered to ſally; and though Nicander did not appear, marched out at the head of the garriſon, armed with firebrands and torches. The Roman ſentinels, ſurpriſed at this ſight, ran to wake the legionaries, and ſoon ſpread a general alarm all over the camp. The legionaries marched in ſmall bodies as they happened to meet, to repulſe the enemy, whom they engaged in three different places. Two parties of the garriſon were driven back; but the third, commanded

by

Ambracia, Ambreada.

by two Ætolian generals, made a great ſlaughter of the Romans, and not finding themſelves ſeconded by Nicander, retired in good order into the city.

Though the beſieged were thus abandoned and had no hopes of aſſiſtance, they continued to defend themſelves with incredible vigour and reſolution. The Romans had no ſooner made a breach in the wall, but it was repaired, and a new one built behind it. The conſul, therefore, altered his meaſures; and, inſtead of making breaches with the ram, began to undermine the wall, in hopes of throwing down great part of it at once, and entering the city before the beſieged could have time to build a new wall. The miners being covered, were not obſerved by the garriſon, till the great quantities of earth brought out of the mine gave the alarm. The Ætolians immediately began to countermine; and having dug a trench of the depth they ſuppoſed the mine to be, they carried it along the wall where they heard the ſtrokes of the pickaxes of the Romans. When the two mines met, a battle enſued, firſt with pickaxes and ſpades, and then with ſwords and ſpears: but this attack did not laſt long, each party making themſelves a kind of rampart with the looſe earth. The Ætolians, in order to drive their enemies quite out of the mine, invented a machine which they brought to the place where the two mines met: this was a hollow veſſel with an iron bottom, bored through in many places, and armed with ſpikes at proper diſtances, to prevent the enemy from approaching it: this veſſel they filled with feathers, which they ſet on fire, and with bellows driving the ſmoke on the beſiegers, obliged them to leave the mine half ſuffocated. This interval the Ætolians made uſe of in repairing the foundations of the wall.

The vigorous reſiſtance made by the Ambracians, however, did not raiſe the courage of the nation in general, who were determined on a peace with Rome at all events. Fulvius, in the mean time, being deſirous of getting poſſeſſion of Ambracia before the concluſion of the peace, employed Amynander, king of the Athamanes, to perſuade the inhabitants to ſurrender. As Amynander had great intereſt in Ambracia, having long reſided there, he eaſily perſuaded them to capitulate on the following terms, viz. That the Ætolian garriſon ſhould have leave to march out of the city; that the inhabitants ſhould pay 500 talents, 200 down, and the reſt at ſix equal payments; and that they ſhould deliver to the conſul all the priſoners and deſerters that were in the city. The gates were then opened to Fulvius; and he was preſented with a crown of gold, together with many fine ſtatues and pictures, of which there were great numbers in the city, it having been the capital of Pyrrhus, who had enriched it with many valuable monuments.

From this time the city of Ambracia made no figure in hiſtory. It is ſcarcely known at preſent where the city ſtood; but that called *Arba*, in Upper Albania, ſeems beſt to agree with what is ſaid of the ancient ſituation of this city. The river Araethus, on which Ambracia was ſituated, is now called by the natives *Spagmagmuriſi*.

AMBREADA, thus they call the falſe or fictitious amber, which the Europeans uſe in their trade with the negroes on the coaſt of Africa, and particularly on the river Senegal. There are ſome large and red pieces of it, a thouſand of which making twenty ropes or ſtrings, weigh three pounds. There are others ſmall, and alſo red, which weigh but two pounds and a half.

Ambreſbury

Ambroſe.

AMBRESBURY, or AMESBURY, a market town in Wiltſhire, about ſix miles north of Salisbury, and ſituated in W. Long. 1. 40. and N. Lat. 51. 20.

AMBRONES, a Gauliſh people who lived near the foot of the Alps, between Switzerland and Provence. They invaded the Roman territories in conjunction with the Cimbri and Teutones; but were defeated with great ſlaughter by Marius, about 101 years before Chriſt. Their women, who had ſtaid during the engagement in a kind of fortification made with their carts, on ſeeing their huſbands flying, and the Romans at their heels, armed themſelves with axes, and, gnaſhing with their teeth, fell with fury on the purſuers and the purſued. Their firſt rage being ſpent, they deſired to ſurrender themſelves, upon the ſingle condition, that their chaſtity ſhould not be violated; but this equitable requeſt being denied, they firſt killed their children, and then themſelves, not one remaining alive out of the whole multitude.

AMBROSE, SAINT, an iſland in the South Pacific ocean, on the coaſt of Chili, four or five leagues due weſt from St Felix iſland. At firſt view, it appears like two ſmall iſlands; but after a nearer approach, it is found they are joined by a reef. It lies in S. Lat. 26. 13. W. Long. 80. 55. from Greenwich. There is a large rock four miles to the northward of the iſland, called, from its appearance, *Sail-rock*. Captain Roberts, who was here in 1792, found St Felix iſland inacceſſible. On St Ambroſe iſland, his crew killed and cured 13,000 ſeal ſkins of the beſt quality, in ſeven weeks. The iſland has little elſe to recommend it. Fiſh and crawfiſh abound. The beſt ſeaſon for ſealing is from the 1ſt of April to the 1ſt of Auguſt.

AMBROSE of Alexandria, lived in the beginning of the third century, and was the intimate friend of Origen. Jerome and Euſebius differ in the account they give of this man. The one denominates him a Marcionite, the other a Valentinian; but they both agree that he was converted to the orthodox faith, through means of the preaching of Origen. As is generally the caſe with new proſelytes, he became very zealous, and was appointed deacon either at Alexandria, or at Cæſarea, where Proteſtetus was preſbyter. Origen dedicated many of his works, and among others his book on martyrdom, to Ambroſe; at whoſe deſire and expence they were publiſhed. Origen and Ambroſe were alike indefatigable in their application to ſtudy, and lived in terms of the moſt intimate friendſhip. Origen being poor, Ambroſe aſſiſted him, by providing notaries and amanuenſes to copy his works.

In that period of ſociety, when the increaſe of copies was a work of immenſe labour and great expence, theſe were not only inſtances of private friendſhip, but of public utility. Ambroſe is thus juſtly entitled to rank among the patrons of learning. Ambroſe has been blamed by ſome, for having made no proviſion at his death for the poor infirm Origen. The friends of Ambroſe excuſe this part of his conduct, by ſaying, that Origen choſe to live poor, and daily dependant on

Ambroſe. a divine Providence. According to ſome hiſtorians, Ambroſe died as a martyr, along with his friend Protectetus, in the perſecution under Maximin, about the year 236; but the dedication of Origen's eight books againſt Celſus ſhews, that though he died before Origen, yet he lived to the year 250, or near that period. Origen ſpeaks of him as a man of great piety, and much devoted to the ſtudy of the ſacred Scriptures. (*Gen. Biog.*)

Ambroſe.

Ambrose, biſhop of Milan, was one of the moſt eminent fathers of the church in the fourth century. He was a citizen of Rome, and born in France; ſome hiſtorians ſay in the year 334, but others ſay in the year 340. The birth of Ambroſe is ſaid to have been attended with a remarkable preſage of his future eloquence, by a ſwarm of bees coming and ſettling upon his mouth as he lay in his cradle. At the period of his birth, his father was Prætorian prefect of Gallia Narbonenſis; but upon his death, the widow repaired to Rome with her family. Ambroſe received a religious education, and was reared in the habits of virtuous conduct by his mother, who was an accompliſhed woman, and eminent for piety. The names of thoſe maſters who inſtructed him in the rudiments of the Greek and Roman literature have not been tranſmitted to poſterity: but in theſe branches he made early proficiency; and, having directed his attention to the law, he employed his eloquence with ſuch reputation in the Prætorian court of Anicius Probus, that he was ſoon deemed worthy of a place in the council. After he had continued in this ſtation for ſome time, Probus appointed him conſular of Liguria and Emilia, comprehending the territories of Milan, Liguria, Turin, Genoa, and Bologna. Milan was choſen for the place of his reſidence, and by the prudent and gentle uſe of his power, he conducted the affairs of the province with general approbation and growing popularity.

In the year 374, Auxentius the biſhop of that city died, and his death gave a ſudden change to the fortune and literary purſuits of Ambroſe. At that period, the tide of religious contention ran high between the Catholics and the Arians, and there enſued a ſtrong conteſt concerning the choice of a new biſhop. When the people were aſſembled in the church to elect, Ambroſe, in the character of governor of the place, went into the aſſembly, and, in a grave, eloquent, and pathetic addreſs, admoniſhed the multitude to lay aſide their contentions, and, in the ſpirit of religious meekneſs, to proceed to the important work of chooſing a biſhop. It is reported, that when Ambroſe had finiſhed his addreſs, a child cried out, "Ambroſe is biſhop." The agitated multitude ſuddenly caught the ſuperſtitious flame, and regarding this as a miraculous intimation, they unanimouſly elected Ambroſe biſhop of Milan. Some ſuppoſe that this was entirely a device of Ambroſe or his friends, and others aſcribe it to mere accident. Ambroſe ſtrongly affected reluctance, and even pretended to fly from the city in order to avoid the intended honour. It is, however, unfortunate for the artifice of the governor that the place of his concealment was ſoon diſcovered, when the will of the emperor was known concerning the confirmation of his election. Finding it inconvenient any longer to reſiſt the public choice, he exchanged the enſigns of civil for thoſe of eccleſiaſtical dignity; and, after being baptized, he was ordained biſhop of Milan, about the end of the year 374.

Ambroſe.

But whatever may be the ſentiments of mankind concerning the ſingular conduct of Ambroſe in accepting an office for which he was certainly unqualified in reſpect of previous ſtudies, habits, and employments, yet it muſt be admitted, that he immediately betook himſelf to the neceſſary ſtudies, and with ability, boldneſs, and integrity, acquitted himſelf in his new elevation. Having appropriated his money to the poor, ſettled his lands upon the church, with the exception of making his ſiſter tenant during life, and having committed the care of his family to his brother, he entered upon a regular courſe of theological ſtudy, under the care of Simplician, a preſbyter of Rome, and devoted himſelf to the labours of the church.

Compelled by the irruption of the Goths and the northern barbarians, who ruſhed down upon the Roman empire, ſpreading terror and deſolation all around, Ambroſe, along with ſeveral others, fled to Illyricum; but he remained only a ſhort period in exile, for the northern invaders were quickly defeated by the forces of the emperor, and driven back with conſiderable loſs into their own dominions; therefore, he and his companions returned to their reſpective habitations.

After he returned to his eccleſiaſtic ſtation, the eloquence and abilities of that zealous biſhop found ample ſcope in the diſpute between the Arians and the Catholics. About this era, the doctrine of Arius concerning the perſon of Chriſt had been extenſively received, and had many powerful defenders, both among the clergy and the common people. Ambroſe eſpouſed the cauſe of the Catholics. Gratian, the ſon of the elder Valentinian, marſhalled on the ſame ſide. But the younger Valentinian, who was now become his colleague in the empire, adopted the opinions of the Arians; and all the arguments and eloquence of Ambroſe were inſufficient to reclaim the young prince to the orthodox faith. Theodoſius, the emperor of the eaſt, alſo profeſſed the orthodox faith, yet there were numerous adherents to Arius ſcattered throughout his dominions. In this general ſtate of religious opinions in the empire, two leaders of the Arians, Palladius and Secundianus, confident of numbers, prevailed upon Gratian to call a general council from all parts of the empire. This requeſt appeared ſo equitable that he complied without heſitation, but Ambroſe, aware of the conſequence, had the eloquence to perſuade the emperor that a general council was improper, and that the matter could be determined by a council of the weſtern biſhops. The reſult was, that a ſynod, compoſed of 32 biſhops, was held at Aquileia in the year 381. Ambroſe was elected preſident, and Palladius being called upon to defend his opinions, declined; inſiſting that the meeting was a partial one, and that the whole biſhops of the empire not being preſent, the ſenſe of the Chriſtian church could not be obtained concerning the queſtion in diſpute. Ambroſe mentioned ſeveral precedents in favour of the authority of the court, and added, that the oriental biſhops being acquainted with the place and nature of the meeting, might have been preſent, if they had deemed the matter in diſcuſ-

Ambroſe. ſion worthy of their attention; therefore, the court, although Palladius perſiſted in his refuſal to plead his cauſe, put the vote, and he, along with his aſſociate Secundianus, was ejected from the epiſcopal office. If Ambroſe diſplayed great zeal in oppoſing the errors of Arius, he diſplayed equal zeal in oppoſing the heathen ſuperſtitions. Many of the ſenators remaining ſtrongly attached to the heathen idolatry, upon Valentinian II. aſcending the throne, they made a vigorous effort to reſtore the worſhip of the heathen deities. Symmachus, a very opulent man, and a great orator, who was at that time prefect of the city, was entruſted with the management of the Pagan cauſe, and drew up a petition, praying that the altar of Victory might be reſtored to its ancient ſtation in the hall of the ſenate, and for the proper ſupport of ſeven veſtal virgins, and the regular obſervance of the other Pagan ceremonies. Great eloquence and peculiar inſinuation characterized the petition. He argued that this form of religion had long been profitable to the Roman ſtate, reminded the emperor how much Rome had been indebted to victory, and that it had been the uniform cuſtom of the ſenators to ſwear fidelity to the government upon that altar. He likewiſe produced many facts to prove the advantages derived to the ſtate from its ancient religious inſtitutions, and inſinuated that it was one divinity that all men worſhipped under different forms, ſo that ancient practice ſhould not be raſhly laid aſide. He even proceeded ſo far as to ſtate the injuſtice of increaſing the public revenue by robbing the church, and attributed the late famine which had overtaken the empire to the neglect of the ancient worſhip.

To this petition, Ambroſe replied in a letter to Valentinian, arguing that the devoted worſhippers of idols had often been forſaken by their deities; that the native valour of the Roman ſoldiers had gained her victories, and not the pretended influence of Pagan prieſts; that theſe idolatrous worſhippers requeſted for themſelves what they refuſed to Chriſtians; that willing virginity was more honourable than that procured by the public money; that as the Chriſtian miniſters declined taking temporal emoluments, they ſhould alſo be denied to Pagan prieſts; that it was abſurd to ſuppoſe that God would ſend a famine upon the empire for neglecting to ſupport a religious ſyſtem contrary to his revealed will in the Scriptures; that the whole proceſs of nature encouraged innovations; and that all nations had permitted theſe, even in religion; that heathen ſacrifices were exceedingly offenſive to Chriſtians; and that every Chriſtian prince ſhould ſuppreſs theſe Pagan ceremonies.

In the epiſtles of Symmachus and of Ambroſe, both the petition and the reply are preſerved, in which ſophiſtry, ſuperſtition, ſound ſenſe, and ſolid argument, are ſtrangely blended. It is ſcarcely neceſſary to add that the petition was unſucceſsful.

The increaſing ſtrength of the Arians proved too formidable for the zealous Ambroſe. The young emperor and Juſtina, along with a conſiderable number of clergy and laity profeſſing the Arian faith, requeſted from the biſhop the uſe of two churches, one in the city, the other in the ſuburbs of Milan. The prelate believing the biſhops to be the guardians, both of the temporal and ſpiritual intereſts of the church, and that Ambroſe. the religious edifices were the unqueſtionable property of the church, poſitively refuſed to deliver up the temples of the Lord into the impious hands of heretics. Filled with indignation, Juſtina reſolved to employ the imperial authority of her ſon in procuring by force what ſhe could not by perſuaſion. Ambroſe was required to anſwer for his conduct before the council. He went, attended by a numerous crowd of people, whoſe impetuous zeal ſo overawed the miniſters of Valentinian, that he was permitted to retire without making the ſurrender of the churches. The day following, when he was performing divine ſervice in the Baſilica, the prefect of the city came to perſuade him to give up at leaſt the Portian church in the ſuburbs. Still continuing obſtinate, the court proceeded to violent meaſures. The officers of the houſehold were commanded to prepare the Baſilica and the Portian churches to celebrate divine ſervice upon the arrival of the emperor and his mother at the enſuing feſtival of Eaſter. The order reſpecting one of them was carried into effect, but the court perceiving the growing ſtrength of the prelate's intereſt, deemed it prudent to uſe ſofter meaſures; but all meaſures proved in vain: the biſhop boldly replied, "If you demand my perſon, I am ready to ſubmit: carry me to priſon or to death, I will not reſiſt; but I will never betray the church of Chriſt. I will not call upon the people to ſuccour me; I will die at the foot of the altar, rather than deſert it. The tumult of the people I will not encourage, but God alone can appeaſe." This ſtrong declaration was followed by a torrent of eloquence from the pulpit, purſuing his ſcheme with the moſt violent zeal. But the court remained unconvinced, and another attempt being made, under a ſtrong guard of ferocious Goths, to ſeize the church of Baſilica; when they were about to enter, Ambroſe thundered the ſentence of excommunication againſt them, and ſo overawed them that they retired; and Ambroſe and his friends remained in poſſeſſion of the churches. About this time, alſo, an Arian biſhop challenged Ambroſe o a diſpute before the emperor; but he declined, ſaying that matters of faith ſhould be determined by a council of biſhops.

Many circumſtances in the hiſtory of Ambroſe are ſtrongly characteriſtic of the general ſpirit of the times. The chief cauſes of his victory over his opponents were, his great popularity, and the ſuperſtitious reverence paid to the epiſcopal character at that period of ſociety. But it muſt alſo be admitted, that he uſed ſeveral indirect means to obtain and ſupport his popular authority. Many indigent perſons were ſupported by his liberal bounty; in his explanations of Scripture he made conſtant and ſevere alluſions to exiſting and public characters; the alternate mode of ſinging had no ſmall effect upon the minds of the vulgar. At a time when the influence of Ambroſe required vigorous ſupport, he fortunately was admoniſhed in a dream to ſearch for the remains of Gervaſius and Protaſius, two martyrs who had quietly repoſed under the pavement of the church. The ſkeletons were found entire, were ſtained with blood, and the head of one of them ſeparated from the body. The vulgar crowded in thouſands to behold theſe venerable relics. According to report,

Ambroſe. report, a blind man was reſtored to ſight, ſeveral demons were expelled, and ſick perſons healed by touching theſe bones. Ambroſe exulted in theſe miracles, and appealed to them in his eloquent ſermons; whilſt the court derided and called in queſtion their exiſtence. The biſhop continued firm in his opinions; the people believed; and the exiſtence of the miracles was eſtabliſhed. And it is a very ſingular fact, that theſe, and many other miracles, obtained current credit among the Chriſtian hiſtorians of the ſecond, third, and fourth centuries. Dr Cave in ſpeaking of them ſays, "I make no doubt but God ſuffered them to be wrought, at this time, on purpoſe to confront the Arian impieties."

Although the court were diſpleaſed with the religious principles and conduct of Ambroſe, yet they reſpected his great political talents; and when neceſſity required, they ſolicited his aid, which he generouſly granted. When Maxentius uſurped the ſupreme power in Gaul, and was meditating a deſcent upon Italy, Valentinian ſent Ambroſe to him, who prevailed upon him to deſiſt from the undertaking. On a ſecond attempt of the ſame kind Ambroſe was employed; and, although he was unſucceſsful, yet, if his advice had been followed upon his return, the ſchemes of the uſurper would have proved abortive; but indifferent to his counſels, the enemy was permitted to enter Italy, and Milan was taken. Juſtina and her ſon fled; but Ambroſe remained in his ſtation, and proved beneficial to many of the ſufferers, by cauſing the plate of the church to be melted for their relief. Theodoſius, the emperor of the Eaſt, eſpouſed the cauſe of Juſtina, and by force of arms regained the kingdom.

In the year 390, a tumult happened at Theſſalonica, in which Botheric, one of the officers of Theodoſius was ſlain; and he was ſo greatly enraged, that he iſſued a royal mandate for the promiſcuous maſſacre of the inhabitants of that place: and about ſeven thouſand perſons were aſſaſſinated, without diſtinction or mercy. The courageous Ambroſe, informed of this deed, wrote to the emperor a ſevere reproof, and an earneſt admonition, charging him not to approach the holy communion with his hands ſtained with innocent blood. When the emperor was about to enter the church of Milan to attend upon the ſervice, the biſhop met him, and with a ſtern countenance prohibited him from approaching the temple of God. The emperor reminded him that David had been guilty of murder and of adultery. The biſhop replied, You have "imitated David in his guilt; go and imitate him in his repentance." The prince obeyed the prieſt, and, by a courſe of penitential ſorrow, during the ſpace of eight months, he laboured to regain the favour of the church. After the termination of this period, he was abſolved, but at the ſame time was made to ſign an edict that an interval of thirty days ſhould intervene before the ſentence of death or confiſcation ſhould be put in execution. When the mind reflects upon the numerous bad effects of inſtant and violent paſſion, this meaſure was certainly fraught with policy and humanity. If the reader laments the weakneſs which ſubjected the conſcience to the clerical power, he muſt be gratified that a moderate uſe was made of that authority.

The undaunted courage of Ambroſe received another ſevere trial in the year 393, after the aſſaſſination Ambroſe. of Valentinian, and the baſe Eugenio had uſurped the empire of the weſt. Rather than join the ſtandard of the uſurper, he fled from Milan. But after the army of Theodoſius was victorious, he generouſly ſupplicated the emperor for the pardon of thoſe who had ſupported the cauſe of Eugenio. Theodoſius, ſoon after he had acquired the uncontrolled poſſeſſion of the Roman empire, died at Milan. The biſhop did not long ſurvive the emperor; but died in the year 397. In his laſt illneſs he preſerved perfect compoſure of mind, informing his friends that he had endeavoured ſo to conduct himſelf that he might neither be aſhamed to live nor to die.

On many accounts the character of the biſhop of Milan ſtands high among the fathers of the ancient church. With unvarying ſteadineſs he delivered his religious ſentiments on all occaſions; with unwearied aſſiduity he diſcharged the duties of his office; with unabated zeal and boldneſs he defended the orthodox cauſe, in oppoſition to the Arians; with a liberal hand he fed the numerous poor who flocked to his dwelling; with uncommon generoſity he manifeſted kindneſs to his adverſaries; and with Chriſtian affection he ſought the happineſs of all men. His general habits were amiable and virtuous, and his powers of mind were uncommonly vigorous and perſevering. Ambition and bigotry were the chief blemiſhes in his character.

The writings of Ambroſe are voluminous, although little more than adulterated editions of Origen and other Greek fathers. The great deſign of his writings was to defend and propagate the Catholic faith. In ſome of theſe he recommends perpetual celibacy as the perfection of Chriſtian virtue. Modern judgment and taſte may perhaps induce ſome to eſteem the writings of Ambroſe abſurd, trivial, and even ludicrous; but there is a ſmartneſs and vigour in his ſtyle, and there are excellent ſentiments interſperſed, which render the writings of the biſhop of Milan worthy of a peruſal. With his uſual ſeverity and acrimony, Gibbons too ſeverely cenſures this prelate. "Ambroſe (ſays he) could act better than he could write; his compoſitions are deſtitute of taſte or genius, without the ſpirit of Tertullian, the copious elegance of Lactantius, the lively wit of Jerome, or the grave energy of Auguſtin." The moſt accurate and complete edition of his works, is that publiſhed by the Benedictine monks, printed at Paris in two volumes in 1682. (*Gen. Biog.*)

AMBROSE, *Iſaac*, an eminent Preſbyterian miniſter, was educated at Brazen noſe college Oxford, where he took the degree of bachelor of arts, and became miniſter of Preſton, and afterwards of Garſtang in Lancaſhire, whence he was in 1662 ejected for nonconformity. It was uſual for him to retire every year for a month into a little hut in a wood, where he ſhunned all ſociety, and devoted himſelf to religious contemplation. Dr Calamy obſerves, that he had a very ſtrong impulſe on his mind of the approach of death, and took a formal leave of his friends at their houſes a little before his departure; and the laſt night of his life he ſent his diſcourſe concerning *angels* to the preſs. The next day he ſhut himſelf up in his parlour, where to the great ſurpriſe and regret of all who ſaw him, he

Ambroſe. Ambroſius. was found juſt expiring. He died in 1663-4, in the 72d year of his age. He wrote ſeveral other books; as the *Prima*, *Media*, *et Ultima*, or the Firſt, Middle, and Laſt Things; War with Devils; Looking unto Jeſus, &c.

AMBROSE, or *St Ambroſe in the Wood*, an order of religious, who uſe the Ambroſian office, and wear an image of that ſaint engraven on a little plate: in other reſpects they conform to the rule of the Auguſtins. See *AMBROSIAN Office* and AUGUSTINS.

AMBROSIA, in *Heathen Antiquity*, denotes the ſolid food of the gods, in contradiſtinction from their drink, which was called *nectar*. It had the appellation *ambroſia* (compounded of the particle α privative, and βροτος *mortal*), as being ſuppoſed to render thoſe immortal who fed on it.

AMBROSIA is alſo a ſplendid kind of title, given by ſome phyſicians to certain alexipharmic compoſitions of extraordinary virtue. The name was particularly given to a famous antidote of Philip of Macedon againſt all poiſons, bites, and ſtings of venomous creatures, as well as many internal diſeaſes.

AMBROSIA. See BOTANY *Index*.

AMBROSIAN OFFICE or RITE, in *Church Hiſtory*, a particular formula of worſhip in the church of Milan, which takes its name from St Ambroſe, who inſtituted that office in the fourth century. Each church originally had its particular office; and when the Pope, in after times, took upon him to impoſe the Roman office upon all the weſtern churches, that of Milan ſheltered itſelf under the name and authority of St Ambroſe; from which time the Ambroſian ritual has prevailed.

AMBROSIN, in middle-age writers, denotes a coin ſtruck by the lords or dukes of Milan, whereon was repreſented St Ambroſe on horſeback, with a whip in his right hand. The occaſion of this coinage is ſaid to have been a viſion of that ſaint, who appeared to the Milaneſe general in 1339, during the time of a battle.

AMBROSINIA. See BOTANY *Index*.

AMBROSIUS AURELIANUS, or AURELIUS AMBROSIUS, a famous general of the ancient Britons, of Roman extraction. He was educated at the court of Aldroen of Armorica; who, at the requeſt of the Britons, ſent him over with 10,000 men, to aſſiſt them againſt the Saxons, whom Vortigern had invited into Britain. Ambroſius had ſuch ſucceſs againſt the Saxons, that the Britons choſe him for their king, and compelled Vortigern to give up to him all the weſtern part of the kingdom divided by the Roman highway called *Watling-ſtreet*. Some time after, the Britons being diſcontented with Vortigern, and having withdrawn their allegiance from him, he retired to a caſtle in Wales, where being beſieged by Ambroſius, and the caſtle taking fire, he periſhed in the flames, and left his rival ſole monarch of Britain; who now took upon him the imperial purple, after the manner of the Roman emperors. Geoffrey of Monmouth tells us, that Ambroſius built Stonehenge near Saliſbury in Wiltſhire. Ambroſius, according to this hiſtorian, coming to a monaſtery near Caercaradoc, now Saliſbury, where three hundred Britiſh lords, maſſacred by Hengiſt, lay buried, and reſolving to perpetuate the memory of this action, he ordered his workmen to prepare a large quantity of ſtones and other materials. But having, at the inſtigation of Tremounus archbiſhop of Caerleon, conſulted the famous Merlin, this magician adviſed him to ſend over to Ireland for certain great ſtones, called *chorea gigantum*, the giant's dance, placed in a circle on a hill called *Killair*, which were brought thither by giants from the fartheſt borders of Africa. A body of forces was accordingly ſent into Ireland, under Pendragon, Ambroſius's brother, to fetch theſe ſtones; but were oppoſed in their attempt by Gilliomanus king of the country, who derided the folly of the Britons in undertaking ſo ridiculous an expedition. Nevertheleſs, the Britons having vanquiſhed this prince in battle, brought away the ſtones; and by the direction and aſſiſtance of Merlin, who had accompanied them, theſe wonderful ſtones, by order of Ambroſius, were placed over the graves of the Britiſh lords, and are now what is called *Stonehenge*. Alexander Mecham celebrates this fable in his poem *De divinæ ſapientiæ laudibus*. Polydore Virgil aſſigns another origin of Stonehenge: he tells us it was erected by the Britons as a monument to their general Ambroſius, on the place where he fell in battle, to perpetuate the memory of his glorious actions and ſervices done to his country. Both theſe ſtories are rejected by our beſt antiquaries; who, however, are by no means agreed as to the true origin of this famous piece of antiquity. See STONEHENGE.

Ambroſius. Ambubajæ

After the Britons had defeated the Saxons, and obliged them to retire northward, Ambroſius is ſaid to have convened the princes and great men at York, where he gave orders for repairing the churches deſtroyed by the Saxons, and reſtoring the exerciſe of religion to its former luſtre. This is confirmed by Matthew of Weſtminſter; who highly applauds the great zeal of Ambroſius in repairing the churches, encouraging the clergy, and reſtoring the honour of religion. The Monmouth hiſtorian gives this prince a very high character. "He was a man (ſays he) of ſuch bravery and courage, that when he was in Gaul no one durſt enter the liſts with him; for he was ſure to unhorſe his antagoniſt, or to break his ſpear into ſhivers. He was, moreover, generous in beſtowing, careful in performing religious duties, moderate in all things, and more eſpecially abhorred a lie. He was ſtrong on foot, ſtronger on horſeback, and perfectly qualified to command an army." The ſame author tells us he was poiſoned at Wincheſter by one Eopa a Saxon, diſguiſed as a phyſician, and hired for that purpoſe by Paſcentius one of the ſons of Vortigern: but the generally received opinion is, that he was killed in a battle which he loſt in the year 508, againſt Cerdic, one of the Saxon generals.

AMBRY, a place in which are depoſited all utenſils neceſſary for houſe-keeping. In the ancient abbeys and priories, there was an office under this denomination, wherein were laid up all charities for the poor.

AMBUBAJÆ, in *Roman Antiquity*, were immodeſt women, who came from Syria to Rome, where they lived by proſtitution, and by playing on the flute. The word is derived from the Syriac *abub*, which ſignifies a flute; although others make it to come from *am* and *Baiæ*, becauſe theſe proſtitutes often retired to Baiæ.

According

Ambulant || Ambuscade.

According to Cruquius, these women used likewise to sell paint for ornamenting the face, &c.

AMBULANT, or AMBULATORY. They gave in France the name of *Ambulant commissioners* to those commissioners, or clerks of the king's farms, who had no settled office; but visited all the offices within a certain district, to see that nothing was done in them against the king's right and the interest of the farm.

AMBULANT is also used to denote those brokers at Amsterdam, or exchange agents, who have not been sworn before the magistrates. They transact brokerage business, but their testimony is not received in the courts of justice.

AMBULATORY, a term anciently applied to such courts, &c. as were not fixed to any certain place; but held sometimes in one place, and sometimes in another: in opposition to stationary courts.—The court of parliament was anciently ambulatory; so also were the courts of king's bench, &c.

AMBURBIUM, in Roman antiquity, a procession made by the Romans round the city and pomœrium, in which they led a victim, and afterwards sacrificed it, in order to avert some calamity that threatened the city.

AMBURY, or ANBURY, among *Farriers*, denotes a tumour, wart, or swelling, which is soft to the touch, and full of blood.

This disorder of horses is cured by tying a horse-hair very hard about its root: and, when it has fallen off, which commonly happens in about eight days, strewing some powder of verdigris upon the part, to prevent the return of the complaint. If the tumour be so low that nothing can be tied about it, they cut it out with a knife, or else burn it off with a sharp hot iron; and, in sinewy parts, where a hot iron is improper, they eat it away with oil of vitriol, or white sublimate.

Many of our farriers boast of a secret which infallibly cures all protuberances of this kind; the preparation of which is this: Take three ounces of green vitriol and one ounce of white arsenic; beat them to a coarse powder, and put them into a crucible; place the crucible in the midst of a charcoal fire, stirring the substance, but carefully avoiding the poisonous steams: when the whole grows reddish, take the crucible out of the fire, and when cool, break it and take out the matter at the bottom; beat this to powder in a mortar, and add to four ounces of this powder five ounces of *album rhosis*; make the whole into an ointment, and let it be applied cold to warts; rubbing them with it every day. They will by this means fall off gently and easily, without leaving any swellings. It is best to keep the horse quiet, and without working, during the cure. What sores remain on the parts from which the swellings fall off, may be cured with the common application called the *Countess's ointment*.

AMBUSCADE, or AMBUSH, in the *Military Art*, properly denotes a place where soldiers may lie concealed till they find an opportunity to surprise the enemy.

In the language of Scripture, these terms are not always taken in their proper signification, for laying ambushes for any one, attacking him in secret, laying snares for him. They sometimes signify no more than attacking a man who has no distrust of such a thing; attacking one behind, concealing one's self in some particular place in order to surprise any one. See the book of Judges, ch. ix. 25, 32, 34, 35. Abimelech, who lay lurking with his people in the heights of Sichem, so, however, as to rob and treat those who passed that way very ill, came and attacked the city of Sichem with his troops divided into three bodies: *Tetendit insidias juxta Sichimam in quatuor locis.* Literally, according to the Hebrew, "They prepared ambuscades against Sichem in four heads or companies." And a little farther, verse 43. "Abimelech, being informed that the Sichemites had marched, took his army and divided it into three bodies, and laid wait for them in the field." It seems certain, that in these passages ambushes, properly so called, were not the things in question. In the first book of Samuel Saul complains that David laid ambuscades for him: *Insidiator usque hodie permanens.* Now nothing could be worse grounded than this accusation, if we understand the word *insidiari* in its proper signification; but he might say, though unjustly, that David was his secret enemy. And in the Chronicles it is said, that God turned the ambushes laid by the enemies of Israel upon themselves; that is to say, their endeavours, their malice, their arms, he turned against themselves; for the enemies there mentioned came not in private or by stratagem; they marched openly in arms against Israel.

Amby || Amelot.

AMBY, a town of the Austrian Netherlands, in the province of Limburg, situated opposite to Maestricht, on the east side of the river Maese, in E. Long. 5. 45. N. Lat. 50. 57.

AMEDIANS, in *Church History*, a congregation of religious in Italy, so called from their professing themselves *amantes Deum*, "lovers of God;" or rather *amati Deo*, "beloved of God." They wore a gray habit and wooden shoes, had no breeches, and girt themselves with a cord. They had 28 convents; and were united by Pope Pius V. partly with the Cistercian order, and partly with that of the Soccolanti, or wooden shoe wearers.

AMELIA, an episcopal city of Italy, in the state of the church, seated on a mountain, in the duchy of Spoletto. E. Long. 13. 20. N. Lat. 42. 33.

AMELIA, a county in Virginia, situated between the Blue-ridge and the tide waters, having Cumberland county on the north, Prince George county on the east, and Lunenburg county on the south and west. Amelia, including Nottaway, a new county, contains 18,097 inhabitants, of whom 11,037 are slaves.

AMELIA *Isle*, on the coast of East Florida, lies about seven leagues north of St Augustine, and very near Talbot island on the south, at the mouth of St John's river. It is 13 miles long and two broad, is very fertile, and has an excellent harbour. Its north end lies opposite Cumberland island, between which and Amelia isle is the entry into St Mary's river, in N. Lat. 30. 52. W. Long. 67. 23.

AMELLUS, STARWORT. See BOTANY *Index*.

AMELOT DE LA HOUSSAI, *Nicholas*, born at Orleans in 1634, was much esteemed at the court of France, and

Amelot, Amelotte.

and appointed secretary of an embassy which that court sent to the commonwealth of Venice, as appears by the title of his Translation of Father Paul's History of the Council of Trent; but he afterwards published writings which gave such offence, that he was imprisoned in the Bastile. The first works he printed were the History of the Government of Venice, and that of the Uscoks, a people of Croatia. In 1683 he published his translations into French of Machiavel's Prince, and Father Paul's History of the Council of Trent, and Political Discourses of his own upon Tacitus. These performances were well received by the public. He did not prefix his own name to the two last mentioned works, but concealed himself under that of La Mothe Josseval. His translation of Father Paul was attacked by the partisans of the pope's unbounded power and authority. In France, however, it met with great success; all the advocates for the liberty of the Gallican church promoting the success of it to the utmost of their power, though at the same time there were three memorials presented to have it suppressed. When the second edition of this translation was published, it was violently attacked by the Abbé St Real, in a letter he wrote to Mr Bayle, dated October 17. 1685. Amelot defended himself in a letter to the same gentleman. In 1684, he printed, at Paris, a French translation of Baltasar Gracian's *Oracula Manual*, with the title of *l'Homme de Cour*. In 1686, he printed *La Morale de Tacite de la Flatterie;* in which work he collected several particular facts and maxims, which represent in a strong light the artifices of court flatterers, and the mischievous effect of their poisonous discourses. Frederick Leonard, a bookseller at Paris, having proposed, in the year 1692, to print a collection of all the treaties of peace between the kings of France and all the other princes of Europe, since the reign of Charles VII. to the year 1690, Amelot published a small volume in duodecimo, containing a preliminary discourse upon these treaties; wherein he endeavours to show, that most princes, when they enter into a treaty, think more how to evade than how to perform the terms they subscribe to. He published also an edition of Cardinal d'Ossat's letters in 1697, with several observations of his own; which, as he tells us in his advertisement, may serve as a supplement to the history of the reigns of Henry III. and Henry IV. kings of France. He wrote several other works; and died at Paris in 1706, at the age of 73. Amelot was at one time confined in the Bastile, probably on account of his political writings.

AMELOTTE, Denis, a celebrated French writer, was born at Saintonge in 1606. He maintained a close correspondence with the fathers of the Oratory, a congregation of priests founded by Philip of Neri. He wrote the life of Charles of Gendron, second superior of this congregation, and published it at Paris in 1643. In this work he said something of the famous abbot of St Cyran, which greatly displeased the gentleman of Port Royal, who, out of revenge, published a libel against him, entitled *Idée générale de l'esprit et de livre de P. Amelotte*. He was so much provoked by this satire, that he did all in his power to injure them. They had finished a translation of the New Testament, and were desirous to have it published; for which purpose they endeavoured to procure an approbation from the doctors of the Sorbonne, and a privilege from the king. But Amelotte, by his influence with the chancellor, prevented them from succeeding. In this he had also a view to his own interest; for he was about to publish a translation of his own. Amelotte's translation with annotations, in four volumes octavo, was printed in the years 1666, 1667, and 1668. It was not very accurate, according to F. Simon, who tells us that it contains some very gross blunders. Amelotte wrote also an Abridgement of Divinity, a Catechism for the Jubilee, and a kind of Christian Manual for every day. Towards the end of his life, he entered into the congregation of the Oratory in 1650; and continued amongst them till his death, which happened in 1678.

Amen || Amentum.

AMEN, אמן, signifies *true, faithful, certain*. It is made use of likewise to affirm any thing, and was a sort of affirmation used often by our Saviour: Αμην, Αμην, λεγω υμιν, i. e. *Verily, verily, I say unto you*. Lastly, It is understood as expressing a wish; as *Amen, So be it* (Numb. v. 22.), or an affirmation, *Amen, yes I believe it*, 1 Cor. xiv. 16. The Hebrews end the five books of Psalms, according to their way of distributing them, with the words *Amen, amen;* which the Septuagint have translated γενοιτο, γενοιτο; and the Latins, *Fiat, fiat*. The Greek and Latin churches have preserved this word in their prayers, as well as *alleluiah* and *hosannah;* because they observed more energy in them than in any terms which they could use in their own languages. At the conclusion of the public prayers, the people answered with a loud voice, Amen; and St Jerome says, that at Rome, when the people answered Amen, the sound of their voices was like a clap of thunder: *In similitudinem cœlestis tonitrui Amen reboat*. The Jews assert, that the gates of heaven are opened to him who answers *Amen* with all his might.

AMEND, or Amende, in the *French Customs*, a pecuniary punishment imposed by a judge for any crime, false prosecution, or groundless appeal.

Amende Honorable, a species of punishment formerly inflicted in France upon traitors, parricides, or sacrilegious persons, in the following manner: The offender being delivered into the hands of the hangman, his shirt is stripped off, a rope put about his neck, and a taper in his hand; then he is led into court, where he must beg pardon of God, the king, the court, and his country. Sometimes the punishment ends here; but sometimes it is only a prelude to death, or banishment to the galleys.

Amende Honorable, is a term also used for making recantation in open court, or in presence of the person injured.

AMENDMENT, in a general sense, denotes some alteration or change made in a thing for the better.

Amendment, in *Law*, the correction of an error committed in a process, which may be amended after judgment, unless the error lies in giving judgment; for in that case it is not amendable, but the party must bring a writ of error. A bill may be amended on the file at any time before the plea is pleaded; but not afterwards, without motion and leave of the court.

Amendment of a Bill, in parliament, is some alteration made in the first draught of it.

AMENTUM, in *Botany*, the name of a species of calyx, consisting of valves, and hanging down in different

Amentum, Amerade. ferent directions from the caulis. Common oats afford a good example of the amentum.

AMENTUM, in *Roman Antiquity*, a thong tied about the middle of a javelin or dart, and faltened to the fore-finger, in order to recover the weapon as ſoon as it was diſcharged. The ancients made great uſe of the amentum, thinking it helped to enforce the blow. It alſo denotes a latchet that bound their ſandals.

AMERADE, a kind of officers among the Saracens, anſwering to the governors of provinces among the Europeans. The name is originally the ſame with that of Emir. Amercement.

AMERCEMENT, or AMERCIAMENT, in *Law*, a pecuniary puniſhment impoſed on offenders at the mercy of the court. It differs from a fine in being impoſed arbitrarily, in proportion to the fault; whereas a fine is a certain puniſhment ſettled expreſsly by ſome ſtatute.

END OF THE FIRST VOLUME.

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