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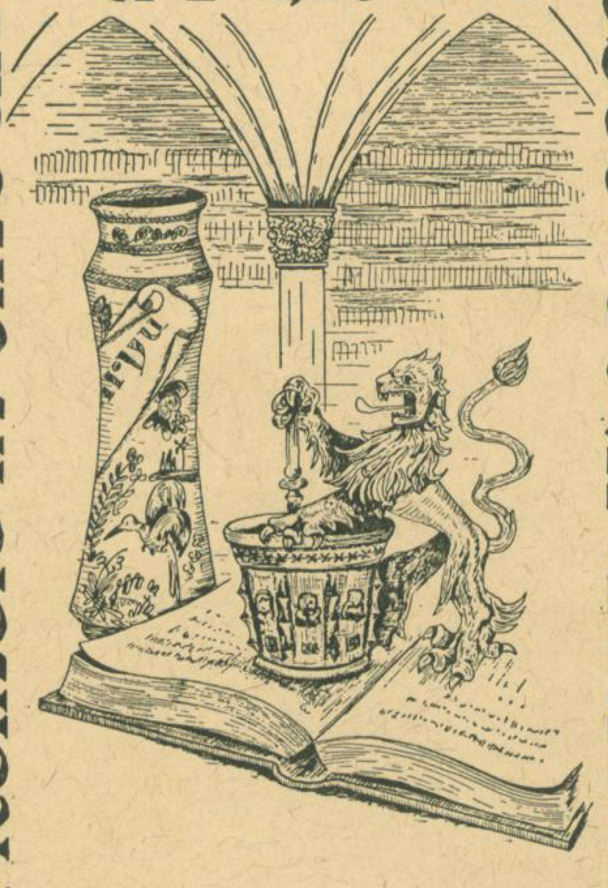

Freiheit in Bindung

Löset vom Zwang

Dr. Helmut Vester

A SYSTEM OF MATERIA MEDICA AND PHARMACY.

A

SYSTEM

OF

MATERIA MEDICA

AND

PHARMACY:

INCLUDING TRANSLATIONS OF THE

EDINBURGH, LONDON, AND DUBLIN PHARMACOPŒIAS.

IN TWO VOLUMES.

BY

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PREFACE.

THIS Treatise, on a more limited scale, was originally designed to afford an outline of the Course of Lectures I deliver on Materia Medica and Pharmacy. Having changed the plan of arrangement of these Lectures, its republication appeared to me unnecessary, and it was only in consequence of the continued demand for it, after the impression had been exhausted, that I was induced again to publish it, extending it at the same time, as no longer subservient merely to its first design, so as to form a System which should include the principles and the more important facts belonging to these departments of Medical Science.

The arrangement of the Materia Medica which I have followed, is that in which the individual substances are connected by their medicinal relations, an arrangement which has some important advantages, and which presents its objects under a scientific form. The processes of Pharmacy I have considered in the order in which they are delivered by the Edinburgh College, an order with which that observed by the other Colleges nearly corresponds. In the preceding edition I had given a translation of the processes of the Edinburgh Pharmacopœia, adding those only of more importance peculiar to the London and Dublin Pharmacopœias. In this edition I have thought it preferable to render this part of the work more complete, by inserting translations of the processes of all the Pharmacopœias; and by giving them in a smaller type and on a fuller page, I have been enabled to do so, as well as to make a number of other additions, without any enlargement of size.

In an Appendix to the history of the Materia Medica, I have given a view of that arrangement, in which the substances belonging to it are classed according to their natural affinities. This, besides affording a contrast with the classification according to their medicinal powers, will be of some advantage to those attending my Lectures, and enable them to derive more assistance from the present publication as a text book, as it presents an outline of the arrangement of the course.

EDINBURGH, *Nov.* 1. 1813.

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ERRATA.

Vol. I. page 148, line 4th from the head, *for* infusion *read* affusion.
———— 356, line 3d from the bottom, *for* pungent *read* purgative.

INTRODUCTION.

MEDICAL Science, considered as relating to the treatment of disease, may be presented under two points of view. Under one, the symptoms of diseases are described, their causes are investigated, the indications are delivered by which their cure is to be attempted, and the remedies are enumerated by which these indications are to be fulfilled. When this method is followed, a previous knowledge is supposed of the natural history, properties, and medicinal powers of the substances employed as remedies; and they are no farther subjects of attention, than to point out their applications to particular cases, and the cautions which, from peculiarity of circumstances, require to be attended to in their administration.

But the subject may also be presented under another aspect. The symptoms of diseases, their causes, and indications of cure, may be supposed to be known, and the remedies themselves become principally the objects of study,—their natural characters, their sensible qualities, their effects on the living system, the theory of their action, and their applications to the treatment of morbid affections, forming so many subjects of description or investigation. This constitutes the department of MATERIA MEDICA,—understood in the most extensive signification of the term.

The medicinal powers of natural bodies are connected with their chemical constitution; they frequently reside, not in the entire matter composing them, but in principles capable of being extracted and obtained in an insulated state, and which in this state can often be employed with peculiar advantages. When given in combination too, these substances are liable sometimes to act on each other, and from the changes arising from these mutual actions, to suffer alterations in their properties. Hence arises the necessity of a strict attention to their chemical composition; and a description of their constituent principles, and of their chemical relations, so far at least as these influence their actions as remedies, belongs to this department of Medicine. We are also often able, by chemical combinations, to modify the powers of these substances, to give them more activity, and even by the production of new compounds, to obtain remedies which nature does not afford. These are the leading objects of PHARMACY, the principal processes of which are chemical, and which is evidently subordinate to Materia Medica.

Regarding all these objects of inquiry as belonging to one department of Medicine, this department naturally falls under three divisions. Under the first may be delivered those principles which are common to Materia Medica and Pharmacy, those which embrace the chemical relations of bodies, and the changes to which they are liable, so far as is connected with their medicinal operations,—forming what may be named Pharmaceutic Chemistry. Under the second is placed the history of the substances employed as remedies, constituting what is regarded as Materia Medica in the more limited sense frequently attached to the term. And under the third may be considered the processes to which these substances are subjected, with the view of preparing them for administration, forming what is more strictly denominated Pharmacy. On these divisions is founded the arrangement of this Work.

PART I.

OF THE GENERAL PRINCIPLES OF PHARMACEUTIC CHEMISTRY.

PHARMACEUTIC CHEMISTRY is that branch of chemical science which investigates the composition of bodies, and considers their mutual chemical relations, so far as these are connected with their medicinal properties and applications. It connects the doctrines of Materia Medica and Pharmacy, and forms a proper introduction to the study of each; an exposition of its principles being necessary to the history of the articles of the Materia Medica, and being not less indispensable in explaining the operations of Pharmacy. It includes two subjects; *first*, the analysis of bodies, so far as relates to the enumeration of their constituent principles; and, *secondly*, the general operations to which they are subjected in their preparation as remedies.

CHAP. I.

OF THE CHEMICAL ANALYSIS OF THE ARTICLES OF THE MATERIA MEDICA.

The ultimate object of chemical investigations, is to discover the composition of bodies; and the result of these investigations is the reducing them into two classes, those which are Simple, and those which are Compound. The former are such as consist of parts perfectly alike; the most minute particles into which a simple body can be resolved, retaining all its essential properties, and being similar to each other. The latter can, on the contrary, be resolved into substances different in their qualities from each other, and from the compound which they form.

It is from the union of simple substances that compounds are produced. When two simple bodies are placed under those circumstances which favour the exertion of their mutual attraction, they unite and form a compound, having peculiar properties. These compounds are farther capable of combining with other simple bodies, or with each other, which gives rise to a series of bodies still more extensive; and these again are capable of new combinations, or of such intimate mixtures with each other, as to form many peculiar substances. There are thus produced, from a few simple substances, all the products of nature, and all those which are the results of the operations of art.

It is the province of Chemistry to trace these combinations; to determine whether bodies are simple or compound; and, if compound, to ascertain the number of their constituent principles, the proportions, and the modes in which they are combined.

The general process by which these objects are attained, is termed, in the language of Chemistry, Analysis. It is merely the separation of a compound body into its constituent parts, and is effected either by the agency of heat, or by the exertion of a superior attraction.

The analysis from the application of heat, differs according to the composition of the body analysed. If a compound, consisting of two simple substances, be exposed to heat, it in many cases happens, that the mutual attraction by which its principles were united ceases, and a decomposition or separation of these principles takes place. This is an example of pure analysis; no change being produced, but merely the separation of the component parts of the compound, so that each is obtained in its original state.

An analysis more complicated is that where several substances are combined together, in such a manner that their attractions are reciprocally balanced, and one compound is formed. When a compound of this kind is exposed to a high temperature, this balance is frequently subverted, and it suffers decomposition. But its constituent principles, instead of passing off pure, enter into new combinations with each other, and form other compounds, each of which may be collected, and in its turn analysed. It is in this manner that vegetable and animal substances are acted on by heat: the products afforded by their analysis are not such as pre-existed in them, but are compounds formed during the decomposition, by new combinations of their ultimate constituent principles. This is what has been named False or Complicated Analysis.

Chemical Analysis is also effected by the exertion of a superior attraction. If a compound be placed successively with different substances in situations favourable to the operation of chemical action, one or other of them may exert a superior attraction to either of its component parts; a decomposition will be produced, and from the products the constituent principles of the compound, as well as their proportions, may be determined.

As compound substances can combine together so as to form a new compound, it is obvious, that this compound may be resolved either into the immediate principles from the union of which it has been formed, or into those of which these consist. It is necessary, therefore, that these should be distinguished. The former are accordingly named the Proximate Principles of a compound; the latter the Ultimate Principles. The proximate principles are compounds; the ultimate principles are the elements of these compounds; and the results of analysis are extremely different, according as one or other of these is obtained.

When by analysis the constituent principles of a body have been obtained, they may often be combined again, so as to reproduce the substance analysed. This operation is named Chemical Synthesis, and, when it can be effected, is the surest proof of the accuracy of the analysis. It is seldom that it can be applied to those compounds which suffer a complicated analysis; and hence the composition of vegetable or animal substances can scarcely ever be confirmed by a synthetic experiment.

In analysing the various products of nature, we arrive ultimately at substances which we are unable to decompose, and which are therefore regarded as simple. The absolute simplicity of these is not indeed established; for our inability to decompose them may not arise from this, but from the imperfections of our modes of analysis; and it is even prebable, that all the substances which are yet known to us may be compounds, and that a more refined chemistry may discover their composition. Until this be accomplished, however, they are regarded as simple, and they are so with regard at least to our knowledge of them. As the ultimate principles, therefore, of all analysis, they are first to be considered in proceeding to the general analysis of the articles of the Materia Medica.

Of these bodies, OXYGEN is the most important. There is no simple substance which exerts an attraction to so many others, or which gives rise to such important compounds. With a few exceptions, indeed, all the productions of nature are either capable of combining, or are already combined with this principle, and the developement of its agencies constitutes the most extensive and important part of chemical science.

Oxygen, when uncombined, always exists in the gaseous state: and its descriptive characters are therefore taken from it as it exists in the aërial form. Like other gases, it is invisible and elastic; its specific gravity is rather greater than that of atmospheric air; it is absorbed by water, but in a very small proportion.

The distinguishing properties of oxygen gas are those of supporting respiration and combustion. An animal lives longer in this air than it does in any other; and combustion in it is more vivid, and continues longer. It is the only air, indeed, which, strictly speaking, can support either of these processes; other aëriform fluids doing so only from the oxygen they contain.

Its capacity of supporting combustion is more particularly to be assumed as its characteristic chemical property; combustion being nothing but the combination of oxygen with combustible bodies, accompanied with the emission of heat and light. It also frequently, however, enters into combination without the phenomena of combustion being apparent, more especially when the absorption of it takes place slowly, or when it is transferred from a compound in which it exists to another substance. The combination of a body with oxygen is termed Oxygenation, or Oxidation. The products of this combination have either certain common properties, belonging to a class of chemical agents long distinguished by the appellation of Acids; or they are destitute of these properties, and they are then denominated Oxides.

Oxygen forms one-fourth part of atmospheric air; and it is principally on its agency that the many chemical changes produced in bodies by that air depends. Combined with another elastic fluid, hydrogen, in the proportion of 85 parts to 15, it forms Water, the substance which has the most extensive operation in promoting chemical action by the fluidity it communicates, and which more directly produces many important chemical changes, by affording oxygen to bodies. Oxygen exists too as a constituent principle of acids, and communicates to them their energy of action. It is also an ingredient in the composition of the alkalis and earths, and it is therefore the principle of alkalinity as well as of acidity. With all the metals it combines, communicating to them a greater susceptibility of chemical action, and greater activity in their relation to the living system; and it exists as a constituent part of nearly all the vegetable and animal products. Hence no principle is more extensively diffused, and none has a more marked influence in the combinations into which it enters.

The elastic fluid which, with oxygen gas, composes atmospheric air, is named AZOTE or NITROGEN. Its chemical agency is less powerful, nor does it possess any very remarkable property by which it can be characterized; hence it is distinguished rather by negative qualities. It is lighter than oxygen gas, is incapable of supporting combustion or respiration, is scarcely sensibly absorbed by water, and is not combustible in the strict sense of the term; for although it combines with oxygen, the combination is not rapid; it does not, after it has commenced, proceed of itself, and it is not attended with any sensible emission of heat or light.

Nitrogen gas forms nearly four-fifths of atmospheric air, the remaining fifth being oxygen gas. In more intimate combination with oxygen, and in that proportion in which they are mutually saturated, it forms a very powerful acid, the nitric acid; and in lower degrees of oxygenation it forms compound gases which have no acid powers. With hydrogen it forms ammonia, one of the alkalis; it exists in some vegetable substances, and is a constituent principle of nearly all the varieties of animal matter. This substance must still be regarded as simple, for although, from some researches connected with the action of potassium on ammonia, conjectures had been formed with regard to the composition of nitrogen, these were always doubtful, and it now appears were founded on inaccurate results.

Atmospheric Air, of which oxygen and nitrogen are the essential constituent parts, has merely the aggregate properties of these two gases, their combination being so slight that no new powers are acquired from it; and, as the oxygen is the more energetic ingredient, the chemical agencies of this air depend chiefly on the operation of this principle. It yields oxygen to a number of substances, with more or less rapidity, and thus changes their chemical constitution. It sometimes acts too by communicating humidity; and in a few cases, by affording an elastic fluid, carbonic acid gas, which is diffused through it in small proportion. Its nitrogen exerts no active power, but apparently serves merely to dilute, and thus to moderate the action of the oxygen gas.

HYDROGEN is another elastic fluid, which in the system of modern chemistry has been regarded as elementary. In its aërial form, in which form only it can be obtained uncombined, it is the lightest of all the elastic fluids, and the lightest substance therefore whose gravity we can ascertain. It is distinguished farther by its high inflammability; it burns when an ignited body is approached to it in contact with atmospheric air, and explodes if previously mixed with the air. The product of its combustion is water, which is therefore considered as a compound of it with oxygen. Combined with nitrogen, it forms ammonia: with the primary inflammables, sulphur, carbon, and phosphorus, it forms compound gases: it dissolves even some of the metals, and it is an abundant ingredient in vegetable and animal substances.

WATER, of which hydrogen is the base, is a substance extremely peculiar in its chemical relations. Its power of combination is extensive, there being few substances on which it does not act, or with which it does not combine; yet in the greater number of these combinations no energetic action is displayed; it in general scarcely produces any alteration of properties; and hence its most important operation is the communicating that state of fluidity to bodies which is necessary to their mutual chemical actions. It is more peculiarly the solvent of all saline substances, and of the greater number of the earths; and it dissolves many of the vegetable and animal products. When it communicates oxygen, it produces more important changes. Several of the metals are slowly oxidated by it; and when they are dissolved by acids, it often acts by affording to them that oxygen which is necessary to the solution. Vegetable and animal substances often suffer chemical changes from the oxygen which water imparts, as well as from the fluidity it communicates favouring the re-action of their constituent parts; and in their decomposition at elevated temperatures, the elements of the water they contain enter into the composition of the products which these decompositions afford.

There are three substances supposed to be simple, distinguished by the property of inflammability, and hence named Simple Inflammables, which exist as constituent principles of a number of natural products. These are carbon, sulphur, and phosphorus. Some researches appear to favour the conclusion, that they contain portions of hydrogen, and perhaps of oxygen, whence it is doubtful if their pure inflammable base have been obtained. They are destitute of the metallic splendour, opacity, and specific gravity, and are connected chiefly by the common property of inflammability. When united with oxygen, they form acids.

Carbon. The ultimate base to which the name of carbon ought to be appropriated is perhaps still unknown to us; but there are several substances of which it constitutes the greater part, and in which it appears to exist in a state nearly pure. Wood charcoal in burning is almost entirely consumed, forming with the oxygen with which it combines a peculiar elastic fluid, carbonic acid, and leaving only a small residuum of earthy, saline, and metallic substances. As a discriminating appellation of the pure inflammable matter which thus combines with oxygen, the term Carbon was introduced, and it denoted therefore simply this matter free from the other substances mixed with it in charcoal, and apparently not essential to its constitution. It was afterwards discovered, that the Diamond, which was known to be a combustible body, affords in burning precisely the same product as charcoal, and hence therefore consists of the same inflammable matter. Different opinions were advanced with regard to the difference between charcoal and diamond; as they combine in burning with the same proportion of oxygen, and afford precisely the same product, the difference appears to be merely in aggregation; charcoal in its common state, however, always contains a portion of hydrogen, and it is doubtful if it can be entirely freed from it. In the substance named Plumbago, the carbonaceous base is united with a small quantity of iron. It is to the inflammable matter common to all these substances, composing nearly the whole of their weight, and forming with oxygen a peculiar acid, that the term carbon is appropriated.

Carbon, besides existing as an element in the composition of many mineral substances, is an abundant ingredient in the products of the vegetable and animal systems. Not being volatile, it forms the principal part of the residual mass when these are decomposed by heat; and it is by this decomposition of vegetable matter, especially of the wood of plants, that it is obtained in the form of charcoal. With oxygen, combined in different proportions, it forms two elastic fluids, carbonic oxide, and carbonic acid. With hydrogen and oxygen, in different proportions, it forms various inflammable gases. Alkohol, or pure ardent spirit, which is the product of the fermentation of saccharine matter, is a similar compound; and ether, which is formed from alkohol by the action of acids upon it, is of the same composition with a larger proportion of hydrogen. Lastly, the ternary combination of carbon, hydrogen, and oxygen, in various proportions and modes of combination, appears to constitute the principal varieties of vegetable matter.

Sulphur is found in nature principally as a constituent part of mineral bodies. It exists combined with many of the metals; and united with oxygen, forming sulphuric acid, it enters into the composition of a number of saline and earthy compounds. It is highly inflammable; in burning it combines with oxygen, principally in that proportion which forms an elastic fluid, pungent and suffocating, sulphurous acid. With a larger proportion of oxygen, it forms a dense inodorous liquid acid, sulphuric acid. With hydrogen, it forms an inflammable gas, sulphuretted hydrogen, which exists in nature impregnating water in the sulphurous mineral waters; and this compound, either alone, or with an additional proportion of hydrogen, forming what is named super-sulphuretted hydrogen, enters into combination with alkalis, earths, and metallic oxides, forming several important pharmaceutic preparations. Lastly, sulphur exists as a constituent part of animal substances: hence sulphuretted hydrogen is generally evolved in the decomposition of these by heat or putrefaction: it has also been detected in the composition of a few vegetables. In its common state, sulphur appears to contain a portion of hydrogen.

PHOSPHORUS exists chiefly as an ingredient of animal matter. Combined with oxygen, in the state of an acid, it also enters into the composition of several of the products of the mineral kingdom. It is of a soft consistence like wax, semitransparent, and of a white or yellowish colour; it is so highly inflammable that it burns spontaneously when exposed to the air. It combines with two proportions of oxygen, forming two acids, the phosphorous and the phosphoric. With hydrogen it forms a gas highly inflammable; and it unites with sulphur and with the metals. It had been supposed to contain minute quantities of hydrogen and oxygen, but there is no conclusive proof that this is the case.

The class of METALS is an extensive one, the substances to which this name is appropriated being numerous, and the number being still farther augmented, if the bases of the alkalis and earths are to be admitted into the class. The physical properties, characteristic of the metals, are opacity, great lustre, density, ductility, and malleability. These are possessed in different degrees by the different metals, and if the bases of the alkalis and earths are to be admitted as metals, the property of density cannot be considered as distinctive, as some of these are even lighter than water. With regard to chemical properties, the metals are fusible, in general not volatile except at very intense heats; they are capable of combining with oxygen, with hydrogen, sulphur, carbon, and phosphorus, with each other, and when oxidated they unite with acids, alkalis, and earths.

Of these combinations, that with oxygen is the most important; and in relation to the object of this outline, the only one requiring any farther observations. This combination is effected in various modes. When heated in contact with the air, they attract its oxygen: if the temperature be very highly elevated, as in that produced in the galvanic circuit, they display during this oxidation the phenomena of combustion; even if the temperature is less elevated, several of them burn more or less rapidly; but the greater number are oxidated more slowly, and without any sensible extrication of light. Several metals are slowly oxidated by water, or by the joint action of air and water at natural temperatures. And all of them can be oxidated by acids, the acid either directly imparting oxygen to the metal, or enabling it to attract this principle from the water which is present.

The compounds of metals with oxygen belong in general to the order of oxides. They are destitute of the physical properties of the metals, and have an earthy-like appearance. Two or three metals acquire, in their highest state of oxygenation, acid powers.

In combining with oxygen, different metals unite with very different quantities of it. Each of them combines too with different proportions of oxygen, giving rise to the production from the same metal of oxides having different properties;

and these different oxides form the bases of compounds which are often also extremely dissimilar,—a circumstance of much importance, as is to be afterwards pointed out, with regard to the pharmaceutical processes on the metals.

When the metals are combined with oxygen, they become capable of combining with the acids, and they then acquire greater activity and power of chemical action. This previous oxidation of a metal is always necessary to its combination with an acid, and hence, when acids act on metals, they first impart to them oxygen, or enable them to attract oxygen from the water, or sometimes from the air, and then combine with the oxide that is formed. As the same metal is capable of existing in different states of oxidation, so by combining in these states with the same acid, it forms very different compounds; and these compounds are farther diversified by the different proportions of acid combined in them.

Metals are rendered active on the living system, principally by being thus combined with oxygen, or farther combined with acids. In their metallic state, they seldom produce any sensible effect; and any effect they do produce appears to arise from their being chemically acted on by the gastric fluids. When oxidated, they become more active; and still more so when the oxide is combined with an acid. And even the degree of oxygenation considerably influences their powers; so that from the same metal preparations of very different degrees of medicinal activity may be obtained, though all agreeing in the kind of action they exert.

It would be foreign to the object of this sketch to give the description of the individual metals: it is sufficient to have stated with regard to them these general facts. Few of them exist as common ingredients in the composition of natural substances, with the exception of iron.

The class of EARTHS comprizes a few substances, possessing certain common properties, which are the ultimate principles of the various compounds, not metallic or inflammable, which occur in the mineral kingdom. An analogy had often been observed to exist between these substances and metallic oxides, which led even to the conjecture that they are of similar constitution, or consist of metallic bases combined with oxygen. Their decomposition has accordingly been effected by the application of galvanism; they are compounds of certain bases with oxygen, and these bases possess general properties, so nearly allied to those of metals, as to be sufficient perhaps to justify the placing them in that class, yet still so far different as to afford some reason for regarding them at least as a peculiar order.

The Primary or Simple Earths, as they are named, to distinguish them from the various earthy aggregates which exist in nature, have been described as substances insipid, insoluble in water, fixed, and nearly infusible by heat, uninflammable, and capable of combining with acids, so as to neutralize the acid properties. All these characters are not equally appropriate; for there are several of the earths which have a pungent taste, and are soluble in water to a considerable extent, and all of them may be fused by very intense heats.

The principal earths are Silex, Argil, Magnesia, Lime, Barytes, and Strontites. Zircon, Glucine, and Ittria, have more doubtful claims to be ranked in this class, or exist in such minute quantities as to be comparatively unimportant.

SILEX is an abundant ingredient, not only in mineral substances, but is frequently contained in vegetable products, and forms part of the earthy residuum of their decomposition. It is tasteless, nearly infusible and insoluble in water, and is peculiarly distinguished by its inertness, and comparatively limited range of combination; among the acids it combines only with the fluoric, and even scarcely neutralizes its properties. It is dissolved by the fixed alkalis, and it unites by fusion with them, and with the other earths, and the metallic oxides.

Argil is insipid, soft to the touch, infusible, insoluble in water, and particularly distinguished by forming with that fluid a ductile plastic mass, which hardens and contracts considerably when heated. With the acids it forms compounds, which have generally a sweetish styptic taste, and which possess the property of astringency.

Magnesia exists in the form of a very light white powder, smooth and impalpable; infusible, insoluble in water, and not forming with it a coherent paste; it has a slightly bitter taste, changes the more delicate vegetable blue colours to a green, and combines with acids, forming compounds, in general very soluble, and having a bitter taste. In its pure form it is medicinally employed as an antacid, and its saline compounds have in general a cathartic power.

Lime, or Calcareous Earth, displays still greater energy of action. It is so far soluble in water, as to communicate to the solution a very harsh styptic taste, and the power of changing the vegetable colours to a green. Being usually obtained by the decomposition of limestone, chalk, or marble, by heat, it is in the form of a hard mass; but when it imbibes water, either directly, or from exposure to the atmosphere, it splits, and falls down into a white powder perfectly dry. It is infusible. Combined with the acids, it neutralizes their properties. Its action is considerable on the animal system. Directly applied to animal matter, it acts chemically, producing decomposition, and thus operating as an escharotic. Given in solution, it exerts an astringent and tonic power, which power is also displayed in several of its saline combinations; and by its chemical agency it acts as an antacid, and, as has been supposed, likewise as a lithontriptic. Its base, Calcium, as it has been named, has been obtained, though not perhaps perfectly insulated; it has the metallic lustre, and is highly inflammable.

Barytes surpasses lime in energy of chemical action. Like it, when in a solid mass, it absorbs water rapidly, and falls into a dry white powder; its taste is harsh and caustic: when water is combined with it, it fuses by a heat comparatively moderate; but when this is dissipated, the heat requires to be raised to a much higher point. It is more soluble in water than any of the earths, cold water dissolving a twenty-fifth of its weight, and boiling water even more than half its weight; this latter solution depositing, as it cools, transparent prismatic crystals. Its solution changes the vegetable colours to a green. This earth combines with the acids, and either from the superior strength of its attractions, or the influence of cohesion on its combinations, it decomposes the greater number of the salts of the other earths and the alkalis. It exerts affinities to the other earths, and to sulphur and phosphorus. Of all the substances of this class, it is the one which acts most powerfully on the living system. Even in small quantities, it occasions unpleasant symptoms, and its preparations prove poisonous to animals. From this quality, and from another, the great specific gravity of several of its saline combinations, particularly the native sulphate and carbonate, barytes was often more peculiarly supposed to be of a metallic nature. Its decomposition has been effected by the application of galvanism, and a base obtained from it, of a metallic appearance, having the colour of silver, considerably heavier than water, fusible at a heat below redness, not volatile, inflammable, and reproducing barytes when combined with oxygen.

Strontites, the last of these earths, bears a close resemblance to barytes in many of its properties. Like it, it has a pungent acrid taste, is soluble in water, crystallizable from its saturated solution by cooling, changes the vegetable colours to a green, combines with the acids, and decomposes a number of the compounds which they form with the other alkalis and earths. Its native compounds, too, have a considerable specific gravity. It is, however, much less soluble in water than barytes; it requires nearly 200 parts of cold water to dissolve it; boiling water dissolves it in much larger quantity. Barytes decomposes its salts. It is not poisonous, nor does it appear to exert any marked action on the living system. A characteristic property of it is that of its salts causing inflammable bodies to burn with a blood-red flame.

Following the series of substances according to their chemical relations from the metallic oxides through the earths, it is terminated by the ALKALIS. These possess the chemical property most characteristic of the whole class, that of combining with acids, neutralizing the acid properties; and they form compounds, analogous in general properties to those formed by the earths and metallic oxides with the acids. But they display still more energy in their chemical actions than the earths do, and are more remote in their qualities from the oxides of the common metals. Their taste is extremely acrid; they are highly caustic; abundantly soluble in water; they change the vegetable blue and purple colours to a green, the yellow to a brown, and they combine with oils, rendering them diffusible or soluble in water. Two of the alkalis, Potassa and Soda, exist naturally in a concrete state, but they are easily fused, and at a heat not exceeding ignition are volatilized. The third, Ammonia, exists when uncombined as a permanent gas, but it is instantly condensed by water, and absorbed by it in large quantity.

The alkalis present a singular anomaly in chemical constitution. At an early period of the researches of pneumatic chemistry, the decomposition of Ammonia was effected, and it was found to be a compound of hydrogen and nitrogen. This suggested the conjecture, that the two fixed alkalis might be of similar composition, containing at least one or other of these elements as a common principle. This conclusion from analogy has not, however, been established. Sir H. Davy, by the application of galvanic action in high intensity, succeeded in decomposing potash and soda; the bases obtained from them are substances of a metallic appearance and lustre; and these bases are combined with oxygen. The analogy of the fixed alkalis to the common metallic oxides was thus so far established, and the earths being afterwards found to be of similar constitution, this analogy was extended to them, and all those substances, distinguished by the common property of neutralizing acids, appeared to be of similar constitution. Ammonia alone remains insulated, and it presents the singularity, that while it possesses the same general property, and strictly resembles the other alkalis in its chemical qualities, no traces of oxygen can be discovered in its composition. The analogy therefore either fails with regard to it, or if it be an oxidated substance, nitrogen or hydrogen must be compound, and contain oxygen as a constituent principle.

The bases of the fixed alkalis are substances of very peculiar properties. They have the lustre, opacity, and tenacity of metals; but they want the most characteristic metallic property, that of density; they are lighter even than water. They are very fusible and volatile, and pass through these changes of form, as well as different states of cohesion, within a very limited range of temperature. They are highly inflammable, they combine with oxygen with the phenomena of combustion, and are susceptible of different degrees of oxidation. These substances have been regarded as the simple bases of the alkalis; but some facts favour the opinion that they contain hydrogen, and are metallic hydrurets, instead of being simple metals.

POTASH, or, as it ought to be named, (in conformity to the rule of giving a similar termination to the names of substances belonging to the same order), POTASSA, is obtained from the incineration of vegetables, especially from the woody part; the saline matter remaining after the wood has been burnt, consists principally of this alkali, in combination with carbonic acid. It is freed from the impurities by lixiviation; the acid is abstracted by the action of lime, the alkali is obtained in solution, and, by evaporation, can be obtained in a solid state. It is of a white colour, crystallizable, fusible, and volatile at a red heat; abundantly soluble in water, soluble also in alkohol, powerfully caustic, and possessed of all the alkaline properties in a high degree. There is some uncertainty, whether it exist in the vegetable matter from which it is procured in the state in which it is obtained, or whether its base is a constituent principle of that matter, and is oxygenated during the combustion: one reason for admitting the latter opinion, at least in part, is, that the alkali cannot be extracted in so large a quantity by any other process as by burning.

POTASSIUM, as the base of potash has been named, is at the temperature of 32° a solid substance, hard and brittle, of a white colour, opaque, and with the lustre of polished silver; at 50° it becomes soft and malleable; at 60° it is in the form of small globules, somewhat consistent; at 70° it becomes more mobile and liquid; and at 100°, or according to Gay Lussac and Thenard at 136°, it is completely so. It requires a temperature near to a red heat to volatilize it. It is lighter than water, or even than alkohol or ether. It is highly inflammable, when heated to its vaporific point, burning with intense heat and vivid light; at lower temperatures it combines more slowly with oxygen ; and such is the strength of its affinity to this principle, that it takes it rapidly from water, and from all the acids. It is susceptible of various degrees of oxidation, which Gay Lussac and Thenard have ascertained. In its rapid combustion it combines with the *maximum* proportion of oxygen : the oxide thus formed is not potash, but a substance of a yellow colour containing nearly three times more oxygen than the alkali does, which is fusible, and acts with energy on inflammable and metallic substances, by imparting its excess of oxygen. The degree of oxidation which forms potash, is established almost exclusively by the agency of water ; it is thus produced by decomposing water by potassium, or by adding water to the oxide at the maximum, the excess of oxygen in the latter being disengaged : the proportions in the real alkali are, according to Gay Lussac and Thenard, 83.37 of potassium, and 16.63 of oxygen. Besides these, there exists an oxide at the *minimum*, formed by the slow absorption of oxygen by potassium from atmospheric air ; it is brittle and inflammable, and decomposes water, attracting a sufficient quantity of oxygen to convert it into potash.

SODA, or Mineral Alkali, as it has been denominated in contradistinction to the other alkali, which has been distinguished by the epithet of vegetable, exists as a constituent principle of several saline mineral substances ; but it is usually extracted from the combustion of marine plants. It is afforded by the combustion, combined with carbonic acid, and associated with various other saline substances, and is obtained pure by the same general process as that applied to potash. Whether it pre-exist in sea-plants, or whether these, in common with land-vegetables, afford potash in burning, which decomposes the muriate of soda with which they are impregnated from their situation, so as to afford soda, has not been well determined. In its physical properties, this alkali bears a considerable resemblance to the other. It is solid and white, crystallizable, though with difficulty, from its watery solution; extremely acrid and caustic, fusible and volatile from heat, having a strong attraction to water, changing the vegetable colours to a green, and possessing all the alkaline properties. From potash it is principally distinguished by the different compounds it forms.

SODIUM, the base of soda, is white and opaque, and has the lustre and appearance of silver; is soft and malleable; is somewhat lighter than water; it is less fusible than potassium, not losing its cohesion at a lower temperature than 120°, and requiring for its perfect fusion a heat of 180°; it is also less volatile. When heated to ignition, it burns vividly; at lower temperatures it absorbs oxygen without undergoing combustion; it abstracts oxygen from water, and from the acids, frequently with inflammation. It appears, like potassium, to be susceptible of various degrees of oxidation; that which forms the alkali is established almost exclusively by the agency of water; the proportions are 74.63 of sodium, and 25.37 of oxygen. Besides this, Gay Lussac and Thenard have shewn, that in its rapid combustion sodium combines with a quantity of oxygen one and a half greater than that which exists in soda, forming an oxide at the *maximum* of oxidation. And there is also an oxide at the *minimum*, formed by the spontaneous absorption of oxy- by sodium at a low temperature.

AMMONIA. This alkali has usually been denominated volatile, from its volatility compared with the others, even when it is combined with water, being considerable. In its insulated state it exists as a permanently elastic fluid; its odour is extremely pungent; water absorbs it in very large quantity, and this solution forms what is named Liquid Ammonia. Its tendency to assume the elastic form, and its comparative dilution, lessen the energy of its action; and hence, though possessed of the general alkaline properties, it appears weaker than the others in the affinities it exerts. Its composition was established at an early period of the researches of pneumatic chemistry, nitrogen and hydrogen appearing, both from analytic and synthetic experiments, to be its constituent principles. When the composition of the fixed alkalis was discovered, and they were proved to be oxides, analogy evidently suggested the conjecture, that oxygen might exist in ammonia, and Davy, from some experiments, concluded that this is the case. It has since been shewn that these are incorrect, and that ammonia, by decomposition, is resolved into hydrogen and nitrogen alone. The analogy in the chemical constitution of ammonia to that of the fixed alkalis, appeared to be established in another respect, that of its having a metallic base; Berzelius and Pontin, Swedish chemists, having found, that when the alkali is placed at the negative wire in the galvanic circuit in contact with quicksilver, the quicksilver increases in bulk, becomes thick, and at length a soft solid,—changes similar to what are produced in it by the addition of metallic matter, and which can scarcely be conceived to arise from any other cause. They concluded, therefore, that in this experiment the ammonia had suffered decomposition, and its metallic base had combined with the quicksilver. And they affirmed, that when the amalgam is exposed to atmospheric air or dropt into water, it absorbs oxygen, hydrogen is disengaged, denoting a decomposition of the water and a transfer of its oxygen to the metallic matter, while in both cases ammonia and quicksilver are reproduced,—results which Davy confirmed. Gay Lussac and Thenard, however, have shewn, that so far as relates to the absorption of oxygen, they are incorrect;

the ammoniacal amalgam, they find, is resolved by decomposition merely into quicksilver, ammonia, and hydrogen, and they regard it therefore as a compound of these, the ammonia and hydrogen being retained by the quicksilver by a very weak affinity, and in a state of slight condensation. It still appears, therefore, that ammonia is a compound of hydrogen and nitrogen, the proportions being from 72 to 74 of hydrogen, with from 28 to 26 of nitrogen.

The last important class of chemical agents is that of Acids. Their characteristic properties are a sour taste, the power of changing the blue, purple, and green colours of vegetables to a red, and that of combining with the alkalis, earths, and metallic oxides, forming compounds, in which, when the combination is established in the due proportion, the properties of the acid, and of the base with which it is united, are equally neutralized. The more powerful acids have a considerable degree of causticity; they have a strong attraction to water, and they act with energy on inflammable and metallic substances.

All the acids are compounds of oxygen, and this element is therefore regarded as the principle of acidity. This truth was established by Lavoisier, with regard to a number of the acids, and extended by analogy to a few which had not been decomposed. The bases of the acids are either inflammable or metallic. The production of acidity is usually the result of their full oxygenation, and in some cases the base combines with two proportions of oxygen, forming two acids, different in their properties from each other.

On these facts, with regard to the chemical constitution of the acids, their nomenclature is founded. The base being specific with regard to each acid, while the oxygen is common to them all, it is from the name of the former that the name of the acid is derived; and, by a variation in the termination of this name, the different acids which may be formed from the base, by a difference in the degree of oxygenation, are distinguished; the name terminating in the syllable *ic*, when the acid is that which contains the larger proportion of oxygen, and in the syllable *ous* when it contains the smaller proportion. Thus sulphur forms two acids, by combining with two proportions of oxygen; the term sulphur is the radical whence the names of these are derived, and according to the above principle, the one is denominated the sulphuric, the other the sulphurous acid. Where a large quantity of oxygen can be farther combined with an acid without increasing, but rather diminishing its acid powers, the name is expressed by prefixing the epithet *oxy*, as oxymuriatic acid.

Acids have an extensive power of combination. From the numerous affinities they exert, and from the facility with which they afford oxygen, they are the most active of any of the compound chemical agents, and are hence employed in many pharmaceutic operations. Those of most importance under this view are the sulphuric, nitric, and muriatic.

The SULPHURIC ACID, formed from the full oxygenation of sulphur, exists combined with a small quantity of water in the form of a liquid of great density, and from this state of concentration acts powerfully, exerting strong attractions to other bodies; and though, from the strength of affinity between its principles, it does not directly afford oxygen with facility to many substances, it enables them to attract oxygen from water, and thus subjects them to chemical change. The SULPHUROUS ACID, which is formed from the same base in a lower degree of oxygenation, existing naturally in the elastic form, which is an obstacle to its entering into combination, and not being very largely absorbed by water, so as to form a concentrated solution, is much weaker in its action.

Nitric Acid is the result of the full oxygenation of nitrogen; and the oxygen, not being retained in the combination by a strong attraction, the acid yields it readily, and hence acts with more facility and energy on inflammable and metallic substance than any other acid,—oxidating the former, and first oxidating, then combining with the latter; hence in pharmacy it is used as the most general solvent of the metals. What is named Nitrous Acid, is the nitric, with an impregnation of nitric oxide gas; it is of a yellow colour, and emits similar coloured dense fumes, while the other is colourless: the chemical agencies of both are nearly the same.

Muriatic Acid exists when uncombined in the aërial form, but it is absorbed in large quantity by water, and forms a liquid acid of considerable strength. Its analysis has not been effected, and its composition is therefore altogether unknown. It appears, however, that in its gaseous form it always contains a quantity of water in intimate combination, amounting to a fourth of its weight, and thus water has an important influence on its acidity; for although the acid itself cannot be obtained free from this water, yet when combinations of it with other acids are procured in this state, the acid powers are completely suspended, and are restored on the addition of a little water. This acid, not directly affording oxygen to bodies, oxidates them only by enabling them to attract oxygen from the water it contains; it thus dissolves metals; and it farther combines with other substances, as the alkalis or earths. It is capable of uniting with an additional proportion of oxygen, forming what is named Oxymuriatic Acid, which, although its acid powers are weaker, imparts oxygen more readily to bodies. And, with a still larger proportion of oxygen, it forms a third acid, Hyper-oxymuriatic Acid, which gives to the saline compounds in which it exists, the power of acting with much energy on inflammable bodies, in consequence of the very large quantity of oxygen condensed in the combination, and not retained by any great force. An hypothesis suggested by Gay Lussac and Thenard, with regard to the nature of this acid, and these combinations of it with oxygen, has lately been maintained by Sir H. Davy, that oxymuriatic acid, instead of being a compound of muriatic acid and oxygen, as had been supposed, is a simple substance, and like oxygen, an acidifying element; and that muriatic acid is a compound of it with hydrogen. This hypothesis, when proposed, was supported by no conclusive independent evidence, but rested entirely on those facts, which are explained more justly, and with more probability, from the peculiar relation of muriatic acid to that portion of combined water which in common with other acids it contains in its insulated state; and in the progress of the discussion with regard to it, the evidence in support of the common doctrine has been extended and confirmed.

Other acids, less important as pharmaceutic agents, are the Carbonic, Phosphoric, Boracic, and Fluoric.

Carbonic Acid, the product of the complete oxygenation of carbon, existing in the elastic form, and being absorbed by water only in sparing quantity, has no very active chemical power, but is of importance from existing in many natural combinations, particularly of saline and earthy substances belonging to the Materia Medica. The characters eminently distinguishing it are its only weakening, not entirely neutralizing the properties of the alkalis, when in combination with them, and its being disengaged rapidly with effervescence by other acids from its saline compounds.

Phosphoric Acid has phosphorus for its base; and the affinity between this base and the oxygen with which it is combined, being strong, it scarcely acts on bodies by oxygenating them, but simply by entering into combination with them; nor are these combinations comparatively of much importance. PHOSPHOROUS ACID, in which the proportion of oxygen is smaller, is still less important.

BORACIC ACID exists in the concrete form, and its chemical action is comparatively weak. So powerful is the affinity between its base and oxygen, that it has only been decomposed by the agency of galvanism, or by potassium; the product of its decomposition is a dark olive-coloured substance, inflammable, and which, by combining with oxygen, reproduces boracic acid; this substance Gay Lussac and Thenard considered as the base of the acid; it is infusible, insoluble in water or in alkohol, neither does it decompose water; it attracts oxygen, however, from other acids, and from a number of saline compounds; it burns vividly when heated in oxygen gas, and forms boracic acid; the acid, according to the estimate of these chemists, containing about one third of its weight of oxygen.

FLUORIC ACID, in the state in which, until lately, it has been known to chemists, is elastic, and is not very largely absorbed by water; its chemical action is from these circumstances, therefore, not powerful. It unites, however, easily with the alkalis and earths, and, what peculiarly distinguishes it, is capable of dissolving siliceous earth. It suffers decomposition from the action of potassium, oxygen appearing to be abstracted from it, and a substance of a reddish brown colour is deposited, which burns in oxygen, and reproduces the acid. This substance appears to contain the base of the acid combined with a portion of potash, formed by the oxygenation of the potassium. The experiments of Gay Lussac and Thenard have shewn, that the acid, in the state to which these observations apply, holds dissolved a portion of siliceous earth, derived either from the materials from which it is procured, or from the glass vessels in which the process is performed; and this silex has a very important influence on its properties. When the acid is procured free from silex, it exists in the liquid state at the temperature of 60°; but it evaporates rapidly, and forms dense vapours when exposed to the air; and the contact of silex causes it instantly to assume the gaseous form; it combines with water with a hissing noise, and the production of much heat; is possessed of high acid powers, and is peculiarly distinguished by the energy of its action on animal matter, instantly destroying it, so that a drop of it allowed to fall on the skin, erodes it with severe pain, and produces deep-seated ulceration. This acid forms, with the boracic, a compound acid, the Fluo-boric, which is also distinguished by very peculiar properties, particularly by its strong attraction to water, and also by its very powerful action on vegetable and animal matter.

There is a series of acids with compound bases, derived from the vegetable and animal system; but those of them entitled to notice will be best considered with the classes of substances with which they are more strictly connected.

The acids combine with the alkalis, the earths, and the metallic oxides; and when the combination is established in the due proportion, the chemical properties of the acid, and of the base with which it is united, are mutually neutralized. Hence these compounds are named Neutral Salts, and, as an order of chemical agents, they are distinguished by certain common properties. They can always be obtained in the solid state: they are generally, though not universally soluble in water; those of them which are soluble, are capable of assuming a crystalline form, the form being very different in different salts. Those which crystallize from their aqueous solution, always retain a quantity of water in combination, essential to the crystal, and therefore named their water of crystallization. When heated, the increase of temperature is often sufficient to enable this water to dissolve the real saline matter: this is named the watery fusion of salts; as it evaporates, the salt becomes concrete, and, by a farther increase of heat, is either fused or decomposed. The term Neutral Salt is sometimes restricted to those of which the alkalis are the bases: those formed from the earths are named Earthy Salts; and those from the metallic oxides, Metallic Salts. The nomenclature of the whole series is in the modern chemical language simple, and, at the same time, systematic and precise. They are formed into genera and species, according to the acids, and the bases of which they are composed; the name of the genus is derived from that of the acid, the name of the species from that of the base with which the acid is united. Thus all the salts formed from sulphuric acid are considered as constituting one genus, and are named Sulphates; and the name of each species is expressed, by adding the name of the base, as Sulphate of Soda, Sulphate of Lime, Sulphate of Iron, &c. The acid which sulphur forms in a different degree of oxygenation, the Sulphurous, forms a different order of salts; these are named Sulphites; and in like manner we have Nitrates and Nitrites, Phosphates and Phosphites, &c. Those formed from oxymuriatic acid are named Oxy-muriates. Salts are sometimes formed with an excess of acid, or with an excess of base: the acid being considered as the principle forming the genus, these compounds are distinguished by prefixing to the usual name the epithet *super*, when the acid is predominant, and the epithet *sub* when it is deficient, or when the base is in excess, as Super-sulphate of Potash, Sub-carbonate of Soda, &c. When an acid is combined in one compound with two bases, as sometimes happens, the names of both bases enter into the name of the Salt, as Tartrate of Potash and Soda. Thus, by this simple system, a facility of nomenclature is afforded; the whole is uniform, and the memory is aided, by the name pointing out the nature of the salt; its adoption in Pharmacy is therefore an important improvement, compared with the arbitrary and unstable nomenclature formerly employed.

So far the chemical analysis of unorganized substances connected with the Materia Medica has been the subject of consideration. It remains to take notice of the analysis of those belonging to the vegetable and animal kingdoms,—a subject of much importance, particularly as it relates to the vegetable part of the Materia Medica, and which, from this importance, as well as from the nature of the substances themselves, requires to be considered with more minute details.

These two classes of bodies are distinguished by very obvious chemical characters. In unorganized substances, the principles are few, and are combined generally in very simple states of union; their analysis can be executed with accuracy; even the proportions of their principles can be determined with precision, and they can be again combined so as to form the decomposed substance, thus confirming the analysis by synthesis. But, with regard to the products of organization, while the composition, so far as it relates to the ultimate elements, is more uniform, it is, with regard to the modes in which they are united, much more complicated. They consist of a few common principles; but these, presented to each other in the vessels of the organic being, have been placed under circumstances indefinitely varied, and which art can very imperfectly imitate. Combinations of the same elements are formed, therefore, greatly diversified, and properties are derived from differences of proportions, or modes of union extremely minute. Hence their accurate analysis is executed with difficulty,—a difficulty increased by the circumstance, that these elements having strong mutual affinities, cannot in general be obtained insulated, but when the compound is decomposed enter into new combinations, liable to be modified by slight variations of circumstances; the proportions therefore can seldom be determined with accuracy, the modes of union in general remain unknown, and the confirmation by synthesis is entirely precluded.

Another character distinguishes these two classes. The composition of unorganized bodies being more simple, is not so liable to be subverted; their constituent principles being few, their affinities operate with more force, and the combination is more permanent. That of organized bodies being more complicated, has characters precisely the reverse. Composed always of several elements, the affinities are more nicely adjusted, and are therefore more easily modified; and their principles having tendencies to enter into numerous forms of combination, slight variations of circumstances subvert the equilibrium. Hence the susceptibility of decomposition by which they are distinguished: they are liable even to spontaneous changes from the reaction of their elements; and when this is favoured by humidity, elevation of temperature, or the action of the air, new combinations are established, whence the original compounds are decomposed.

From the peculiar constitution of the products of organization, there are two kinds of analysis to which they are subject. The object of the one is to discover their ultimate composition; that of the other is less refined, being confined to the investigation of the proximate principles of which they are composed.

It is seldom that a vegetable substance is homogeneous. The seed, for example, the bark, or the leaves of a plant, is not of one uniform composition, but consists of various proximate principles in a state of mixture, or of slight combination, and capable of being easily separated from each other. Now, these are often connected with their medicinal virtues; the virtue residing perhaps not in the entire substance of the leaf, bark, or seed, but in a principle capable of being separated, and which may frequently be employed in its insulated state. Hence the importance of the analysis of the vegetable substances belonging to the Materia Medica, so far as relates to their proximate principles; the knowledge it conveys enabling us to employ them with more discrimination, and to submit them to the proper pharmaceutic treatment. An enumeration of their proximate principles, and more particularly of those on which their medicinal powers depend, accordingly always enters into their description as articles of the Materia Medica.

This analysis is executed in various modes, adapted to particular cases, according to the principles which form the vegetable substance.

Sometimes it is effected merely by heat. The temperature cannot indeed be elevated very high, as then the proximate principles of the vegetable would be themselves decomposed, and their elements brought into new combinations. But at a heat comparatively moderate, as that of boiling water, this does not happen; and at this temperature several of these principles, such as essential oil, camphor, and some others not very well defined, are volatilized without decomposition, and of course can be obtained pure.

The action of different solvents is of more extensive use in conducting the vegetable analysis. Water dissolves several of their component principles, such as gum and extractive matter, tannin, saline substances, and some others. These are dissolved in greater or less quantity, and in more or less purity, according to the temperature of the water employed. In general, by raising the water to its boiling point, it is able to dissolve them more completely; but some of them are apt to be volatilized, and others altered in composition, especially if the atmospheric air is not excluded. Of the substances which the water holds dissolved, part are separated as it cools; the gum can be precipitated by alkohol; the saline substances may be crystallized, or can be discovered by evaporating the solution to dryness, and exposing the mass to such a heat as will destroy the inflammable parts; tannin and some others are detected by their chemical tests.

Alkohol is another agent of much importance in executing the vegetable analysis. It dissolves the resin, balsam, camphor, and essential oil: these solutions are decomposed by water, each substance being separated, and discernible by its peculiar qualities. Equal parts of alkohol and water, or proof spirit as it is named, is also often employed as a solvent in the analysis of vegetables. Ether dissolves nearly the same principles as alkohol. And the acids, alkalis, and soluble earths, are sometimes of utility as re-agents, in pointing out the existence of peculiar principles.

Lastly, in the analysis of vegetables, we are often able to procure several of their proximate principles, by mechanical means, particularly by expression. Sometimes too, they exude spontaneously from the growing vegetable, or are obtained by it from incisions made in the branches or trunk.

After we have discovered the proximate principles of a plant, or of any part of it, the next step is to ascertain their composition. This is an investigation attended, however, with much difficulty, as being liable to all the deceptions arising from a complicated analysis, and incapable of being confirmed by the surer test which synthesis affords.

The composition of these substances with respect to their ultimate principles is nearly uniform. All of them contain carbon and hydrogen, generally if not invariably united with oxygen: some farther contain nitrogen and phosphorus; and in others several of the metals, particularly iron and manganese, exist. Lime, too, and the two fixed alkalis, either pure or more commonly in combination with some of the acids, are not unfrequently constituents of vegetable matter. These latter substances, however, are seldom in any considerable proportion; nor in general do they appear to modify much the properties of the substances in which they exist. Nitrogen, and perhaps lime, when present, appear to have the most important influence, and with the exception of the few compounds of which they form a principal part, it may be said, that the vegetable proximate principles consist of carbon, hydrogen and oxygen; the differences in their properties being produced by differences in the proportions of these principles, and of the modes in which they are combined.

That a difference in the proportions of these elements may give rise to the differences in the properties of the compounds which they form, cannot be doubted; since in many other cases of chemical combinations, where there is no difficulty in the analysis, differences equally important and well marked are produced by this cause. In vegetable substances we accordingly can often trace this as the cause, without being able to point out any other. Thus, fixed and volatile oils have properties in many respects dissimilar: by analysis both are found to consist of carbon and hydrogen, united in different proportions, the volatile oils having more hydrogen in proportion to the carbon than the fixed have; this is a cause sufficient to account for the difference in their properties; and it accords sufficiently with that difference, for hydrogen being a substance of great rarity and volatility, those compounds in which it predominates, as ether, alkohol and others, are in general light and volatile. The greater volatility, therefore, of the essential, compared with the fixed oils, may be ascribed to its predominance.

In other cases, it is probable that the mode in which the constituent principles of these substances are united, is the cause of the difference in their qualities. This is indeed a cause which can be but imperfectly investigated, either by analysis or synthesis; but it is conceivable *a priori*, and sufficiently confirmed by chemical facts, that a difference in the mode of union may give rise to very important diversities of properties. If a compound, for example, consist of three elements, these may be united in two modes. Their attractions may be reciprocally balanced, and they may form what is named, in strict propriety, a ternary combination; or, from a variation in the circumstances under which the union has been effected, or a difference in the strength of their attractive powers, two of them may be combined, and the compound thus formed may exert an attraction to the third principle, unite with it, and form a new substance. The compounds resulting from these different modes of combination, though composed of the same principles, united perhaps even in the same proportions, would still have properties different from each other. Still greater diversities will be produced where the elements are more numerous, and the possible modes of union are of course more diversified. And when we consider these causes from difference of proportions, and modes of combination, we shall scarcely be surprised at the number of different substances, immense as it is, which nature forms from a few elementary principles.

The proximate principles of vegetables are sometimes analysed by exposure to heat: their elements enter into new combinations, and from the nature of the products, we discover what the principles were. Thus, if the substance exposed to heat yields a large quantity of acid, we conclude that it contains a considerable quantity of oxygen as a constituent part. If it afford much empyreumatic oil, we infer that it contains a large proportion of hydrogen, this principle being necessary to the constitution of that product. When ammonia or prussic acid is afforded by this kind of analysis, we conclude, for the same reason, that nitrogen has been a constituent principle. And by the same mode are discovered the earths and metals which had been present in it; these remaining after the volatile parts have been expelled. Lastly, from the quantity of charcoal which remains as a residuum, we can form some conclusion as to the quantity of carbon which the vegetable substance contained.

Their analysis is also effected by exposing them to heat with the access of atmospheric air, and collecting the products of the combustion that takes place. From the nature of these products, we can ascertain the proportions in which they were united. Oil, for example, when subjected to this analysis, yields nothing but carbonic acid and water. We conclude therefore that it is composed of carbon and hydrogen, since these principles, united with oxygen, form these products, and since, if any other simple substance had existed in the oil, it would have appeared either pure or in combination with oxygen. We can even determine in this manner the proportion in which the carbon and hydrogen existed in the combination. From knowing what quantity of carbon exists in a given quantity of carbonic acid, and what quantity of hydrogen exists in a given quantity of water, we thus also discover whether any oxygen had existed in the composition of the oil.

Their analysis is also sometimes executed by the agency of the nitric acid, which communicates to them oxygen, and by the product ascertains the nature of their acidifiable base.

This mode of analysis by oxygenation has lately been rendered more exact in the execution by a variation introduced by Gay Lussac,—that of employing hyper-oxymuriate of potash as the oxygenating substance; a certain weight of this salt being heated with a portion of the vegetable matter in its driest state; and the products formed by the combination of the oxygen of the salt with the elements of the vegetable substance being collected. His experiments establish the important general results,—that in one class of vegetable products, those which are of the nature of gum or fecula, the oxygen and hydrogen they contain are in that proportion to each other which forms water, there being added to this a certain quantity of carbon;—that in another class, those which are acid, the oxygen is to the hydrogen in a larger proportion than that which forms water;—and that in a third class, composed of those which are oily or inflammable, the hydrogen is in larger proportion. The following table presents these results, and the proportions of the elements of some of the most important vegetable proximate principles, as assigned by this method.

Substances analysed.	Carbon contained in that substance.	Oxygen contained in that substance.	Hydrogen contained in that substance.	Supposing the oxygen and hydrogen in the state of water in the substance. Carbon.	Water.	Oxygen in excess.
Sugar	42.47	50.63	6.90	42.47	57.53	0
Gum-arabic . .	42.23	50.84	6.93	42.23	57.77	0
Fecula	43.55	49.68	6.77	43.55	56.45	0
Sugar of milk .	38.825	53.834	7.341	38.825	61.175	0
Oak-wood . .	52.53	41.78	5.69	52.53	47.47	0
Beech-wood .	51.45	42.73	5.82	51.45	48.55	0
Mucous acid .	33.69	62.67	3.62	33.69	30.16	36.15
Oxalic acid . .	26.57	70.69	2.74	26 57	22.87	50.56
Tartaric acid .	24.05	69.32	6.63	24.05	55.24	20.71
Citric acid . .	33.81	59.86	6.33	33.81	52.75	13.44
Acetic acid . .	50.22	44.15	5.63	50.22	46.91	2.87
						Hydrog. in excess.
Resin, common	75.94	13.34	10.72	75.94	15.16	8.90
Copal	76.81	10.61	12.58	76.81	12.05	11.14
Wax	81.79	5.54	12.67	81.79	6.30	11.91
Olive oil . . .	77.21	9.43	13.36	77.21	10.71	12.08

The ultimate analysis of the vegetable substances belonging to the Materia Medica is seldom of utility, since we can scarcely ever discover any relation between the composition and the medicinal powers of the substance analysed. These, in common with all its properties, no doubt depend on that composition; but our modes of analysis are still too limited and imperfect to admit of our tracing the connection between them. The application of chemistry, therefore, to the vegetable substances belonging to the Materia Medica, is in a great measure confined to the discrimination of their proximate principles.

The Proximate Principles of vegetables are numerous, and of very different kinds. They are not all to be met with in every vegetable, or in every period of vegetation: some exist only in certain plants, and that only in their state of vigour and maturity: at other times they are to be found only before they have arrived at that period; some are deposited in particular organs, others are diffused through the whole substance of the vegetable, and mixed in a manner more or less intimate with all its parts: and some are nearly peculiar to certain vegetables, while others are common to almost every plant. Those only require to be pointed out in this sketch, which are particularly connected with medicinal properties.

These principles are the products of vegetation from a common juice or sap, which circulates freely through every part of the vegetable system, being supplied by absorption from the soil, and perhaps from the atmosphere. It varies in its qualities, particularly according to the season, and the progress of the plant to maturity; frequently too it has an intermixture of the proper juices: it always contains the usual elements of vegetable matter, with generally saline substances, having principally lime for their base. By the chemical changes it suffers from the action of the vessels of the plant, aided by the action of the air and of light, its elements pass into various states of combinations, whence the peculiar products of vegetation are formed.

The first transition of the sap appears to be into MUCILAGE, or GUM, one of the proximate principles contained in greatest abundance in vegetables. Gum is the name given to this principle when it is obtained in a concrete state; Mucilage is the name given to it when it is expressed in a liquid state, or extracted by maceration in water. Between these there exist some differences in their relation to reagents, whence a distinction has been established between them; but their general properties are the same, and similar differences exist between the different varieties of gum itself.

This principle is found in all young plants, in greater or less quantity; and is often so abundant in the plant, as to be discharged by spontaneous exudation. It abounds also in their roots, stalks, and leaves, and especially in their seeds. It is an inodorous, insipid, and glutinous substance, soluble in water, in every proportion, and forming with it a thick viscid solution, which by evaporation affords a tenacious mass, that when dried is brittle and again soluble. It is insoluble in alkohol, ether, or oil, and is precipitated from its solution in water by the addition of alkohol. It does not absorb oxygen from the atmosphere; though its solution becomes sensibly acid by keeping, owing to partial spontaneous decomposition, and the combination of part of the principles of the gum, so as to form acetic acid. Exposed to heat it is neither fusible nor volatile. At a temperature superior to 212, but inferior to that of ignition, it is decomposed; its principles entering into new combinations: the products are an acid liquor, consisting principally of acetic acid, carbonic acid and carburetted hydrogen gases, with a little ammonia, and a residuum of charcoal containing lime, one ounce of gum, affording 6 grains of lime. This lime is also detected by adding sulphuric acid to a solution of gum. From these products of the analysis, it is evident that the ultimate principles of gum are, oxygen, hydrogen, and carbon, with smaller proportions of nitrogen and lime. Gum is not capable of passing into the vinous fermentation, which appears to be owing to the portion of lime existing in it, as lime has the effect of preventing even sugar from suffering this change.

Gum is not inflammable; for although, when heated, in contact with atmospheric air, it combines with oxygen, it emits no flame. The principal products of this combination are carbonic acid and water. By the action of nitric acid it is converted into oxalic, malic, and saccholactic acids. Oxymuriatic acid converts it into citric acid.

Gum is usually obtained either by spontaneous exudation, or by incisions made in the trunks and branches of trees. It is more or less pure as it is obtained from different plants. Its existence in vegetables is detected by boiling gently the vegetable substance with water; the water dissolves the gum, and if much of that principle be present, the solution is glutinous. It may be allowed to remain till the impurities have subsided; if it then be evaporated to the consistence of thin syrup, the addition of three parts of alkohol will separate the whole of the gum in flakes.

Pure gum is not an active substance, considered with respect to its effects on the living system. In medicine it is only used for its lubricating quality; and so little activity does it exert, that it has often been taken for a considerable time as an article of food. From its chemical properties, it is of rather more importance. As a component part of vegetable matter, it renders the other parts more soluble in watery liquors, and may thus favour their action on the stomach. In Pharmacy it is used as a medium to combine balsams, resins and oils with water. If a small quantity of any of these substances be triturated with a little gum or mucilage, on the addition of water they remain suspended in it, forming a white milky-like mixture, retaining all the properties of the balsam or oil. Though pure gum is thus inactive, yet the virtues of many vegetables depend on a gummy matter.

Fecula is a principle approaching in several of its characters to gum. Like it, it is soluble in hot water, and forms a viscid glutinous solution; but it is at once distinguished by being perfectly insoluble in cold water. It exists principally in the tuberose roots and gramineous seeds. It is extracted by beating the dried root or seed with a large quantity of water; the liquid soon becomes milky, from the diffusion of a white powder through it. On being poured from the remaining vegetable matter, and allowed to remain at rest, this powder is deposited, and when washed and dried is the fecula of the plant. It is generally mild and insipid, of a white colour, with a peculiar kind of brilliancy, soft to the touch; but portions of the other principles of the plant sometimes adhere to it, from which it receives colour, smell, and taste. Starch is the fecula of wheat, and is the most abundant part of that grain.

Fecula is insoluble in alkohol. The action of the acids on it is somewhat analogous to that they exert on gum, dissolving it when they are weak or diluted, but decomposing it when they are more concentrated. The alkalis also dissolve it. Exposed to heat, it is charred, and suffers decomposition, affording products which indicate carbon, hydrogen and oxygen to be its constituent principles. A property eminently characteristic of it, and probably depending on its composition, is that of being convertible into saccharine matter, and thence ultimately passing into the vinous fermentation,—a property not belonging to gum or any other principle. This conversion takes place in germination, and is accompanied with an absorption of oxygen, and formation of carbonic acid.

Fecula is a substance highly nutritive, and is usually contained in those plants which serve as food. It is sometimes employed in its pure state in medicine, on account of its nutritive quality, and from being easy of digestion; sago and salop are substances of this kind.

GLUTEN. This principle is usually associated with fecula, and is obtained in the process in which the fecula is separated. It then appears as a viscous, elastic, and fibrous-like substance, which, from its close resemblance to the animal product named Gluten, has been denominated Vegetable Gluten. It is obtained from the flour of wheat in greatest abundance: the flour is made into a paste with water, which being compressed by the hand, while a stream of water falls upon it, the fecula is carried off in the state of powder: the mucilaginous and saccharine parts of the grain are dissolved by the water; and there remains a tenacious ductile mass, forming the gluten; it has scarcely any taste, is of a greyish colour, and when dried is semi-transparent, resembling glue in its appearance: it is insoluble in water, and is dissolved in very small quantity by alkohol: by the action of nitrous acid, it is converted into oxalic acid, giving out, at the same time, nitrogen gas: decomposed by heat, it affords a large quantity of ammonia, and it is subject like animal matter to putrefaction. It contains a larger proportion of nitrogen than any other vegetable product does, and it is supposed to render those vegetables in which it is present highly nutritive.

Another principle which has been supposed to exist in vegetables, is that which has been named Albumen, from its resemblance to the animal principle of that name. It is soluble in cold water, its solution being coagulated by heat: it is coagulated also by alkohol, but is dissolved by the alkalis: like gluten, it is liable to putrefaction, and furnishes a large quantity of ammonia by distillation. This principle is found in hemlock, scurvy grass, cresses, and several other plants, and is obtained from the fresh expressed juice of the leaves when they are heated nearly to the boiling point; the albuminous matter coagulating, and separating in the form of flakes. A similar separation takes place on the addition of spirit of wine. It is contained also in the seeds of other plants, particularly in the different nutritive grains; in the farina of wheat, for instance, it is found dissolved in the water which is employed in separating the fecula from the gluten. This principle has, however, been regarded, and perhaps justly, as a variety of gluten; it differs little from it in chemical properties; and the peculiar physical qualities supposed to be distinctive of gluten are obviously derived from the process by which it is obtained.

Saccharine Matter. This exists in many vegetable substances, especially in their fruits and roots, but often intimately united with their mucilaginous and extractive matter. When freed from these, its taste is sweet, without any peculiar flavour; it is soluble in water and in alkohol; is capable of crystallizing; its watery solution enters first into the vinous, and then into the acetous fermentation. By the action of nitric acid, it is converted into oxalic acid; by decomposition by heat, it affords a large quantity of empyreumatic acetic acid, a small quantity of empyreumatic oil, carbonic acid and carburetted hydrogen gases, the residuum being charcoal. It consists, therefore, of carbon, hydrogen and oxygen; and from the large quantity of acid which its analysis yields, it appears to contain more oxygen than any other vegetable substance that is not acid.

Sugar appears to be often formed from the fecula of the vegetable in which it exists. It contains nearly the same principles as fecula does, and the operation of malting throws considerable light on its formation; in this process, the fecula of grain is converted into saccharine matter, oxygen is absorbed, and carbonic acid formed; and this abstraction of carbon, if it constitutes the whole change, of course proves that the sugar, which is the product of the operation, has an increased proportion of hydrogen and oxygen.

In other cases, as in the maturation of fruits, sugar appears to be formed from the acid juice of the fruit, and this is probably effected by an abstraction of oxygen. Saccharine matter has little activity, though there are some varieties of it, in which some weak medicinal powers reside.

OIL is a common proximate principle of vegetable matter; it is of two kinds, expressed or fat oil, and distilled, volatile, or essential oil. These have the common qualities of unctuosity and inflammability; but they also possess peculiar properties, by which they are distinguished as species.

The Expressed, fat, or fixed oils, are thick and unctuous, insipid and inodorous; they congeal on exposure to cold, are lighter than water, and insoluble in that liquid; they are likewise insoluble, except in very minute quantity, in alkohol, and they combine with the alkalis, forming soap. They are not volatilized at the temperature of 212°: some require to be raised to 600° to make them boil, and the condensed oil is changed in its properties. At a temperature somewhat higher, they are decomposed in close vessels, and burn when the atmospheric air is admitted. They also slowly absorb oxygen at a low temperature; a small quantity of an acid is formed, which renders them rancid; by longer exposure to the air, they are inspissated, and even become at length concrete. Those oils in particular which have been expressed with the aid of heat, and which are named drying oils, suffer this last change, and are ultimately converted into a resinous matter.

Expressed oils consist chiefly of carbon and hydrogen, as is established by the products of their decomposition by heat, which are chiefly carburetted hydrogen and carbonic acid. The products of their combustion are water and carbonic acid.

These oils are generally contained in the seeds and fruit of vegetables, and only at the period of their maturity. They are extracted by expression, or by decoction with water; they are frequently impregnated with part of the extractive, mucilaginous or resinous particles, which the seed or fruit contains; from which they derive colour, and in many cases a peculiar taste and odour, and even perhaps certain medicinal powers. In general, however, they have little activity as medicines. They are mild and emollient, and are used principally for these virtues. They are rendered miscible with water by the medium of gum or sugar, or by the addition of a small quantity of any of the alkalis.

Volatile or Essential oils have characteristic properties different from those of expressed oils. They are volatile at a low temperature, and are entirely and quickly converted into vapour at the heat of boiling water, without being decomposed; they are soluble in a small proportion in water, and hence the impregnation which water receives from many vegetables by distillation. In alkohol, they are completely soluble; but they do not combine with the alkalis with facility; they are in general odoriferous, pungent, and even acrid; they are more highly inflammable than the fixed oils, and by exposure to the atmosphere they slowly absorb oxygen, are thickened and coloured, lose much of their smell and pungency, and are at length converted into substances of a resinous nature. This change is partly owing to the volatilization of the oil, but principally to the oxygen absorbed combining with a portion of their hydrogen.

These oils, from their analysis by heat, or by combustion, appear to consist principally of carbon and hydrogen. They differ from the fixed oils in containing a larger proportion of hydrogen; hence they are more volatile, and more inflammable, and by combustion afford a larger quantity of aqueous vapour.

Volatile oils are less abundant in the products of vegetation than some other principles; they do not exist indeed in any considerable quantity but in the aromatic plants; in some plants, the oil is confined to the flowers, fruit, leaves, or bark; sometimes it is contained in several of these parts, and in a few instances it is found diffused through every part. The quantity varies, not only according to the age, but also according to the vigour of the plant; hence it is much influenced by climate, soil, and season. It is remarkable, that some of the most odoriferous flowers, as the rose or jessamine, yield scarcely any essential oil, though they lose their flavour by a gentle heat.

Some of these oils, being contained in distinct vesicles, may be obtained by simple pressure. In this manner, essential oils can be obtained from orange or lemon rhind. More usually, they are procured by distillation; the vegetable is boiled in water; the essential oil is volatilized with the aqueous vapour; both are condensed in close vessels; the water has the taste and flavour of the plant, from having dissolved a small part of the oil; the greater part of it, however, is collected pure, either swimming on the surface of the water, when the oil is lighter, as is generally the case, or, in a few cases, when it is heavier, having fallen to the bottom.

The essential oils of vegetables are not without some degree of medicinal activity. They have always the odour, and generally the taste of the vegetable from which they are obtained, accompanied with more or less pungency. Some of them, however, are less pungent and less acrid than the vegetable matter from which they are procured, these qualities residing in the resin, or some of the other proximate principles.

A proximate principle, found in some vegetables similar in many of its properties to essential oil, is CAMPHOR. It is a solid substance of a white colour, semi-transparent, having a strong peculiar smell, and a penetrating taste; tenacious, and slightly unctuous to the touch. It is very sparingly soluble in water, but is abundantly soluble in alkohol, ether, and oils; from these solutions it is precipitated by the addition of water. It evaporates entirely, though slowly, at the common temperature of the atmosphere; at a higher temperature, in close vessels, it is sublimed without alteration; it is also highly inflammable, the products of the combustion being carbonic acid, and a quantity of what is named camphoric acid. It is acted on by the more powerful acids, sulphuric acid charring it and forming a portion of tannin; nitric acid dissolving it, and decomposing a portion of it, converting it into an acid; muriatic, fluoric, acetic and carbonic acid dissolving it, without materially changing its composition, as the greater part can be precipitated by water. Nitric acid, repeatedly distilled from it, converts it into a concrete acid, named camphoric acid, which appears to be different from any known acid, though it approaches in many of its properties to the benzoic.

By peculiar arrangements, which impede its volatilization, camphor may be decomposed by heat. This is effected by mixing it intimately with six parts of pure clay, making the mixture into balls by the addition of water, and when these are dry, subjecting them to a strong heat, suddenly raised. A volatile oil, fragrant and pungent, of a golden yellow colour, amounting to one-third of the weight of the camphor, distils over; a quantity of charcoal, about ¼th of the weight of the camphor, remains; the remaining products of the decomposition are, carburetted hydrogen, carbonic acid gas, and camphoric acid. From the result of this analysis, camphor appears to differ from the essential oils, principally in containing a much larger proportion of carbon, since, by its decomposition by heat, it is resolved principally into charcoal, or compounds of carbon, and into an oil, which has all the properties of an essential oil, being odorous and pungent, volatile and inflammable, soluble in alkohol, and precipitated from it by the addition of water.

Camphor is found in distinct vesicles, in the wood and bark of certain vegetables. It is also contained in many essential oils, as those of lavender, sage and others, from which it is deposited on long keeping. A substance analogous to it in many of its properties, is capable of being artificially formed, by the action of muriatic acid on oil of turpentine.

The same relation which camphor bears to the volatile, WAX seems to have to the fixed oils. This substance, though formed by the bee, is also a product of vegetation; it is yielded by the leaves and fruit, and it is sometimes intimately mixed with the resin, gum, or extractive matter of plants. It is insoluble in water, and is soluble in very small quantity with the aid of heat in alkohol. It combines with the fixed alkalis, though with some difficulty. It unites easily with the expressed oils. It melts at a moderate heat. By distillation in close vessels it affords an acid, and a considerable quantity of thick oil, a small quantity of charcoal being the residuum.

RESIN. This principle is in some measure connected with essential oil, and in plants is often united with it, as well as with other principles. Some vegetables, however, exude juices which concrete into a matter entirely resinous, and it is from these that the characters of the substances belonging to this genus are taken. The distinguishing properties of a resin are its existing in a solid state, being insoluble in water, but soluble in alkohol, ether, and oils; the solution in ether or alkohol is decomposed by water; resins are in general odorous and sapid, though neither of these qualities is essential to a pure resin; they are inflammable, and burn with much smoke; at a temperature nearly that of boiling water they melt; but they cannot be volatilized without being decomposed. In close vessels the products of their decomposition by heat are water, empyreumatic acetic acid, an empyreumatic oil, and a residuum of charcoal, indicating carbon, hydrogen, and oxygen, to be their ultimate principles. At the common temperature of the atmosphere, they do not combine with oxygen; neither are they acted on by water; the solutions of them in alkohol are therefore employed under the form of varnishes, to preserve other bodies from alteration by exposure to the air. They are dissolved by the fixed alkalis, likewise by some of the acids, especially the acetic: the stronger acids decompose them.

The existence of resin in a vegetable is discovered by infusing it in alkohol; this dissolves the resin if any is present, and it can then be precipitated from the solution by the addition of water. The method of estimating the quantity of resin in any vegetable, is by ascertaining the increase of weight which alkohol acquires from it by digestion, or the alkohol may be evaporated by a moderate heat, and the resin obtained pure.

Resins are in general more active than gums, with respect to their medicinal powers. The purest resins are indeed nearly inert, but there are many vegetable substances which act powerfully on the system, that appear to consist principally of resinous matter, and it is in this resinous part that their powers reside. The proper solvent or menstruum of resin is alkohol; by this it can be extracted from some of the other constituent parts of vegetables: there are others, however, which are soluble in the same fluid, and therefore it is difficult to obtain the resin pure. Though resin is insoluble by itself in water, yet part of it can be taken up, and kept suspended by the medium of gum.

These two principles, Gum and Resin, are often naturally mixed in vegetables, forming what are named GUM-RESINS, and some of the most active articles of the Materia Medica are natural compositions of this kind. Their chemical properties are derived from the two principles of which they consist: thus, they are only partially soluble either in water or in alkohol; they are soluble in alkaline liquors; they are not fusible by heat, they only soften, and if the heat is raised higher are decomposed, affording a little ammonia with the usual products, probably derived from the gum they contain. The proportions of gum and resin, thus mixed, are in different substances of this family very various; but they are generally such, that a mixture of equal parts of water and alkohol dissolves the gum-resin. This is their proper solvent; it also dissolves some other vegetable principles, particularly extract, and hence it is the menstruum most generally used in Pharmacy to extract the active matter of vegetables.

BALSAMS are resinous juices, with an intermixture generally of essential oil, and containing always a portion of the acid named Benzoic Acid. They are usually thick and tenacious, becoming by age concrete. They are odorous and pungent, principally from the essential oil they contain.

A principle of considerable importance in its pharmaceutic relations, which is supposed to constitute the active matter of many vegetables, is what has been named by the French Chemists, by whom its characters were first established, EXTRACT, or Extractive Matter. Its leading character is, that it is soluble equally in pure water and in alkohol; and hence a solution of it in the one fluid is not precipitated by the addition of the other. By this property it is distinguished both from gum and resin, the one being insoluble in water, the other in alkohol. The compound of the two, or gum-resin, is indeed partly soluble in either of these fluids, but it never is completely so, since if it contain as much gum as renders it soluble in water, it is only partially dissolved by alkohol; and if it consist principally of resin, so as to be completely dissolved by alkohol, it is imperfectly dissolved by water. If a gum-resin be digested with alkohol, the tincture it affords is decomposed by water, and, *vice versa*, its watery solution is decomposed by alkohol.

There is another character by which extractive matter is distinguished, that of suffering decomposition when exposed in a humid state to the atmospheric air; this takes place even at natural temperatures, and with still more rapidity when the temperature is raised, as when the extractive matter is boiled in water: it then becomes insoluble and comparatively inert. This change Fourcroy ascribed to the fixation of oxygen. According to T. Saussure, oxygen is indeed absorbed, but carbonic acid is at the same time formed; he supposes, too, that part of the oxygen and hydrogen of the extractive matter combine and form water, and that the inert insoluble precipitate has therefore an increased proportion of carbon. It is from this cause apparently that the medicinal powers of many vegetables are injured by decoction in water with the admission of air, and not, as was at one time believed, from the dissipation of any volatile active principles; many plants indeed which sustain injury from this operation, containing no such principles.

By oxymuriatic acid, extract is converted into a concrete substance of a yellow colour, insoluble in water, probably from a similar change. It exerts affinities to argil and to metallic oxides, and is hence acted on by a number of metallic salts. Muriate of tin, at the maximum of oxidation, precipitates it copiously, and forms therefore a delicate test of it, which is liable however to the fallacy that it likewise precipitates some other vegetable principles. By heat it is decomposed, affording empyreumatic oil and acid, with a portion of ammonia; and in this, as well as in its spontaneous decomposition, when the re-action of its elements is favoured by humidity, it leaves as a residuum carbonates of potash and lime.

This principle is supposed to be the base of what are named the Extracts of Plants;—preparations formed by boiling vegetables in water, and evaporating the clear liquor to a thick consistence. As procured in this way, it must generally have an intermixture, greater or less, of those principles, which are soluble in water; and from being so liable to decomposition, it must be injured during the evaporation. It is the basis, too, though in a similar state of intermixture and partial decomposition, of what are named the inspissated juices of plants. It exists also in the seeds, leaves, bark, and wood.

Though the characters of this principle appear to be distinctive, there is still some ambiguity with regard to it, particularly from the circumstance, that these characters are not uniform; a principle existing in some vegetables which has some of these distinctive properties, without the others; as, for example, in Peruvian bark, the active matter of which is rendered inert and insoluble by decoction in water, and so far has one of the peculiar properties of extract; while it has not the other, that of equal solubility in alkohol and water, but is more soluble in the former than in the latter. Nor is there any certainty that this extractive matter has been obtained pure and insulated; and it is therefore possible that it may consist of some of the other principles in a state of mixture, their properties being modified by their reciprocal action.

Tannin. The important medicinal property of astringency, appeared from some chemical facts to be dependent in vegetable substances on a peculiar principle, as it is discoverable in them by a chemical test, that of striking a deep purple colour with the salts of iron. This effect is exhibited by all the powerful vegetable astringents, and in a degree nearly proportional to their astringency. A peculiar acid having been discovered to exist in these astringents, afterwards named Gallic Acid, it was supposed to be the principle on which this property depends. But subsequent experiments have proved, that the astringency resides in a principle of a different nature, which, from being the agent chiefly concerned in the operation of tanning, has obtained the name of Tan or Tannin.

This principle exists in all the powerful vegetable astringents; it is extracted by maceration with water, and is detected in the infusion by a peculiar test, that of the animal principle denominated Gelatin. If a solution of gelatin is added to the infusion, it becomes turbid, and a precipitate is thrown down, composed of the tannin and gelatin in combination. We have no very perfect process for obtaining tannin in an insulated state; but the most simple is precipitating it from the infusion of a vegetable astringent by lime-water, and afterwards submitting the compound of lime and tannin, which is formed, to the action of dilute muriatic acid, which abstracts the lime, and leaves the tannin.

Tannin evaporated from its solution is loose and friable, of a brown colour, has a resinous fracture, a peculiar odour, and a taste rough and bitter. It is soluble in water, either cold or warm, and in alkohol not very highly rectified. It appears to suffer decomposition from exposure to the air in a humid state. By the acids, it is precipitated from its watery solution, and by some of them is decomposed. It unites with the alkalis, forming soluble compounds; with the earths it forms compounds of sparing solubility; it exerts affinities to the metallic oxides, and it is principally from its action that infusions of vegetable astringents produce dark-coloured precipitates with metallic salts. Exposed to heat, it affords an acid liquid, an oil, and a considerable quantity of carbonic acid, leaving a spongy charcoal.

Its action on animal gelatin is its most important property in relation to the object of the present outline, as on this probably depends its astringent power; it combines with it, forming an insoluble precipitate, whence it corrugates and renders more dense the animal fibre of which gelatin constitutes a principal part. It exists in all the powerful vegetable astringents, mixed with extractive matter, mucilage, gallic acid, and other principles. It has also been established, that a product very analogous to it is capable of being artificially formed, principally by the action of sulphuric and nitric acids on vegetable substances which abound in carbonaceous matter.

Vegetable Acids. The acid found in the juice and other parts of plants, is not always the same. Not less than seven acids, different from each other, are of vegetable origin,—the Gallic, Oxalic, Malic, Citric, Tartaric, Benzoic, and Acetic. To these may be added the Prussic, though this is more peculiarly formed from animal matter.

Gallic Acid. The existence of this acid in some of the more powerful astringents, particularly in the gall nut, can be discovered by their watery infusion reddening the infusion of litmus. If the concentrated infusion be left exposed to the air for some months, this acid is deposited in the state of a crystalline deposite, mixed with mucous flakes, from which it may be purified. It may also be obtained by sublimation from the gall nut, or even by distillation with water, though it is doubtful whether, as procured by these or other processes, it is altogether free from tannin; that by sublimation appears to be most so. By crystallization it is obtained in slender prisms of a white colour; its taste is sour, and it reddens the vegetable colours; it is soluble in 24 parts of cold, and in less than 2 parts of boiling water; it is also soluble in alkohol. It suffers decomposition from heat, and the process indicates a large quantity of carbon in its composition. It combines with the alkalis and earths, and also with the metallic oxides, forming with the latter in general coloured precipitates; it is doubtful, however, whether these colours are not in a great measure derived from the action of tannin adhering to it.

Gallic acid was at one time supposed to be the principle of astringency, from being contained in the vegetable astringents, and giving a dark colour with the salts of iron, the chemical test by which astringency appears to be indicated. It is doubtful, however, as has just been remarked, whether this latter property does not arise from the presence of tannin: the colour it does produce is less deep too, than that which the infusion itself strikes; and the acid in its insulated state has no astringency. Tannin is much rather to be considered as the astringent principle, and it exists accordingly in some of the more powerful vegetable astringents, as in catechu or kino, with scarcely any trace of gallic acid.

Malic Acid is contained in the juice of unripe apples and other fruits; it is uncrystallizable, forming when evaporated merely a thick liquor, which, if the heat be continued, becomes charred. By this and by the properties of the salts which it forms, it is principally distinguished from the other vegetable acids. By nitric acid it is converted into oxalic acid.

Citric Acid often accompanies the malic acid in the juices of unripe fruits, and it exists in a purer form in the juice of the lemon and lime: from these it is usually extracted, the mucilaginous matter of the juice being separated by alkohol. It crystallizes in rhomboidal prisms; which, when it is pure, are colourless; its taste is extremely sour: it is abundantly soluble in water; its solution undergoes spontaneous decomposition, but the crystallized salt can be preserved without injury. The more powerful acids decompose it, converting it principally into acetic acid.

Oxalic Acid exists in the juice of the sorrel (oxalis acetosella) and some other plants, combined with a portion of potash, not sufficient to neutralize it. It can also be artificially formed by subjecting fecula, gum, or sugar to the action of nitric acid. It crystallizes in slender prisms of a white colour; its taste is extremely sour; it is soluble in twice its weight of cold water, and an equal weight of boiling water; it is also soluble in alkohol. It is decomposed by the more powerful acids: in its decomposition by heat, it affords little empyreumatic oil; hence it appears to contain only a small portion of hydrogen; and as some of the other vegetable acids are converted into it by the action of nitric acid, there is probably a large proportion of oxygen in its composition. The test by which it is peculiarly distinguished, is the insoluble precipitate it forms with lime, an earth to which its affinity is such that it attracts it from all the other acids.

Tartaric Acid. This acid, as it exists in vegetables, is usually combined with potash, in such a proportion, however, as to leave an excess of acid in the combination. This forms the super-tartrate of potash, which is contained in a number of vegetable fruits. It is deposited from the juice of the grape in its conversion into wine, or in the slow fermentation which the wine suffers when kept. The acid procured from this salt is in tabular crystals, transparent; they are very soluble in water, the solution when concentrated being of an oily consistence. It is decomposed by heat, affording a large quantity of liquid acid little changed, with much carbonic acid gas. By nitric acid repeatedly distilled from it, it is converted into oxalic acid. This acid is an important one in pharmacy, from the numerous combinations of it applied to medicinal use.

Benzoic Acid is obtained from the vegetable balsams, generally by the process of sublimation. It condenses in slender crystals, white and brilliant. It is volatile, and its vapour is inflammable; it is very sparingly soluble in cold water, but abundantly in hot water; the solution on cooling depositing nearly the whole of the acid in prismatic crystals: it is also soluble in alkohol, from which it is precipitated by cold water; it is pungent, but not very acid to the taste; in its usual state its smell is fragrant, especially when it is heated; but this odour has been supposed to arise from a minute portion of the oil of the balsam adhering to it; as by repeated combinations with an alkaline base, and precipitation by an acid, it is obtained at length inodorous. It is not easily decomposed by the action of the more powerful acids. Decomposed by heat, it affords a larger quantity of empyreumatic oil than any other vegetable acid, whence hydrogen is supposed to predominate in its composition.

Acetic Acid. This acid is more exclusively the product of fermentation; it exists likewise, however, ready formed in the sap of the vine, and, combined with alkalis and earths, in the sap of plants. In its pure and concentrated state, in which state it can be procured only by artificial processes, it is a very powerful acid, highly pungent and fragrant, volatile and inflammable. It is distinguished by the peculiar action it exerts on some of the other proximate principles of plants,—essential oil, resin, gum-resin, camphor, gluten, and caoutchouc, which it dissolves without decomposing. Hence, even in its diluted state, under the form of distilled vinegar, it is sometimes used as a solvent in pharmaceutic processes; though it is seldom that it can be employed to advantage, as it is liable to modify the powers of the substances it dissolves.

Prussic Acid. The substance to which this name is given, is formed from some varieties of animal matter by artificial processes. It had often been remarked, that its odour is similar to that of the peach blossom, and that the same odour is perceptible in the distilled water of the cherry laurel, and of the bitter almond. This led to experiments on these; whence the fact, rather singular, has been discovered, that all of them contain this acid. The fact, not less important, has been established, that the narcotic property possessed by these distilled waters, depends on the prussic acid. In its insulated state, this substance is volatile, so that it escapes even from its watery solution under exposure to the air. It has no sensible sourness, and does not redden even the more delicate vegetable colours. The character of acidity is therefore given to it, rather from its powers in the combinations it forms, especially those with the metallic oxides, than from its properties in its insulated state,—these compounds being strictly analogous to other saline combinations.

Several of the vegetable acids, particularly the citric, malic, and tartaric, exist in the same vegetable, and in proportions varying according to the stage of vegetation, whence it is probable that they are mutually convertible. They are seldom pure, but generally in combination with saccharine, mucilaginous, and extractive matter. Combined with alkaline and earthy bases, they form what have been named the essential salts of plants.

The last of the proper proximate principles of vegetables is LIGNIN, or wood; the substance which, composing the vessels of the plant, is the basis through which the other principles are diffused, or to which they are attached, and which is the basis therefore of all the parts of vegetables, with the exception of their secreted juices. It is, when freed from the principles diffused through it, insipid, inert, and insoluble, liable in a humid state to slow spontaneous decomposition, inflammable, and is decomposed by heat, leaving a large residuum of charcoal, which indicates carbon to be its predominant ingredient, whence probably arises its solidity and comparative chemical inactivity. Being insoluble in water, or in alkohol, it forms the greater part of the residuum, when the active matter of vegetable substances has been abstracted by maceration in these solvents.

Besides the principles which can thus be obtained in a distinct form from vegetables by analysis, there are others of a more subtle nature, the existence of which has been supposed to be established by some facts, though they are scarcely capable of being exhibited in an insulated state; such are the Aromà or Spiritus Rector of plants, the Acrid Principle, the Bitter Principle, and the Narcotic Principle.

The AROMA is the principle in which the odour of plants has been supposed to reside. This quality is generally found in the essential oil; but there are some vegetables, having a strong odour, which yield little or no essential oil, such as the jessamine, the violet, or the rose; or, if this oil be procured from them in small quantity, it has not that strength of odour which, considering their fragrance, and the smallness of its quantity, might be expected from them. They exhale this odour, however, when exposed to the air; it is at length dissipated; or it is communicated to water by distillation at a very gentle heat. Hence it has been concluded, that a principle more subtle than the essential oil exists in which the odour resides, and that it is even this principle which communicates odour to the oil.

These facts, however, are inconclusive. The property of odour may belong to any of the proximate principles of vegetables, and does belong to principles of very different kinds; it exists in other bodies in which we cannot suppose the existence of any common principle; nor is there any reason to assume the existence of such a principle in plants: and all the facts considered as favourable to the opinion, are accounted for on the supposition that essential oil is the more common principle of odour, and is capable of being volatilized in small quantity at a low temperature, and of thus being diffused through the atmosphere, or communicated to water.

The existence of an Acrid Principle has been inferred from an acrimony residing in some plants, which they lose on drying, while their other active powers remain; and from this acrimony being in some cases transferred to water or alkohol by distillation. It is not very certain, however, if this quality is not in such cases connected with some of the known proximate principles; nor has this acrid principle, if it do exist, been obtained so as to submit it to chemical examination.

Bitter Principle. A principle of bitterness has been supposed to exist in some vegetables. It is obvious, however, that this quality may belong to any of the known proximate principles; and the characters which have been assigned to this principle as it exists in some of the purest vegetable bitters, particularly in gentian or quassia, such as equal solubility in water and in alkohol, and being precipitated by certain re-agents, rather prove it in these cases at least to be a variety of extractive matter.

A Narcotic Principle has been supposed to exist, from the narcotic power of some vegetables being impaired by age, without any apparent loss of matter, and from its being rendered inert by decoction, though no volatile matter is collected possessed of the quality. But such facts are rather favourable to the conclusion, that the loss of power is owing to chemical changes in one or other of the known principles, probably the extract, in which the narcotic quality may be supposed to reside. In submitting opium to analysis, it has been affirmed, that a crystalline matter is obtained, which proves narcotic, and has been supposed to be the principle on which that quality possessed by the opium depends. But it does not, admitting its existence, appear to be possessed of the narcotic property in that high degree we should expect, were it the principle on which that property is dependent, nor is there any proof that it exists in any other narcotic.

The existence of all these principles, therefore, is problematical; and the qualities assigned to them may, with more probability, be referred to modifications of composition in the known vegetable principles, which are probably too subtle to be determined by chemical analysis.

ALKOHOL, and the ETHERS formed from Alkohol by the action of acids, cannot strictly be regarded as vegetable products; yet they have a relation to these, as their chemical constitution is similar, and they cannot be formed but by changes produced in vegetable matter. As important, medicinal, and pharmaceutic agents, they are entitled to notice.

Alkohol is formed by the process of fermentation from saccharine matter, or from fecula, the latter being previously subjected, partially at least, to the operation of malting, by which it is converted into the former. The fermented liquor being distilled, affords alkohol diluted with water, and with some impregnation of odour from the fermented substance. From this pure alkohol is procured by repeated distillation, the abstraction of the water from it being aided by the action of potash, or sub-carbonate of potash.

Alkohol is a colourless transparent fluid, having a specific gravity, according to its state of concentration, from 0.835 to 0.800; it is fragrant and pungent, and in its action on the living system exerts a high degree of stimulant and narcotic power; it is volatile and inflammable, affording, during its combustion, water and carbonic acid, the quantity of water exceeding even the weight of the alkohol. It contains, therefore, much hydrogen in its composition, with which carbon is combined, and perhaps also a portion of oxygen. It combines with water in every proportion, and, in consequence of the affinity between these fluids, they mutually precipitate substances which either has dissolved, that are insoluble in the other. It is decomposed by the acids, affording, as the principal product, the different ethers. As a pharmaceutic agent, it is of much importance from the solvent power it exerts on a number of the vegetable proximate principles,—essential oil, camphor, extract, and others, and from its property too of counteracting the spontaneous changes to which vegetable matter is liable.

Ether. The name Ether is given to a peculiar product obtained by the action of the more powerful acids on alkohol, the product differing in its properties according to the acid employed in its formation, but in general being extremely light, volatile, and inflammable. Sulphuric ether, formed by the action of sulphuric acid on alkohol, has a specific gravity not greater, when it is pure, than 0.716; it is so volatile as to evaporate rapidly at the common temperature of the atmosphere; in burning it affords water and carbonic acid: its odour is fragrant and penetrating; its taste pungent; it is soluble in water only in limited proportion, about one part in ten. It exerts on the vegetable principles the same solvent action nearly as alkohol, except on extract, which it has been said to precipitate,—an effect, however, I have not been able to obtain from it. Nitric ether is equally light and even more volatile; it is inflammable; it is soluble in water in limited quantity, but combines with alkohol in every proportion: its odour is strong and penetrating. Muriatic ether is more volatile than either; it exists in the state of gas, under the atmospheric pressure, at 60°; at 50 it becomes liquid, and its specific gravity is not less than 0.874; it is transparent, colourless, odorous, and pungent. Acetic ether is moderately light, volatile, and inflammable, soluble in water in limited quantity, and has an odour etherial, but approaching also to that of vinegar. All these ethers appear to differ from alkohol, principally in having a larger proportion of hydrogen in their composition, to which probably their greater levity and volatility are to be ascribed; and they generally contain a portion of the acid by the action of which they have been formed, which, in some of them at least, appears essential to their chemical constitution.

Having pointed out the distinguishing properties, and the general pharmaceutic relations of the Proximate Principles of Vegetables, it may be proposed as a question important in relation to the object of the present outline,—Do these principles usually exist in the vegetable in a state of chemical combination, whence some modification of their powers may result, or are they more generally mechanically mixed?

The latter appears to be generally the case. These principles can often be observed existing apart from each other, and even placed in separate vesicles; they can in many cases be separated by mechanical means; and even where they are more intimately mixed, that change of properties does not take place, which we must have expected were they chemically united, the virtues of each principle being discernible in the entire mixture, weakened, but not changed. It seems to follow, therefore, that the virtues of vegetable substances do not depend on chemical combinations of their proximate principles, but rather on the peculiar ultimate composition of one or other of these principles. Hence also it is evident, that in separating the proximate principles of any vegetable, we cannot expect to alter or improve its virtues, farther than in concentrating them by a separation from what is inert, or in separating principles which are possessed of different or even opposite powers. The attainment even of these ends, however, is, in innumerable cases, of importance in their exhibition as medicines.

From this enumeration of the Proximate Principles of Vegetables, may be explained the rationale of those pharmaceutic processes to which plants are usually subjected.

Vegetable matter being liable to decomposition when in a humid state, from the re-action of its elements, and their entering into new combinations, Exsiccation is an operation to which they are generally subjected, to preserve them without injury. It is performed either by the action of a current of air, or by exposure to heat, care being taken that the heat shall not be such as to dissipate any of their volatile principles, or cause any chemical change.

Inspissation is an operation performed on the expressed juices of plants, with the same view, the dissipating the watery portion of the juice, and thus communicating to it a thick or solid consistence, rendering it less liable to those spontaneous chemical changes which it would otherwise undergo. It is performed by the application of a gentle heat.

By infusion of vegetable matter in water, the fluid is impregnated with the gum, sugar, extract, tannin, saline substances, part of the essential oil, and part also of the resinous principle. The aroma of the plant is generally first taken up: by longer infusion the water is loaded with the colouring, astringent, and gummy parts: these are also most abundantly dissolved when the temperature is high. Hence an infusion differs according as the water has stood longer or shorter on the materials, and according as it has been promoted or not by heat. An infusion made in the cold is in general more grateful, while one made with heat, or by keeping the fluid long upon the materials, is more strongly impregnated with active matter.

By Decoction or boiling, the solvent power of the water is still farther increased; and hence the liquor always appears darker coloured, and it is more loaded with those principles of the vegetable which it can hold dissolved. Those, however, which are volatile, particularly the essential oil, are entirely dissipated; and therefore it is an improper process for vegetables, the virtues of which depend, wholly or partially, on these principles. Even some of the fixed principles of vegetables are injured by long decoction. The extractive matter, for instance, gradually absords oxygen from the atmosphere, and is converted into a substance nearly insipid and inert. Opium, Peruvian bark, and many other vegetables, are injured in this manner by decoction, especially if the atmospheric air is freely admitted; and these two circumstances, the dissipation of the volatile matter, and the oxygenation of the extractive, considerably limit the application of this process. It is still used, however, with advantage, to extract the mucilaginous parts of vegetables, their bitterness, and several others of their peculiar qualities.

Alkohol may be applied to vegetables to dissolve those principles which are not soluble in water, such are their essential oil, camphor, and resin; and as these are often the principles on which the virtues of vegetables depend, these solutions, or Tinctures as they are termed, are often active preparations.

Equal parts of alkohol and water, in general, extract still more completely the active matter of plants, as we thus obtain a solution of all those substances which are separately soluble in either of these fluids.

When, by the action of one or both of these fluids, a solution of the active principles of a vegetable is obtained, it may be evaporated to the consistence of a thick tenacious mass. This forms what is termed an Extract: it is named an Aqueous Extract when obtained from the aqueous infusion or decoction of a plant, and Spiritous when alkohol has been the solvent. The design of this preparation is to obtain the active matter of the vegetable in a small bulk, and in such a state that it may be preserved without suffering any alteration. It is evident, that it is a process which can be properly applied to such plants only as have their virtues dependent on some of their fixed principles, and even these are often injured by the heat applied, and the free access of the atmospheric air.

Distillation is another process applied to vegetable substances, by which we obtain some of their active principles, particularly their essential oil. If the vegetable matter be heated with a large portion of water, the oil is volatilized with the aqueous vapour: it separates from the water on being allowed to remain at rest; a part of it, however, is also dissolved, and communicates a considerable degree of flavour, and often also of pungency. This forms what are named Distilled Waters. If alkohol be used instead of water, the essential oil is entirely dissolved in it, and we thus obtain what are termed Distilled Spirits.

By such processes we extract the active matter of vegetables from the inert matter with which it is more or less mixed, and are thus enabled to administer many remedies under a variety of forms, suited to particular circumstances. A single example will shew the utility of investigations of this kind, respecting the component principles of vegetable products, and their relations to the more important chemical agents. Peruvian bark is one of the most important remedies in the Materia Medica. It is not always, however, practicable to exhibit it in substance with advantage, as where the stomach is uncommonly irritable, or where, from the nature of the disease, it is necessary to give it in large doses, frequently repeated, it is liable to occasion sickness and other uneasy sensations, and even to be rejected by vomiting. Such inconveniences are attempted to be obviated, by giving it in the different forms of infusion, decoction, tincture or extract, as any of these may be best suited to the case. Our knowledge of its constituent parts can only lead us to the proper application of these processes. From an accurate analysis of this bark, it has been proved that seven parts out of eight consist of woody fibre, or of a matter inert and insoluble, which cannot act on the system, and which affects the stomach only by its weight and insolubility. The remaining eighth part is that in which the activity of the medicine resides: it is therefore evident, that if this be extracted, without injuring its activity, the medicine could be exhibited with much more advantage. This is in part accomplished by the preparations of it that have been mentioned; but even these do not convey it in all its force. If the bark be infused or boiled in a certain quantity of water, the infusion or decoction is not nearly equal in efficacy to the whole quantity operated on. It is therefore evident, that during either of these operations, the active matter has not been entirely extracted, or has suffered some change. And here Chemistry farther elucidates the peculiar nature of this substance, and the changes produced in it by these processes. It has been found, that the matter on which the power of this bark depends is liable to oxygenation, and that, during the infusion, and particularly the decoction of that drug, it suffers this change from the action of atmospheric air, and is converted into a substance insipid and inert. This leads to the improvement of the preparations of this medicine; and experiments instituted for the purpose have accordingly proved, that, while by long boiling the virtues of the bark are nearly destroyed, they are extracted with less loss by a few minutes' decoction in covered vessels. The same investigations have pointed out the nature of the action of some other substances on bark, formerly not well understood. Thus, it had been found by experience, that the alkalies, and more particularly magnesia, enable water to extract the virtues of bark more completely by infusion,—a circumstance elucidated by the fact afterwards discovered, that the extractive matter of the bark, to which its activity is owing, combines with facility with these substances, and forms soluble compounds.

Similar examples might be given from other important vegetable remedies, which would sufficiently prove the utility to be derived from the analysis of the substances belonging to the vegetable kingdom, and that indeed researches of this kind are absolutely necessary for their proper preparation as medicines.

The account of the analysis of animal substances, and of their proximate principles, would, to the same extent at least, be foreign to the objects of this sketch, as so few of these substances are employed in medicine; and of those which are used, the composition, and consequently the pharmaceutic treatment, are in a great measure peculiar to each.

Their general chemical characters are similar to those of vegetable principles.—Composed of a few ultimate elements, the differences in their properties arise in a great measure from the different proportions, or the different modes in which these are combined. And these elements having powerful reciprocal attractions, and being disposed to enter into combinations almost indefinitely diversified, these substances are extremely susceptible of decomposition, from the re-action of their elements, favoured by humidity, by the action of the air, or by elevation of temperature. They are even more liable to this than vegetable substances; for the elements existing in simultaneous combination are more numerous, their affinities are therefore more nicely adjusted, and of course the equilibrium is more easily subverted.

Along with carbon, hydrogen, and oxygen, which are the chief constituent principles of vegetable matter, nitrogen, and frequently sulphur and phosphorus, enter into the composition of animal substances. Hence, when decomposed by heat, they afford products composed of these, of which ammonia is always the principal; and the re-action of these principles, and the evolution of the products arising from this, seem principally to form the series of changes which constitute putrefaction, the species of spontaneous decomposition to which animal matter is more peculiarly subject.

Like vegetable substances, the animal products consist of various proximate principles, and some analogy may be traced between several of the vegetable and animal proximate principles. Animal fat has a strict connection in properties and composition with fixed oil; animal mucus resembles vegetable mucilage; fecula has a similar relation to gelatin; vegetable and animal gluten are nearly if not entirely the same: a substance similar to saccharine matter exists in milk, and in some of the other animal secretions: in the bile is found a principle strictly analogous to resin; and benzoic, oxalic, and acetic acids are common to both. Hence, generally speaking, the few animal substances belonging to the Materia Medica are acted on by the usual solvents in nearly the same manner as vegetable substances, and are submitted to similar pharmaceutic processes. The results of these are similar officinal preparations. Thus, by the action of alkohol, the active matter of musk, castor, and cantharides is extracted, and tinctures of these are employed. In other cases water is the proper solvent, particularly of those which consist of gelatin; but such solutions being very liable to decomposition, must always be of extemporaneous preparation.

CHAP. II.

OF THE PHARMACEUTICAL OPERATIONS TO WHICH THE ARTICLES OF THE MATERIA MEDICA ARE SUBJECTED.

NATURAL substances are not always obtained in that state in which they are best adapted to exhibition as remedies. They are subjected, therefore, to various processes, with the view of preparing them for use; and to complete this statement of the Principles of Pharmaceutic Chemistry, the nature of these is to be pointed out.

These processes, or at least the greater number, and the most important of them, are chemical, and are dependent therefore on the agencies of those general forces whence chemical changes arise; they are indeed little more than applications of these, under peculiar regulations adapted to different substances. The general facts, therefore, connected with the operation of these forces, are first to be stated, in so far as they have any relation to the present subject.

The force principally productive of chemical action, is that species of attraction exerted between the particles of bodies, which brings them into intimate union. If two substances of different kinds be placed in contact, and with that degree of fluidity which admits of the particles of the one moving to those of the other, it often happens that they unite together, and form a substance in which neither can be any longer recognised, and which is homogeneous, and in general possessed of new properties. This constitutes what, in the language of chemistry, is named Combination, and it is conceived to arise from an attraction exerted between the particles of the one body and those of the other. This species of attraction, denominated Chemical from being productive of chemical phenomena, sometimes also named Affinity, is distinguished from the other species of attraction by the phenomena to which it gives rise, or by the laws it obeys,—from the attraction of gravitation, by not being exerted at sensible distances, or on masses of matter, but only at insensible distances, and on the minute particles of bodies,—from the attraction of aggregation, by being exerted between particles of different kinds, and forming a substance with new properties, while that force operates on particles of a similar nature, and unites them into an aggregate in which the same essential properties exist. It is possible, however, that these forces, though thus distinguished, may be the result of the same power modified by the circumstances under which it acts.

The substance formed by chemical combination is named a Compound. The substances united are the constituent or component parts or principles of the compound. When these are separated, the process is named Decomposition. The most minute parts into which a body can be resolved without decomposition, are named its integrant parts; and it is between these that the force of aggregation is conceived to be exerted. Chemical attraction is exerted between the constituent parts.

The most important phenomenon attending chemical combination is a change of properties. In general, the form, density, colour, taste, and other sensible qualities, as well as the fusibility, volatility, tendency to combination, and other chemical properties in the compound, are more or less different from what they are in either of its constituent parts, and frequently indeed they are wholly dissimilar. There are cases, however, where the change is less considerable, as is exemplified in several of the operations of Pharmacy,—the solution of the vegetable proximate principles in water or in alkohol, or the solution of salts in water, in which the body acquires merely the liquid form, with perhaps a slight change of density, but in which no important property is changed, nor any new one acquired.

Chemical attraction is not an invariable force exerted by every body to every other, and always with the same degree of strength. Between many substances, it does not sensibly operate, though this perhaps may be owing to the predominance of external circumstances, by which its operation is influenced, rather than to the absence of all mutual attraction. It is exerted too by each body towards others, with different degrees of strength.

It is not limited in its action to two bodies, but is frequently exerted at the same time between three, four, or a greater number, so as to unite them in one combination. Such compounds are named Ternary, &c. according to the number of their constituent principles; they are abundant among the productions of nature, and can be formed also by the arrangements of art.

This force is exerted, too, so as to combine bodies in more than one proportion; and from the union of two substances in different proportions, compounds are formed frequently as dissimilar in their properties as if they were composed of principles totally different. In some cases, the combination is unlimited with regard to proportions: in others, it is fixed to two or three relative quantities, which are definite, and there are examples where it can be established in only one proportion.

The compounds formed by the exertion of chemical attraction have apparently the same relation to this power as simple bodies have: they have a similar tendency to combination, unite in different proportions, and with different degrees of force; and all these combinations are accompanied by the same phenomena, and appear to observe the same laws. It has been supposed, however, that when compound substances combine together, the combination is the result, not of the mutual attraction between the integrant particles of these compounds, but of the affinities of their ultimate elements, modified by the condition in which they exist.

In all cases, attraction is much modified, and its results determined, by circumstances foreign to the attractive force itself. The operation of these circumstances has been established with more precision by the labours of Berthollet, and has been proved to be more important than was formerly believed. They require, therefore, more distinct enumeration, especially as some of them give rise to important results in the processes of Pharmacy.

1*st*, Quantity of matter influences affinity, an increase in the relative quantity of one body with regard to another enabling it to act with more force; or, as the law has been stated, "every substance having a tendency to enter into "combination, acts in the ratio of its affinity and its quan- "tity." Hence an effect can be produced from the mutual action of two bodies, when one is in a certain relative proportion to the other, which will not be obtained when the proportion is changed; a compound, for example, may be decomposed by a substance exerting an attraction to one of its ingredients, when the decomposing substance is present in large quantity, while the decomposition will not happen from its action in a smaller quantity. Hence, too, decomposition is often only partial, for in proportion as an ingredient, in consequence of an affinity exerted to it by any body, is abstracted from another with which it has been combined, the quantity of the latter becoming relatively larger to the portion of the former which remains, adds so much to the force of its affinity, that it is capable of counteracting the action of the decomposing substance, of at length arresting it, and preventing the decomposition from being complete. Both of these circumstances are of much importance in Pharmacy, and render necessary particular attention towards insuring the uniform strength of active preparations.

2d, COHESION, or the state of a body with regard to the aggregation of its integrant particles, must obviously modify the chemical action of another body upon it, by opposing a resistance which must be overcome before the union of their particles can be effected; hence the cause, that two solid bodies seldom act chemically on each other, and that fluidity promotes chemical action. But besides this obvious effect, cohesion, even when it has been overcome, still modifies the exertion of chemical attraction, by resuming its force whenever the force of that attraction is diminished, and thus sometimes giving rise to new combinations; and sometimes too, when suddenly established in consequence of the affinities becoming effective, it determines the proportions in which bodies combine, by insulating the compound at a certain stage of the combination. It is thus the most powerful cause in placing limits to the exertion of chemical attraction. INSOLUBILITY is merely the result of the force of cohesion, in relation to the liquid which is the medium of chemical action, and its action is of course similar; it counteracts combination, by withdrawing the insoluble substance from the action of a body exerting an attraction to it; and by the same operation, it insulates a compound when it is formed: and great DENSITY, or specific gravity, so far as it influences attraction, operates in nearly the same manner, counteracting it, by withdrawing the substances between which it is to be exerted from the sphere of mutual action.

3d, ELASTICITY, or that property of bodies arising from repulsion between their particles, and present to any extent only in those existing in the aëriform state, opposes the exertion of chemical attraction, by enlarging the distances at which these particles are placed. Hence aërial fluids combine in general with difficulty; and hence too, a compound which contains an ingredient which, when insulated, assumes the aërial state, is more easy of decomposition, and the decomposition is more complete, than a compound, the ingredients of which are fixed; for the tendency to elasticity in the volatile ingredient counteracts the mutual affinity; and when, by the application of heat, or the operation of a superior attraction, any portion of it is displaced, it is immediately withdrawn from the sphere of action, by assuming the elastic form, and ceases to oppose any obstacle by its affinity or quantity to the progress of the decomposition. Elasticity too, by counteracting attraction, places limits to the proportions in which bodies combine.

4th, The last circumstance influencing attraction is TEMPERATURE, or the state of a body with regard to heat or cold: it sometimes favours, and in other cases subverts combination. The cause of temperature is a peculiar subtle power or principle, (in modern chemical language denominated Caloric), capable of being communicated to bodies, and of being in part withdrawn from them. Its immediate tendency is to establish a repulsion between their particles; hence it gives rise to expansion or enlargement of volume, greater in each body according to the quantity of caloric introduced. This progressive augmentation of distance, at which the particles are placed by its action, is accompanied with a proportional diminution in the force of cohesion; if carried, therefore, to a certain extent, that force is so far modified, that the particles become capable of moving easily with regard to each other,—a state which constitutes fluidity; and, if the communication of caloric be continued, the expansion still continuing, the particles are at length placed at such distances, that the attraction is entirely overcome, and they repel each other,—a state which constitutes the aërial or gaseous form. The operation of caloric in influencing chemical attraction, appears to depend on the changes it occasions in the cohesion and elasticity of bodies;—it favours combination by diminishing cohesion, it counteracts or subverts it by communicating or increasing elasticity; and these effects are often produced together, and modify each other.

From the differences of the forces of affinity among bodies, or from the operation of those circumstances by which affinity is modified, its power is often suspended or overcome, and substances which have been combined are separated. This forms what in Chemistry is named Decomposition, and it presents results equally important with those from Combination.

The decomposition may be simple, that is, a compound may be resolved into its constituent parts, each of which is insulated. This is in general effected by the agency of heat. Within a certain range of temperature, the affinity which has combined two bodies continues to operate; but when the temperature is raised, and when the bodies differ in their volatility, or the tendency they have to assume the elastic form, the elasticity of the more volatile one is so far favoured by the elevated temperature, that the mutual affinity is overcome, and it is disengaged. It is generally obtained pure: but the fixed substance, from the influence of quantity on chemical attraction, frequently retains a portion of the other combined with it.

Decomposition is more complicated when it is produced by the introduction of a third substance, which exerts an attraction to one of the ingredients of a compound. When this is effective, the body added combines with this ingredient, forming a new compound, and it is only the other ingredient of the original compound that is obtained insulated. A case still more complicated is, where two compound substances are brought to act on each other, and the principles of the one exert affinities to those of the other; so that an interchange takes place, the two compounds are decomposed, and two new ones are formed. The former case used to be named by chemists single elective attraction; the latter double elective attraction; and both were considered as the results of the relative forces of attraction among the bodies concerned. But there is some reason to believe, that they arise from the operation of cohesion, elasticity, and the other forces that influence attraction; and that but for the operation of these forces, three or more bodies presented to each other would enter into simultaneous union, instead of passing into binary combinations.

Galvanism, as well as Caloric, influences chemical affinity, and, by the attractive as well as by the repulsive force it exerts, is even more powerful in producing decomposition. It scarcely admits, however, of being applied to any pharmaceutic process.

The OPERATIONS of Pharmacy are generally dependent on these chemical powers; they consist of arrangements of circumstances, with the view either of promoting their exertion, or of obtaining the products of chemical action.

Some preliminary operations are frequently had recourse to of a mechanical nature, to diminish the cohesion of bodies, or enlarge their surface. Such are Pulverization, Trituration, Levigation, Granulation, &c. PULVERIZATION is the term employed where solid bodies are reduced to powder by beating: TRITURATION that where the same effect is produced by continued rubbing. LEVIGATION denotes the operation where the powder is rubbed to a still greater fineness, the rubbing being facilitated by the interposition of a fluid, in which the solid is not soluble. As by any of these operations, the powder must consist of particles of unequal size, the finer are separated from the coarser by sifting or washing. Sifting is passing the powder over a sieve, the interstices of which are so minute as to allow only the finer particles to pass. WASHING, or ELUTRIATION, is an operation performed on substances which are not soluble in water. The powder is diffused through a quantity of that fluid, and the mixture is allowed to remain at rest. The coarser particles quickly subside, and the finer remain suspended. The fluid is then decanted off, the powder is allowed to subside, and is afterwards dried. These methods of reducing bodies to powder, can be applied to very few of the metals, their force of cohesion being too strong. They are mechanically divided by rasping, or by being beat into leaves, or they are granulated,—an operation performed by melting the metal, and when it is cooled down as far as it can be without becoming solid, pouring it into water: it passes to the solid state, assuming the granular form.

In Pharmacy, these operations are sometimes of importance, besides merely promoting chemical combination, as there are some medicines which act with more certainty, and even with more efficacy, when finely levigated, than when given in a coarse powder.

As means of promoting chemical combination, it is evident that they can act only indirectly; the bodies being far from being reduced to their minute particles, between which only chemical attraction is exerted. They are therefore employed, merely as preliminary to those operations in which such a division is obtained by chemical means. Of these the first is SOLUTION. By this is understood that operation in which a solid body combines with a fluid in such a manner that the compound retains the fluid form, and is transparent. Transparency is the test of perfect solution. When the specific gravity of a solid body differs not greatly from that of a fluid, it may be diffused through it, but the mixture is more or less opaque; and on being kept for some time at rest, the heavier body subsides; while in solution the particles of the solid are permanently suspended by the state of combination in which they exist, and are so minute as not to impair the transparency of the liquid.

The liquid has, in this case, been regarded as the body exerting the active power, and has been named the Solvent or Menstruum; the solid is considered as the body dissolved. The attraction, however, whence the solution proceeds, is reciprocal, and the form generally proceeds from the larger quantity of the liquid employed, and from the absence of cohesion being more favourable to the combination proceeding to a greater extent.

In general, a solid can be dissolved in a liquid only in a certain quantity. This limitation of solution is named Saturation; and when the point is reached, the liquid is said to be saturated with the solid. As the fluid approaches to saturation, the solution proceeds more slowly. When a fluid is saturated with one body, this does not prevent its dissolving a portion of another; and in this way three, four, or five bodies may be retained in solution at the same time by one fluid. In these cases, the fluid does not dissolve so large a proportion of any of these substances, as if it had been perfectly pure, though sometimes the whole proportion of solid matter dissolved is increased from the mutual affinities the bodies exert. Neither is the solvent power always thus limited, there being many cases where a solid may be dissolved in a fluid to any extent. Gum or sugar, for example, will dissolve in water, and form a perfect solution in every proportion.

An increase of temperature, in general, favours solution, the solution proceeding more rapidly at a high than at a low temperature; and in those cases in which a certain quantity only of the solid can be combined with the fluid, a larger quantity is taken up when the temperature is increased. The quantity dissolved is not in every case promoted alike by an increase of temperature; water, for example, having its solvent power, with regard to nitre, greatly increased by augmentation of temperature, while sea-salt is dissolved in nearly as great a quantity by water at a low as at a high temperature. This difference in these salts, and in many others, depends on the difference in the degree of their fusibility by heat; those which are most easily fused having their solubility in water most largely increased by increase of temperature. All these facts, indeed, with regard to solution, are explained, by considering this operation as depending on chemical affinity overcoming cohesion in the body dissolved.

Agitation favours solution, by bringing successively the different parts of the liquid into contact with the solid, and thus preventing the diminished effect which arises from the approach to saturation in the portion immediately covering the solid. The mechanical division of a solid, too, is favourable to its solution, principally by enlarging the surface which is acted on.

Solution is an operation frequently had recourse to in pharmaceutical chemistry, the active principles of many bodies being dissolved by their proper solvents. Salts are dissolved in water, as are also gum, extract, and other vegetable products. Products of a different kind, as resin, camphor, and essential oils, are dissolved in alkohol and wine: and metals are rendered soluble and active by the different acids. Solutions in water, alkohol, or wine, possess the sensible qualities and medical virtues of the substance dissolved. Acid and alkaline liquors change the properties of the bodies which they dissolve. In Pharmacy, the operation receives different appellations, according to the nature of the solvent, of the substance dissolved, and of the manner in which it is performed. When a fluid is poured on any vegetable matter, so as to dissolve only some of its principles, the operation is named EXTRACTION, and the part dissolved is said to be extracted. If it is performed without heat, it is termed MACERATION; if with a moderate heat, DIGESTION; if the fluid is poured boiling hot on the substance, and they are kept in a covered vessel till cold, this is denominated INFUSION. DECOCTION is the term given to the operation when the substances are boiled together. It is evident, that these are all instances of solution, varied only by particular circumstances; and I have already stated, under the analysis of the vegetable part of the Materia Medica, the advantages belonging to each. LIXIVIATION is the term applied to solution performed on saline substances where the soluble matter is separated, by the action of the solvent, from other substances that are insoluble; and the solution obtained in this case is named a LEY.

The other principal method by which that fluidity necessary to chemical action is communicated, is FUSION. It requires merely with regard to each substance, the necessary degree of heat; and where this is high, it is performed usually in crucibles of earthen ware, or sometimes of black lead, or on a large scale in iron pots.

Chemical combination is frequently promoted by an elevation of temperature, though the heat may not be so high as to produce fusion, but only to diminish cohesion to a certain extent. CALCINATION, as it used to be named, or metallic oxidation, is an example of this; a metal being heated to a high temperature, so as to enable it to combine with the oxygen of the air. DEFLAGRATION is a similar operation, an inflammable or metallic substance being exposed to a red heat in mixture with nitre; the acid of the nitre yields its oxygen; which being thus afforded in large quantity and nearly pure, the oxidation takes place with it rapidly, and generally to its *maximum*.

When chemical action has been exerted, other operations are sometimes required to obtain the product, or sometimes this product is formed and collected in the operation itself.

By EVAPORATION, or dissipating a liquid by the application of heat, a solid substance which has been dissolved in it is recovered, and this operation is one frequently performed in Pharmacy. When performed on a small scale, vessels of glass, or of earthen ware, are generally employed, and the heat is applied either by the medium of sand, or, if it is required to be more moderate, the vessel is placed over water which is kept boiling, forming what is named the Water Bath, or *Balneum Mariæ*. When performed on a larger scale, shallow iron pots or leaden troughs are used, to which the fire is directly applied; and experiments have shewn that the operation is conducted more economically when the liquor is kept boiling strongly, than when it is evaporated more slowly by a more gentle heat. There is, on the other hand, however, some loss, from part of the dissolved substance being carried off when the heat is high, by its affinity to the liquid evaporating; and in many cases in Pharmacy, particularly in the evaporation of vegetable infusions or tinctures, the flavour, and even the more active qualities of the dissolved substance, are liable to be injured, especially towards the end of the operation, by a strong heat.

When the object is to obtain the volatile matter by evaporation, the process is of course conducted in close vessels, adapted to condense the vapour and collect the liquid. This forms the operation of DISTILLATION, which, with regard to different substances, requires to be conducted in various modes.

When a volatile principle is to be obtained from vegetable substances by this process, the difficulty is to apply the heat sufficiently, without raising it too high. The mode generally employed is to heat the vegetable matter with water, and the distillation is then usually performed in the common still. At the heat of boiling water, the essential oil of plants, which is the chief volatile principle they contain, is volatilized; it rises with the watery vapour; is condensed; if little water has been employed, the greater part of the oil is obtained apart; if much has been used, it retains it dissolved, acquiring taste and flavour, and thus forming the distilled waters of plants. If alkohol, pure or diluted, has been the medium of distillation, it always retains the oil in solution, and forms what are named Distilled Spirits. The still in which the operation is performed with these views is of copper or iron; it consists of a body and head, the former designed to contain the materials, and to which the fire is applied, the latter to receive the vapour; there issues from it a tube, which is connected with a spiral tube, placed in a vessel, named the refrigeratory, filled with cold water. The vapour, in its progress through the tube, is condensed, and the liquid drops from the extremity of it.

When metallic matter would be acted on, by the materials or the product of distillation, vessels of glass or earthen ware are employed; the retort, which is generally used, being connected with a single receiver, or with a range of receivers, according as the vapour is more or less easily condensed; or if the product is a permanently elastic fluid, which cannot be condensed but by passing it through water, a series of bottles connected by tubes, on the principle of Woolfe's apparatus, is used. When the product obtained by distillation is not perfectly pure, it can be frequently purified by a second distillation; the process is then named *Rectification*: when it is freed from any superfluous water combined with it, the operation is named *Dephlegmation* or *Concentration*.

When the product of volatilization is condensed, not in the liquid, but in the solid form, the process is named SUBLIMATION, and the product is a Sublimate. As the condensation, in this case, takes place with much more facility, a more simple apparatus is employed, consisting usually of a conical bottle or flask with a round bottom, thin and equal, named a Cucurbit, in which the materials are contained, heat being applied by the medium of a sand bath. The vapour condenses in the upper part of the flask, forming a cake, which adheres to it, the orifice being lightly closed to prevent any part from being lost; or a globular head, with a groove at its under edge, and a tube to convey off any liquid that may be condensed, (a Capital as it is named), is applied.

When a solid substance is thrown down from a liquid by chemical action, it forms the operation of PRECIPITATION, and the matter thrown down is named a Precipitate. Frequently the substance precipitated is one which had been dissolved in the liquid, and which is separated by a substance added, combining with the solvent, or the substance which renders it soluble, and weakening its attraction to the one which it held in solution. Or sometimes it arises from a compound being formed by the union of one body with another, insoluble in the liquid that is the medium of action. The precipitate is allowed to subside, is usually washed with water, and is dried. From the law of chemical attraction, that quantity influences the force of affinity, it often happens that the precipitate either retains in combination a portion of the substance by which it had been dissolved, or attracts a portion of the substance by which it is thrown down, and this sometimes proves a source of impurity, or of peculiar powers in medicinal preparations.

When a substance, in passing to the solid state, assumes a regular geometric form, the process is named CRYSTALLIZATION, and these figured masses are denominated Crystals. Their forms are various, though nearly constant with regard to each substance; they are usually transparent, hard, and have a regular internal structure. The crystallization may happen in two ways from a state of solution. If a saturated solution has been prepared with the aid of heat, the increased quantity of the solid, which the heat has enabled the liquid to dissolve, separates as the temperature falls; and the attraction of cohesion being thus slowly exerted between the particles, unites them so as to form crystals. Or, if a portion of the solvent be withdrawn by evaporation, and especially by slow evaporation, the particles of the solid unite slowly, and with a similar result.

In both these kinds of crystallization from a watery solution, the crystallized substance always retains a quantity of water, and frequently even a considerable proportion in its composition. It is essential to the constitution of the crystal, its transparency, structure, and form, and is hence named the Water of Crystallization. Some crystals lose it from mere exposure to the air, when they are said to effloresce; others attract water, and become humid, or deliquesce.

Crystallization is promoted by the mechanical action of the air; likewise by affording a nucleus, whence it may commence, and especially a crystal of the substance dissolved; and with regard to a few substances, their affinity to the solvent requires to be diminished by the addition of another substance to enable them to crystallize.

In Pharmacy, crystallization is of importance, by enabling us to obtain substances, especially those belonging to the class of salts, in a pure form; different salts, even when present in the same solution, being thus separated by their different tendencies to crystallization, according as they are more or less soluble in the solvent, or have their solubility more or less promoted by heat, and each salt, when it does crystallize, being in general pure.

These are the principal operations of Pharmacy. Connected with this subject, there remain to be noticed the weights and measures which are usually employed. The division according to what is named Troy weight, is that ordered in the Pharmacopœias. Its parts, with the symbols by which they are denoted, and their relative proportions, are represented in the following table:

A pound	(libra),	℔	contains	12 ounces.
An ounce	(uncia),	℥		8 drachms.
A drachm	(drachma),	ʒ		3 scruples.
A scruple	(scrupulus),	℈		20 grains (grana) gr.

Measures have been subdivided in a similar manner, being made to correspond to the specific gravity of water. As the specific gravities of liquids vary, however, considerably, a source of error is introduced in applying the standard measure to different liquids, unless the due allowance be made for the difference in specific gravity. This it is to be presumed will often be neglected, and hence the Edinburgh College have rejected the use of measures, and given the proportions of every liquid by weight. The use of measures, however, in apportioning liquids, those at least which are not too dense, being more easy and convenient, will probably always be retained; and it is therefore sanctioned by the Dublin and the London Colleges, in the late edition of their Pharmacopœias. The Dublin College adopt the usual division of the wine gallon into eight pounds or pints, the pound into sixteen ounces, and the ounce into eight drachms. The London College distinguish them, at the same time, by particular appellations, which cannot be confounded with those denoting the weights, as represented with their symbols in the following table:

A gallon	(congius),		contains	8 pints.
A pint	(octarius),	O	contains	16 fluidounces.
A fluidounce	(fluiduncia),	f℥	contains	8 fluidrachms.
A fluidrachm	(fluidrachma),	fʒ	contains	60 minims, (minima), ♏.

This last measure is one newly introduced. In apportioning liquids into very small quantities, the quantity has been usually estimated by drops (gutta, gtt.) allowed to fall from the edge of the mouth of a bottle; but the size of the drop is liable to vary, not only according to the mobility and specific gravity of the liquid, a circumstance of inferior importance, since with regard to each substance it remains the same, but also according to the thickness of the edge of the vessel, and the degree of inclination. The London College have therefore substituted this division of minims, which are measured in a slender graduated glass tube. It is necessary to recollect that these minims have no strict relation to drops, as indeed is evident from the circumstance, that a drop is a very variable quantity both in size and weight from different liquids. A drop of water is equal to about a grain, but 60 grains of alkohol are equal to about 175 drops of it, 60 grains of white wine to 96 drops, and sixty grains of tinctures with diluted alkohol, to from 135 to 145 drops. The measures of a table and of a tea spoonful are sometimes used in extemporaneous prescription, and, though not very accurate, may be admitted where a small difference in the dose is not important. The one is understood to be equal to half an ounce by measure, the other to about one drachm.

PART II.

OF MATERIA MEDICA.

MATERIA MEDICA, in the extensive signification which has been attached to the term, comprizes the history both of Aliments and of Medicines. It is used, however, more correctly, as opposed to the Materia Alimentaria; and in this limited sense may be defined that department of Medicine, which describes the properties, and investigates the effects on the living system, of those substances which are employed as remedies against disease,—substances which are not necessary to the immediate support of the functions of life, to repair the waste of the body, or furnish matter whence its secretions are derived, but are more peculiarly adapted to excite actions in the system, or produce changes, with a view to the removal of morbid states. It includes the history of these substances, independent of the preparations to which they are subjected to fit them for administration, this belonging to the department of Pharmacy.

CHAP. I.

PRELIMINARY OBSERVATIONS ON THE OBJECTS OF STUDY IN THE HISTORY OF THE ARTICLES OF THE MATERIA MEDICA, AND ON THEIR CLASSIFICATION.

THE subjects of inquiry, in the study of the articles of the Materia Medica, may be comprized under their Natural History, their Chemical History, and what may be more strictly denominated their Medical History.

The utility of NATURAL HISTORY in furnishing appropriate characters by which the productions of nature may be distinguished from each other, is abundantly obvious; and its application to the articles of the Materia Medica is under this point of view indispensable. From want of such characters, many of the remedies described by the ancient physicians cannot now be accurately ascertained; did we not possess them, *our* observations would in the progress of time be liable to the same inconvenience; and the accurate distinctions which the methods of natural history afford, are at present necessary to discriminate between substances which have a near resemblance to each other, or to describe with accuracy the remedies employed in different countries.

This subject has likewise been considered under a higher point of view. From attention to the characters of the articles of the Materia Medica, as they are objects of natural history, it has been supposed, that assistance may be derived know precisely the primary operation of it, whence these effects arise, this might serve as the basis of its classification; but this being unknown, and the classification being established on these secondary operations, it must necessarily be placed under each of these classes, and under each its history is imperfect, as it must be limited to the operation which gives the character of the class under which it is arranged.

In a course of lectures this is inconvenient; the history of many important articles of the Materia Medica being placed under different divisions, frequently remote from each other. But in a treatise, to the different parts of which it is easy to refer, it is of less importance, and is more than compensated for by the other advantages of which this method of classification is possessed. And when the merits of two modes of classification are so nearly balanced, it is even of importance to exhibit the subjects connected with them under the points of view which each mode more peculiarly affords. It is this classification, therefore, which I have followed in the present work.

in the investigation of their virtues. In those artificial systems of classification, indeed, in which the arrangements are founded entirely on a few leading discriminating characters, the natural alliances which exist among bodies are often disregarded, and they are in no case particularly traced; the substances which are associated being placed together merely from possessing these characters, though they may at the same time differ widely in the general assemblage of their qualities. But in those natural methods of classification in which the arrangement is founded on the occurrence of a number of characters taken from what is essential to the substance, the gradations of nature are more strictly observed, and those bodies are arranged together, which, in their general appearance, nature, and qualities, have a close resemblance. It is the prosecution of this natural method that has been supposed useful in ascertaining the medicinal virtues of the productions of nature,—a supposition not unreasonable, since, where there exists a natural resemblance in structures and qualities, it is no improbable inference that there may be a resemblance in medicinal powers.

In the vegetable kingdom especially, this natural affinity has been industriously traced and applied to this purpose. Those vegetables which agree in their general structure, habit, and appearance, are thrown into what are named Natural Orders or Families; and experience has shewn, that the individuals composing many of these natural orders have a remarkable similarity in their effects on the system. In the subdivisions of the order, this analogy is not less striking, the different species having in general similar virtues. If, therefore, a new species of any of these genera be discovered, the discoverer may infer with some probability *à priori*, that it will possess virtues similar to those of the genus to which it belongs.

This criterion of the virtues of medicines, though undoubtedly so far just, is however liable to many exceptions. Many natural orders are composed of vegetables, which, though they agree in structure, have the most various and opposite qualities; and even in those in which there is the greatest similarity, there are important differences in the properties of many plants arranged under them. Even in the subdivision of the genus, there is often a remarkable difference in the properties of the species; and what sufficiently points out the deficiency of this method, different parts of the same plant have frequently opposite powers. Yet it is to be admitted, that with all these exceptions, Naturalists have often been led by such analogies to just conclusions respecting the virtues of plants; and in studying the vegetable part of the Materia Medica, attention is undoubtedly due to these natural distinctions.

A part of the Natural History of Medicines, of not less importance than their generic and specific characters, is the accurate description of their sensible qualities.

Such descriptions afford the most obvious method of distinguishing them, and in many cases also the most easy and certain criterion of their purity and perfection. A knowledge of these qualities is not less necessary in leading to their proper administration, since, from the peculiar qualities of taste, flavour, specific gravity, or consistence in any substance, one form may be better adapted to its exhibition than another.

It has also been imagined, that the sensible qualities of medicines, particularly their taste and smell, afford indications of their peculiar powers, and experience to a certain extent confirms this supposition. In the vegetable kingdom especially, it has been found, that substances which are insipid and inodorous rarely possess any important medicinal virtue, and a number of such substances have justly been discarded from practice from attention to this circumstance: their insipidity having led to suspicion of their activity, and occasioned a more strict examination of the evidence on which their supposed virtues were said to be established. On the other hand, plants possessing much odour or taste, are in general active remedies; and those which resemble each other in these qualities, have often the same general medicinal powers: thus astringency is indicated by a styptic taste; bitters are tonic, aromatics are stimulating, and fœtids narcotic.

There are, however, so many causes of obscurity and error in these indications, that they do not admit of very extensive accurate application. The different tastes and odours are so little reducible to precise definition or description, that few general rules can be formed from them; and even to the few that have been delivered on this subject, there are many exceptions. The most active vegetable substances too, have not these properties more peculiar than many others comparatively inert, and hence it is not often that much assistance can be derived from this criterion of the virtues of plants.

The Chemical History of the articles of the Materia Medica forms another important general object of investigation.

The opinion seems to have been early adopted by those who cultivated chemistry with a view to its application to medicine, that those substances which act in a similar manner on the living body must be composed of the same principles, and that therefore chemical analysis may be a successful method of investigating their medical virtues;—an opinion not altogether unreasonable. The properties of any compound depend on its chemical composition; they originate from that composition, and are altered by every variation which it suffers. The medicinal powers of such substances must, in common with their other qualities, depend on the same cause; and it is not unreasonable to presume, that where similar powers exist, they arise from similarity of composition, either with regard to the constituent principles, or to the peculiar mode in which these are united.

Confiding in the justness of these conclusions, the chemists, about the beginning of the 17th century, bestowed much labour on the analysis of the different vegetables used in medicine. Above 500 plants were analyzed; but this labour led not to a single useful result; and had even the analysis been performed with all those essential precautions, which it was impossible that the state of Chemistry at that period could have furnished, the nature of it was such, that it could afford no useful information. The plants subjected to analysis were exposed to heat, and the products collected; but as these products do not pre-exist in the vegetable, but are formed by new combinations of its elements, and as these elements are in all vegetables nearly the same, no connection can be traced between them and the qualities of the substance from which they are obtained. It was found accordingly, that the most inert and the most poisonous vegetables afforded the same products; and if the experiment were now to be repeated with all the advantages of the rigorous methods of Modern Chemistry, no information of any value to the physician would be obtained. Similar proximate principles of different plants, though possessed of different medicinal powers, would give similar results; or if any difference were observed, it would be impossible to connect this with the difference in their powers. Nor can we expect from the chemistry, at least of our times, to be able to discover on what chemical principle, or what peculiarity of combination, the medicinal virtues of any active vegetable depend; for although these, in common with other qualities, may arise from chemical composition, yet the varieties of combination from which they may be supposed to derive their origin, are too minute to be detected by our modes of analysis.

The pretensions of Modern Chemistry, as applied to Materia Medica, are therefore more humble, but they are also more just. By discovering those proximate principles of vegetables in which their active powers reside, and enabling us to separate them from each other, or from other inert and noxious matter with which they may be mixed, it allows us to apply them with much more advantage: it determines how far in every case such operations are useful: whether the principles thus operated on are altered by these operation, and by what means such alterations, if injurious, may be obviated. Similar advantages are obtained from its application to the few products of the animal kingdom that are employed in medicine; and those belonging to the mineral kingdom can be used with much more advantage and discrimination, when their nature has been ascertained by analysis, than when we are left to collect their virtues from experience.

By the combinations which Chemistry regulates, it furnishes us with many remedies which owe to these combinations their sole power, and which are equally active with many of those afforded by nature. Lastly, it has taught us the proper methods of administering these substances. Many of them exert a mutual action, combine together, or decompose each other; and were such facts which Chemistry discovers not precisely known, important errors would frequently be committed in their mixture and administration.

The last object in the study of the Materia Medica, that to which the others are subservient, is their MEDICAL HIS-

TORY, or the investigation of the virtues and uses of remedies. This comprehends several important subjects of inquiry.

There belongs to it the consideration of the action of these substances on the system in its healthy state; since, when this is ascertained, it leads to their application to the treatment of disease. It may in general be affirmed, though the principle is not without exception, that substances which do not act sensibly on the body in a healthy state, will not prove active remedies; and that, on the contrary, every substance which is capable of producing any important change in the system, must be more or less extensively adapted to the removal of morbid affections.

Another subject of inquiry, scarcely less important, relates to the mode in which remedies act, and by which they produce their peculiar effects. It is not sufficient merely to have ascertained by the evidence of experience the virtues of certain remedies in certain cases. It is of importance, farther, to arrange the facts thus collected; to institute some comparison between remedies possessed of nearly the same general power, and so far as can be done, to investigate their mode of operation, with the view of extending their application, and of administering them with more precision.

Lastly, with regard to what may be more strictly termed the medicinal powers of remedies, there are a number of subjects of consideration of importance. It is necessary to take notice of the applications for which each individual article is distinguished; the forms of disease to which it is adapted; the circumstances that may influence its operation, or in certain cases render its exhibition doubtful or improper; the cautions necessary in its use; the dose in which it is given; the usual and proper forms of exhibition; and the effects of the combinations of remedies with each other.

These observations point out the subjects to which the attention is principally to be directed in the study of the articles of the Materia Medica.

Very different systems have been followed, according to which these substances are arranged. Two methods are superior to the others, and are possessed of undoubted advantages,—one in which the classification is founded on the natural distinctions of the substances arranged, the other in which it rests on their medicinal powers.

The latter classification appears more systematic, and more conformable to the object of the study itself, than any other. These substances are subjects of inquiry, merely as possessed of certain medicinal properties: they ought to be classed, therefore, it might be concluded, on principles conformable to this: and by founding the classification on this basis, some important advantages are obtained; we are enabled to place together the remedies which are possessed of similar virtues, to deliver the theory of their operation, to compare the powers of the individual substances arranged under the class; and by a reference to this generalization, to point out more distinctly their degrees of activity, and the peculiarities which may attend the operation of each.

The principal difficulty which attends it, is one arising perhaps from our imperfect knowledge of the laws of the animal economy, and of the operation of remedies, in consequence of which we cannot always assign their primary action, but are often under the necessity of arranging them from their more obvious, though secondary effects. Hence, as many substances are capable of producing various effects of this kind, and are employed in medicine to obtain this diversity of effect, the same substance frequently requires to be considered under different classes, and under each its history is incomplete. It may be capable of acting, for example, as an emetic, as a cathartic, and as a diuretic: did we

CHAP. II.

GENERAL VIEW OF THE OPERATIONS OF MEDICINES, AND OF THEIR CLASSIFICATION FOUNDED ON THESE OPERATIONS.

THE advantages of an arrangement of the articles of the Materia Medica, founded on their medicinal operations, I have stated under the preceding observations; and in endeavouring to exhibit this branch of medicine, strictly as a science, it is that undoubtedly which ought to be followed. The difficulty of constructing such an arrangement, has at the same time always been experienced. No subject is involved in greater obscurity, than what relates to the action of substances on the living system. Their effects are not always easily appreciated with accuracy, especially in a state of disease, and our knowledge of the laws of their action is extremely imperfect. When we attempt, therefore, to class them according to these actions, we can scarcely form an arrangement strictly just and systematic, but are forced to admit of some deviations, and to be guided not unfrequently by imperfect analogies.

The difficulty of constructing a classification of medicines from their operations, will be apparent from the failure even of Cullen, when he attempted its execution; for there can be little hesitation in affirming, that the one he has given rests on principles nearly altogether false. The following table exhibits this classification.

MEDICAMENTA AGUNT IN

- SOLIDA.
  - Simplicia.
    - *Astringentia.*
    - *Tonica.*
    - *Emollientia.*
    - *Erodentia.*
  - Viva.
    - *Stimulantia.*
    - *Sedantia.*
      - *Narcotica.*
      - *Refrigerantia.*
    - *Antispasmodica.*
- FLUIDA.
  - Immutantia.
    - Fluiditatem.
      - *Attenuantia.*
      - *Inspissantia.*
    - Misturam.
      - Acrimoniam corrigentia.
        - In genere.
          - *Demulcentia.*
        - In specie.
          - *Antacida.*
          - *Antalkalina.*
          - *Antiseptica.*
  - Evacuantia.
    - *Errhina.*
    - *Sialogoga.*
    - *Expectorantia.*
    - *Emetica.*
    - *Cathartica.*
    - *Diuretica.*
    - *Diaphoretica.*
    - *Menagoga.*

Now, without examining it minutely, it may be remarked, that the basis of this classification, the assumption that some medicines act exclusively on the fluids of the body, is incorrect; for, with the exception of two or three classes, the action of the whole is on the living solids. Emetics, cathartics, diuretics, diaphoretics, emmenagogues, expectorants, sialogogues, and errhines, which Cullen has placed as medicines acting on the fluids, produce their effects, unquestionably by no operation on the fluids which they evacuate, but by exciting particular organs to action. The distinction is equally nugatory in the greater number of cases, between the action of medicines on the simple solids and on the living solids. It cannot be doubted, but that tonics produce their effects in removing debility, not, as the classification of Cullen assumes, by any action on the inanimate fibre of the body, giving it density or tone, but by their operation on the vital powers of the system. Nor can the effects of astringents be ascribed entirely to their corrugating quality.

In this arrangement too, are placed classes of medicines which have probably no existence, the action ascribed to them being merely hypothetical. We may be allowed to question the existence of attenuants and inspissants,—medicines which render the fluids of the body more thin, or which produce the opposite effect. Nor is there any reason to believe in the reality of antiseptics. The process of putrefaction probably never takes place in the living body; and if it did, we know of no medicines by which it could be retarded or counteracted.

In the system of Brown, advanced in opposition to that of Cullen, more just views were unquestionably given of the relations of external agents to the living system, and of the laws regulating their action. The operations of medicines, however, are even in this system imperfectly explained, partly from the imperfect state of the science, and partly from its author having surveyed his subject with those views of generalization which preclude minute distinctions. Medicines he supposed to operate merely as other external agents, by exciting to action either the general system, or the particular organs on which they operate; and to differ from each other in little more than in the degree in which they exert this stimulating power. They have, farther than this, no specific properties, but are adapted to the removal of morbid affections, by producing excitement, partial or general, with certain degrees of rapidity or force.

This proposition is far from being just, at least in an unlimited sense. Medicines, and even external agents in general, unquestionably differ, not only in degree, but in kind of action. Every substance applied to the organs of sense, gives a different sensation, not referrible to the mere force of the impression, but which must be attributed to some essential varieties in the modes of action of the agents themselves. Every organ is excited to its usual or healthy action only by its appropriate stimulant. It is the same with regard to medicines, or differences in the kind of action they exert are not less conspicuous. Opium and mercury both excite the actions of the system, and so far they agree in their general operation. But the ultimate effects they produce are extremely dissimilar, nor from either of them can we, by any variation of dose, or mode of administration, obtain those which usually result from the action of the other. All the important articles nearly of the Materia Medica, might be brought forward as similar examples, and as proving, that they are not to be regarded simply as stimulants varying in strength, but that their action is modified by peculiar powers they exert.

Still the principles of this system approach to the truth, and appear most conformable to the laws which regulate the animal economy, and, with some modifications, they may be applied so as to afford a more satisfactory view of the operations of medicines, and foundations for arranging them under different classes.

If we attend to the general operation of medicines, we find, that it is usually that of exciting to action, either the general system or particular organs. This is the primary effect; and to express the agency of the substance producing it, the term of stimulant operation may be employed. And, according to the kind and degree of this, different effects will be produced, the discrimination of which may afford several important distinctions.

Thus, of those stimulants which act on the general system, the operation is extremely different with regard to diffusibility and permanence. Some are highly diffusible in their action, or, soon after they have been received into the stomach, they produce increased vigour, which is immediately conspicuous in the force of the circulation, the nervous system, or the different functions of the body; while, with regard to others, the same general effect is produced more slowly, and is scarcely perceptible but from their repeated or continued administration. Those which are diffusible are at the same time generally transient in their operation; while those which produce excitement more slowly, are generally more permanent. And by both diversities of action, it is obvious their operation must be productive of very different effects: the high excitement produced by the one is generally immediately followed by proportional languor; the gradual excitement from the other being reduced more slowly, they occasion no such sudden changes, but are fitted to produce more lasting effects. These varieties of action serve, accordingly, to explain the differences in the power of some of our most important medicines, and they afford the distinction of two principal classes, Narcotics and Tonics; the one, so far as their action is understood, being apparently general stimulants, diffusible and transient, the others slow and permanent.

Another important difference among stimulants is derived from the action of some being general with regard to the system, while that of others is more peculiarly directed to particular organs. The effect with regard to either is not easily explained; but the fact is certain, that some substances, as soon as they are received into the stomach, not only produce on it a stimulant effect, but extend this to the general system; while there are others which, without any very evident action on the stomach, and still less without any general action, excite particular organs: some, for example, stimulating the intestinal canal, others exciting the action of the secreting vessels of the kidneys, and others operating on the exhalent vessels of the skin. These afford the distinctions of cathartics, diuretics, and diaphoretics, and there are other classes founded on similar local operations. With this local action, many substances exert, at the same time, more or less of a general operation, by which the individuals of a class become capable of producing peculiar effects, and many of them, by peculiarity of administration, act specifically on more than one part of the system, by which their effects are still more diversified.

When medicines are thus determined to particular parts, they are either directly conveyed, by being received into the blood, or their action is communicated indirectly from the stomach, by the medium of the nervous system; and in both ways important local effects are produced.

Thus, there are many substances which appear to be capable of being so far assimilated with the food, as to enter into the composition of the chyle, and are received into the circulating mass. Being brought, in the course of the circulation, to particular organs, they often excite in them peculiar actions. Mercury affords an example of this. It enters the circulation, and, when accumulated to a sufficient extent, generally acts on the salivary glands. It is on secreting organs that these local effects are usually produced, and frequently the substance is separated with the secreted fluid, so as to act on the secreting vessels. Such is the case with the alkaline salts, or with nitre, which are secreted by the vessels of the kidneys, stimulate them at the same time to action, and are capable of being detected in the urine by chemical tests.

But the most general mode in which the operation of medicines taken into the stomach is extended, either to the system in general, or to any particular organ, is by the medium of nervous communication. An impression is made on the fibres of the stomach by the substance received into it, and however difficult it may be to conceive the mode in which this can be communicated by the nerves to distant parts, the fact is undoubted, and established by the plainest evidence. It is evident from the effects of these substances being produced in a shorter time after they have been received into the stomach, than they could be were they to act by being absorbed by the chyle into the circulating mass. The stimulus of wine or of opium received into the stomach will instantly remove lassitude, and increase the vigour of the circulation, or of muscular exertion; or the same substances, in a larger dose, will, with the same celerity, depress all the functions, and exhaust the powers of life. Digitalis given to sufficient extent will speedily reduce, to a great degree, the frequency of the pulse; or a large dose of cinchona, given half an hour before the expected recurrence of the paroxysm of an intermittent, will prevent its attack. It has also been proved by experiment, that this communication of action from the stomach to other parts, in a number of cases, does not take place where the brain and spinal marrow have been destroyed, though the heart and vascular system have been preserved uninjured.

From this susceptibility of impression, and of communicating action to other parts, the stomach becomes an organ of the first importance, since, independent of its being the vehicle by which substances are conveyed into the blood, it is that by means of which medicines are brought to act on the system by the medium of the nerves. It sometimes happens, however, that a similar extension of action may take place from other parts; and hence effects may be obtained from medicines, by applying them to the surface of the body, similar to those which they produce when they have been received into the stomach. Sometimes the effect is conveyed by nervous communication, and sometimes the substance applied is absorbed by the lymphatics, and enters the blood. Examples of the first are to be found in many narcotics. Opium, applied to the skin, either in the solid form, or in that of tincture, often relieves pain, and removes spasmodic affections, either general or local. Tobacco applied to the region of the stomach excites vomiting; and garlic applied to the feet acts as a powerful stimulant, and raises the strength of the pulse. Examples of the second mode of operation are still more frequent. Friction on the surface is a common method of introducing mercury into the system. By the same means oxide of arsenic, tartrate of antimony, and various other active substances, may be introduced; a solution of them in water being rubbed on the palms of the hand; and under certain circumstances, this is preferable to their administration by the stomach. Many substances applied to an wound, produce important effects on the system, affecting the functions of the heart or brain: in such cases they appear to act by entering the circulation through the divided veins of the part to which they are applied.

These are examples of the various relations which medicines bear to the living system. We are unable to assign a cause for these peculiar properties, to ascertain why the action of some should be extended to the system in general, or why that of others should be determined to particular parts, either where substances enter the blood, or where they act by the medium of the nerves. But from the possession of such properties, it is evident, that their powers as medicines must be more diversified than if they were merely general stimulants, varying in the degree of their stimulating power; and farther, that distinctions are thus afforded for establishing a variety of classes.

Another cause remains to be pointed out, by which the actions of medicines are diversified. Besides acting as stimulants, they sometimes occasion changes, either mechanical or chemical, in the state of the fluids, or of the simple solids, and these changes are productive of medicinal effects.

This operation of medicines was formerly supposed to be much more extensive than it really is. Sufficient weight was not allowed to the important fact, that the actions of external agents on the living body are governed by laws different from those which regulate the actions exerted between the masses or particles of inanimate matter. Hence we find in medical speculations, constant attempts to trace the causes of diseases to changes merely mechanical or chemical, to plethora or obstruction, to laxity or rigidity, to the abundance of acid or of alkali, or to the presence of other specific acrimonies still less defined. The explanations of the operations of medicines were of course founded on these notions, and hence the distinctions of inspissants, attenuants, antacids, antalkalies, antiseptics, and several others with which the Materia Medica was loaded.

These errors are now nearly exploded. We have learned to consider the living system as endowed with peculiar properties and modes of action, incapable of being explained on mere mechanical or chemical principles; and to regard external powers acting upon it as producing changes conformable to these peculiar properties of life. Yet still we can sometimes refer a salutary change, effected in the system, or in particular organs, to changes mechanical or chemical in the solids or fluids. Thus, symptoms arising from irritation may be removed by lubricating the irritated surface; acid in the stomach may be corrected by the exhibition of alkalies or absorbent earths; and urinary concretions may be dissolved, or at least their increase may be prevented, by the use of alkaline remedies. These properties of certain medicines are not perhaps highly important; but they demand attention, and they afford sufficient distinctions for the formation of several classes.

In conformity to these views, the classification of the articles of the Materia Medica, founded on their medicinal operations, may be established. It is only necessary to observe, principally to obviate hasty criticism, that in classifications founded on this principle, perfect precision is not to be expected. The science of medicine is still in so imperfect a state, particularly in what regards the relations of external agents to the living system, that both in arranging the classes, and associating the substances which we place under each, we must frequently rest satisfied with remote analogies, which will not always bear a strict examination. This is an imperfection at present unavoidable; it must either be submitted to, or such modes of classification must be altogether rejected; and the question therefore ultimately is, not whether these arrangements are unobjectionable, but whether the advantages belonging to them are not such as to justify their adoption even with their imperfections.

UNDER the first division of the arrangement I propose, may be placed those substances which exert a general stimulant operation on the system. Of these there are two subdivisions, the Diffusible and the Permanent; the former including the class of Narcotics, with which may be associated, as not very remote in their operation, the class of Antispasmodics; the latter comprising two classes, Tonics and Astringents. Through these there is a gradual transition from the more highly diffusible stimulants, to those more slow and durable in their action.

A second division comprehends Local Stimulants,—those the action of which is determined to particular parts of the system. Such are the classes of Emetics, Cathartics, Emmenagogues, Diuretics, Diaphoretics, Expectorants, and Sialogogues; with which may be associated the classes of Errhines, and of Epispastics, founded on direct local application.

The remaining classes include substances which do not operate according to laws peculiar to the living system. To one division may be referred those, the effects of which depend on the chemical changes they produce in the fluids or solids: the classes which may be established on this principle are Refrigerants, Antacids, Lithontriptics, and Escharotics. To another division belong those, the operation of which is purely mechanical,—Diluents, Demulcents, Emollients, and Anthelmintics.

Under these classes may be comprehended all those substances which are capable of producing salutary changes in the human system, and which are used as remedies. A view of this classification is exhibited in the following table:

TABLE OF CLASSIFICATION.

A. General Stimulants.		
	a. Diffusible.	Narcotics.
		Antispasmodics.
	b. Permanent.	Tonics.
		Astringents.
B. Local Stimulants.		Emetics.
		Cathartics.
		Emmenagogues.
		Diuretics.
		Diaphoretics.
		Expectorants.
		Sialogogues.
		Errhines.
		Epispastics.
C. Chemical Remedies.		Refrigerants.
		Antacids.
		Lithontriptics.
		Escharotics.
D. Mechanical Remedies.		Diluents.
		Demulcents.
		Emollients.
		Anthelmintics.

From this arrangement, some classes are excluded that have usually found a place in others; but these have either appeared to me not essentially different from those that are admitted, or to have been founded on false or hypothetical distinctions.

There is no great advantage in extending the arrangement into systematic subdivisions of the classes. The substances under each may follow each other according to their natural affinities, their chemical relations, or analogies in medicinal power less important than those which form the basis of the class itself; and in the different classes one of these methods will frequently be found better adapted to any purpose of utility than the others. That which gives the most natural arrangement may therefore always be followed.

FIRST DIVISION.—OF GENERAL STIMULANTS.

THIS division, according to the preceding table of classification, includes the four classes of Narcotics, Antispasmodics, Tonics, and Astringents,—these agreeing in the general stimulant operation they exert on the system, and differing principally in the diffusibility and permanence of action. They are therefore strictly connected, at least so far as to form a series through which the transition is easily traced.

CHAP. III.

NARCOTICA—NARCOTICS.

NARCOTICS, according to the definition that has usually been given of them, are substances which diminish the actions and powers of the system, without occasioning any sensible evacuation. This definition is imperfect, in as much as it does not include that stimulant operation which they equally produce, and which in part at least must be admitted as the cause of these effects. The term Narcotic is the most unexceptionable that can be assigned to these remedies. They are also named Sedatives, from their power of diminishing action; Anodynes, from their capability of alleviating pain; and Hypnotics, or Soporifics, from their power of inducing sleep.

The following are the general effects from their operation. In a moderate dose they increase the force and frequency of the pulse, promote the secretions, give vigour to the body, and rouse the faculties of the mind, rendering its conceptions more vivid and forcible, and inducing hilarity or intoxication. These effects are however only temporary, and after some time symptoms of an opposite kind make their appearance; the pulse not only returns to its former standard, but becomes more slow, and at the same time full and soft; the respiration is more easy; the secretions, excepting that by the skin, are diminished; pain and inordinate motion, if present, are alleviated or depressed: there is a general languor, averseness to motion, and dulness of sense: the mind is placid and inactive; and this state generally soon terminates in sleep. This, after continuing for some time, is followed by temporary debility, marked by some degree of sickness, tremors, anxiety, and oppression. If the dose has been large, these symptoms of diminished sense and action are induced, even without any previous increased action; or, if a still larger dose has been given, the immediate consequences are delirium, paralysis, convulsions, coma, and death.

These effects are considerably diversified, as arising from different Narcotics. In some, any stimulant operation is scarcely perceptible, even in a very moderate dose; others, with the narcotic power, possess an acrid quality; and in a large dose, with the general effects above enumerated, induce irritation or inflammation of the stomach, by which their action is modified. Some are more apt to induce sickness than others: and there is reason to believe that there are others in which the action is not equal upon the nervous and vascular systems, but is more determined to the one than to the other.

The medicines belonging to this class evidently act primarily upon the stomach, whence their action is propagated by nervous communication to the rest of the system. That they do not act by being received into the blood, is evident from the fact, that their effects are apparent in general in a very short time after they have been swallowed; and it has been found on dissection immediately after these effects have appeared, that the whole of the quantity administered has remained in the stomach undissolved.

Applied externally, these medicines often exert their usual action, though with much less force. Opium deadens pain, and represses spasmodic muscular action, and this not only in the part to which it is immediately applied, but in others more distant. Several others of the class have similar effects; and their operation in this mode of application, too, seems to be extended by the medium of the nerves.

Narcotics applied to the muscles of animals, quicken at first their action; but in a very short time they exhaust all irritability and sensibility. The heart even of cold-blooded animals is deprived of all power of motion by the application of a strong solution of opium for a few minutes. When injected into the blood-vessels, the animal instantly dies without convulsions, and all the muscles of the body, voluntary or involuntary, are deprived of the power of contraction. When applied to an wound, they often affect the general system, and in this case they appear to act, by being received through the divided veins into the circulation; the interposition of a ligature on the blood-vessels preventing the effect.

In the production of the effects arising from the action of Narcotics, the brain seems to be the organ chiefly affected, and it is in a great measure from this affection that death seems to follow from their operation, the direct action on the heart being much less considerable. This has recently been more clearly established by the experiments of Mr Brodie. On injecting alkohol into the stomach of a small animal, or introducing a small quantity of the juice of aconite, or of the essential oil of the bitter almond diffused in water, or of the leaves of tobacco, into the rectum, or in a concentrated state into an wound, the entire loss of voluntary motion, and total insensibility were produced; yet even when this state was allowed to continue until all the external signs of apparent death were produced, the heart, when exposed to view, was found contracting with considerable force, and by inflating the lungs and producing artificial respiration, its action could be kept up nearly to the natural standard for a considerable period. It appears, therefore, that while the nervous system was so much affected, the powers of the circulating system were little impaired; and the cessation of the circulation ultimately producing death, farther appears in such cases to arise principally from the respiration being affected, and at length ceasing in consequence of this function being so much more dependent on the influence of the nerves. The immediate effects of narcotics arise, therefore, from affection of the functions of the brain; the function of respiration is affected in consequence of this, and at length ceases, and this occasions, or at least accelerates, the failure of the circulation, which produces death. From this an important conclusion follows. In the case of insensibility produced by the operation of a narcotic, as the heart continues to act, it is possible, that if the cessation of its action be prevented by keeping up respiration artificially, the affection of the brain may gradually pass off, and the functions of life be restored. A striking experiment in illustration of this, is stated by Mr Brodie, in which the state of total insensibility was induced in a rabbit by a drop of the essential oil of almond inserted into an wound; after five minutes respiration had ceased, but the heart was still felt beating through the ribs:

its motion must, however, have soon ceased, and of course life have been extinguished: artificial respiration was excited, in six minutes the animal moved and made an effort to breathe; these efforts were repeated, after sixteen minutes the artificial respiration was discontinued, spontaneous respiration being established; all the functions revived, and in two hours the animal appeared to be perfectly well. In another case the animal recovered from a state of insensibility, after artificial respiration had been excited for nearly three hours. From these facts, the preventing the failure of respiration, and the exciting it if necessary artificially, at the same time keeping up the proper animal temperature, would appear to be important indications in the extreme state of exhaustion occasioned by the operation of a narcotic.

There are some narcotics which appear to operate with more force on the muscular fibre, and which directly affect the heart. The infusion of tobacco injected into the intestines occasions immediate loss of motion and sensibility, and the heart, instead of continuing to contract, was found by Mr Brodie to have ceased contracting, and to be distended with blood. The poison of the *upas antiar* has a similar effect: but what is singular, the distilled oil of tobacco does not act like the infusion, but like other narcotics.

The theory of the operation of narcotics is attended with considerable difficulty, and very different opinions have been maintained with regard to it.

As they in general diminish the actions of the system, when given even in a small dose, it happened, that from their exhibition this effect was in general most obvious, and their stimulant operation was more rarely observed. Hence their primary action was generally considered as of a depressing kind, and they were described by authors under the appellation of Sedatives. The stimulant effects which were also observed to arise from their action, were ascribed to what was termed the re-action of the system. It was supposed, that there belongs to the animal frame a power, the tendency of which is to resist and obviate the effects of any thing noxious. If such an agent were applied, this principle was believed to be roused into action, and all the powers of the system were excited to throw off the noxious application. On this hypothesis, the action of narcotics was attempted to be explained by Cullen. Their natural tendency was supposed to be to depress the powers of life; if given in a large dose, this was exerted with effect, and hence the symptoms of exhaustion; but, if given in a smaller dose, the vis medicatrix, or preserving power, was enabled to resist, and by its resistance occasioned the symptoms of increased action that first appeared. These substances, therefore, were considered as directly sedative, and as indirectly stimulant.

Precisely the reverse of this view was advanced by Brown, narcotics being regarded as stimulants, surpassing all others in the diffusibility and little durability of their action, and on this principle their effects were explained in the following manner.

It is the necessary effect of stimulant operation, to produce for a time increased action; but as this is attended with a diminution of vital power, the excitement soon ceases, and diminished action succeeds. These effects are proportional, partly to the absolute force of the exciting power, and partly to the rapidity with which it operates. If sufficiently strong, and if, at the same time, it be diffusible and transient in its operation, the excitement it produces is quickly raised to its highest point, and is as quickly followed by proportional languor and diminished action. Or if the dose is large, the stimulant effect is so rapid as to be hardly perceptible, and hence the sedative or depressing effects only appear. Thus narcotics were regarded as powerful stimulants, the operation of which is not confined to the part to which they are applied, but is rapidly extended over the system. In a moderate dose, they promote action of every kind, which is succeeded by a degree of languor or debility, proportioned to the excitement that had been raised; and in a large dose, they produce diminution of power, and consequently of action, without any symptom of previous excitement. Hence they were regarded as directly stimulant, and indirectly sedative.

If, in investigating this subject, we merely contrast these two theories, little doubt can remain of the superiority of the latter. The former is founded on a hypothesis established by no evidence, that a power presides over the system, ready to resist every noxious application; the latter is apparently more strictly deduced from the properties of the substances whose operation is to be explained: for, as it is proved, and indeed admitted, that the stimulant operation resulting from the exhibition of narcotics follows immediately, and previous to any symptoms of languor and debility, these ought strictly to be considered as the consequences of the former. The most extensive analogy too has been traced between the operation of narcotics, and other substances allowed to be stimulant, but which are less rapid in their action; as, for example, between ardent spirit and opium, though in the one the stimulant, in the other the sedative operation is usually more apparent. And, lastly, the advantage derived from the cautious administration of narcotics in some diseases of diminished action, is scarcely compatible with the supposition of their exerting a direct depressing power.

The principal difficulty attending the theory, arises from the fact apparently established, that the sedative power of these substances is not always proportional to their stimulant operation, but is greater than this, and in several of them indeed any previous stimulant effect is even scarcely perceptible. Yet this difficulty is in some measure obviated by the fact, that substances, the stimulating action of which is unquestionable, as ardent spirit, if given in a very large dose, produce depression without any previous perceptible increased action. In like manner, electricity, applied in moderate quantity, stimulates the muscular fibre to contraction; while, applied in a highly concentrated state, it instantaneously produces total exhaustion of the contractile power. The more forcibly, therefore, a stimulant operates, the more rapid does the immediate action appear to be produced, and the more quickly to cease, so as to be followed by the secondary effect; and with the admission of this principle, may perhaps be explained, on this hypothesis, the fact, that the sedative effects of narcotics appear often to be greater than their previous stimulating operation; the exhaustion following so rapidly, that any previous excitement is scarcely to be perceived. Narcotics, therefore, so far as we can speculate with any probability on their action, may be regarded as general diffusible stimulants.

The hypothesis may also, however, be maintained perhaps, that along with their stimulating operation, they *directly* exhaust the powers of life; and that these two modes of action are not strictly proportional, but are different in different narcotics. The effects of certain chemical agents on the system, as of nitrous oxide, and carburetted hydrogen, favour an hypothesis of this kind; the one producing high excitement without any proportional depression, the other producing exhaustion of power without any previous increased action. The truth, however, is, that from our imperfect knowledge of the laws of the living system, all such speculations are deficient in precision; nor can we do more than state the most general analogies, without attempting to extend them to any very minute applications. Thus, in all the theories which have been advanced with regard to the operation of narcotics, the conclusions have been drawn from the action of a few of the most powerful,—alkohol or opium. They are, after all, imperfectly adapted to these, and are still more deficient when considered in relation to the others.

As narcotics are capable of being administered, so as to obtain from their action either stimulant or sedative effects, it is obvious, that they may be employed as remedies, with the view of producing either of these. The exciting operation, however, is in general so transient, that few of them can be administered with advantage as stimulants. When given with this intention, they are applied in small doses, frequently repeated, as thus the state of excitement is best sustained. More usually they are given with the view of obtaining that state of diminished action and susceptibility to impression, which is the more common and more easily regulated consequence of their operation; they are then given in larger doses at more distant intervals. As stimulants, they are sometimes employed in various forms of continued fever, remittent and intermittent fever, and numerous diseases of debility. As sedatives, they are still more extensively used to alleviate or remove spasmodic action, to allay pain and irritation, to induce sleep, and to restrain morbidly increased evacuations and secretions.

There is a peculiarity in the operation of narcotics, that by repetition their action on the system is diminished more than that of any other class of medicines, so that, after having been used for some time, they require to be given in increased doses to produce their usual effects, and quantities of them have at length been taken, which at first would have destroyed life. No very satisfactory explanation has been given of this, for it is not connected with any proportional reduction of irritability, or any apparent permanent change in the system; but the fact is generally true with respect to these medicines, and requires to be attended to in their administration. It appears too to be more peculiarly the case with some than with others. It is remarkably so, for example, with opium, with tobacco, or with hemlock, while it is scarcely to be observed with regard to foxglove.

The individual narcotics may be arranged partly according to their chemical relations, and partly according to analogies in power.

NARCOTICS.

ALKOHOL.
ETHER.
CAMPHOR.
PAPAVER SOMNIFERUM.
HYOSCYAMUS NIGER.
ATROPA BELLADONA.
ACONITUM NAPELLUS.
CONIUM MACULATUM.
DIGITALIS PURPUREA.
NICOTIANA TABACUM.
LACTUCA VIROSA.
DATURA STRAMONIUM.
RHODODENDRON CHRYSANTHUM.
RHUS TOXICODENDRON.
ARNICA MONTANA.
HUMULUS LUPULUS.
STRYCHNOS NUX VOMICA.
PRUNUS LAURO-CERASUS.

ALKOHOL. Alkohol. *Ardent Spirit. Spirit of Wine.*

By the process of vinous fermentation, liquors are formed from certain vegetable juices, or infusions, possessed of pungency, spiritous flavour, and intoxicating power. From these liquors a product is obtained by the process of distillation, which, in the diluted state in which it is at first procured, forms the spiritous liquors of commerce. By repeated distillations, it is procured more pure and concentrated, and then forms what was named Pure Ardent Spirit, or Spirit of Wine by the older chemists,—names for which that of Alkohol is substituted in modern chemical language. This substance operates on the living system as a highly diffusible stimulant; in the state of spiritous and vinous liquors, it is employed for medicinal purposes; and in its pure form is an important pharmaceutic agent.

Alkohol is formed during the process of fermentation; and from the changes which occur during that process, we endeavour to infer the theory of its formation. Saccharine matter, in the state in which it exists in sweet vegetable juices, and fecula, which has been converted by malting into sugar, or even fecula to a certain extent unmalted, are the substances chiefly susceptible of this process: the access of the air is not necessary to it; and the water of the fermenting liquor does not appear to suffer decomposition. The series of changes, whence the alkohol is formed, must arise therefore from the reaction of the elements of the vegetable matter, and the new combinations which are established. These elements are carbon, hydrogen, and oxygen; during the fermentation, carbonic acid is formed and disengaged: this must be derived from the combination of portions of the oxygen and carbon of the saccharine matter, (or of the fecula, which is of similar composition); and the alkohol, which is the only other product of the process, may, under this point of view, be considered as a compound of the remaining elements; in other words, of the hydrogen of the sugar with its remaining carbon and oxygen. This is the theory of the vinous fermentation, and of the composition of alkohol inferred by Lavoisier, from experiments undertaken with the view of investigating this subject.

More recent researches, however, have shewn that it is imperfect. Lavoisier had supposed that pure saccharine matter alone is capable of fermenting, and that the whole changes which occur during the process are changes in its composition. But this is not strictly true. To excite fermentation in a solution of pure sugar, a certain quantity of what is named Ferment, of which yeast is a variety, is necessary, and sweet vegetable juices suffer it only from naturally containing this ferment. The agency of this substance remains to be explained, and this has not yet been done in a satisfactory manner. It appears to approach to gluten or albumen in its nature, and in particular contains nitrogen in its composition. This nitrogen, it is shewn by the experiments of Thenard, disappears during the fermentation, and he has supposed that it enters into the composition of the alkohol, while a portion too of the carbon of the ferment combines with part of the oxygen of the sugar, and contributes to form the carbonic acid disengaged. The whole of this subject, however, requires farther elucidation.

From the analysis of alkohol, it appears to be a compound of carbon, hydrogen, and oxygen; hence, in burning, it affords merely water and carbonic acid, and the quantity of water produced exceeds even the alkohol in weight. Lavoisier inferred, that it consists of 28.5 of carbon, 7.8 of hydrogen, and 63.5 of water, without any conclusive proof, however, that this large quantity of water exists in it fully formed, and not in part at least in the state of its elements.

Saussure, in decomposing alkohol, by detonating the vapour of it with oxygen gas, or by passing it through an ignited tube, discovered a little nitrogen in its composition, and has given the following as the proportions of its elements: carbon 43.65, oxygen 37.85, hydrogen 14.94, nitrogen 3.52. But with regard to the results of this analysis, it remains altogether uncertain, what proportions of oxygen and hydrogen exist in the composition of the alkohol as immediate principles, and what exist in it in the state of water.

The process for obtaining alkohol, consists in submitting vinous or fermented liquors to distillation. It distils over with a quantity of water, and in this manner are formed the spiritous liquors of commerce, these deriving peculiar flavour from the substances from which the fermented liquor has been prepared. These spiritous liquors, by repeated distillations, afford alkohol in a more concentrated state, different substances being added to facilitate the concentration and rectification. The process belongs to the pharmaceutical part of the work.

It had usually been supposed, that the alkohol obtained by distillation from fermented liquors, pre-exists in them. The opposite opinion, that it is formed during the distillation, was advanced by Fabroni, principally from his finding that no portion of alkohol can be detected in wine previous to distillation, by dissolving potash in it to saturation, though by this method a small quantity of alkohol added to the wine is, according to his experiments, easily separated, and floats on the solution. This result always appeared improbable, and Mr Brande, on repeating Fabroni's experiments, found them incorrect. He afterwards succeeded in obtaining spirit from wine without distillation, by first precipitating the extractive and colouring matter by acetate of lead, and then adding subcarbonate of potash in large quantity, which combines with the water and separates the spirit. It is singular, however, that the intoxicating power of wine is not equal to what might be expected from the portion of spirit it yields by distillation. Brandy, for example, according to Brande's experiment, affords about 53 *per cent.* of alkohol, while Port Wine yields from 21 to 25 *per cent.* Yet the spiritous strength of the latter, estimated by its action on the living system, is certainly not equal to one half that of the former. If the whole of the alkohol, therefore, obtained from wine by distillation, pre-exist in it, its powers must be materially modified by the other principles with which it is combined.

Pure alkohol is colourless and transparent; its odour is fragrant, and its taste highly pungent; it is lighter than water, the difference being greater as the alkohol is more pure and concentrated, and hence the specific gravity is the best test of its strength. As prepared by the usual processes, it is of the specific gravity .835, and it is of this strength that it is ordered in the Pharmacopœias, as fit for pharmaceutical purposes. By careful rectification, however, it may be brought to .815, and even to .800; and still, when of this degree of concentration, we have no method of discovering what quantity of water is contained in it: hence, we do not know what constitutes real alkohol. When of the common strength, it is so volatile as to evaporate speedily at the common temperature of the atmosphere; it boils at 165° of Fahrenheit. It is highly inflammable, burning when in contact with the air, when its temperature is raised not much above 300°; the products of its combustion are water and carbonic acid.

Alkohol exerts chemical affinities to a number of substances. With water it combines in every proportion. It dissolves a number of saline substances, especially the pure alkalis, and several neutral salts. It likewise dissolves sulphur and phosphorus; and is the solvent of a number of the vegetable proximate principles, such as resin, camphor, essential oil, balsam, extract, and saccharine matter.

From this solvent power, alkohol is a very important pharmaceutic agent, particularly as applied to the vegetable articles of the Materia Medica; the principles which it dissolves being those in which medicinal powers frequently reside, and being dissolved by it in such quantity as to afford very active preparations. It has another important property, that of counteracting the spontaneous changes to which vegetables are liable from the reaction of their elements; and hence these solutions or tinctures retain their properties unimpaired. When diluted with an equal weight of water, it still exerts its solvent power to a certain extent, added to the solvent power of the water; and this diluted alkohol, or Proof Spirit, as it is named, the standard specific gravity of which is .935, is even more generally employed in pharmacy as a solvent of vegetable matter, than alkohol in its pure form.

Alkohol is a powerful and highly diffusible stimulant. Taken in a moderate quantity, it almost immediately increases the force of the circulation, communicates a greater degree of muscular vigour, and excites exhilaration of mind: these gradually subside, and are followed by proportional languor. If the quantity is more considerable, its exciting effects are more quickly produced, and are followed by intoxication, temporary delirium, and stupor: and in a large dose it occasions death, with scarcely any symptom of previous excitement. Its analogy in producing these effects to other narcotics is sufficiently obvious. Its exciting power, however, appears to be rather more permanent than that of some of the medicines of this class; and hence, while it can be successfully employed to rouse the powers of the system, it can scarcely be used with equal advantage to repress irregular action, diminish irritation, or induce sleep.

Alkohol, in its pure state, can scarcely be said to be employed in medicine. Sometimes it is used as an application to burns, and to certain states of local inflammation not connected with increased action; it is applied by friction to relieve muscular pains; or to bleeding wounds to restrain hæmorrhage.

Spiritous liquors, which consist merely of diluted alkohol, are employed as general stimulants to excite the actions of the system. Their stimulant operation, however, is not sufficiently permanent or capable of being regulated, so as to avoid the injurious consequences they are liable to produce, to admit of their being employed, except as occasional remedies.

The action of Wine on the system, though analogous to that of alkohol, is not precisely alike; its stimulant operation appears to be less sudden and more durable; and hence it can be employed with more advantage as a tonic. It is as a tonic indeed, rather than as a narcotic, that wine is administered. Its chief medicinal application is in the treatment of fevers of the typhoid type, to support the strength of the system, and to obviate symptoms arising from debility. With these views, it is given with more advantage than any other tonic,—a superiority derived from its stimulating power being obtained with more certainty, and being more easily regulated, from its being more grateful, and probably not requiring to be assimilated by the digestive organs to produce its effects. The quantity in which it is given is dependent on the state of disease; the object to be attained is that of supporting the strength of the system until the disease has run its course; the danger to be avoided is that of giving it so largely, as to occasion any degree of exhaustion. Its administration is regulated, therefore, by the effects it produces; advantage being always derived from it, when it renders the pulse more slow and firm; when the recurrence of delirium is prevented; when irritation is lessened, and sleep induced. If the pulse is quickened, and the countenance becomes flushed; if it excite thirst, increase the heat of the body, and occasion restlessness or delirium, it is obviously injurious; aad the dose must either be diminished, or its use altogether suspended. In general its operation is less powerful than it is on the system in a state of health; larger quantities therefore can be taken, and are even required, to produce any exciting effect.

In various diseases of chronic weakness, or where the strength of the system has been reduced by profuse evacuations, or by any other debilitating operation, wine is in common use as a cordial and tonic.

Different wines have effects somewhat different, according as they are possessed of astringency, or as they are sweet or acescent; and are hence adapted to answer different indications.

The wines prepared from other fruits than the grape, are less spiritous and more acescent, and are hence inferior in tonic power. Fermented liquors, especially porter, are sometimes substituted for wine, where this is necessary from idiosyncracy, and their powers are somewhat modified by their other qualities, particularly by their bitterness, and by the pungency arising from their excess of carbonic acid. Their narcotic power too is often greater than is proportioned to their vinous strength, owing to the addition of narcotic substances which they often receive in their preparation.

From the immoderate and long continued use of vinous and spiritous liquors, many diseases derive their origin; as dyspepsia, hypochondriasis, visceral obstructions, chronic inflammation of the liver, and gout,—morbid states probably arising either from the increased action it excites, giving rise to organic derangement, or from the exhaustion of power, general or local, produced by stimulant operation unnecessarily excited or too long continued. In an excessive dose, spiritous liquors produce a state of coma or apoplexy, which has sometimes a fatal termination. Evacuation of the stomach by a principal emetic, is the remedy obviously indicated, and from what has been stated under the general account of the operation of narcotics, (page 118.), the propriety of sustaining respiration by artificial inflation of the lungs, if necessary, is equally obvious.

Æther Sulphuricus. *Sulphuric Ether.*

Alkohol suffers decomposition from the action of the more powerful acids upon it; and substances are formed by these decompositions which have a resemblance in their general properties, though, as produced by the action of the different acids, they have also peculiar powers. They are denominated Ethers. Sulphuric ether, formed by the action of sulphuric acid on alkohol, is the one that has been chiefly applied to any medicinal purpose; and its powers are those of a narcotic. Nitric ether, in the state in which it has been used, dilute, and with a portion of free acid, forming the spirit of Nitrous ether, or Dulcified Spirit of Nitre, acts principally as a diuretic, and is therefore placed under that class. The other ethers are of more difficult preparation, and have scarcely been introduced into the Materia Medica.

Sulphuric ether is obtained by exposing a mixture of sulphuric acid and alkohol in equal weights, to a heat sufficient to produce ebullition; the ether is the product of the action of the acid on the alkohol; it distils over, and is purified by a second distillation, any free acid being abstracted by an alkali. The process is considered more fully in the pharmaceutical part of the work. A diluted preparation is ordered in the pharmacopœias, in which the rectified ether is mixed with two parts of alkohol; and in the London Pharmacopœia there is another preparation, in which a product that is obtained at the end of the distillation, of an oily appearance, etherial oil as it is named, is added to this diluted ether: neither of these preparations is of any importance.

Sulphuric ether is colourless and transparent, highly odorous and pungent, and of a specific gravity inferior even to that of alkohol, being, when highly rectified, not more than .730, compared with the standard specific gravity of water. It is very volatile, so as to evaporate speedily at natural temperatures; and from its rapid transition to vapour, it produces much cold during its evaporation. In vacuo it boils below the freezing point of water, and under the atmospheric pressure it boils at 98°. It is also highly inflammable, and affords by its combustion water and carbonic acid. It differs from alkohol, principally in containing a larger proportion of hydrogen, and to this its greater levity and volatility are probably owing. The proportions of its elements, as assigned by Saussure, are carbon 59, oxygen 19, hydrogen 22.

Sulphuric ether is a powerful diffusible stimulant, somewhat analogous to alkohol in its action, and, like it, capable of producing intoxication. Its stimulant operation appears to be even more suddenly exerted, and to be less durable: hence its superiority as a narcotic and antispasmodic. As a stimulant, it is sometimes given in occasional doses in typhus fever, more particularly in those cases where symptoms are present, connected with spasmodic action; it is also given in other forms of fever to obviate nausea; and it is said to be useful in abating the violence of sea-sickness. As an antispasmodic, it is employed in spasmodic asthma, and sometimes affords sudden and complete relief, producing for a time at least remission of the paroxysm: it is also given with advantage in the hysteric paroxysm: it is one of the most powerful remedies in cramp of the stomach, and singultus; and it sometimes relieves some of the symptoms of cholera, especially the vomiting. Its usual dose is a tea spoonful, equal to about a drachm; but its beneficial effects are frequently not obtained, unless it be given in a larger dose, or until the dose has been repeated at short intervals. In dyspnœa and cattarh, its vapour inhaled into the lungs affords relief, probably from its antispasmodic power. Externally applied, it relieves muscular pains; it is an excellent application to burns; and from the degree of cold which attends its evaporation, it has been employed to favour the reduction of strangulated hernia, being dropt on the tumor, and allowed to evaporate freely.

CAMPHORA. Camphor. Laurus Camphora, Lin. *Cl. Enneandria. Ord. Monogynia. Nat. Ord. Oleraceæ. Habitat, Japan, India.*

CAMPHOR is not the produce exclusively of one vegetable, but is contained in many plants, especially those of the aromatic kind, diffused through their wood or bark, and is often deposited from their essential oils when these are long kept. The oils of peppermint, thyme, sage, and a number of others, thus afford it. For the purposes of commerce, it is obtained from a species of laurel, the Laurus Camphora, a native of Japan and Sumatra. It exists in grains in the wood of the root and branches of this tree. It is extracted by sublimation; the wood is exposed to heat with a quantity of water, and the temperature thus communicated is sufficient to volatilize the camphor; in Europe, it is purified by a second sublimation, with the addition of one-twentieth of its weight of lime.

Camphor is colourless, semi-transparent, tenacious, and somewhat unctuous to the touch; its smell is strong and fragrant; its taste pungent and bitter. It is volatile at natural temperatures, and soon diminishes in bulk from exposure to the air; it melts at a heat a little superior to 212°; is highly inflammable; it is very sparingly soluble in water, but is entirely soluble in alkohol, ether, and oils essential or expressed. The alkalis do not act upon it. The weaker acids dissolve it, and the more powerful acids decompose it. These properties are sufficient to distinguish it from the other proximate principles of vegetables. It approaches nearest in its characters to essential oil, and appears to differ from oil in chemical composition, principally in containing a larger proportion of carbon. Hence, when its volatilization is prevented, and it is subjected to a temperature so high as to decompose it, as may be done by exposing it in mixture with pure clay to a heat suddenly raised, it affords a liquid, having all the properties of an essential oil, odorous and pungent. There remains a considerable proportion of charcoal; carbonic acid, and carburetted hydrogen gases are disengaged, and an acid liquid is obtained, named camphoric acid. This acid, which is also formed from camphor by combustion, and by the action of nitric acid, has some resemblance to benzoic acid.

In a moderate dose, camphor produces effects similar to those of other narcotics. Its stimulant operation, however, is not considerable; and in a large dose it diminishes the force of the circulation, induces sleep, and sometimes causes delirium, vertigo, convulsions, or coma.

As a stimulant, camphor has been used in typhus, cymanche maligna, confluent small-pox, and other febrile affections accompanied with debility; in retrocedent gout, and to check the progress of gangrene; but its stimulant operation is scarcely sufficiently permanent to admit of being easily regulated. As a sedative, it is used in affections of an opposite nature, as in pneumonia, rheumatism, and gonorrhœa, combined with nitre or antimonials, or by itself, where evacuations have been previously employed, though in these cases also it is little employed in modern practice. In mania, it has sometimes succeeded as an anodyne: as an antispasmodic, it has been used in asthma, chorea, and epilepsy.

The dose of camphor is from 5 to 20 grains, but it is seldom that it is given at once in so large a dose as the latter quantity, from being liable to produce nausea and irritation. In small doses, on the other hand, it produces little effect; unless they are frequently repeated. In divided doses, it may be given to the extent of a drachm or more in the day. Its power of checking the progress of gangrene has been supposed to be augmented by combination with musk, or carbonate of ammonia: combined with opium, it forms a powerful diaphoretic; and its efficacy in inflammatory diseases is promoted by antimonials.

Camphor ought to be given in a state of mixture in some liquid form, as in the solid state it is liable to excite nausea. It may be diffused in water by trituration with sugar, mucilage, or almonds. The camphorated mixture of the London Pharmacopœia, in which camphor is triturated with water, and strained, is a preparation which, from the sparing solubility of camphor in water, can have scarcely any power. In the pharmaceutic treatment of camphor, it is necessary, in order to reduce it to powder, to add a few drops of alkohol during the trituration. Magnesia, by being triturated with it, has the effect of dividing and rendering it smooth, and may be used for its suspension in water; a number of the gum-resins also act on it in such a manner, that, from their mixture, a soft uniform mass is formed, and this affords another mode of diffusing it. From this chemical action, it cannot well be combined with gum-resins in the solid form.

Externally applied, camphor is used as an anodyne in rheumatism and muscular pains, and as a discutient in bruises and inflammatory affections; it is dissolved in alkohol or expressed oil, and applied by friction to the part. Added to collyria, or mixed with lard, it is of advantage in ophthalmia. Suspended in oil, it is used as an injection in ardor urinæ, and as an enema to relieve the uneasy sensations occasioned by ascarides. The combination of it with opium is useful as a local application in toothach.

OFFICINAL PREPARATIONS.—Acid. Acetos. Camph. Emuls. Camph. Ol. Camph. Tinct. Camph. *Ed.*—Mist. Camph. Lin. Camph. Lin. Camph. Comp. Tinct. Camph. Comp. *Lond.* *

PAPAVER SOMNIFERUM. White Poppy. *Polyand. Monogyn. Rhæades. Capsula et Succus spissatus. Europe, Asia.*

THE White Poppy is a native of the warmer regions of Europe and Asia; it also grows in colder climates without any diminution of its powers. The large capsule which it

* In annexing a list of the officinal preparations of each article to its history, I place first those of the Edinburgh Pharmacopœia, and, without extending it unnecessarily, by inserting the names of the corresponding preparations of the London and Dublin Pharmacopœias, add those peculiar to either of the latter.

bears, affords, by incision in its cortical part, a milky juice, which, by exposure to the sun and air, becomes concrete, and of a brown colour. This is named Opium, and is the product of the plant that is chiefly medicinally employed. The leaves and stalks afford by expression a juice inferior in narcotic power; the seeds contained in the capsule, are bland and inert. Opium, though it has been obtained in this country of full narcotic power, is usually prepared in Syria and India. When the capsule has nearly attained maturity, a longitudinal incision is made in its side, care being taken that it does not penetrate into the cavity. This is done in the evening; the milky narcotic juice exudes apparently from the vessels of the bark of the capsule; it adheres to the sides of the incision, is collected in the morning; and a large quantity being procured from a field of poppies, it is inspissated by exposure to the sun.

The opium of commerce is in flat or rounded masses, which when cut present a substance soft and tenacious, of a dark reddish-brown colour, having a strong odour somewhat fœtid, and a taste bitter and acrid. If kept in a dry place it becomes hard, but it retains its brown colour, and its fracture presents a resinous appearance. It also softens when pressed in the hand. These are the properties of what are named Turkey Opium, the kind usually met with in the shops. If hard, brittle, and of a grey colour with black spots, it is of inferior quality. What is sold by the name of East India Opium, is soft, of a blackish colour, has a fainter smell, and is much inferior in narcotic power.

Though opium has been often submitted to analysis, its proximate principles are still imperfectly determined. It is highly inflammable; submitted to the action of alkohol, a considerable portion of it is dissolved; and water likewise dissolves it in part. The solution in alkohol is much more highly impregnated with dissolved matter than that in water; and it possesses, in a much higher degree, the narcotic power. Diluted alkohol, composed of equal parts of alkohol and water, appears to dissolve all the active matter of opium; the tincture prepared by this menstruum, when the due proportion of solvent is employed, being equal, or very nearly so, in power, to the quantity of opium submitted to its action. After the joint action of alkohol and water, there remains, mixed with the accidental impurities, a substance plastic and glutinous, the nature of which has not been ascertained; Bucholz considering it as similar to caoutchouc, and Gren supposing it analogous to gluten; it retains no activity; its proportion is about one part from twelve of Turkey opium; it is not present in India opium. By boiling in water under exposure to the air, the narcotic power of opium is impaired; this can scarcely be ascribed, however, to the dissipation of any active volatile principle; for when water is distilled from it, and condensed, it is found to have scarcely any narcotic quality: it must therefore be owing to changes produced at this temperature in the principles in which the activity of the opium resides. The distilled water from opium is slightly milky, and has its odour, and in part its taste; a thin film collects on its surface, but no sensible portion of oil is obtained.

From these facts it is not easy to draw any precise conclusion with regard to the nature of the active matter of opium. As it is partly soluble both in water and in alkohol, and appears to suffer decomposition when boiled in water under exposure to the air, it might be concluded to be of the nature of extractive matter. On the contrary, being inflammable, and more soluble in alkohol than in water, it approaches in its characters to resin; yet it is not purely resinous, for its solution in pure alkohol is but slightly decomposed by water.

The quantity of this principle more peculiarly soluble in alkohol, and in which the powers of opium chiefly reside, appears to amount to about five parts in twelve. The quantity of matter soluble in water is, according to Crumpe, in nearly the same proportion. It is not precipitated by alkohol, and its nature is not well known. The slight narcotic power it possesses, is probably derived from a portion of the other matter adhering to it. The analysis of opium, in common with that of many of the other articles of the Materia Medica, affords sufficient proof of our very imperfect knowledge of the constituent proximate principles of vegetable matter.

It has been stated by Dérosne, that a peculiar principle exists in opium, in which its narcotic quality resides. It is obtained by digesting water on opium, and evaporating the solution; a matter which precipitates during the evaporation, and which consists of this principle with a portion of resin and extract, is to be digested with alkohol; the resin and this principle are dissolved; and as the solution cools, the latter separates in crystalline grains, which may be purified by solution and crystallization; it is described as being in prisms, white, insipid and inodorous; insoluble in cold water, very sparingly soluble in hot water, but dissolved by alkohol, ether, and by the acids and alkalis, and possessed of narcotic power. The nature of this substance is not well determined, but it cannot be regarded as the narcotic principle of opium, since its power, though it exists in small proportion only to the other principles, does not appear to have much exceeded that of opium itself. Mr Thomson states, in his London Dispensatory, that in repeating Dérosne's experiments, he had obtained a much larger proportion of crystals of this salt from the East Indian, than from the Turkey opium.

The facts ascertained with regard to the action of the usual re-agents upon opium, are of importance, as pointing out its proper pharmaceutic treatment. Diluted alkohol dissolving all its active matter, is the menstruum best adapted to its preparation under the form of tincture. Water dissolving it less perfectly, can scarcely be employed with advantage. Vinegar dissolves its active matter, but has been found to impair its narcotic power, probably by causing in it some chemical change. Wine, though it dissolves sufficiently its active principles, being liable to pass to the state of vinegar, is an improper menstruum. Any purification of opium, by dissolving it, and evaporating the solution, only weakens its strength, and renders it uncertain; and hence this process is now discarded from the Pharmacopœias, or at least is retained only in that of the Dublin College.

The effects of opium on the system, are those of a very powerful narcotic. When given in a moderate dose, as that of one grain, to a person unaccustomed to its use, the pulse is soon sensibly increased in frequency, fulness and force; if the dose is rather larger, this is accompanied with some degree of exhilaration, the different functions both of body and mind are performed with more vigour, and this state may rise even to intoxication and delirium. These effects, however, are transient; the pulse returns to its former standard, and it continues to fall both in frequency and force, but usually remains soft and full; a degree of lassitude and drowsiness is produced, sensibility to external impressions is impaired, so that pain, if present, is less severely felt, and after some time sleep is induced; or if this does not happen, a state of languor and calmness comes on, and continues usually for some hours; the skin is warm and moist, the secretions are diminished, and there is generally some thirst. This stage of the operation is usually succeeded by more or less nausea or headach, and sometimes by tremors of the voluntary muscles; the peristaltic motion of the intestines is diminished, so that costiveness follows; the appetite and digestion are also impaired. The exciting operation of opium may continue nearly an hour, the sedative effect usually six or eight hours.

From a larger dose all these effects are produced in a more marked degree. In those particularly who are accustomed to its use, the exhilarating operation from such a dose is equal to, or exceeds that from wine, as is proved by the striking effects it produces on those who indulge in it habitually to excess among Mahommedan nations, where the established religion prohibits the use of wine; in those not accustomed to it, it is less evident, probably from the system, not habituated to it, being unable to bear the necessary dose: in both, however, the state of diminished sensibility and action quickly succeeds, the dulness and languor are greater, and sleep, sometimes approaching to stupor, is induced; when this terminates, thirst, headach, and nausea are urgent, vomiting frequently occurs, with tremors and general debility. If the quantity is still larger, the consequences are delirium, stupor, flushing of the countenance, slow and stertorous breathing, an oppressed pulse, convulsions, and death.

From the topical application of opium to sensible and irritable parts, pain, increased muscular action, augmented heat, and even inflammation, are first induced, but are ultimately succeeded by a greater insensibility to impressions, and a greater difficulty of being excited to contraction by the application of other stimulants. The latter state is also immediately produced by its application in a large quantity and concentrated state to the muscular fibre.

With regard to the nature of the action of opium on the living system, opinions have been maintained diametrically opposite. It was usually considered as a sedative, or substance, the immediate operation of which is to depress the functions, and exhaust the powers of life. The theory was afterwards advanced by Brown, that its primary operation is stimulant, and that its apparent sedative effects are the consequences of the exhaustion of vital power, produced by the excess of stimulant action. The primary effects from its exhibition, so far as they can be accurately ascertained, undoubtedly lead, by the least hypothetical induction, to the latter opinion. They are those of excitement, both of the vascular and nervous systems; and the state of diminished susceptibility and action which follows, ought in strict reasoning to be considered as the effect of this, conformable to the general law of the animal œconomy, that excitement suddenly raised is followed by exhaustion of power. In its effects in a large dose, the analogy of opium to other diffusible stimulants is also sufficiently strict. And its action on the system in a diseased state, appears to prove not less clearly its stimulant operation. In typhus and other diseases of debility, its exhibition in a moderate dose produces the salutary effects resulting from the administration of wine and other powerful stimulants, while in diseases of an opposite nature, where there is increased action, it is not less prejudicial.

It is to be admitted, however, with regard to opium, that its apparent sedative effects, displayed in its lessening the sensibility to external impressions, diminishing action, and inducing sleep, are greater than are proportional to the previous excitement it raises, or to an equal or greater excitement produced by other stimulants, as by alkohol. This has been accounted for from the greater diffusibility, and less durability of its primary operation; in consequence of which, the excitement it produces is soon extended over the system, and is more quickly succeeded by the secondary state of diminished power. Whether this theory of its action be satisfactory or not, and whether it be regarded as a powerful stimulant, or as a direct sedative, it is to be observed, and the observation extends to analogous narcotics, that the practical application of it is nearly the same; since it is admitted that it may be exhibited so as to obtain from it stimulant and also depressing effects, and that the former are primary, and are obtained from it in a moderate dose, while the latter are secondary, and are only produced by a larger dose. Although, therefore, the explanation of the mode of operation be different, there is no dispute as to the operation itself, or the effects it produces.

Opium was at one time supposed to act on the system, by the medium of the blood; but experiments have sufficiently shewn, that its general effects are produced when the circulation is entirely interrupted, that its action is on the living solids, and is propagated to distant parts by nervous communication.

The principal indications which opium is capable of fulfilling, are, supporting the actions of the system, allaying pain and irritation, relieving spasmodic action, inducing sleep, and checking morbidly increased evacuations. It is differently administered, as it is designed to fulfil one or other of these indications. When given with the view of obtaining its stimulant operation, it ought to be administered in small doses, frequently repeated, and slowly increased, as by this mode the excitement it produces is best kept up. But where the design is to mitigate pain or irritation, or the symptoms arising from these, it ought to be given in a full dose, and at distant intervals, by which the state of diminished power and sensibility is most completely induced. It is principally with the latter views that it is employed in medicine; and in its usual medium dose, that of one grain to an adult, any stimulating effect from it is scarcely apparent, while its power of diminishing action, lessening sensibility, and inducing sleep, is sufficiently exerted. Nor can it, in any case, be given with much advantage as a stimulant. Its stimulant operation is even frequently prejudicial; and hence the general rule established with respect to the administration of opium, that it ought not to be given in any pure inflammatory affection, at least unless evacuations have been used, or unless means are employed to determine it to the surface, and produce diaphoresis.

In continued fever, not inflammatory, opium has been administered sometimes as a general stimulant; but its operation being less permanent than that of wine, and not so easily regulated, it is not so well adapted to obviate debility; or at least with this intention it is employed only as subsidiary to wine. It is more frequently used to diminish irritation, and lessen that state of increased susceptibility to impressions connected with debility, which frequently gives rise to restlessness, watchfulness, delirium, and spasmodic affections, particularly tremors and subsultus tendinum. A full dose is usually given at bed-time; and to obviate these symptoms when they are urgent, it is farther occasionally administered, generally in combination with wine, in the course of the day. Its exhibition is improper, or requires to be conducted with much caution, where there is any tendency to inflammatory action, or to determination to the head. It then fails in lessening irritation or procuring sleep, and rather aggravates the inflammatory state, or gives rise to local inflammation. If it increase delirium, it is obviously injurious. Dr Currie has also remarked, that it is rather injurious than otherwise, when the heat of the surface is above the natural standard, and the skin is at the same time dry. But if the skin is becoming moist, it accelerates the change, and produces its other beneficial effects. Hence it is often used with advantage after this change on the surface has been obtained by the cold infusion, or by partial fomentation: it is also often useful to delay its administration in the evening, until the febrile exacerbation at that period begins to subside, and to give it therefore at a later hour. When it is repeatedly administered, it is necessary to guard against the constipation it is liable to produce.

In intermittent fever, the administration of an opiate, previous to the expected approach of the paroxysm, renders it milder, or sometimes prevents its attack; given even during the hot stage, it lessens its violence: and administered in either mode, it facilitates the cure by other remedies, the stimulant operation of which is less transient.

In the plegmasiæ, the propriety of the employment of opium is from its stimulant operation more doubtful, and in any pure inflammatory affection, attended with highly increased vascular action, it must be hazardous. Where it is given so as to determine its action to the surface of the body, and produce sweat, it is often advantageously employed, particularly in rheumatism; or in some of the other diseases of this order, where the inflammatory stage has subsided, its exhibition is occasionally necessary to obviate symptoms connected with irritation.

In the exanthemata, opium is employed with similar intentions, and is often more peculiarly advantageous, by lessening the irritation connected with the eruption. In small-pox, it is peculiarly useful with this intention after the eruption is completed where it is copious; and if the concomitant fever be of the typhoid type, the same advantage is derived from it as in pure typhus; it is also useful in promoting the maturation of the pustules, and relieving the irritation on the surface. In measles, the state of the system being more purely inflammatory, its use is rather contraindicated.

In hæmorrhagies, not connected with a state of plethora, or of highly increased vascular action, opium is a valuable remedy, by removing that state of increased irritability whence the discharge frequently arises; it is thus employed more particularly in passive menorrhagia, and in the hæmorrhage which sometimes succeeds abortion or delivery.

In the profluviæ, opium is employed with a similar intention. In dysentery, the propriety of its administration has been questioned, but evident advantage is derived from it when it is given in such doses as to relieve the pain and irritation which prevail; the constipation it might produce being obviated by the exhibition of mild purgatives, usually employed in the treatment of the disease. The combination of it with calomel is more peculiarly useful.

In cattarh it proves of the highest utility, by obviating the irritation whence the cough arises; it requires, however, to be administered with some caution, where the disease is in its acute stage, and accompanied with an inflammatory state; it can then be given with more safety and advantage when combined with an antimonial, by which its direct stimulant action on the vascular system is obviated, and its operation is determined to the surface of the body. In phythisis it is given as a palliative and anodyne.

In spasmodic and convulsive diseases, opium is obviously indicated, and in many of them is the remedy of greatest power. In chorea, it has been advantageously employed; though the dependence of this disease on the accumulation of feculent matter in the intestines, as established by Dr Hamilton's observations, suggests the necessity of its being employed with caution, and of its constipating effect being carefully guarded against. In epilepsy, it sometimes abates the violence of the paroxysm, especially where this is liable to recur during sleep; but as this disease so often depends on change of organic structure, the effects of opium can be those only of a palliative; where plethora is present it may be hurtful. In tetanus, to produce any relief, it requires to be given in very large doses, and these must be frequently repeated; and even then the system is often little affected by it; when pushed, however, to a great extent, the violence of the spasmodic affection has at length been overcome, and a cure obtained. A similar remark applies to hydrophobia, in which very large quantities of opium have been given without any sensible effect on the state of the functions, but in some cases with ultimate success, especially when combined with calomel. In mania, the system is in general little susceptible to the action of any medicine; but opium, when given in sufficient doses, is frequently useful in diminishing irritation, and producing composure or sleep. In other cases it altogether fails, when given even in a very large dose, and sometimes it aggravates the restlessness and agitation of the patient; and when a plethoric or inflammatory state exists, its use must be hazardous. In the hysteric paroxysm, opium is often employed with advantage, either introduced into the stomach, or given under the form of enema. Its frequent employment to relieve the less urgent symptoms of hysteria is improper, as tending to the injurious consequences from its habitual use; and the same remark applies to its employment in hypochondriasis and melancholia. In purely spasmodic asthma, the paroxysm is shortened, and even sometimes cut short by a full dose of an opiate; and in all the varieties of dyspnœa, opium affords more or less relief. In cholic, it relieves the violence of the pain; though its administration requires caution, where there is any tendency to an inflammatory state; and the constipation it is liable to produce requires also to be obviated. In cholera it is the principal remedy, and is given in moderately large and repeated doses, until the symptoms are subdued. In diarrhea it speedily checks the evacuations, and the precaution is hence necessary, not to use it too freely, until any acrid matter, or substance exciting irritation, has been discharged. In pyrosis, a moderate dose generally affords at least temporary relief; and it also frequently succeeds in checking vomiting from morbid irritability of the stomach.

Opium is given to relieve the pain of gastrodynia, and that attending icterus; and in that form of the latter disease depending on calculus of the biliary ducts, by lessening irritation and relieving spasm, it promotes the discharge. It is given on the same principle to relieve the pain, and promote the discharge of urinary calculus. In syphilis, it is employed, principally with the intention of alleviating the irritation arising from the operation of mercury; for there is no sufficient evidence for the opinion which has been advanced, that it is possessed of real anti-syphilitic power. Considerable advantage is derived from its use in extensive venereal ulceration; as well as in the treatment of painful and irritable ulcers, not connected with a venereal taint. It is given as a stimulant to check the progress of gangrene, and frequently with marked advantage, as well as to relieve those spasmodic symptoms, and that state of irritation, which often accompany gangrene, or the injuries from which it arises.

In many other cases of morbid affection, opium is had recourse to merely to lessen irritation, relieve pain, or induce sleep. As a palliative and anodyne, it is indeed the most valuable article of the Materia Medica, and its place could scarcely be supplied by any other.

Externally applied, opium alleviates pain and spasmodic action. Applied by friction, it was known to relieve the pain of cramp, and even of tetanus; and rubbed over the abdomen, to alleviate spasmodic pain of the stomach and intestines. From recent observations by some of the continental physicians, which have been confirmed in this country, it appears that this mode of employing it admits of more extensive application, and even in general affections of the system. It has succeeded in reducing the violence of the paroxysm of mania, and in relieving the delirium of typhoid fever, removing irritation and inducing sleep; and much advantage has been derived from this application of it in some forms of dysuria, in cholera and hysteria. In trismus, either hysterical or arising from other causes, relaxation of the spasm has been obtained from opiate friction. Dr Percival employed for this purpose a liniment, in which opium is triturated with half its weight of camphor, to render it smooth, and this is mixed with a little lard; a quantity requires to be rubbed in, containing from 6 to 9 grains of opium, to obtain its action on the general system. According to Mr Ward's observations, the tincture of opium is preferable as producing more speedy and certain effects; from 3 to 6 drachms of it being employed, according to the severity of the symptoms, and being rubbed on the sides of the arms, until the whole is absorbed. This mode of application has the advantage of avoiding the action of opium on the stomach and intestinal canal.

By local application, opium relieves the pain of toothach, a little of it being introduced into the cavity of the affected tooth, or the gums being rubbed with laudanum; sometimes even it succeeds when applied to the temple or cheek. Under the form of enema, it is of singular efficacy in relieving tenesmus, and that painful affection of the prostate gland which is sometimes the consequence of the discharge in gonorrhœa having been suddenly checked; and also that irritable state of the neck of the bladder, which renders the discharge of urine painful. It is used under the same form in diseases where it cannot be introduced into the stomach. A very dilute watery solution of it injected into the urethra, has been used to relieve *ardor urinæ* in gonorrhœa; and a few drops of the vinous infusion introduced beneath the eye-lids, is of much efficacy in some forms of ophthalmia, where the active inflammation has ceased.

The dose of this narcotic is very various, according to the state of disease, and the intention with which it is administered. One grain is the medium quantity to a person unaccustomed to its use, but to remove the symptoms from irritation, or relieve pain, it often requires to be given in a larger quantity. Its stimulating operation is principally obtained by frequent repetition of small doses; its sedative effect by a larger dose, repeated, if necessary, at greater intervals. Its power on the system soon becomes weaker; and from habitual use is so much impaired, that very large doses are required to produce its usual effects. In some diseases, too, particularly mania, tetanus and hydrophobia, it produces little sensible effect unless the dose be very large. In the last disease, it has been taken to the extent of two drachms in twelve hours, without abating the violence of the symptoms. Lastly, the operation of opium is much varied by idiosyncracy, the same dose producing very different effects on different individuals. Too small a dose of opium is liable to produce restlessness or disturbed sleep. The latter effect, with sickness and thirst, and sometimes delirium, are the consequences of a dose rather too large.

By the immoderate or long continued use of opium, the vigour of the digestive organs is impaired; hence loss of appetite, wasting of the body, and muscular weakness; the nervous system, and even the functions of the mind, are also affected; the patient is distressed with uneasy sensations, which are only imperfectly relieved by other stimulants, if opium is withheld, and at length fatuity and stupor are induced.

When such a dose of opium is taken, as would prove fatal if its effects were not obviated, the symptoms which usually occur are, insensibility, so that the patient cannot be roused by any exertion; a pulse usually slow and full; deep and difficult breathing, with the countenance generally somewhat flushed; this state of stupor continues sometimes with occasional convulsions, until it terminate in death. The principal remedy in such a case is the immediate exhibition of an emetic, which requires to be of the most powerful kind. Sulphate of zinc, or sulphate of copper, is generally used, dissolved in water, and introduced by a flexible tube into the stomach, the former in the dose of one scruple, the latter in a dose from five to ten grains. The sulphate of copper is by far the most powerful, and if the other has failed, ought to be immediately given. In using either of them, if vomiting is not soon induced, the dose ought to be repeated. Along with this is employed free dilution with the vegetable acids; as vinegar, which is to be swallowed in as large draughts as the stomach can receive it. The powers of the stomach and of the general system may be roused and sustained by small doses of warm brandy; coffee has been said to have been taken with advantage: and the patient ought to be kept awake, and, if possible, in a state of gentle motion, at least for some hours. Analogy, from the operation of other narcotics, points out the necessity of exciting artificial respiration, if necessary, in the state of extreme stupor, as has been already explained, (page 119.).

Opium is used either solid, or under the form of tincture, twenty-five drops of the tincture being equal to one grain of crude opium. It is employed in the solid state when we wish it to act slowly, or on the stomach and intestinal canal, otherwise it is more convenient in the liquid form. There are, besides, various preparations, in which it is either the principal ingredient, or modifies the power of others, few of which, however, are of much importance. The officinal opiate electuary powder and pill, merely afford convenient forms for its exhibition. The powder of opium and ipecacuan is the composition under which opium is usually employed as a sudorific. The Ammoniated and Camphorated Tinctures of Opium, are the Paregoric Elixirs of the older pharmacopœias, forms under which opium has been principally used in cattarh. The troches of liquorice and opium are likewise designed to allay the cough in cattarh, by being allowed to dissolve slowly in the mouth. The Tincture of Opium and Soap, and the Plaster of Opium, are intended for external application. The Opium wine, besides its internal administration, is employed as a topical application to the eye in chronic ophthalmia. The Syrup is designed for administration to children.

Officinal Preparations.—Elect. Opiat. Pil. Opiat. Pulv. Opiat. Pulv. Ipecac. cum opio. Tinctura Opii. Tinct. Opii Ammoniatæ. Tinct. Saponis cum opio. Troch. Glycirrhiz. cum opio, *Ed.*—Pil. Opii cum Sapon. Pulv. Cornu Usti cum opio. Tinct. Opii Camph. Vin. Opii. Extr. Opii. Emplast. Opii. *Lond.*—Opium Purification. Ext. Opii. Syrup. Opii. *Dub.*

The dried capsule of the poppy is sometimes employed for medicinal purposes. Its active matter is extracted by decoction with water; this evaporated, affords an extract similar in power to opium, but weaker, or it is made into a syrup, by boiling with sugar, which is used as an anodyne. This syrup is a weak preparation, and is in general only given to children. One ounce of it is supposed to be equal to one grain of opium, but it is liable to be variable in strength. The dose to a child a year old is one drachm. A syrup made from opium has been supposed to be preferable, as the dose can be regulated with more certainty, and a formula of this kind is accordingly adopted by the Dublin College; being prepared by dissolving the watery extract of opium, and forming this into a syrup, by adding the due proportion of sugar. But it is somewhat doubtful if the dissolved matter remains permanently diffused in this syrup. An infusion of the capsule is used as an anodyne fomentation.

Offic. Prep.—Extr. Papav. alb. Syr. Papav. somnif. *Ed.*—Decoct. Papav. Somn. *Lond.*

HYOSCYAMUS NIGER. Black Henbane. *Pentand. Monog. Solanaceæ. Herba, Semen. Indigenous.*

THE leaves of this plant, when recent, have a slightly fœtid smell, and a mucilaginous taste; when dried, they lose both taste and smell, and their narcotic power is in part impaired. The root possesses the same qualities as the leaves, and even in a more eminent degree, but it is liable to be more variable in strength. The seeds also are narcotic. The leaves only are medicinally employed; they afford a juice which possesses their narcotic power, and which inspissated forms an officinal preparation; they also yield their active matter to diluted alkohol.

Henbane has a greater analogy to opium in its action than any other narcotic has, particularly in the power of inducing sleep. In a moderate dose, it increases at first the strength of the pulse, and occasions some sense of heat, which are followed by diminished sensibility and motion; in some cases by thirst, sickness, stupor, and dimness of vision. In a larger quantity, it occasions profound sleep, hard pulse, and sometimes delirium; and in a dose which proves fatal, its operation soon terminates in coma, with a remarkable dilatation of the pupil, distortion of the countenance, a weak tremulous pulse, and eruption of petechiæ. On dissection, inflamed or gangrenous spots have been observed on the internal surface of the stomach, and the vessels on the membranes of the brain have appeared enlarged. Its baneful effects, like those of other vegetable narcotics, are best counteracted by a powerful emetic, and by drinking largely of the vegetable acids, or vinegar.

Henbane is one of the narcotics which has been longest known to physicians, having been employed by the ancients for mitigating pain, and restraining hæmorrhage. It had, however, fallen into disuse, until Dr Störk of Vienna introduced it, with several other vegetable narcotics, to the notice of modern practitioners. He employed it in various spasmodic and painful diseases, as in epilepsy, hysteria, palpitation, headach, paralysis, mania and scirrhus. It was given in the form of the inspissated juice of the fresh leaves, the dose of which is from one to two grains, which requires to be gradually increased. At present, it is principally employed as a substitute for opium, where the latter, from idiosyncrasy, occasions any disagreeable symptom, or where it is more peculiarly of importance to avoid its constipating effect: the henbane is also used in preference to opium as a sedative in some forms of mania, more especially puerperal mania, either alone or in combination with camphor. A tincture of it has been introduced into the Pharmacopœias, which affords a preparation probably more uniform in strength than the inspissated juice. Its dose is thirty or forty drops.

Offic. Prep.—Succ. spiss. Hyosc. N. Tinct. Hyosc. N. *Ed. Lond. Dub.*

Atropa Bellandonna. Deadly Nightshade. *Pentand. Monogyn. Solanaceæ. Folia. Indigenous.*

This is an indigenous herb, often growing in wastes and shady situations. Its leaves have scarcely any smell, and only a slightly nauseous, sub-acrid taste. The berries, which are purple, are sweetish. Both are highly narcotic, as is also the root, but the leaves are preferred for medicinal use, as being more uniform in strength. In a moderate dose, belladonna occasions a sense of warmth, followed by diaphoresis, and a disposition to sleep, frequently with nausea and headach; in a larger dose, symptoms of intoxication, vertigo, sickness and thirst: the pulse becomes low and feeble, the pupils are dilated, the face becomes swelled, vision is impaired, and these symptoms terminate in convulsions, coma, or paralysis. On dissection, where it has proved fatal, the stomach and intestines have been found inflamed or gangrenous, and the blood in a dissolved state. The remedies are an emetic in a sufficiently large dose, and dilution with the vegetable acids.

Belladonna was first employed as an external application, in the form of fomentation, to scirrhus and cancer. It was afterwards administered internally in the same affections; and numerous cases in which it had proved successful, were given on the authority of the German practitioners. It has been recommended, too, as a remedy in extensive ulceration, in paralysis, chronic rheumatism, epilepsy, mania, and hydrophobia, but with so little discrimination, that little reliance can be placed on the testimonies in its favour; and in modern practice, it is not often employed. It appears to have a peculiar action on the eye; hence it has been used in amaurosis; and from its power of causing dilatation of the pupil, when topically applied under the form of infusion, it has been used before performing the operation for cataract,—a practice which is hazardous, as the pupil, though much dilated by the application, instantly contracts when the instrument is introduced. When given internally, its dose is from one to three grains of the dried leaves, or one or ½ a grain of the inspissated juice.

this is incorrect — not alway

Offic. Prep.—Succ. Spiss. Atrop. Bellad. *Ed. Lond.*

Aconitum Napellus. Aconite, Monk's-hood, or Wolfsbane. *Polyand. Trigyn. Multisiliquæ. Herba. Europe, America.*

The aconite which has been medicinally employed, is regarded by Wildenow, not as the aconitum napellus, but the aconitum neomontanum; and this has been admitted, on his authority, by the Dublin College, while the other is retained by the London College. The smell of its leaves, when recent, is narcotic, but is lost by drying. Their taste is subacrid. In a moderate dose its effects are those of a narcotic, accompanied with slight diaphoresis; in a larger dose it occasions vertigo, syncope, paralysis and convulsions: when it is dried, its strength is liable to considerable variation.

Aconite was employed by Störk in obstinate chronic rheumatism, exostosis, paralysis, ulceration, and scirrhus. Though highly praised, it has fallen almost entirely into disuse. Its dose is from one to two grains of the dried leaves; of the inspissated juice half a grain, this dose being gradually increased: it is chiefly in obstinate chronic rheumatism, that a trial is sometimes made of it in modern practice.

Offic. Prep.—Succ. Spiss. Aconit. Napell. *Ed. Lond.*

Conium Maculatum. Cicuta. Hemlock. *Pentand. Digyn. Umbellatæ. Folia, Semen. Indigenous.*

This plant, which grows abundantly in this country in waste grounds, is of the umbelliferous kind. It is distinguished from other similar vegetables by its large and spotted stalk, by the dark green colour of the lower leaves, and by its peculiar faint disagreeable smell, which becomes more perceptible in the leaves when they are bruised. The seeds have a still fainter odour, and are inferior in power. The root has similar powers, but varies in strength at different seasons. The leaves are, therefore, preferred for medicinal use.

Hemlock is a very powerful narcotic. Even in a moderate dose, it is liable to produce sickness and vertigo; in a larger dose it occasions permanent sickness, with great anxiety, dimness of vision, delirium, convulsions and coma. The use of it was confined to external application, until it was introduced by Störk, principally as a remedy in scirrhus and cancer; and the beneficial effects obtained from it were in many cases so conspicuous, that sanguine expectations were formed of its efficacy; in cancerous ulceration in particular, the pain abates, and the discharge becomes less copious and acrid under its use, and the ulcer frequently contracts in size, and shews a disposition to heal. These effects, however, are usually only temporary, or cannot be carried beyond a certain extent; and though many cases were related by Störk and others, of permanent cures having been obtained from it, there is much reason to believe that its efficacy was exaggerated. It is now regarded only as a palliative, but, considering it even as such, it is still a valuable remedy; it relieves the pain, and corrects the discharge even more effectually sometimes than opium, and it is not liable to occasion the disagreeable consequences which arise from that narcotic. And when opium is employed, hemlock is a valuable aûxiliary, as it renders a smaller quantity of the former necessary.

Benefit is derived frequently from cicuta in other cases of extensive ulceration; particularly in those connected with a scrofulous taint; it promotes too the operation of mercury in healing venereal ulcers, and is useful in those forms of ulceration which arise under the action of mercury, and which are aggravated instead of being removed by its protracted use; and it is useful in removing glandular obstruction and induration.

Cicuta is given either under the form of the dried leaves, or of the juice of the fresh leaves inspissated by a gentle heat to the consistence of an extract, the former being given in a dose of two or three grains, the latter in a dose of two grains. The dose of either requires to be increased, and that more quickly, and to a greater extent, than is the case with almost any other substance in the Materia Medica, so that at length it has been taken to the extent of a number of drachms in the course of the day. The inspissated juice is a preparation on the operation of which we can never depend; hence it is seldom used; and even the powder of the dried leaves is liable to be variable in strength. Its pharmaceutic treatment, therefore, is of much importance. The leaves ought to be collected when the flowers are about falling off: they ought to be dried before a gentle fire, be reduced to powder as soon as they are dried, and kept in small phials, carefully secluded from the air and light. The proofs of their proper preparation, and of their activity, are the powder being of a lively green colour, and retaining the peculiar odour of the plant.

The recent leaves are sometimes applied externally to painful or ill-conditioned ulcers, or a cataplasm for the same purpose may be formed from the dried powder mixed with crumbs of bread.

Offic. Præp.—Succus. Spiss. Conii Macul. *Ph. Ed. Lond. Dub.*

DIGITALIS PURPUREA. *Foxglove. Didynam. Angiosperm. Solanaceæ. Folia. Indigenous.*

THIS indigenous plant grows on dry elevated situations, and, from the beauty of its flowers, has often a place in our gardens. All the parts of it are powerfully narcotic, but the leaves, being most uniform in strength, are preferred for medicinal use. They are large and oblong, of a green colour rather dark, have little smell, and a bitter somewhat acrid taste. They are collected when the plant is in blossom, and are dried before a gentle fire, the thicker stalks being removed; and they ought to be kept without being reduced to powder. Both water and alkohol extract their active matter by infusion.

The operation of digitalis on the system is extremely peculiar, and there is even considerable difficulty in ascertaining its real effects. From a small dose there is no very sensible effect, until after its continued administration. In a full dose, it produces exhaustion of power, marked by a great and sudden reduction in the force of circulation; the pulse being reduced both in frequency and force, falling sometimes from 70 to 40 or 35 beats in a minute, and being small, tremulous, and often intermitting. This is accompanied with sickness, anxiety, a sense of faintness, vertigo, dimness of vision, and, in a large dose, with vomiting, syncope, coldness of the extremities, convulsions, and coma, with sometimes a fatal termination. Yet these effects are not uniform, but even from the same dose we observe considerable diversity of operation in different individuals: the pulse is sometimes rendered slower, without being diminished in fulness; at other times it is rendered irregular, and under the operation of foxglove it appears to be peculiarly liable to be affected by slight muscular exertion, or by trivial causes of irritation. The sickness does not always accompany the reduction of the force of the circulation. Sometimes none of these effects, and scarcely any perceptible change in the state of the functions, are immediately apparent; but if the dose be continued, they are suddenly produced.

Effects are even observed from the operation of foxglove, apparently of a very opposite kind. While it reduces the force of the circulation, it appears to increase the action of the absorbent system, and hence it proves a powerful remedy in dropsy; and Dr Withering, by whom its powers were first particularly investigated, observed, that when given in a state of disease, it was most successful, not where there existed increased action in the system, but, on the contrary, in states of debility, where the pulse was feeble and intermitting, and the countenance pale. Other authors have remarked its apparent stimulant operation; and Dr Sanders, from a series of observations and experiments, has inferred, that it always acts primarily as a stimulant, augmenting, when given in a dose not too large, the force and frequency of the pulse, and inducing a state of increased action; it is only when the dose is too large, or when it is accumulated by repetition, that reduction of the force of the circulation and other symptoms of diminished power are produced; and hence, according to this view, it is analogous in its operation to other narcotics.

It must be admitted, however, that it is more difficult to regulate its administration so as to obtain its continued stimulant operation, than it is with regard to other stimulants; that there is a rapid transition to a state of diminished action, and that this is greater, and more permanent, compared with the primary stimulant effect, than in other stimulants even of the most diffusible kind.

Foxglove, producing very different effects according to the mode in which it is administered, or according to the state of the system, is employed as a remedy in different diseases. Under the present class, those applications are to be considered, which appear to be connected with its action as a narcotic.

On this, in part at least, has been supposed to depend the advantage derived from it as a remedy in phthisis pulmonalis. When given to that extent in which it reduces the velocity and force of the circulation, it proves useful, by counteracting that state of increased action which prevails in the incipient stage of the disease; and by diminishing the rapidity of the circulation through the lungs, it may facilitate the removal of the local affection. In the more advanced stages, it may operate, it has been conceived, by promoting absorption, thus removing the tuberculous affection, or withdrawing the purulent matter, before it has been rendered acrid by the action of the air. Sanguine expectations were at one period formed of the advantages to be derived from it in the treatment of phthisis, many of the symptoms disappearing under its use, and the progress of the disease appearing to be arrested. The change of organic structure is, however, so considerable, at least in the advanced state of the disease, as scarcely to admit of a cure from the operation of any remedy; and in the earlier stages, where some degree of inflammatory action exists, it is difficult to give it so as to reduce the force of the circulation, and continue this effect, without its inducing other consequences, which compel us to relinquish its use.

Foxglove has been proposed as a remedy in pneumonia, from its power of reducing the force of the circulation when given in a sufficient dose, conjoined with blood-letting; and cases have been related of the success attending the practice, while some authors have condemned it as hazardous, from the excitement it is liable to produce. On a similar principle, it has been proposed to be employed in croup.

In active hæmorrhage, it might be expected, from the same operation, to be a remedy of much power; and, according to the observations of Ferriar and others, it may be employed with signal advantage in epistaxis, hæmoptysis, and menorrhagia, either alone or in combination with opium.

In spasmodic asthma, the combination of it with opium has afforded much relief. In palpitation arising from intemperance, or from passions of the mind, and not connected with dyspepsia, the irregular action of the heart has been abated, and at length entirely removed by its operation.

Foxglove is given in substance, or under the form of infusion, decoction, or tincture. The medium dose of the powder of the dried leaves is half a grain; the dose of the infusion, prepared according to the formula in the Edinburgh Pharmacopœia, is half an ounce; that of the tincture is fifteen drops; these quantities being given twice a-day. The decoction is an improper form, as being variable in strength. The tincture is the form of preparation under which it has usually been given as a narcotic; the infusion that in which it has been employed as a diuretic. When it is given in substance, there is supposed to be rather more risk of its effects accumulating from repetition of the dose, so as to induce the unpleasant symptoms which arise from an over dose.

To obtain the full narcotic operation of foxglove, the dose given at first requires to be gradually increased, but this increase must be made with much caution, not only from the hazard attending an over dose, but from the circumstance that the action of the remedy is for a time not apparent; but if the dose is too quickly increased, or repeated at intervals not sufficiently distant, it appears suddenly, and continues progressive. Hence the necessity of the practitioner's watching with the greatest attention the effects it produces. If the dose given at first is small, the augmentation may proceed at the rate of from one-eighth to one-fourth of the original quantity every second day, and the dose should not be repeated more than twice, or at farthest thrice a-day, unless in acute diseases, where the effect must be more speedily obtained, and where, therefore, the augmentation must be more rapid. The administration of the remedy is continued until the effect intended to be obtained is produced, or until its operation is apparent on the system; whenever the pulse begins to diminish in frequency or force, the increase of dose must be stopt; and if the reduction be considerable, or proceed rapidly, the administration must be suspended, and, only after a sufficient interval, cautiously renewed. This is more especially necessary when the pulse becomes intermitting, or when nausea is induced, with dimness of vision, vertigo, or any tendency to fainting. When these symptoms do occur, they are best obviated by small doses of stimulants, warm wine, or brandy and water, with aromatics, ether, and, as some have recommended, strong bitter infusions, small doses of opium, and a blister applied to the region of the stomach.

The infusion of foxglove has been applied externally as an anodyne lotion to painful cutaneous eruptions, or ulceration.

An ointment composed of the powder mixed with lard, has been found successful in obstinate tinea capitis.

The application of foxglove, as a diuretic, will be considered under the class of diuretics.

Offic. Prep.—Infus. Digit. P. Tinct. Digit. P. *Ed. Lond. Dub.* Decoct. Digit. *Dub.*

NICOTIANA TABACUM. Tobacco. *Pentand. Monogyn. Solanaceæ. Folia. America.*

THIS plant, though sometimes cultivated in this country, is usually imported from America. Its leaves, which are of a large size, are of a light green colour, which they retain with little change when merely dried; but in the usual preparation to which they are subjected, they are rendered brown by the action of a little sulphate of iron. Their smell is fœtid, their taste extremely bitter and acrid. They deflagrate in burning, from a quantity of nitre they contain. Their active matter is extracted both by water and by alkohol; by decoction its activity is much impaired. The essential oil obtained from them by distillation is very highly narcotic, so that when introduced into an wound, or injected into the rectum, it occasions instant death. According to Vauquelin, a peculiar acrid principle exists in tobacco, volatile, and soluble both in water and in alkohol.

Tobacco operates as a very powerful narcotic. This is apparent, even in the common practices of smoking and chewing it, though its effects, like those of other narcotics, become less powerful from continued use. In a person unaccustomed to it, or in an over dose, it excites the most severe and permanent sickness, with vomiting, reduces the force of the circulation, and occasions extreme muscular debility, with insensibility, cold sweats, and convulsions. The singularity has already been remarked, that the infusion of tobacco not only affects the nervous system, like other narcotics, but acts powerfully on the heart, causing its contractions to cease, while the essential oil has no such effect.

As a diffusible stimulant, the smoke of tobacco, thrown into the rectum, was at one time employed in the recovery of drowned persons,—a practice proved experimentally to be prejudicial, and now exploded. The same practice is still occasionally employed in ileus and incarcerated hernia; in the former disease, with the view of removing the constricted state of the intestines; in the latter, with the intention of producing that state of muscular relaxation which may favour the reduction of the protruded intestine. The practice, though not without hazard, has sometimes proved successful. The watery infusion of the strength of one drachm of the dried leaves to a pound of tepid water, is a more convenient form of employing it than the smoke, as an enema; and even the infusion of this strength has sometimes produced alarming symptoms of exhaustion. Unless it be used, however, in such a state of activity, as to produce some degree of muscular debility, no advantage can be derived from it; and the practice is therefore only to be had recourse to, where other methods have failed. The smoke of tobacco received into the mouth, relieves the pain of toothach, either by its narcotic power, or by exciting a profuse salivary discharge. It sometimes too, by its action on the lungs, relieves the paroxysm of spasmodic asthma. The powder is in common use as an errhine. The infusion or decoction is sometimes used as an emetic, but its operation is extremely harsh, and accompanied with severe sickness. In small doses, tobacco excites the urinary secretion, probably by promoting absorption. The medicated wine is the form under which it has been used as a diuretic, in dropsy and dysuria, its dose being 30 drops. The leaves bruised, or moistened, have been employed as a fomentation or cataplasm, in tinea capitis, and in various cutaneous eruptions; incautiously applied, they have sometimes occasioned the violent effects which arise from the internal administration of tobacco in too large a dose.

Offic. Prep.—Vim. Nicot. Tab. *Ph. Ed.*—Infus. Nicot. Tab. *Lond.*

Lactuca Virosa. Strong-scented Lettuce. *Syngenes. Polygam. æqual. Compositæ. Folia. Indigenous.*

The leaves of this plant have a strong fœtid smell, similar to that of opium, and yield a white juice, in which their activity resides. Their taste is bitter and acrid. Though narcotic, they have been used principally from their diuretic power in the treatment of dropsy, under the form of the expressed juice inspissated. The dose of this is 5 or 10 grains, which is gradually increased to 1 or 2 drachms in twenty-four hours. By the German practitioners, by whom principally this plant has been recommended, it has also been used as a remedy in palpitation of the heart, and in intermittent fever.

Off. Prep.—Succ. Spiss. Lact. Vir. *Ed.*

Datura Stramonium. Thorn-Apple. *Pentand. Monog. Solanaceæ. Herba. Indigenous.*

Thorn-Apple is an indigenous herb, the leaves of which have a narcotic odour, and a bitter taste. They possess all the powers of a narcotic, producing, when taken in too large a quantity, vertigo, sickness, delirium, and convulsions. With other plants of the same family, stramonium was made the subject of clinical experiments by Störk; and it was recommended by him as a remedy in convulsive diseases, especially in epilepsy, and in mania. The usual form in which it has been given, is that of the inspissated expressed juice of the leaves, the dose of which is from 1 to 3 grains twice a-day, gradually increased. The herb, or the root smoked like tobacco, has been found to afford relief in the paroxysm of spasmodic asthma. The smoke is drawn into the lungs as fully as possible, from a common tobacco pipe, continuing the smoking until the quantity is consumed, and repeating this occasionally and even frequently if necessary. It often excites some degree of vertigo, usually promotes expectoration, and relieves the cough, dyspnea, and spasmodic irritation.

ARNICA MONTANA. Leopards-Bane. *Syngenes. Polygam. superf. Compositæ. Flores, Radix. Germany.*

THE flowers of this plant have a smell slightly fœtid, and a penetrating bitter taste; both taste and smell are extracted by maceration in water. In their action on the system, their direct stimulating power is very apparent along with their narcotic action; they increase the force of the vascular system, and appear to communicate tone to the muscular fibre. In a larger dose, they produce vomiting and purging, sometimes followed by muscular pains, vertigo, and convulsions. They have been used in amaurosis, paralysis, convulsive disorders, gout, and rheumatism. The dose is 5 grains in substance dried, or half-a-drachm in infusion.

The root of arnica is aromatic and tonic, and has been used as a substitute for Peruvian bark.

Rhododendron Chrysanthum. Yellow-flowered Rhododendron. *Decand. Monogyn. Bicornes. Folia. Siberia.*

The leaves of this shrub are destitute of smell, but have a bitter, rough and subacrid taste, which they communicate to water by infusion or decoction. They are stimulating and narcotic, and occasion in a small dose increased vascular action; in a large dose intoxication and delirium. They have been employed principally in chronic rheumatism and gout, their application in the former disease having been derived from the practice of the natives of Siberia. Their power is said to be marked by a sensation of creeping in the skin, and by diaphoresis being induced. The form in which they have been given is decoction, 2 drachms being boiled in 10 ounces of water, and 1 or 2 ounces of the strained liquor being given twice a-day, and gradually increased.

Rhus Toxicodendron. Poison Oak. *Pentand. Trigyn. Dumosæ. Folia. North America.*

This plant has so much acrimony, that the touching of the leaves, or rubbing them on the skin, occasions itching, inflammation, and desquamation; if taken internally, nausea, vertigo, and pain in the head are produced. The dried leaves have been used in paralysis, in some cases related by Mr Alderson with marked advantage. The dose given was half a grain twice or thrice a-day in the form of bolus, and gradually increased to three or four grains daily. It excited a sense of heat, and irregular motions in the parts affected.

Humulus Lupulus. *Hop. Dioecia. Pentand. Scabridæ. Indigenous.*

This plant is cultivated in England, its strobiles being used to give bitterness to fermented malt liquors. They are picked off when ripe, and are dried by artificial heat. They have an odour somewhat fragrant and aromatic, and a taste very bitter, with some astringency; these are extracted by water by infusion; by decoction the aromatic flavour is lost: by distillation with water, a portion of essential oil is obtained. Hop, along with its bitterness, has a narcotic power; of this the popular remedy, sometimes successful, of a pillow of hops to procure sleep in the delirium of fever and in mania, is a proof. It accordingly, when given internally in a full dose, reduces the frequency of the pulse, and procures sleep. It has been employed as an anodyne, principally in rheumatism and in the paroxysm of gout, either in substance, in the dose of three grains, or under the form of infusion or tincture, the latter being given in the dose of from half a drachm to a drachm, once or twice a-day. An extract prepared by inspissation of its decoction, is also given in a dose of five or seven grains. An over dose occasions headach and vertigo. A cataplasm or ointment, prepared from it, has been used as an anodyne application to cancerous sores; and a fomentation of the strobiles has been used in the same case, and as an application to painful tumours. It has now a place in the London Pharmacopœia, and officinal preparations of it are inserted.

Off. Prep.—Tinct. Humul. Extr. Humul. *Ph. Lond.*

Strychnos Nux Vomica. Vomica Nut. *Pentand. Monogyn. Solanaceæ. East Indies.*

The kernel of the fruit is the part of this plant that is powerfully narcotic; its taste is intensely bitter; it has little or no smell, and is so hard that it cannot be reduced into powder by beating, but requires to be filed down. Its narcotic operation is well exemplified in the effects it produces when given as a poison to dogs and other animals. It occasions extreme anxiety, paralysis of the hinder extremities, convulsions, and death; and on dissection, no marks of inflammation, or local affection, are to be discovered in the stomach.

As a narcotic, it has been recommended in mania, epilepsy, and hysteria, but it has scarcely been employed. It has been given in dysentery and intermittent fever, in a dose of 5 grains twice a-day; but the use of it is so hazardous, that it has not been established in practice, nor received into the Pharmacopœias.

Prunus Lauro-Cerasus. Cherry-Tree Laurel. *Icosand. Monog. Pomaceæ. Folia. Europe.*

The leaves of this plant have an odour slightly fragrant; their taste is extremely bitter. They possess a highly narcotic quality, which is extracted by infusion in alkohol or water, and is even brought over by distillation; the distilled water is narcotic, and a small quantity of essential oil may likewise be procured, possessed of the same property. The very singular fact has been established, that the volatile principle in which the narcotic quality of this plant resides is the prussic acid. It had often been observed, that the odour of this acid is similar to that of the cherry laurel, peach blossom, and bitter almond. Bohn found, that the distilled water of the bitter almond contains prussic acid. Schroeder discovered it in the distilled water of the peach blossom and cherry laurel, prussiate of potash being obtained by distilling them from the alkali; and Bucholz succeeded in separating the prussic acid from the essential oil of the cherry laurel by agitation with an alkaline solution. This acid in its pure state has been further found to be highly narcotic; and the narcotic power of all these plants no doubt depends on it. They afford a curious example of the existence in the vegetable kingdom, of a substance which had before been regarded as a product only of an artificial process, and which, formed by the decomposition of animal substances, resembles them in chemical constitution; and the volatility of this acid not less explains the singular fact of a high degree of narcotic power belonging to a distilled water of plants, or an essential oil.

The distilled water of the cherry laurel has long been known as a poison; it speedily kills small animals, and its effects are those of a pure narcotic. The noxious operation of the plant is also sometimes displayed in the effects of those spirituous cordials to which it has been added to communicate flavour. It has not been employed in medicine, but a cataplasm prepared from the leaves has been used as an anodyne application to painful tumors and ulcers.

CHAP. IV.

ANTISPASMODICA—ANTISPASMODICS.

It is not easy to assign precisely the differences in kind of action between Narcotics and what are named Antispasmodics. The effects they produce are similar; they are capable of exciting the actions of the system, and they are often equally powerful in allaying pain and inordinate muscular action. But antispasmodics do not in general produce that state of insensibility and diminished power which follows the application of narcotics. This might be supposed owing to a mere difference in strength; yet there seems also to be something farther than this, since antispasmodics produce no such effect in any dose, and since, although they are so much inferior to narcotics in this respect, they are equally powerful in repressing inordinate and irregular muscular action. The difference has been explained on the supposition, that as stimulants they have less diffusibility and greater durability of action; or else, that with their stimulant operation, they have no direct power of diminishing the powers of the system. Considered under either view, they form an intermediate class between Narcotics, which are so highly diffusible, and Tonics, which are much more permanent in their stimulant operation; and experience shews, that they partake of the properties of both; several narcotics and tonics are frequently used as antispasmodics; and the powers of the principal antispasmodics, in obviating spasmodic affections, are apparently connected principally with their stimulant power.

From the name given to this class, their medicinal applications may be understood. Spasm consists in irregular muscular contraction; sometimes the contraction is permanent; at other times it alternates with relaxation, but even then both are performed more quickly, and the contractions are more powerful and permanent than natural. Many diseases depend on spasmodic action, and others are accompanied with affections of this kind. The medicines which obviate and remove such a state are termed Antispasmodics.

Spasm may originate from various causes. One of the most frequent is a strong irritation, continually applied, such as dentition, worms, or the presence of any foreign substance in wounds, the effect of this irritation being extended more or less to the nervous system, or to the voluntary muscles. In such cases, narcotics must prove useful by diminishing irritability and sensibility. Sometimes spasm appears to arise from mere debility, and the obvious means of removing this is by the use of tonics. Both narcotics and tonics, therefore, are occasionally useful as antispasmodics; such, for example, as opium and ether belonging to the one, and zinc, mercury, and Peruvian bark to the other; and these are accordingly in common practice regarded as belonging to this class. But there are farther several substances which cannot be with propriety referred to either of these divisions, as musk, castor, assafœtida, galbanum, valerian; they are in some measure intermediate; and it is to these that the name of Antispasmodics is more exclusively appropriated.

Few general observations can be made on this class of medicines. As their effect is not very permanent, they require to be given during the paroxysm of the spasmodic disorder, or a short time before its approach. For the same reason, the dose requires to be frequently repeated. Those, however, which belong to the class of tonics, require an opposite mode of administration; their beneficial effects being obtained only from their continued use. Some of those more strictly antispasmodics, stimulate the general system, and render the pulse more frequent; but in general they can scarcely be regarded as medicines of much power, and even in removing spasmodic affection, are inferior to some of the narcotics, particularly to sulphuric ether, or opium.

ANTISPASMODICS.

MOSCHUS.
CASTOREUM.
OLEUM ANIMALE EMPYREUMATICUM.
SUCCINUM, OLEUM ET ACIDUM SUCCINI.
BITUMEN PETROLEUM.
CARBONAS AMMONIÆ PYRO-OLEOSUS.
FERULA ASSAFOETIDA.
BUBON GALBANUM.
SAGAPENUM.
VALERIANA OFFICINALIS.
CROCUS SATIVUS.
MELALEUCA CAJUPUTI.

NARCOTICS used as ANTISPASMODICS.

ETHER.
CAMPHOR.
OPIUM.

TONICS used as ANTISPASMODICS.

CUPRUM.
ZINCUM.
HYDRARGYRUS.
CINCHONA.

MOSCHUS. Musk. Moschus moschiferus. *Cl. Mammalia. Ord. Pecora. Asia.*

THE animal which affords musk is a native of the elevated regions of the East of Asia. The musk appears to be a peculiar secretion, which is deposited in a small sac situated near the umbilicus of the male. It is brought from China, or from India, in its natural receptacle, a small membranous bag, covered externally with coarse hair. The musk within is in grains, slightly unctuous, of a black colour, having a very strong durable smell, and a bitter taste. It yields part of its active matter to water, by infusion; by distillation the water is impregnated with its flavour; alkohol dissolves it, the impurities excepted.

Musk is an antispasmodic supposed to be of considerable power; it is administered occasionally in the greater number of spasmodic diseases, especially in hysteria, epilepsy, and singultus, and also in diseases of debility. In typhus fever it is employed to relieve subsultus tendinum, and other symptoms of a spasmodic nature. In cholera, it is given with the view of checking vomiting. In retrocedent gout it is employed as a stimulant. Combined with ammonia, it has been celebrated for its power of arresting the progress of gangrene. With regard to its efficacy in some of these affections, its virtues have been perhaps exaggerated, and from this, as well as from its high price, it is at present not very often employed. Its dose is from 6 to 20 grains, repeated, if necessary, every five or six hours. It is best given in the form of bolus. To children, it has been given under the form of enema, as a remedy in the convulsions arising sometimes from the irritation of dentition.

Offic. Prep.—Mist. Mosch. *Lond.*—Tinct. Mosch. *Dub.*

CASTOREUM. Castor. Castor Fiber. *Mammalia. Glires.*

THE beaver, an amphibious quadruped, is a native of the North of Europe, Asia and America. Castor is a peculiar product collected in membranous cells near the extremity of the rectum, in this animal. The follicles inclosing it are cut off, and dried by exposure to the smoke of fuel. The castor, which is naturally soft and oily, becomes hard. It is imported of superior quality from Russia; an inferior kind is brought from New England. The former is dry, slightly unctuous, of a reddish brown colour, intermixed with fibres, and covered with a tough membrane; it has a strong unpleasant smell, and a bitter acrid taste. The American castor is more shrivelled, and inferior in taste and smell. The active matter of castor is dissolved by alkohol, proof spirit, and partially by water; the tincture with alkohol is the least nauseous.

Castor is used as an antispasmodic, in hysteria principally, sometimes in amenorrhœa, in a dose from 10 to 20 grains, or from one to two drachms of the tincture. From the experiments of Dr Alexander, it appears to be a remedy of no power, as given in a quantity much larger than its usual dose, it produced no sensible effect on the system.

Offic. Prep.—T. Castor. *Ph. Ed. Lond. Dub.* T. Castor. Comp. *Ed.*

OLEUM ANIMALE EMPYREUMATICUM. Empyreumatic Animal Oil. Ol. Cornu Cervi.

THE fresh bones or horns of animals, when exposed to heat in close vessels, afford an empyreumatic oil, derived from new combinations of the elements of the animal matter attached to the phosphate of lime, which is the base of bone. This oil is at first of a thick consistence, black colour, and extremely fœtid smell, but by repeated distillation becomes thinner, and nearly colourless and transparent, though it remains still fœtid. In this state it has been used as an antispasmodic, in a dose of 10 or 15 drops. It retains its place in the Dublin Pharmacopœia, under the name of Oleum Cornu Cervini Rectificatum, being obtained in the process of the distillation of hartshorn or bones, for the preparation of carbonate of ammonia; but it is entirely discarded from practice.

SUCCINUM. OLEUM et ACIDUM SUCCINI.

THE bituminous substance, amber, though it has a place in the list of the Materia Medica of the different Pharmacopœias, is perfectly inert, and is introduced only as affording, by distillation, an empyreumatic oil, which has been applied to some medicinal uses. This oil is at first thick and of a dark brown colour; but by repeated distillations with water it becomes limpid, still retaining however a very fœtid odour. It has been celebrated for its antispasmodic power, and has been employed in hysteria and amenorrhœa in a dose of from 10 to 15 drops. It is now discarded from practice, or is used only occasionally as an external stimulating application in paralysis and chronic rheumatism.

Along with this oil, a peculiar concrete acid is produced in the distillation, which is at first impure, but is purified by sublimation, or by solution and crystallization. It has a place in the Edinburgh and Dublin Pharmacopœias, but is destitute of any medicinal power, and is never applied to any use.

Bitumen Petroleum. Petroleum Barbadense. Mineral Tar.

Various kinds of liquid bitumens exist as natural productions, of different degrees of thickness, of a colour more or less deep, and also more or less volatile. That which has been usually kept in the shops, under the name of Barbadoes Tar, is thick, of a dark brown colour, having a smell that is fœtid, and a warm bitter taste. It has an analogy to the preceding empyreumatic oils in its properties; and like them has been used as an antispasmodic and expectorant in asthma and chronic cattarh, and externally as a stimulating application in rheumatism and paralysis. Though it retains its place in the Pharmacopœias, it is scarcely ever used.

Carbonas Ammoniæ Pyro-Oleosus. Empyreumatic Carbonate of Ammonia. Sal Cornu Cervi.

The bones of animals, when exposed to a sufficient degree of heat, afford a large quantity of carbonate of ammonia, formed by new combinations of the elements of the animal matter contained in the bone. There is a similar production of empyreumatic oil, and with this oil the ammoniacal carbonate is always impregnated, whence it derives a peculiar fœtid odour. It has also been supposed to derive from it certain medicinal powers, and has been used in preference to the pure carbonate of ammonia as an antispasmodic. Having been first procured from the bones of the deer, it has retained the name of Sal Cornu Cervi, and it still retains its place in the Dublin Pharmacopœia; being procured dissolved in the water which distils over, and this being rectified by repeated distillations. When thus rectified, it differs in little from pure carbonate of ammonia; and even combined with the empyreumatic oil, it has probably no additional medicinal efficacy, while from its fœtor it is unpleasant. Pure ammonia, dissolved in alkohol, is used as a solvent of the active matter of castor, assafœtida, and other antispasmodics, on the supposition that it coincides with them in their action on the system.

FERULA ASSAFOETIDA. Assafœtida. *Pentand. Digyn. Umbellatæ. Gummi-Resina. Persia.*

ASSAFOETIDA is a concrete gum-resin, obtained by exudation from incisions made in the roots of the plant; the juice, after it exudes, being inspissated by exposure to the sun. It is in small masses, adhering to each other, of a variegated texture, yellow on the external surface, white within, having an extremely fœtid smell, and a taste bitter and subacrid. It consists of about two-thirds of gum, and one-third of resin, its taste and smell residing in the resinous part. It yields all its virtues in alkohol. Triturated with water, it forms a milky-like mixture, the resin being diffused by the medium of the gum. Distilled with water, it affords a small quantity of essential oil, extremely fœtid.

Assafœtida is used as an antispasmodic in different nervous diseases, especially in amenorrhœa, hysteria, dyspnœa, dyspepsia attended with flatulence, and tympanitis, and is regarded as superior in efficacy to any of the fœtid gums. Its usual dose is from 5 to 20 grains, in the form of pill, or diffused in water. It is likewise given under the form of enema, in tympanitis, flatulent colic, in the violent hysteric paroxysm, and as a remedy against worms, 2 drachms being diffused in 8 ounces of warm milk or water; it is sometimes too applied externally as a plaster.

Offic. Prep.—Alkohol Ammon. Fœtid. Emp. Assafœt.

Pil. Assafœt. Comp. Tinct. Assafœt. *Ed.*—Mist. Assafœt. *Lond. Dub.* Enem. Fœtid. *Dub.*

Bubon Galbanum. Galbanum. *Petand. Digyn. Umbellatæ. Gummi-Resina. Africa.*

The plant which affords this resinous substance is a native of Syria, and also of the Cape of Good Hope. The Galbanum is obtained in the form of a milky juice, by exudation from incisions in the stem of the plant; when hardened it is in the form of a mass somewhat variegated in its texture, tenacious, of a yellowish brown colour, having a smell somewhat fœtid, and a bitter acrid taste.

Alkohol dissolves its resin, in which its powers have been supposed to reside; proof-spirit dissolves it entirely, the impurities excepted. Triturated with water, it is diffused, and forms a milky-like fluid; by distillation it affords about one-twentieth of its weight of essential oil.

Galbanum has the virtues of the fœtid gums, and is used for the same purposes, and sometimes combined with them in hysteria and amenorrhæa; being inferior in strength, however, to assafœtida, it is less employed. Its dose is 10 grains. Externally, it is more frequently used as a discutient to indolent tumors, and as a stimulant to promote suppuration.

Offic. Prep.—Pil. Galb. Comp. *Lond.*—Tinct. Galban. *Dub.* Emp. Galb. Comp. *Lond. Dub.*

Sagapenum. *Gummi-Resina.*

This gum-resin, usually imported from Alexandria, is the produce of an unknown tree said to be a native of Persia. It is in small masses, of a yellow colour, having a smell slightly fœtid, and a pungent nauseous taste; it is soluble in proof spirit; by distillation it affords a small quantity of essential oil.

Its virtues and uses are the same as those of the assafœtida, to which, however, it is inferior in power, and is therefore seldom employed. Its dose is from 10 to 20 grains. It is sometimes applied externally as a discutient.

VALERIANA OFFICINALIS. Wild Valerian. *Triand. Monogyn. Aggregatæ. Radix. Indigenous.*

THE root of this plant, which is the part of it used in medicine, consists of a number of slender fibres twisted, and attached to one head, of a light brown colour, having a smell strong and unpleasant, and a warm bitter taste, the smell and taste being stronger in wild valerian than in that which is cultivated. Its active matter is dissolved equally by water and alkohol, and appears therefore to consist of extractive matter, with perhaps a small portion of tannin, as its infusion changes colour on the addition of sulphate of iron. By distillation, water is impregnated with its flavour, but not with its taste, and scarcely any essential oil is obtained.

Valerian is an antispasmodic, not unfrequently employed in modern practice, especially in hysteria, chorea, and epilepsy, where these depend not on organic derangement, or on any permanent irritation, but on increased susceptibility of the nervous system. Sometimes, also, it is used with advantage in hemicrania. Its dose is from one scruple to one drachm, three or four times a-day, which is increased gradually as far as the stomach can bear it. Sometimes it is taken under the form of infusion, or of tincture.

Offic. Prep.—Tinct. Valer. Tinct. Valer. Ammon. *Ph. Lond.* et *Dub.* Extr. Valer. Infus. Valer. *Dub.*

CROCUS SATIVUS. Saffron. *Triand. Monogyn. Liliaceæ. Floris Stigmata. Indigenous.*

THIS plant is cultivated in the South of England to afford the Saffron of the shops. The stigmata which crown the pistil of the flower, are separated from the other parts, are submitted to pressure with a moderate heat, and thus form a soft mass of intermixed fibres, named Cake Saffron; when dried separately, they form Flower Saffron. The former is what is usually kept. It is in tough cakes somewhat moist, of a deep reddish yellow colour; its flavour is aromatic and diffusive, its taste warm and bitterish. The active matter is equally dissolved by alkohol, water, proof spirit, and vinegar, and appears, therefore, to afford an example of the principle peculiarly named Extract; the residuum, which is not more than 6 parts out of 16, is inert ligneous fibre. By distillation with water, a small quantity of essential oil is obtained.

Saffron was formerly regarded as a very active medicine, possessed of high stimulant and antispasmodic power, and requiring, it was imagined, to be given with much caution. Experience has proved it to be nearly inert, and it is now banished from medical practice. It sometimes enters into compositions on account of its colour, and is used as a popular remedy in the exanthemata, particularly in small-pox.

Offic. Prep.—Tinct. Croci. *Ed. Dub.*—Syr. Croci. *Lond.*

MELALEUCA CAJUPUTI. *Polyadelph. Polyand. Hesperidæ. Oleum Volatile. Ol. Cajeputæ. Cajeput Oil. India.*

THE essential oil, known by the name of Cajuput Oil, was supposed to be obtained from the Melaleuca Leucadendron; but, from later investigation, it appears to be procured from another species, to which the name of Melaleuca Cajuputi has been given. It is a native of Borneo and Amboyna. The oil is obtained by distillation from the leaves and fruit; it has a green or yellowish colour, a strong fragrant odour, somewhat similar to that of camphor, and an extremely pungent taste. It is highly volatile and inflammable.

This oil has been used as a highly diffusible stimulant and antispasmodic, in tympanitis, flatulent cholic, hysteria, palsy, chronic rheumatism, and various other diseases of debility. Its dose is 3 or 4 drops. It is also applied externally to relieve rheumatic and gouty pains, and sometimes gives sudden temporary relief; it also often succeeds in relieving the pain of toothach, when applied to the affected tooth.

Several substances are employed as antispasmodics, and which I have therefore placed in the table, which more strictly belong, however, to some of the other classes. Under these, therefore, their history is given, including the notice of those few applications of them as remedies, connected with their antispasmodic power.

CHAP. V.

OF TONICS.

By Tonics are understood those substances, the primary operation of which is to give strength to the system. It has been conceived, that muscular vigour depends on a certain degree of tension, or tone, as it is named, of the muscular fibre; and those substances which renew that vigour when impaired, have been considered as restoring this due degree of tension, and have thus received the appellation of Tonics. They are not, however, to be considered as acting by producing any mechanical change in the state of the solids, as this opinion implies. They act upon the living principle, and, so far as their action is understood, are stimulants of considerable power, permanent in their operation.

The distinction has been already pointed out between stimulants, which is founded not so much on a difference in their power, as in the quickness with which their full effect is produced, and in the transient nature of that effect. If a medicine suddenly raises a high state of excitement, this is as quickly followed by proportional languor or debility, and the changes from both modes of action, in the state of the functions of the body, are well marked. But if the stimulant operation be more slowly exerted, any change is much less conspicuous, and the succeeding collapse takes place to no considerable extent; when the administration of the remedy is suspended, the effect is merely a gradual abatement of excitement, and this is rendered less evident from being counteracted by the action of the stimulants habitually applied. On these principles, the action of tonics is explained. It is only by their stimulant operation that they can obviate debility; and as their effect is gradual, their action is not followed by that exhaustion and diminished susceptibility which invariably follows from excitement suddenly raised. If their administration, however, be carried to excess, or be continued too long, it may at length diminish the powers of the system: and if employed in a state of health, or high vigour, their effects may be injurious.

Tonics acts primarily on the stomach, the action they excite in that organ being conveyed generally by nervous communication to the rest of the system. This is evident from their effects often taking place in a short time; and there are experiments which prove, that when some tonics, as Peruvian bark, have been taken for a considerable length of time, no portion of them can be discovered by any chemical test in the blood. There are some of them, however, especially the metallic tonics, which are received into the circulation.

The stimulating effect of tonics is principally to be observed from their continued administration; they increase gradually the force of the circulation, promote the action of the digestive organs, augment the secretions, or moderate them when they have been morbidly increased, and give vigour to the muscular system. From the action of some of the more powerful remedies of this class, these effects are apparent, even in a short time. The diseases in which they are employed, must be obviously those of diminished power.

Tonics may be subdivided into those derived from the mineral, and those from the vegetable kingdoms: the former division comprehends several of the metals, and one or two of the earths. Under the vegetable tonics are comprised a number of substances possessing bitterness, and an aromatic pungency. These two qualities are generally blended in the most powerful tonics belonging to the vegetable kingdom; and there is a transition from these to the more pure bitters and aromatics. The stimulating action of the latter is rather too local and ~~and~~ transient to give rise to much permanent tonic effect: yet they can scarcely be placed under any other class, and I have therefore associated them with the substances with which they are thus connected. The purest Bitters are powerful Tonics, as is proved by their efficacy in curing intermittent fever. Aromatics may also be considered as tonic in their action on the stomach, if not on the general system, and are often employed to obviate debility in that organ, and to promote the digestive powers.

TONICS.

From the Mineral Kingdom.

Argentum.
Hydrargyrum.
Ferrum.
Zincum.
Cuprum.
Arsenicum.
Bismuthum.
Barytes.
Calx.
Acidum nitricum.
Hyper-oxymurias potassæ.

From the Vegetable Kingdom.

Cinchona officinalis.
Cinchona caribæa.
Cinchona floribunda.
Aristolochia serpentaria.
Dorstenia contrayerva.
Croton eleutheria.
Cusparia febrifuga.

Swietenia febrifuga.
Swietenia mahagoni.
Colomba.
Quassia simarouba.
Quassia excelsa.
Gentiana lutea.
Anthemis nobilis.
Citrus aurantium.
Citrus medica.
Acorus calamus.
Laurus cinnamomum.
Laurus cassia.
Canella alba.
Myristica moschata.
Caryophyllus aromaticus.
Capsicum annuum.
Piper nigrum.
Piper longum.
Myrtus pimenta.
Amomum zingiber.
Amomum zedoaria.
Amomum repens.
Carum carui.
Coriandrum sativum.
Pimpinella anisum.
Mentha piperita.

Tonics from the Mineral Kingdom.

These are in general more local in their action than the vegetable tonics; they either operate more directly on the stomach without their action being so quickly extended to the whole system, or they act by being received into the blood. Hence they produce less immediate general excitement, and it is only from their continued administration, generally in small doses, that their tonic effect is obtained. The analogies from which I have placed together the substances associated under this division, are somewhat remote and imperfect; and, to some of them, the appellation of tonic may be considered as applied by rather too free an extension of the term. But such imperfections in the classification of substances, from their action on the living system, are in the present state of medical science unavoidable to a certain extent. The substances, with regard to which this objection may be urged in the present case, could scarcely be referred with propriety to any other class: affinities may be traced in their operation, sufficient to connect them by their medicinal effects; and, even considered individually, the claim of each may be established to a certain degree of tonic power.

Argentum. Silver.

This metal is distinguished by its pure white colour, its high degree of lustre, and its great ductility and malleability. It is not very susceptible of oxidation; it does not suffer that change from exposure, even in a state of fusion, to the atmosphere, but is tarnished, apparently from the action of the sulphuretted hydrogen of animal effluvia. Those acids which yield oxygen readily oxidate and dissolve it, particularly nitric acid, which is hence employed as its usual solvent. The solution, when evaporated, affords the nitrate of silver in a crystalline form.

It appears that nitrate of silver was sometimes employed by the older physicians, but the harshness and violence of its operation led to its disuse. More lately, it has been introduced as a remedy in epilepsy,—a disease which, when not depending on organic derangement, is frequently connected with morbid susceptibility, and which tonics sometimes remove. The advantage derived from the administration of nitrate of silver has been established on the testimony of Dr Sims, Dr Cappe, Dr Bostock, and others. The dose is a quarter of a grain of the crystallized nitrate, which may be given three or four times a-day. Distilled water must be employed to dissolve it, as spring water, from the saline matter it contains, decomposes it; and the solution may be made into pills with crumbs of bread. It sometimes acts as a cathartic, and if it occasion much purging with griping, or if it excite nausea, the dose must be diminished. In one case of Angina Pectoris, the symptoms were removed by a similar administration of nitrate of silver. Fused nitrate of silver, lunar caustic as it is named, is used as an escharotic.

Hydrargyrum. Hydrargyrus. Argentum Vivum. Mercurius. Mercury or Quicksilver.

It has not been usual, in arrangements of the articles of the Materia Medica from their medicinal power, to place mercury under the class of tonics, but rather under that of sialogogues. Its power, however, of exciting the salivary discharge is merely a secondary effect, not constant nor uniform, and which is not essential to its efficacy in any disease. On the contrary, its tonic power is its primary operation; it is the most general stimulant belonging to the Materia Medica, pervading every part of the system; acting, as Dr Cullen has remarked, as a stimulus to every sensible and moving fibre of the body, and producing the most permanent effects. Hence it is the most general evacuant we possess; and from its stimulant operation, exerted directly or indirectly, is derived its utility in many diseases.

This metal is peculiarly distinguished by its fluidity at all natural temperatures, with the exception of the intense cold that sometimes prevails in very northern regions. Its congealing point is —40° of Fahrenheit. In its liquid state, it has the perfect opacity and lustre characteristic of metals, and likewise the property of great density, its specific gravity being to that of water as 13.5 to 1 nearly: it boils at a temperature a little above 600°, and when boiling suffers oxidation from the action of the atmospheric air. It is oxidated even at natural temperatures, when subjected to agitation; or still more easily, when triturated with any viscid matter, which is interposed between its globules, so as to extend their surface.

Quicksilver occurs in nature principally combined with sulphur, and is usually obtained from this ore submitted to heat mixed with iron or lime, either of which combines with the sulphur, and the mercury is separated by distillation. The quicksilver of commerce is sometimes impure, or adulterated by the intermixture of other metals, particularly lead and bismuth. This may be suspected when the metal loses its lustre speedily, and is covered with a grey film, or from its diminished mobility, in consequence of which its globules do not preserve exactly the spherical form, nor unite easily with each other; and it may be discovered, with more certainty, by exposing it to a heat sufficient to volatilize the quicksilver, when any other metal present will remain. It is best purified by distillation from iron-filings in an iron retort.

Mercury is not, in its metallic state, applied to any medicinal use; but under various forms of preparation, in which it is either simply oxidated, or its oxides are combined with acids, it is extensively employed, and affords a series of very active remedies.

When rendered active on the system by any of the modes of preparation to which it is subjected, it operates as a very powerful and general stimulant; as, from being received into the blood, it is enabled to act on every part of the system. When given in moderate quantity, it communicates general vigour: it increases the force of the circulation when this has been languid; by the increased vascular action which it excites, it gives to the blood the disposition to assume the buffy coat; and by its stimulant operation on secreting organs, it promotes the secretions, and hence acts as a very general evacuant. It peculiarly stimulates the salivary glands, and under all its forms of preparation speedily excites the salivary discharge, an effect scarcely produced by any other substance not locally applied, and probably owing, as will be explained under its history as a sialogogue, to its affinity to the saline matter existing in that secretion. It increases also the cuticular discharge, and it appears to promote the secretion of bile, and probably of the other intestinal fluids. Its stimulant operation on the absorbent system is not less evident; hence the emaciation which is the consequence of its continued action. From these diversified effects which Mercury produces, it is capable of being applied to the treatment of numerous states of disease.

In the febrile affections of warm climates, yellow fever and bilious remitting fever, it is a remedy of the highest value. It is probably useful principally as an evacuant, these forms of fever being peculiarly connected with a disordered state of the intestinal canal and abdominal secreting organs; and it is accordingly under the form of calomel, the mercurial which acts most powerfully on the liver and intestines, that it is chiefly employed. Some benefit is probably, at the same time, derived from its general stimulant action, as it proves most successful when given to that extent as to affect the system. Advantage is derived from it, probably from a similar mode of operation, in dysentery, especially when it is given in combination with opium. In the fevers of cold climates it is less employed.

There are some forms of inflammatory action in which mercury is useful, particularly in rheumatism. And in that chronic inflammation which affects glandular organs, it is the principal remedy both in counteracting it, and in removing that state of morbid structure which is often its consequence. Hence the peculiar advantage derived from mercurials in chronic hepatitis, and induration of the liver, in glandular obstruction and schirrosity, and in indolent tumors. Calomel is the preparation which in these cases appears to be most effectual, though the introduction of mercury by friction is also employed, perhaps with equal success.

In various diseases dependent on spasmodic action, mercury affords the most powerful remedy. In tetanus particularly, if the mercurial action on the system can be fully established, the violent spasm is sometimes resolved, and calomel given to a large extent, aided by mercurial inunction, affords the remedy which has been most frequently attended with success. In the milder affection of trismus, it is employed with the same views. And cases of hydrophobia have occurred, in which the disease appears to have yielded to a similar mode of treatment. It is also a valuable remedy in croup. In all these cases calomel is the preparation usually employed.

The stimulant operation of mercury on the absorbent system, renders it useful in the different forms of dropsy. It is given to the extent of exciting salivation in hydrocephalus; in ascites it is more usually employed to promote the action of diuretics, and in that species of dropsy when it depends on induration of the liver, and also in dropsy of the ovarium, it proves still more useful by its deobstruent power. Its stimulant operation on the uterine system leads to its employment as an emenagogue.

Different obstinate cutaneous diseases, lepra, tinea capitis, scabies, and others, are occasionally removed by the internal administration of mercury as an alterative; and these, as well as various forms of cutaneous eruption and ulceration, often yield to the external application of mercurial preparations.

The most important medicinal operation of mercury, remains to be stated,—that displayed in removing the disease induced by the syphilitic poison. In this its power is nearly, if not altogether specific; no article of the Materia Medica could be substituted for it; and there may be affirmed of it, what cannot with equal justice be said of any remedy employed in the treatment of any other morbid affection, that, if duely administered, it will scarcely ever fail in effecting a cure. It is difficult to assign any satisfactory theory of its operation. Its efficacy has been ascribed to its general evacuant power, in consequence of which the syphilitic virus is discharged from the body. But the speedy disappearance of the local symptoms of syphilis under its use, and even from its local application, affords a proof that it operates on some other principle; no similar advantage is derived from other evacuants; and its efficacy is not proportional to the evacuation it excites, but is frequently displayed where this is altogether insensible. The opinion has been advanced, that it acts as an antidote to the venereal virus, neutralizing it somewhat in the manner in which one chemical agent subdues the properties of another,—an opinion extremely vague and hypothetical, and rendered improbable from the consideration of the very small quantity of some of the more active preparations of mercury, from which a cure may be obtained, compared with the large quantity of others less active, that requires to be administered. The explanation advanced by Mr Hunter, that the efficacy of mercury in the treatment of syphilis depends on its general and permanent stimulant operation on the system, by which it induces and keeps up an action incompatible with that morbid action which constitutes the disease, until the virus is destroyed by the chemical changes going on in the system, or until it is eliminated from the body by the usual excretions, is on the whole most probable; it rests on a principle undoubted, that there are states of morbid action incompatible, so that one suspends the action of the other; mercury does exert a very general action, inducing and keeping up what may be regarded as a morbid state: and if this is incompatible with the action which constitutes syphilis, the continuance of it for some time will suspend the latter; and the venereal virus will, in common with any other matter contained in the circulating mass, be changed or discharged.

The mode of administering mercury, for the cure of the venereal disease, under all its forms, is now ascertained with sufficient precision. There is no advantage in giving it so as induce profuse salivation; this is even to be avoided as hurtful; at the same time, it is proper that salivation should be excited to a certain extent, not probably as essential to its efficacy, but as a proof of its full action on the system being obtained. This is kept up for a certain time, longer or shorter, according to the state of the symptoms, and the previous continuance of the disease. Exposure to cold is avoided, as being liable to cause the more partial operation of mercury on the salivary glands; and the state of irritation is diminished, or determination to the intestines producing purging is obviated, by the exhibition of an opiate. When profuse salivation occurs, the remedies employed to check it are cathartics in moderate doses, small doses of opium, the application of a blister to the throat, and the administration of sulphuret of potash; the last being employed from the doubtful hypothesis, that its chemical agency may neutralize the mercury. Free exposure to a cool dry air is, according to the observations of Mr Pearson, more effectual than any other method. When the morbid irritation, from the action of mercury, rises too high, producing a state of exhaustion, which sometimes proceeds rapidly to an alarming extent, the administration of the remedy must be immediately suspended; and in this case also, exposure to a cool atmosphere is advantageous.

The preparations of mercury, medicinally employed, are those in which it is oxidated, in which the oxidated metal is combined with an acid, or in which either the metal or the oxides of it are combined with sulphur. The particular processes for obtaining them are inserted and explained in the pharmaceutical part of the work. Here it is sufficient to notice briefly their distinctions and applications.

The Grey Oxide, formed by the trituration of mercury, is the basis of a number of preparations. In these, the metal has been supposed indeed to be merely mechanically divided; but in its metallic state, mercury does not appear to exert any sensible action on the living system, and the activity of it in these preparations is a proof that it is oxidated.

This is also established more directly; quick-silver, by agitation, is converted into a black powder, and this, like other oxides, is soluble in muriatic acid, which metallic mercury is not.

This oxidation is much promoted by the quicksilver being triturated with any viscous substance which facilitates the division of its globules. By trituration with mucilage of gum arabic, a preparation is obtained, named Plenk's Mercurial Solution, the operation of which is extremely mild. Rubbed with chalk, it forms the Hydrargus cum Creta of the London Pharmacopœia, a preparation having nothing to recommend it. The Mercurial Pill, prepared by triturating quicksilver with conserve of roses, and adding a sufficient quantity of starch to form a pill mass, is, of all the preparations adapted to affect the general system, the one most commonly employed, and is perhaps equal to any other, having the advantage of not being liable to produce much irritation, while we can depend on the certainty and permanence of its action. In a dose of eight grains, morning and evening, it soon affects the general system; in a larger dose, it is liable to occasion purging. Quicksilver, triturated with lard, soon loses its metallic form; and the ointment, after it has been kept for some time, contains little of it in the metallic state, the unctuous matter probably promoting its oxidation. The oxide is diffused through the lard, and it has been conjectured, is in part too combined with sebacic acid, formed from the oxygenation of the fat. Rubbed on the skin, in the quantity of one drachm of the strongest ointment, (that composed of equal parts of quicksilver and lard), it is forced through the cuticle, and is taken up by the absorbents; the system is thus affected, without the unpleasant consequences of nausea and purging, sometimes occasioned by the internal administration of even the mildest mercurial preparation;

this method is employed, therefore, where, from the state of the system, these affections are liable to be produced. Where it is necessary too to give the remedy in a large dose, or to bring the system speedily under its action, mercurial friction is employed, along with the administration of some of the mercurial preparations by the mouth. And, lastly, it has been supposed, that in certain local affections, particularly bubo, some advantage is derived from the mercury being conveyed through the affected gland.

The Mercurial Plaster is the metal triturated with melted resin and oil, and mixed with litharge plaster: it is sometimes applied to indolent glandular tumors as a discutient. Its power is supposed to be increased by the addition of gum-ammoniac, and this compound plaster has a place in the London and Dublin Pharmacopœias.

Mercury oxidated by exposure to atmospheric air, at a high temperature, gives an oxide in scales of a red colour, containing about 7 of oxygen in 100 parts. This, the red oxide, (Oxidum Hydrargyri Rubrum of the London Pharmacopœia), affords a preparation, which has been supposed to be the most uniform in its strength, and most certain in its operation, of all the mercurials. Its dose is one grain night and morning. It is more active than the grey oxide, but is more liable to produce irritation.

Various preparations are obtained from the metal oxidated by the acids. The Nitrate of mercury decomposed by heat, furnishes what is named Oxidum Hydrargyri Rubrum per Acidum Nitricum by the Edinburgh College, Hydrargyri Nitrico-Oxydum by the London. It is probably not an oxide, but a sub-nitrate, and from the acid combined with it is derived its escharotic power, for which only it is employed; it is applied externally to change the diseased surface of ulcers, or to other purposes for which escharotics are used.

This sub-nitrate, and also the nitrous solution of mercury, form, when mixed with lard, ointments which, from their stimulating power, are applied with the greatest advantage in chronic ophthalmia and psor-ophthalmia.

When the nitrate of mercury, containing the mercury in a low state of oxidation, is decomposed by ammonia, a precipitate is thrown down of a grey colour, which appears to be nearly a pure oxide. It is the Oxidum Hydrargyri Cinereum of the Pharmacopœias; is comparatively mild in its operation, and is frequently employed, its dose being one or two grains. It is also sometimes used under the form of ointment, as a mode of applying mercurial friction.

Mercury, oxidated by sulphuric acid, forms the Sulphate of mercury, which, decomposed by the affusion of boiling water, affords a yellow powder, the Sub-sulphate, or, as it was formerly named, Turbith Mineral. This acts with too much violence to be used as a mercurial. In a dose of 3 or 4 grains, it operates as a powerful emetic, and it is sometimes used as an errhine.

The preparations in which the mercury is saturated with an acid, are very active. The nitrous solution of it is highly caustic. Mixed with lard, it forms an ointment, Unguentum Nitratis Hydrargyri, used with much advantage in cutaneous diseases.

Mercury, oxidated and combined with muriatic acid, forms two very active preparations, differing in the degree of oxidation, and in the proportion of acid with which the oxide is combined. The one has been long known by the name of Corrosive Sublimate of Mercury, the other by that of Mild Sublimate or Calomel. The former is now named Muriate of Quicksilver by the Edinburgh College, and Oxymuriate of Quicksilver by the London College; the latter by both Colleges Submuriate of Mercury;—names not sufficiently distinctive, and chemically incorrect. The old distinguishing epithets are still the least ambiguous, and even in conformity to strict chemical nomenclature are properly used.

The first of these compounds, Corrosive Muriate of Mercury, is composed of the metal highly oxidated, and this oxide is combined with a large proportion of muriatic acid. The proportions, according to Chenevix's analysis, are 69.6 mercury, 12.3 oxygen, and 18 of acid: those assigned from the later analysis by Zaboada, are 71.5 of mercury, 8.5 of oxygen, and 19.5 of acid. It is obtained by sublimation in the form of a solid white mass, or if more slowly sublimed, in crystalline needles. It is soluble in water and in alkohol, has a taste styptic and metallic, and exerts a degree of escharotic power. It is the most active of all the preparations of this metal: even in a small dose it occasions severe griping and purging, a larger quantity causes inflammation of the intestines, tenesmus, and discharge of blood; profuse salivation is induced, and convulsions terminate in death. As a poison, it affects both the heart and nervous system, the affection of the latter being marked by the convulsions and the state of insensibility which it induces; of the former, by the rapid cessation of the circulation; it appears at the same time, to act chemically on the stomach, the mucous membrane of that organ in an animal killed by it, being found on dissection soft and pulpy, so as to be easily detached. The remedies which have been employed to counteract it, are alkaline solutions, or lime-water, by which it may be decomposed, and mucilaginous diluents to facilitate vomiting.

Corrosive muriate of mercury is distinguished by some peculiarities of action from the other mercurials. From its great activity it sooner affects the system, and hence is calculated, in the treatment of syphilis, speedily to arrest the progress of the symptoms. Its operation too, when it is not given in too large a dose, is more general; it is less liable, therefore, to induce salivation, or any other local affection, and hence fewer precautions, with the exception of the due regulation of the dose, are required during its use. It succeeds best when given in small doses, such as the $\frac{1}{8}$ or $\frac{1}{6}$ of a grain twice a-day, and its operation is rendered more mild by the free use of diluents. It must always be given in solution, in order that the dose may be apportioned with sufficient accuracy. Its solution in diluted alkohol is supposed to sit easier on the stomach than its watery solution, and under this form it was recommended by Van Swieten, who introduced its free use. Another form of prescribing it is, to encrease its solubility by the addition of muriate of ammonia, so that a small quantity of water dissolves it, and to form this solution into pills by the addition of crumb of bread, each pill containing $\frac{1}{8}$ grain. Much caution is required in encreasing the dose, and whenever it produces nausea or purging, it ought to be intermitted.

The advantages belonging to this preparation have led to its frequent use. It has disadvantages, however, which more than counterbalance them. Its effects are liable to be violent, and what forms the most important objection to it, its operation does not appear to be sufficiently permanent; hence, when the symptoms of syphylis have disappeared under its use, they are liable, it has been alledged, to return when it is suspended, or the disease recurs in some of its secondary forms. From these circumstances it is now not much employed in the general treatment of syphylis, but is rather used from particular indications. Some of the empirical medicines which are boasted of as antisyphylitic remedies, and as containing no mercury, owe their efficacy to it; its activity rendering the dose so small, that it is more easily disguised by substances with which it is mixed, and its action being less liable than that of others, when the dose is small, to excite salivation. It is occasionally employed in other diseases in regular practice, particularly as an alterative in lepra and other obstinate cutaneous affections, and in rheumatism. A very dilute solution of it is used as a gargle in venereal sore throat, and as a lotion in some cutaneous affections. The system has sometimes been observed to be affected from its too free external application, especially when in a concentrated state, under the form of ointment or plaster; and some cases are related by Plenk, of death having been the consequence of such applications. When introduced into an wound, it quickly occasions death, producing, at the same time, total disorganization of the part.

Mild Muriate of Mercury, or Calomel, is obtained by triturating the corrosive muriate with nearly an equal part of the metal, and favouring their mutual action by the action of heat, the product being sublimed. The additional metallic mercury which is thus brought into combination, shares the oxygen and the acid of the corrosive muriate, so that the whole of the metal is in a lower degree of oxidation, and this oxide is combined with less muriatic acid. The quantity of acid, however, is as much as the oxide requires to combine with it, and hence the product is not a sub-muriate, as the name given to it in the Pharmacopœias implies. The proportions of its principles, according to its analysis by Chenevix, are mercury 79, oxygen 9.5, and acid 11.5; according to its analysis by Zaboada, they are 85 of mercury, 4.4 of oxygen, and 10.6 of acid. It is obtained in the form of a dense crystalline cake, composed of short aggregated prisms; if its vapour be condensed on the surface of water, this aggregation is prevented, and it is obtained in powder, as it is also when prepared in the humid way, by decomposing a solution of nitrate of mercury at the minimum of oxidation, by muriatic acid or a solution of muriate of soda. It is perfectly insipid and insoluble in water.

Mild muriate of mercury is one of the mildest of the mercurials, and at the same time one of the most certain in its operation on the general system. It is not so much employed as a remedy in syphylis, principally from its being liable to induce purging; but when this is obviated by the addition of small doses of opium, it is given in the dose of one or two grains morning and evening, and soon affects the general system. It is the mercurial, however, which is chiefly employed in the treatment of the other diseases in which mercury is prescribed. To the treatment of some of them it is peculiarly adapted by its action on the intestinal canal, and the secreting organs connected with it; hence its employment in febrile affections, in hepatitis and chronic induration of the liver, in schirrous affections of other visceral organs, in dysentery, and as a remedy in worms. The mildness of its operation rendering it safe to administer it in large doses, so as speedily to bring the system under the action of mercury, renders it equally proper for administration in tetanus, hydrophobia, croup, and other diseases in which this is required. The same mildness adapts it to continued use, and hence the preference given to it in cutaneous affections, in glandular obstructions, in dropsy, and wherever mercury is employed as an alterative. It not only produces the general effects of a mercurial, but also, when given in sufficient doses, acts with certainty and mildness as a cathartic. It is hence often employed to promote the operation of other cathartics, and it has the peculiar advantage, that it does so without adding to the irritation which they are liable to occasion. Hence, this combination is peculiarly useful where it is difficult to cause purging, or where, from the state of the stomach, the usual cathartics are liable to be rejected, especially when they are given in large doses. Its dose as a cathartic is from five to ten or even fifteen grains. When prescribed with other intentions, the dose is various; as an alterative a grain is given night and morning, and this, after being continued some time, will affect the system. When it is necessary that this should be done more speedily, a larger dose is prescribed, and, if necessary, its purgative operation may be obviated by opium.

Muriate of Mercury and Ammonia, Hydrargyrus Præcipitatis Albus of the London Pharmacopœia, is prepared by decomposing corrosive muriate of mercury by ammonia. A precipitate is thrown down, which consists of oxide of mercury combined with a portion of muriatic acid and a small quantity of ammonia, the proportions being 81 of oxide, 16 of acid, and 3 of ammonia. It is too acrid for internal use, but is employed externally as a mild escharotic, and as an application in various cutaneous affections. An ointment adapted to these purposes has a place in the London and Dublin Pharmacopœias.

With acetous acid mercury forms the Acetis Hydrargyri, a preparation which, as the basis of Keyser's pill, was at one time much celebrated for the mildness of its action; it is given in a dose of from 2 to 5 grains; its operation has been supposed, however, to be uncertain, and it has fallen into disuse. This, as well as other saline compounds of Mercury, are most easily obtained by adding to a solution of nitrate of mercury a solution of a compound salt, containing the acid with which the oxide of mercury is designed to be combined. Thus, to form the acetate, a solution of acetate of potash is added.

United with sulphur, mercury forms two preparations, the black sulphuret, and the red. In both of them the metal has been supposed to be oxidated, and in the red a large quantity of oxygen has been supposed to be contained. This has not been established, however, and it is probable that they are metallic sulphurets without oxygen. The black sulphuret, formerly named Ethiops Mineral, is prepared by triturating equal parts of mercury and sulphur together, so as to form a black powder. It is a very inactive preparation, and has been used only as an anthelmintic, in a dose to an adult of one scruple or half a drachm. The red sulphuret, or Cinnabar, is the mercury united with about one-sixth of its weight of sulphur by sublimation. It is applied principally by fumigation, with the view of stopping the progress of venereal ulcers, being converted into vapour by being laid on a hot iron, and this vapour being directed on the part.

FERRUM. Iron.

THIS metal is the one which has been regarded as most salutary to the animal system; and the remark is perhaps just, that it is the only metal having any sensible activity, which has no poisonous quality. It exists as a constituent principle of the blood, and has hence been supposed to serve some important purpose in the animal œconomy. When given medicinally, the effects obtained from it are those of a tonic; it encreases the vigour of the circulation, causes the blood, it has been affirmed, to assume a more florid hue, promotes digestion, excites the secretions, or restrains them when they have been morbidly encreased, and by its astringency checks profuse evacuations, and counteracts the tendency to hæmorrhage. It is in diseases of debility that it is employed, and as its operation is only gradual, chiefly in chronic affections,—dyspepsia, hypochondriasis, hysteria, amenorrhea, leucorrhea, passive menorrhagia, chronic catarrh, hectic, paralysis, scrofula, and rickets. It is less proper where there is any tendency to inflammatory action, or a plethoric state of the vessels; and its administration ought to be suspended when it renders the pulse quick in such cases, or when it occasions a sense of fulness, flushing, head-ach, or costiveness. The remark has been made by Cullen, that "the good effects of the preparations of iron have been "often missed by their being given in too small doses." The opposite observation is probably more just, that they are lost from too large doses being employed, and in practice this is perhaps the more common error. Large doses of the less active preparations, as the rust of iron, seem merely to load the stomach without any equivalent advantage; the more active saline preparations, on the other hand, almost always injure its tone, so as soon to cause disorder of its functions, impaired digestion, pain, and irritation; it is this indeed which gives rise to the principal difficulty in the administration of iron as a tonic. And this very irritation which the active chalybeates excite, counteracts their salutary operation, and probably prevents their conveyance into the circulation, on which their efficacy may depend. These inconveniencies are best obviated by giving the active preparations of iron in small doses, regularly taken, continued for some time, and rendered milder by dilution. Hence, probably, the greater benefit derived from the chalybeate mineral waters than from iron in any other form. Besides dilution, the addition of an aromatic is often useful, and in all cases the precaution ought to be attended to, of diminishing the dose, or intermitting the remedy when it produces irritation, nausea, or impaired digestion.

Numerous preparations of this metal are medicinally employed.

The filings of iron, (Limatura Ferri), which, for medicinal use, are purified by the magnet, are given in a dose from one scruple to a drachm or two; their activity is probably dependent on the oxidation they suffer in the stomach, from the action of the gastric fluids. They are administered mixed with a little sugar and an aromatic.

The Carbonate, or Rust of Iron, Carbonas Ferri, Rubigo Ferri, is the metal oxidated by the action of atmospheric air and water, and combined with carbonic acid; it is more active than the pure metal, and less irritating than the saline preparations. It is given in a dose from 5 to 20 grains. Besides its use as a general tonic in the cases in which chalybeates are usually employed, it has been used as a remedy in cancerous ulceration, both internally administered in its usual dose, and externally applied sprinkled on the sore. Cases have been given in which this practice has proved successful, while, from the experience of others, it has appeared to operate merely as a palliative, or at farthest, to be of permanent advantage only in some forms of ill-conditioned ulcers, not truly of a cancerous nature. Another form of it, supposed to be more pure, is what is named Carbonas Ferri Præcipitatus, prepared by adding a solution of carbonate of soda to a solution of sulphate of iron. This was first used under the form of an extemporaneous preparation combined with Myrrh, *Griffith's Antihectic Mixture*, which had obtained some celebrity as a remedy in phthysis and hectic. The formula for this has been received into the London Pharmacopœia. In the Edinburgh Pharmacopœia the precipitate of carbonate of iron is ordered to be washed and dried. In this case it absorbs oxygen, and in consequence of this differs little from the rust of iron.

Muriate of Iron and Ammonia, of the Edinburgh Pharmacopœia, what is named by the London College Ferrum Ammoniatum, is obtained, by sublimation, from a mixture of muriate of ammonia and red oxide or carbonate of iron.

It is an active preparation, but liable to be variable in composition. It is given in a dose from 5 to 10 grains. Dissolved in diluted alkohol, it forms an officinal tincture, the dose of which is 30 drops.

The Muriate of Iron, employed under the form of tincture, (Tinctura Ferri Muriati), is prepared by dissolving black oxide of iron in muriatic acid, and diluting the solution with alkohol. It is a very active preparation; sometimes too much so to admit of being used in an irritable state of the stomach. Its dose is 10 or 15 drops diluted with water, or taken in wine, in which it is more grateful. If it occasion nausea or pain, the dose must be diminished. It is the preparation usually employed where the full operation of iron is attempted to be obtained. Besides its employment in the diseases in which chalybeates are usually prescribed, Mr Cline has mentioned a peculiar application of it in which it had proved of singular efficacy, that of suppression of urine from spasm of the urethra, 10 drops being given every ten minutes; after the sixth dose the suppression in different cases was relieved.

Sulphate of iron is formed in the large way, by the oxygenation of the native sulphuret by exposure to air and humidity; or it is obtained more pure by dissolving iron in diluted sulphuric acid, and evaporating the solution. It crystallizes in rhomboidal prisms of a green colour. It is one of the most active preparations of the metal, and is not unfrequently prescribed in amenorrhœa. Its dose is from one to five grains. The red sulphate appears to be possessed of still higher tonic power, and has been employed with much advantage as a remedy in the various forms of dyspepsia and hypochondriasis. It is prepared by adding to nitrous acid, the green sulphate in powder, as long as any effervescence takes place, applying a gentle heat to favour their mutual action. The residual liquid is a saturated solution of the red sulphate, and may be given in a dose of four or five drops twice or thrice a-day.

The Tartrate of Potash and Iron has a place in the London Pharmacopœia, though not much employed in practice. It is prepared by rubbing equal weights of iron-filings and super-tartrate of potash with water, exposing the mixture to the action of the air, drying the mass, and again subjecting it to the action of water, to render the oxidation and combination of the iron more complete. The preparation is a mild one, and can be given to the extent of 10 or 15 grains as a dose. A similar preparation, in which the iron is more highly oxidated, and its combination with the tartaric acid probably more perfect, is obtained by a process given by the Dublin College, in which carbonate of iron and super-tartrate of potash are boiled with a portion of water, the liquor filtered, and evaporated until on cooling it form a saline mass. This, in a dose of three or four grains twice a-day, acts not only as a tonic, but also as a diuretic, and, from the combination of these powers, has been employed with advantage as a remedy in dropsy. From the mildness of its operation, too, it is well adapted for exhibition in scrophula.

The Wine of Iron, which has a place in the London and Dublin Pharmacopœias, prepared by digesting iron-filings in white wine, is another form under which the tartrate is used; the metal being dissolved by the tartaric acid of the wine. Its dose is one or two drachms.

Acetate of iron has been introduced by the Dublin College, being prepared, according to one process they have given, by digesting carbonate of iron in acetic acid; according to another, by rubbing together acetate of potash and sulphate of iron until they become soft; drying this with a moderate heat, and digesting it with alkohol. Of the tincture thus formed, 20 or 30 drops are a dose.

The London College have given a place to a preparation of iron, (Liquor Ferri Alkalini), of rather a singular nature. Iron is dissolved in nitric acid largely diluted; and to this solution a solution of sub-carbonate of potash is added, as long as effervescence is excited: the liquor, after standing for six hours, is poured off. It is probably a ternary combination of oxide of iron, potash, and carbonic acid; any nitric acid remaining undecomposed in the oxidation of the iron, being probably withdrawn combined with a portion of potash, as the liquor, on standing, deposites nitre. This preparation has been long known by the name of Stahl's Martial Alkaline Tincture. It had almost entirely fallen into disuse, so that few recent observations have been made with regard to its powers. The following account of it is from the experience of a very able physician. "It in general sits easy on the most delicate stomach, and instead of impairing, rather encreases the appetite and assists digestion. It usually proves laxative and diuretic. Hence, it is given with great advantage in dropsical complaints, and particularly in those cases of dropsy where it is usual to conjoin tonics with the usual evacuants, or to prescribe them when the dropsical fluid has been removed by diuretics or by an operation. In scrofulous affections of the glands, and in scrofulous ulceration, it has proved a valuable remedy, as it has also in leucorrhæa and in gleet. Much advantage is derived from it too in pulmonary affections, after the inflammatory stage has been removed, where a tendency to relapse exists, or where any spasmodic symptoms have supervened. Its medium dose is 10 drops three or four times a-day in a glassful of water, and this may be encreased gradually to 20 or 30 drops. It has been encreased to 60 or 80 drops a dose, but this is not adviseable, as it produces uneasiness at the stomach, and acts very powerfully on the bowels. Its action on the bowels is the best criterion to determine to what extent the dose may be encreased, always taking into view, that less advantage is to be derived from large doses of iron, than from small doses long and regularly taken." Though these powers render this preparation a valuable one, it has the disadvantage, as is to be stated under its pharmaceutical history, of being very liable to be variable in strength. The dose, however, being regulated in some measure by its operation, may with care be accommodated to this; and as it appears to sit easier on the stomach, and to prove less irritating than any of the other active chalybeates, an advantage probably derived from its alkaline impregnation, it undoubtedly deserves a farther trial.

The Mineral Chalybeate Waters afford another form under which iron may be administered. The iron is generally dissolved in them by the carbonic acid; and from the state of dilution, they are often used with more advantage than the more active preparations of the metal.

Zincum. Zinc.

This metal is of a white colour, with a shade of grey; it is brittle, except at a temperature between 200° and 300° of Fahrenheit, when it has considerable ductility and malleability; it is fusible at a heat approaching to that of ignition, and when raised to that temperature burns with a bright flame, forming a white oxide.

Zinc exerts no sensible action on the system in its metallic state; it is employed therefore under various forms of preparation, which are in general possessed of a degree of tonic and astringent power.

White oxide of zinc, obtained from the combustion of the metal, has been employed as a remedy in various spasmodic affections, particularly chorea and epilepsy, in a dose of five grains, gradually encreased. There are cases on record where a cure was obtained; but it does not appear to be very active or certain in its operation. An ointment composed of it is used as a healing cerate, and as an application in ophthalmia.

There is a substance named Impure Oxide of Zinc by the Edinburgh College, long known by the appellation of Tutia, the nature and origin of which are not very well ascertained. It has been supposed to be artificial, and to be prepared from oxide of zinc obtained in the roasting of zinc ores, which is afterwards mixed with clay. It is of a grey or bluish colour, and earthy texture, and when levigated it is used sometimes as the basis of a cerate employed as a dressing to wounds, or applied to the eye in some forms of ophthalmia.

What has been named Calamine Stone, (Lapis Calaminaris), is regarded as a carbonate of zinc; and it generally is so, though there are varieties of it composed of oxide of zinc and siliceous earth. It is employed only externally, the levigated powder is dusted on the skin in slight cases of excoriation and superficial inflammation, and it forms the basis of the common healing cerate.

Sulphate of Zinc, formed by exposure of the native sulphuret to air and humidity, is obtained by evaporation of its solution in a solid mass, forming the white vitriol of commerce; or it is procured more pure, and in a crystalline form, by evaporation of the solution of zinc in diluted sulphuric acid. It has been employed in the same cases as the oxide, and Dr Cullen has observed that it is possessed of the same powers; it has likewise been given, in the dose of a few grains, as a tonic in intermittent fever, and as a tonic and astringent in chronic dysentery, and lately has been employed with much advantage, in small doses combined with bitters, as a tonic in dyspepsia. Its administration in all these cases requires to be conducted so as to obviate the nausea which it is liable to occasion. In a large dose it always operates as an emetic, and is sometimes employed as such in a dose from 10 to 20 grains, particularly where the stomach is not easily roused to action, as where a narcotic poison has been swallowed. Its solution is a common astringent injection in gonorrhœa in the strength of a grain and a half to an ounce of water; and nearly of the same strength it is often employed as a collyrium in ophthalmia.

Acetate of Zinc, under the form of solution, has a place in the Edinburgh Pharmacopœia, being obtained by mixing solutions of acetate of lead and sulphate of zinc, when sulphate of lead is precipitated, and the acetate of zinc remains dissolved. It is used as a collyrium in ophthalmia, and an astringent injection in gonorrhœa, and is considered as less irritating than the solution of the sulphate.

Cuprum. Copper.

This metal is not, like the greater number of the metals, insipid and inodorous; it has an unpleasant styptic taste, and when rubbed a perceptible smell. It is extremely noxious to animal life. Still, when properly administered, it proves a remedy of value, and, like zinc, has some claim to be ranked as a tonic, from its successful operation in epilepsy, chorea, and other spasmodic affections dependent on or connected with debility. It is also employed under various forms of preparation as an astringent, emetic, and escharotic.

Sulphate of Copper, Blue Vitriol as it was formerly named, is its most important saline compound. It is often obtained from the water which filtrates through copper mines, in which it exists dissolved; or it is prepared by calcining the native sulphuret of copper, and exposing it in a humid state to the air; the metal is oxidated, the sulphur, also absorbing oxygen, is converted into sulphuric acid, and the sulphate of copper thus formed, is procured by lixiviation and crystallization. The crystals are short rhomboidal prisms of a rich blue colour, transparent, but liable to a slight efflorescence. This salt is rather too active to admit of internal administration as a tonic; even in a very small dose it excites nausea and vomiting; and as a powerful emetic it is employed, where from the state of the stomach it is difficult to excite vomiting, as where a narcotic has been taken in too large a quantity; the dose being from 2 to 5 grains, or even larger, according as it is more difficult to excite vomiting. Externally it is used as an astringent and escharotic,—applications of it to be afterwards noticed.

Sub-acetate of Copper, Verdigris as it has been named, is prepared by covering copper plates with the husks of the grape, after the expression of the juice in the wine-press. A number of plates with the interposed husks being placed together, and these being occasionally moistened, the vegetable matter passes into fermentation, and a portion of acetic acid is formed; this acting on the copper forms a green oxide, with which a portion of the acid likewise combines, so as to form a sub-acetate. The crust of this is scraped off, and beat into masses, which are dried. It is of a bright green colour, and from the excess of oxide it contains, is only partially soluble in water. By dissolving it in distilled vinegar, this excess of oxide is saturated, and by evaporation of the solution, the proper acetate of copper is obtained in a crystallized mass of a very deep green colour. This is scarcely medicinally employed. The sub-acetate has been employed as a form of giving copper in epilepsy, and also as an emetic;

but it is chiefly as an escharotic that it is used in modern practice.

The preparation named Ammoniuret of Copper (Ammoniaretum Cupri, Cuprum Ammoniatum) is the one usually employed to obtain the action of copper on the system. It is prepared by triturating sulphate of copper and carbonate of ammonia together, and is either a ternary compound of oxide of copper, ammonia, and sulphuric acid, or a mixture of sulphate of ammonia, and the compound of ammonia with oxide of copper. It is given in epilepsy, in a dose of half a grain twice a-day, increasing it gradually as far as the stomach or system will bear it, and continuing it until the remedy has received a fair trial. It has in some cases proved successful, though in a disease arising from such various causes, and so frequently depending on derangement of organic structure, any remedy must frequently fail. It has been given in a similar manner with advantage in chorea and dysphagia.

Arsenicum. Arsenic.

The name Arsenic used to be applied to what has been ascertained to be the oxide of a peculiar metal, and in chemical nomenclature it is to this metal that the name is now appropriated. It occurs sometimes native, or in the state of oxide, but more generally combined with sulphur, forming the ores named Orpiment and Realgar; and frequently also associated with other metallic sulphurets. It is extracted from these by sublimation, in the state of an oxide, its oxidation being effected by the action of the atmospheric air during the volatilization; and from this oxide the arsenic is usually obtained by exposing it to heat mixed with a portion of the black flux: the metal is sublimed. Metallic arsenic is of a dark grey colour, with considerable lustre, which is however very liable to tarnish ; its texture is foliated, and it is extremely brittle ; its specific gravity is 8.3. It is volatile at a heat considerably inferior to that of ignition, and when in vapour has a peculiar smell, often compared to that of garlic. At the same temperature, it is oxidated rapidly by the action of the air, forming a white vapour which condenses. At a higher temperature it burns, and affords the same product. This product used to be regarded as an oxide. Being soluble however in water, capable of crystallizing, reddening the infusion of litmus, and combining with the alkalis, it has been regarded as an acid, and has been named Arsenious Acid. Though there is some foundation for this conclusion, this substance may perhaps still be ranked as an oxide ; for it does not neutralize the alkaline properties, nor act on them more forcibly than many other metallic oxides ; it even neutralizes the properties of acids. By a higher degree of oxygenation, it is converted into a substance of undoubted acid powers, the arsénic acid.

The oxide of arsenic, or white arsenic of commerce, is not formed from the oxygenation of the metal, but is obtained by sublimation in the roasting of various metallic ores, particularly those of cobalt, in which it exists. The sublimate, at first impure, is again sublimed, and is thus obtained in the form of an opaque white dense cake, which is reduced to powder, for the uses to which it is applied. In the London Pharmacopœia, this is ordered to be prepared for medicinal use by another sublimation, probably without any advantage. It consists of 75.2 of arsenic, and 24.8 of oxygen. Its taste is acrid and penetrating ; it is soluble in 80 parts of cold, and in 15 parts of boiling water ; the latter solution, on cooling, affording minute crystals : it reddens the colour of litmus.

This substance has been long known as the most virulent of the mineral poisons. Even in a very small quantity, it occasions vomiting, purging, tremors, and paralysis; in a quantity a little larger, it excites severe pain in the stomach, with a sense of heat extending from the œsophagus, extreme thirst, violent vomiting, with great anxiety and depression. The pain extends over the abdomen, respiration becomes difficult, the pulse is small, quick and irregular; the vomiting is incessant, accompanied with tremors, convulsions and fainting; there is a sense of coldness, sometimes with cold sweats, paralysis frequently supervenes, and the patient dies exhausted. On dissection, the internal surface of the stomach and upper part of the intestines is found inflamed; the inflammation is usually confined to the mucous membrane, which often assumes a florid red colour, becomes soft and pulpy, and is easily detached; the blood-vessels on its surface are frequently turgid, and sometimes there are small spots of extravasated blood; signs of putrefaction, it has been said, appear sooner than in other cases of sudden death, but this is doubtful, as well as the appearance of livid spots on the skin, which has been said to occur: the blood is usually in a fluid state, and the body is frequently swelled.

All the effects of arsenic, it has been clearly established, are produced by its incautious external application, and they appear with great celerity and violence when the arsenic is applied to an wound. Some facts which had been partly known with regard to this, have lately been confirmed and illustrated by the experiments of Mr Brodie, so as to lead to a more particular view of its mode of operation. When applied externally to an wound, it occasions death even more speedily than when it has been received into the stomach, and with similar symptoms; vomiting and purging, in particular, are produced to as great an extent, and on dissection the stomach and intestines are found to be inflamed. This shews the particular determination of its action to these parts*; and as the inflammation of the stomach is found even to precede any appearance of the inflammation of the wound, so that the former cannot be considered as connected by sympathetic action with the latter, it, as well as the general affection of the system, probably arises from the arsenic being received into the circulation through the divided blood-vessels of the wound. Though the inflammation of the stomach, which follows from its internal administration, may arise from its direct application, it is also possible that it may be produced in this indirect mode by its entering the circulating mass.

Though so violent in its operation, arsenic has been frequently employed in medical practice; and when properly administered, we obtain from it, in certain diseases, all the advantage which is derived from the operation of the most safe and powerful tonic. This is well displayed in its efficacy in the treatment of intermittent fever, the disease in which it has been principally used.

It is employed medicinally under various forms. A preparation of it introduced by Fowler, and analogous to one which had been known under the name of Tasteless Ague Drop, has been adopted by the London College, and named Liquor Arsenicalis. It is prepared by dissolving sixty-four grains of the white oxide, and the same quantity of sub-carbonate of potash, in sixteen ounces of water, adding half an ounce of compound spirit of lavender. This is given in a dose of 4 drops, three times a-day, which is gradually increased to double that quantity; its administration being occasionally intermitted, not too long persisted in, and immediately relinquished if it occasion nausea or purging, vertigo, headach, or cough, or indeed any particular indication of the system being much under its influence. The arseniate of potash, prepared by exposing the white oxide of arsenic with an equal weight of nitre, to a heat gradually raised to redness, and crystallizing the residual mass, is another preparation which has been employed, and has been lately sanctioned by the Dublin College. It is used in the same manner, in the dose of the eighth part of a grain of the crystallized salt. Under the same forms arsenic has been given in remitting fever, in periodic headach, in that painful affection of the face named Tic Douloureux, is an antidote to the poison of venomous animals, in hydrophobia, lepra, and elephantiasis; and in some of these diseases with very marked advantage in cases where other remedies had failed. Its administration always requires, however, to be conducted with much care. Even in the small doses in which arsenic has been administered medicinally, it is liable to exert its deleterious agency. It often excites nausea, pain at stomach and purging; sometimes pain in the forehead, with a sense of tension, a stiffness of the palpebræ, soreness of the mouth, and increase of the salivary discharge, and when its operation proceeds still farther, it excites severe symptomatic cough. These effects sometimes arise even from its external application. Whenever they appear, the dose ought to be diminished; and if they become urgent, the use of the remedy ought to be immediately suspended.

Externally, arsenic is used in scirrhus and cancer; applications of it to be noticed under the class of Escharotics.

The antidotes which have been employed to counteract the poisonous operation of arsenic are various. Vomiting, if not produced by its action, which it generally is, must be immediately excited, and as the stomach is highly irritable in such cases, the milder emetics, and especially oil, which is supposed to involve the particles of the poison, have been recommended. According to the assertion of Renault, oil appears from experiments rather to favour its action; probably, from its not mixing easily with the contents of the stomach, or the mucus on its surface, and therefore not aiding its rejection; tepid water, or mucilaginous liquors, ought to be preferred; these too are useful in facilitating vomiting. Reliance has been placed on solutions of the alkaline sulphurets, or of sulphuretted hydrogen. The latter appears, from Renault's experiments, to have some power, since, if it were previously combined with the arsenious acid, it rendered it nearly inert; but if merely introduced into the stomach with it, or after it had been swallowed, especially if the arsenic were not dissolved, it seemed to have little efficacy as an antidote, and indeed cannot be expected to have much effect. A solution of soap has been recommended as useful from its alkaline matter, and it has the advantage of being easily procured. As the effects from arsenic are those denoting inflammatory action in the system, and as even the inflammation of the stomach and intestines seems to be the consequence of this as much as of any local operation of the arsenic itself, blood-letting would appear to be indicated, and in a case of such urgency might probably be carried to a considerable extent with advantage. In a case related by Dr Roget, in which blood-letting was suggested to him by the evident inflammatory affection of the stomach, eighteen ounces of blood were drawn from the arm, the patient fainted, and remained half an hour in a state of insensibility. The violent affection of the stomach, however, was relieved, and after a succession of various symptoms indicating affection of the nervous as well as of the vascular system, the patient recovered, though with difficulty, and was restored to health.

The medical practitioner has sometimes to determine in cases of judicial investigation, whether a person has been poisoned by arsenic or not. This can scarcely be inferred with certainty from the symptoms, nor even from the state of the stomach ascertained by dissection; for although inflammation is usually present, and has the characters stated above, it is not invariably so, or when it has been present, the appearance is sometimes slight. Recourse therefore is had to chemical tests.

These can be applied with certainty, only when a portion of arsenic has been procured, either from the contents of the stomach discharged by vomiting, or from its contents carefully collected and examined after death. Any indication of its presence is scarcely ever to be obtained by a chemical examination of the fluids of the stomach, or of the fluid discharged; more care, therefore, is requisite in collecting any solid arsenic, which is done by minute inspection of the inner surface of the stomach, and by washing it carefully, and allowing the matter to subside from the fluid, or from the fluid which had been discharged by vomiting. The arsenic being of considerable specific gravity, more easily separates by subsidence from the other matter; and if a very minute quantity be procured, the necessary experiments may be performed on it with perfect precision, using the precaution of dividing it, and operating on different portions.

The first experiment is to attempt the reduction of the substance procured to the metallic state. A little of it may be mixed with an equal weight of the black flux, or with half its weight of charcoal powder. The mixture being put into a slender glass tube, coated with clay, and closed with a clay plug, on being raised to a low-red heat, by placing the tube over a charcoal fire, the oxide will be reduced, and, the metal being volatilized, will form a brilliant crust on the internal surface of the tube. No other substance will present the same appearance but arsenic; the result therefore is decisive, and the only deficiency of the test is, that it is not the most delicate, a grain or two of the oxide at least being required to operate on.

A little of the reduced metal in powder, or of the white arsenic made into a soft paste with the black flux and oil, being placed between two clean pieces of copper, and secured by an iron wire twisted round, after exposure of the pieces to a red heat for ten minutes, they will be found permanently whitened on the surfaces which had been in contact with the arsenic. To render the white colour more evident, the surface should be rubbed with a little chalk. This test, however, is not a very delicate one.

If a little of the arsenic be dissolved in hot water, with three times its weight of carbonate of potash, on adding this solution to a warm solution of sulphate of copper, a precipitate of a lively green colour will be formed. It is necessary to be aware, that the carbonate of potash alone will throw down a precipitate from sulphate of copper, but this is of a bluish-green colour, not of the grass-green colour which the arsenic gives.

A test of great delicacy proposed by Mr Hume, is that of nitrate of silver. If a stick of the common fused nitrate, or lunar caustic, be applied to the surface of a solution of so small a quantity as a grain of oxide of arsenic with a grain of carbonate of soda in ten ounces of distilled water, a bright yellow precipitate is thrown down. Dr Marcet employed a similar test,—applying to the surface of a fluid containing oxide of arsenic in solution, a glass rod dipt in water of ammonia, and then another rod dipt in a solution of nitrate of silver; a precipitate of a lively yellow colour falls down: It is necessary to avoid an excess of ammonia, as this retains it in solution. The other mode has appeared to me to afford a more delicate test, and one less likely to fail in common use. Carbonate of soda alone, indeed, gives a precipitate with nitrate of silver, but this can scarcely lead into error when the experimenter is aware of the fact, and that the colour of this precipitate is not yellow, like that produced when the arsenic is present. The precipitate, in both modes of applying the test, is a compound of oxides of silver and arsenic. This and the two preceding experiments ought to be made in day-light, that the shades of colour may be better perceived.

A test which has been much employed, is that of placing a little of the white oxide on a piece of iron red hot: it volatilizes in a white smoke; and if, before being exposed to heat, it is made into a paste with oil, it will when evaporating give a peculiar smell resembling that of garlic. Or by heating a small piece of the reduced metal, it will be volatilized with the same odour. A vapour may arise, however, from the intermixture of other matter in small quantity; this too may disguise the smell, and there is room for the influence of imagination in judging of the odour. This test, therefore, is not much to be relied on.

Bismuthum. Bismuth.

This metal is of a white colour, with a shade of yellow, has a foliated fracture, is brittle, very fusible, capable of being volatilized, and easily susceptible of oxidation. Though it has not been received into the Pharmacopœias, it has a claim to a place in the Materia Medica, as its oxide, or rather sub-nitrate, has been employed with considerable advantage in Gastrodynia, Pyrosis, and other affections connected with debility of the digestive organs. This preparation is obtained by decomposing the solution of bismuth in nitric acid by the affusion of water; the sub-nitrate is precipitated, and is washed and dried. It is given in a dose from two to six grains, two grains being given twice or thrice a-day, or in more severe cases five grains being given at once. In these doses, it scarcely produces any other sensible effect than a remission of pain, and ultimately a removal of the morbid state from which this has arisen.

BARYTES. Terra Ponderosa. Barytes.

THIS earth is found in nature combined with sulphuric acid, and with carbonic acid. The native carbonate was known to prove poisonous to animals, and the degree of activity which this indicated, suggested the application of it to medicinal purposes. The form under which the barytes has been used, is in combination with the muriatic acid; for the preparation of which two processes are inserted in the Edinburgh Pharmacopœia; one consists in decomposing the native carbonate by muriatic acid; the other in decomposing the sulphate by heating it with charcoal, and adding muriatic acid to the solution obtained by washing the residual matter with water. The muriate in either case is obtained by crystallization, and a formula is given for a solution of it to be medicinally employed, in which one part of the salt is dissolved in three of water. It is a substance of great activity, acting as a poison when given in too large a quantity: it occasions reduction of the force of the circulation, insensibility and paralysis, and on dissection the stomach is frequently found inflamed. The same effects arise from its application to an wound, and with great rapidity; the symptoms indicate the brain principally to be affected, and on dissection, if a large quantity has been applied, it is found to be inflamed; the motion of the heart is also diminished; the stomach is sometimes, but not always, slightly inflamed. Medicinally, barytes has been employed as a remedy in scrofula, in cancer, some forms of syphilis, and in hectic fever connected with ulceration. Its sensible effects, where advantage has been derived from it, have been improving the appetite and general strength; sometimes it occasions diaphoresis or diuresis, and in an over dose is liable to produce nausea, vertigo, tremors, and insensibility. Its usual dose is 5 drops of the saturated solution, gradually increased to 20 or more. Its virtues have been either over-rated, or its mode of administration not properly conducted, as it has fallen into disuse.

Calx. Lime.

This earth exists abundantly in nature combined with carbonic and other acids. From the native carbonate it is obtained by expelling the carbonic acid by heat. It is soluble in water in small quantity; the solution has a styptic taste, and is the form under which lime has been medicinally employed. Lime Water, as it is named, is used with advantage in dyspepsia; its beneficial effects arise principally from its tonic and astringent quality, as in the small quantity which water can dissolve, it can have little effect by any chemical agency in obviating acidity. It is employed too as an astringent in chronic diarrhœa and in leucorrhœa. Carbonate of lime is used as an antacid: and Phosphate of lime has, from theoretical views, been proposed as a remedy in rickets and mollities ossium. Muriate of lime is a more active substance, and more powerful tonic; it is prepared, according to a formula given by the Edinburgh and Dublin Colleges, by decomposing carbonate of lime by muriatic acid, and is obtained in the state of a saturated solution. In its action on the system, it has a considerable analogy to muriate of barytes, and, like it, has been used principally in scrofula and hectic fever, and in dyspepsia. Its dose is half a drachm of the saturated solution; and as it is a medicine of considerable activity, it requires to be given with caution. Like other saline substances designed to act on the general system, it is probably most successful when administered in small doses, with large dilution, as in large doses, and a more concentrated state, its absorption is counteracted, and its action is confined to the intestines. Hence probably the greater benefit frequently derived from it in scrofulous affections under the form of mineral waters, of which it is not unfrequently an ingredient. I found a mineral spring in Yorkshire, that of Ilkley, much celebrated for its efficacy in scrofula, to be water free from all saline matter, except a very minute quantity of muriate of lime.

THE two following substances, though not strictly belonging to the mineral kingdom, may be associated with the preceding tonics, as connected with them by chemical relations.

ACIDUM NITRICUM. Nitric Acid.

THIS acid is the product of the saturation of nitrogen with oxygen, and consists of 29.5 of the former, and 70.5 of the latter. It is obtained by decomposing nitrate of potash by sulphuric acid, assisted by heat ; the sulphuric acid combines with the potash, and the acid of the nitre distils over in the state of nitrous acid ; this exposed to a gentle heat, loses the portion of nitric oxide gas loosely dissolved in it, and is converted into nitric acid. It is colourless ; emits white fumes ; its specific gravity is 1.55 ; is extremely corrosive, acts with much energy on inflammables and metals from parting with oxygen readily, and is eminently possessed of all the acid properties.

The tonic powers of this acid are conspicuous in supporting the system under the irritation of a mercurial course. As a remedy against lues venerea, it was some years ago introduced into practice, and received an extensive trial. Very discordant opinions were for a time maintained with regard to its powers, but the question appears now to be sufficiently determined. There can be no doubt that the primary symptoms of syphilis are often removed by its use, and that even the secondary symptoms are alleviated, or altogether disappear; venereal ulcers heal, enlargements of the glands subside, venereal pains become less severe, venereal eruptions become less vivid or entirely fade, and the general vigour of the system is improved. But even in producing these effects, nitric acid frequently fails, and it appears to be established, that when it has removed the symptoms, its action is not in general sufficiently powerful or permanent to eradicate the syphilitic poison; the symptoms recur, or the disease appears, after some time, in one or other of its secondary forms.

Though in this respect, however, nitric acid is inferior to mercury, and cannot be relied on alone in the treatment of syphilis, there are other important indications which it fulfils, and which render it a remedy of much value. It supports the strength of the system under the irritation of mercury, and wherever this remedy requires to be given to a considerable extent, is in this respect advantageous; it appears even to promote in many cases the operation of mercury, symptoms, especially those of constitutional affection, disappearing under their combined administration, which are more slowly removed, or resist even the administration of the latter alone. In cases, too, where from circumstances mercury cannot for a time be given to the requisite extent, the symptoms are arrested by the use of the acid, or where some secondary symptoms, ulceration of the throat in particular, are making a rapid progress, they are more speedily checked when it is given; though still in these cases the precaution is proper, of employing as much mercury as would have been judged necessary alone for their removal. Lastly, in symptoms occurring during a protracted mercurial course, probably arising from the excessive use of mercury, and aggravated rather than removed by its continuance, much benefit is derived from the acid; and it sometimes succeeds in the removal of obstinate sores, when all other remedies, local and constitutional, have failed.

There are other diseases in which it is administered with advantage, particularly in that chronic affection of the liver frequently arising from residence in a warm climate, in dyspepsia with the view of relieving sickness and anorexia, and in obstinate cutaneous eruptions. Its medium dose, in its continued administration, is from one to two drachms in twenty-four hours; the latter quantity in general cannot be exceeded, without nausea or griping being produced. It is given largely diluted with water, adding usually a little sugar, so as to form a beverage not unpleasant.

OXY-MURIAS POTASSÆ. Oxy-muriate of Potash.

THIS salt, which, strictly speaking, is the Hyper-oxymuriate of Potash, is prepared by introducing a current of oxymuriatic acid gas into a solution of potash. The acid is decomposed, one portion of it yielding oxygen to the other; the one therefore returns to the state of muriatic acid, the other becomes hyper-oxymuriatic acid, and common muriate and hyper-oxymuriate of potash are formed, the latter separating by crystallization in brilliant white plates. The process has been introduced into the Dublin Pharmacopœia.

As a remedy, hyper-oxymuriate of potash may be classed with nitric acid, and it was the hypothesis of nitric acid acting medicinally by imparting oxygen to the system, that led to its medicinal use, this salt containing a very large quantity of oxygen, which is not retained in it by a strong affinity. Its operation in checking or removing the symptoms of syphilis is similar; it also encreases the force of the circulation, and excites the actions of the system. Its efficacy as an anti-venereal remedy was inferred, from the trials made of it, to be superior to that of the nitric acid, but it does not appear to be equally advantageous as an auxiliary to mercury. Hence, as its operation alone cannot be relied on for certainty, and as it frequently fails, it is little employed, while nitric acid still continues to be used with the views already stated. The dose in which the oxymuriate has been given, is 10 grains three or four times a-day, and encreased gradually to 20 or 25 grains.

Tonics from the Vegetable Kingdom.

The tonic power of vegetable substances is intimately connected with certain sensible properties which they possess, particularly with bitterness, and the aromatic quality. In those tonics in which these qualities are blended, they are their most distinctive properties; and in those vegetables in which either of them is predominant, we discover a degree of tonic power, or at least of that stimulating operation on which this power depends.

The vegetable products in which bitterness, without any other marked sensible medicinal quality, predominates, have always more or less of a tonic power; the stimulant operation on which this depends, seems, however, to be not much extended over the system: hence bitters have scarcely any sensible effect in augmenting the force of the circulation or the heat of the body, in encreasing the secretions, or in stimulating to action any particular part: their operation is principally in giving vigour to the stomach, and other digestive organs, and obviating those symptoms connected with debility of these organs. Still their operation is not entirely local; they prove tonic to the general system, not only indirectly by their action on the stomach, but by a more direct operation. This is displayed in their power of removing diseases connected with general debility, as intermittent fever, or the different species of dropsy, particularly anasarca, which so frequently depend on diminished energy of the absorbents. The injurious consequences which sometimes arise from the use of bitters too long continued, afford another proof of their action on the general system.

Bitterness in vegetables has been supposed to reside in a peculiar proximate principle, which has been named the Bitter Principle. This opinion, however, is extremely vague, and rests on no sufficient evidence. The quality of bitterness may reside in any of the known principles of vegetable matter: in many of the bitters of the Materia Medica, it appears to be connected with an extractive matter, as it is obtained equally by the action of water and alkohol; it is not volatile, and in general is not much impaired by decoction.

Aromatics are more rapid and diffusible in their action; they stimulate the general system, and augment the force of the circulation; but this is scarcely sufficiently permanent to admit of their being administered with advantage as tonics. They are therefore rather employed as temporary stimulants, to obviate debility of the digestive organs, or as promoting the action of bitters. Still, as strictly connected with the substances belonging to this class, I have not hesitated to place them under it. There is one general virtue they possess, and for which they are often used, that of preventing or relieving nausea; this they do partly from their agreeable taste and odour, and partly probably from their stimulant operation on the stomach. The aromatic quality in general resides in their essential oil; hence it is communicated both to water and alkohol by infusion: their oils are usually pungent and stimulant, and their distilled waters and spirits partake of these powers.

From the qualities which bitters and aromatics possess, the stimulant operation of the one being slow and permanent, that of the other being more diffusible and transient, it might be inferred, perhaps, that their combination will afford a superiority of tonic power. In the most powerful vegetable tonics, accordingly, these qualities are generally blended; these may be placed first, and from them there is a series to the more pure bitters and aromatics.

Cinchona Officinalis. *Cortex Peruvianus.* Cinchona. Peruvian Bark. *Pentand. Monogyn. Contortæ. Cortex. Peru.*

The natural history of the genus Cinchona was, until lately, very imperfectly elucidated. Linnæus had described a species under the name of Cinchona Officinalis; the characters of which, however, were indistinctly given under this general name. The Edinburgh College have inserted in their catalogue of the articles of the Materia Medica, the three kinds of Peruvian bark at present met with in the shops, the Pale, the Red, and the Yellow, leaving undetermined their natural distinctions. The species of this genus, it now appears, are numerous, and many of them natives of Peru. The subject has lately been investigated by Mutis and

Zea, and on their authority the London College have inserted three species, Cinchona Cordifolia, Cinchona Oblongifolia, and Cinchona Lancifolia; the first furnishing the pale bark, the second the red, and the third the yellow bark of the shops. They are natives of different provinces of Peru.

These barks appear to be procured and prepared in a similar manner. The bark is stripped from the trunk and branches, during the dry season; it is dried by exposure to the sun, and after being imported into Europe, is sorted by separating the finer from the coarser.

The Pale Bark is considered as the bark of the Cinchona Cordifolia of Mutis, though it is very probable that, as it occurs in commerce, it is also furnished by other species. The tree producing it is found in the mountains of Quito and Santa Fe; what is brought from Loxa is regarded as of superior quality; the best kind met with in the shops, is in thin pieces, singly convoluted, forming small quilled twigs, internally of a cinnamon colour, smooth but fibrous in the texture; externally it is covered with a thin epidermis of a greyish-brown colour, to which a crust of lichen sometimes adheres; it breaks close and smooth, and is friable between the teeth; its powder is of a pale colour. There are often intermixed with this, what is considered as bark of inferior quality, in thicker pieces, flat, or very little convoluted, rougher externally, and of a more distinctly fibrous texture. The taste of pale Peruvian bark is bitter, and slightly astringent; its flavour is slightly aromatic, with a degree of mustiness.

The Red Bark is the bark of the Cinchona Oblongifolia of Mutis, a tree of considerable size, which grows on the Andes. It is in large thick pieces, usually flat, though sometimes quilled, externally covered with a brown rugged epidermis, internally more smooth and compact, but fibrous, the fibres being coarse, of a dark red colour; its taste and smell are similar to those of the pale, but the taste is rather stronger, and more astringent. It first appeared in Europe about the year 1780.

The Yellow Bark, so named, not from its colour being distinctly yellow, but because it approaches rather more to that than the colours of the others, is the bark of the Cinchona Lancifolia of Mutis. It was imported as a new variety about twelve years ago, but it has been stated to be that which was first known, though the importation of it had ceased, and to be therefore the real Peruvian Bark. It is in flat pieces, not convoluted like the pale, nor dark-coloured like the red; is externally smooth, internally of a light cinnamon colour, friable, and fibrous; it has no peculiar odour different from the others, but a taste incomparably more bitter, with scarcely any sensible degree of astringency.

Cinchona has often been subjected to chemical examination, but its constituent proximate principles are still far from being well determined. This indeed appears to be attended with peculiar difficulties, from the different species containing different principles, and from the nature of some of these being not well ascertained.

The basis of all of them is the ligneous fibre, constituting the greater part of their weight, but to this are attached various principles capable of being extracted by different solvents. Cold water infused on pale bark for some hours, acquires a bitter taste, with some share of its odour; when assisted by a moderate heat, the water takes up more of the active matter; this infusion is transparent while warm, but as it cools becomes slightly turbid; by decoction, a fluid, deep-coloured, of a bitter styptic taste, is obtained, which, when cold, deposites a precipitate soluble in alkohol. By long decoction, the virtues of the bark are nearly impaired or destroyed, owing to the chemical change and precipitation of its active matter. Alkohol is a more powerful solvent of its active principles than water, the tincture being of a much deeper colour and stronger taste, and holding more matter dissolved. Brandy and other spirits and wines afford strong solutions in proportion to the quantity of alkohol they contain. A saturated solution of ammonia is also a powerful solvent; vinegar is less so even than water. By distillation, water is slightly impregnated with the flavour of bark; but it is doubtful whether any essential oil can be obtained.

The action of menstrua on the red bark is nearly the same, the solutions being rather stronger, or containing a larger quantity of the matter which is precipitated from the decoction as it cools, and which is more peculiarly soluble in alkohol, this matter being apparently composed of the principles in which the activity of the bark resides.

The analysis of the yellow bark shows that its active principles are more powerful than in either of the others, its infusions in water, alkohol, &c. being at least much more bitter.

It is not easy to determine from these results, the nature of the principles extracted, or what relation they have to the powers of the bark. As the active matter appears to be more soluble in hot than in cold water, being partially precipitated from the former as it cools, and as it is still more soluble in alkohol, it might be concluded to be of a resinous nature. Being soluble to a certain extent, however, in water, and suffering at least a partial decomposition when boiled under exposure to the air, it may also be considered as approaching in its characters to extract.

Besides this, from the effects of re-agents, Peruvian bark has been considered as containing a quantity of astringent matter, and this appears to have some relation to the matter extracted by water with the aid of heat, and by alkohol. On adding a solution of sulphate of iron to the infusion, a deep colour is struck, not purple indeed like that usually produced by the action of that test on the vegetable astringents, but rather of a dark olive green; the same colour is still deeper when the salt is added to the decoction, or the tincture. This was regarded as a proof of the presence of the astringent principle or tannin, and hence it might be inferred, that a precipitate would be produced by the addition of gelatin. This accordingly happens with some kinds of Peruvian bark; a solution of gelatin added to the infusion giving a precipitate more or less copious. But the singular fact has been discovered, that there are other varieties which do not precipitate gelatin: Dr Maton observed even that a precipitate was produced with tannin, or at least with infusion of oak bark, or of infusion of galls. This latter result Seguin considered absurdly as depending on the presence of gelatin, and pretended that gelatin exerted the specific power of Peruvian bark on the system, so that with animal glue he had cured intermittent fever. Dr Duncan inferred, that the precipitation with tannin is owing to the presence of a peculiar proximate principle of vegetable matter not before observed, to which he gave the name of Cinchonin. Vauquelin, in his analysis of the different species of Peruvian bark, found generally, that their aqueous infusion gave a precipitate both with tannin and gelatin; some, however, gave no sensible precipitate with gelatin, while they precipitated tannin. Among these, he ranks the common pale bark. Others again did not precipitate tannin, but formed a precipitate with gelatin. His observations, however, are of less value, as, although deduced from experiments on seventeen species, as he calls them, of cinchona, these are not distinguished by their specific characters, and we therefore scarcely know to what the observations apply. From the intermixture of different kinds of Peruvian bark in commerce, and the uncertainty of their uniformity, it is not easy to determine what species more peculiarly afford this principle. I have found, that the watery infusion of the pale bark is not sensibly precipitated either by gelatin or tannin; that of the red bark is not precipitated by gelatin, but gives a copious precipitate with tannin; and that of the yellow is rendered turbid by gelatin, and precipitated copiously by tannin.

There is a difficulty in determining the nature of the principles on which these phenomena depend,—either that which gives a precipitate with gelatin, or that which is precipitated by tannin, if these differ from each other. In a dissertation by B. A. Gomes, a process is given to obtain Cinchonin pure, and its qualities in this state are described as different in several respects from those which had been assigned to it. The process consists in evaporating tincture of bark to the consistence of an extract, adding to this successively small portions of distilled water, while any colour or taste is acquired; filtering these solutions, then evaporating them; adding to the solid matter successive portions of a solution of potash, until these come off colourless. A white substance is thus obtained, which is washed with a small portion of cold water. When dry it forms a white powder, which is nearly pure cinchonin. By dissolving this in alkohol, straining the solution, adding to it an equal quantity of distilled water, leaving this exposed to the air until the alkohol evaporates, straining the residual liquor, and allowing the solid deposite to dry on the filtre, the cinchonin is obtained perfectly pure in fine white filiform crystals. These are described as insipid and inodorous, inflammable, insoluble in water cold or warm, soluble in alkohol, ether, and in acids, yielding a precipitate from solutions in acids, on the addition of infusion of galls, which is redissolved by alkohol: being also precipitated from solution in sulphuric acid by potash, the precipitate being apparently cinchonin unchanged. This principle, as Gomes remarks, is analogous to resin in its inflammability, insolubility in water, and solubility in alkohol and ether; but it differs by its crystallization, and its solubility in acids. In these, as well as in the other properties, it bears a more close resemblance to camphor; but it differs from it in want of odour, in greater specific gravity, as it sinks in water, and in giving a precipitate with infusion of galls. The solubility of this principle in water, as it exists in cinchona, must, according to this statement, be owing to principles with which it is combined.

It does not clearly appear, what relation these principles of Peruvian bark, whether cinchonin, or that which gives a precipitate with gelatin, have to the matter in which the active powers of the cinchona reside. It may be concluded, however, that they are not essential to it, since they are in sparing quantity in pale bark, and since they are not uniform in the other species in any relation to the medicinal qualities. The same facts prove, that they have no relation to the resino-extractive matter, the principle probably of greatest activity of any which bark contains. Gomes affirms, however, that cinchonin is contained in all the varieties of cinchona which are febrifuge, and that in those which are not it is wanting.

The infusions of some varieties of bark redden the more delicate vegetable infusions; and Vauquelin has discovered, in the matter extracted by water with the aid of heat, a salt composed of lime, with a peculiar crystallizable acid, which he has named Kinic Acid.

The active matter of bark is rendered more soluble in water by acids, a circumstance of some importance in its pharmaceutic preparation. The alkalis also add to its solubility; and some of the earths, particularly lime and magnesia, have the same effect.

The comparative medicinal activity of the different kinds of Peruvian bark is not easily determined, owing to the variable state in which they are found in the shops. The red, at its first introduction, was represented as much superior in efficacy to the pale, and this appeared to be confirmed by chemical experiments on the proportion of active matter in it to that of the ligneous fibre; but there is some reason to doubt of this superiority with regard to the red bark now usually met with. The yellow bark has a much greater degree of bitterness, and some clinical observations appear to establish its superior medicinal power. According to Mutis and Zea, it is far superior to the other species, in curing intermittent fever, and they regard it as the only species directly febrifuge. If even its superiority be admitted, its intense bitterness renders it unpleasant, and liable to occasion nausea, at least unless it be taken in a dose inferior to that of the other.

The effects of Peruvian bark are those of a powerful and permanent tonic, so slow in its operation as to be scarcely perceptible by any alteration in the state of the pulse, or of the temperature of the body. Its tonic power is inferred, therefore, principally from obviating states of debility; and it is one of those medicines, the efficacy of which in removing disease, is much greater than could be expected, *à priori*, from its effects on the system in a healthy state. The only effects arising from too large a dose are nausea and headach.

Intermittent fever is the disease for the cure of which bark was introduced into practice, and there is still no remedy which equals it in power,—a superiority of which, from its known operation, it is difficult to give any explanation. Little diversity of opinion now exists with regard to the rules regulating its administration. It is given freely in the earliest stage of the disease, and without any previous preparation, farther than the exhibition of an emetic to evacuate the stomach. And it may be employed with safety and advantage in every period of the fever. It has been supposed rather more effectual when given before the recurrence of the paroxysm, and that, from this mode of employing it, less is required for that cure. The usual practice, however, is to give it in doses of a scruple or half a drachm every fifth or sixth hour during the interval of the paroxysm; it may be even given with safety during the hot fit, but is then more apt to excite nausea. It requires to be given for some time, and continued after the fever has been removed, in order more effectually to guard against a relapse.

In remittent fever it is given with equal freedom, even though the remission of the fever may be obscure, and frequently with advantage. The remissions become more distinct, and the febrile state is at length subdued.

In those forms of continued fever which are connected with debility, as in typhus, cynanche maligna, and confluent small-pox, &c. Peruvian bark has been regarded as one of the most valuable remedies. It is difficult, however, to give it in such quantities as to obtain much sensible effect from it, as from the weakened state of the organs of digestion, it remains in the stomach unaltered, and is liable to produce nausea and irritation. In modern practice, therefore, bark is less employed in typhus, preference being given to the more powerful exciting operation of opium and wine. It has been regarded as even hurtful in those forms of fever, where the brain or its membranes are inflamed, or where there is much irritation, marked by subsultus tendinum, and convulsive motions of the extremities. Advantage is sometimes derived from it in the convalescent stage of the disease.

Even in fevers of an opposite type, where there are marks of inflammatory action, particularly in acute rheumatism, bark has been found useful, blood-letting being generally previously employed.

In erysipelas, in gangrene, in extensive suppuration, and in scrofulous and venereal ulceration, the free use of cinchona has been regarded as of the greatest advantage: In some of these diseases, however, the slowness of its operation renders it less effectual, and this is not easily obviated by any encrease which can be made in the dose.

In the various forms of passive hæmorrhagy, in many other diseases of chronic debility, dyspepsia, hypochondriasis, paralysis, rickets, scrofula, dropsy, and in a variety of spasmodic affections, epilepsy, chorea, and hysteria, cinchona is administered as a powerful and permanent tonic, either alone, or combined with other remedies suited to the particular case. The more common combinations of it are with sulphuric acid as an astringent, with preparations of iron as a tonic, with mercury in syphilis, in spasmodic diseases with valerian, and with cicuta in scrofula and extensive ulceration.

Its usual dose is half a drachm. The only inconvenience of a larger dose is its sitting uneasy on the stomach. It may, therefore, if necessary, be frequently repeated, and in urgent cases may be taken to the extent of an ounce or even two ounces in twenty-four hours, though from such large doses probably no adequate advantage is derived. If it excite nausea, smaller doses may be taken and repeated more frequently, and may be reconciled to the stomach by the addition of any grateful aromatic.

The powder is more effectual than any of the preparations; it is given in wine, or in any spiritous liquor diluted with water, sometimes in milk, especially in butter-milk, or diffused in water by the medium of syrup or extract of liquorice. For particular purposes different preparations are employed. The cold infusion is the least powerful, but is grateful and sits easy on the stomach; it is however so weak, that it is scarcely used but as a bitter in dyspepsia. Prepared by previous trituration of the bark with a little magnesia, it is rather more active. The decoction contains more of the active matter of the bark, and is the preparation generally used when the powder is rejected; its dose is from 2 to 4 ounces; but even it cannot be relied on for any important effect. The spiritous tincture, though containing more of the active principles, cannot be extensively used on account of the menstruum, but is principally employed occasionally, and in small doses of 2 or 3 drachms, as a stomachic. The extract is a preparation of some power, when properly prepared by the joint action of alkohol and water; but as this is expensive, the watery extract only is usually found in the shops, and it is very variable in strength. It is given in the form of pill, in a dose from 5 to 15 grains, and affords the best form for combining bark with iron.

Bark is likewise sometimes given in the form of enema; a scruple of the extract, or 2 drachms of the powder, being diffused in 4 ounces of starch mucilage. The decoction is sometimes applied as a fomentation to ill-conditioned ulcers, or the powder is sprinkled on the ulcerated surface.

Offic. Prep.—Decoct. Cinch. Extr. Cinch. Inf. Cinch. Tinct. Cinch. *Ed.*—T. Cinch. C. *Lond. Dub.*

Cinchona Caribæa. Caribæan Bark.

This species, a native of the Caribee Islands, belonging to the same genus with the officinal cinchona, has been proposed as a substitute for it, and has as such been received into the Edinburgh Pharmacopœia. It is more bitter, and less aromatic, is of a brown colour, somewhat convoluted and fibrous. According to the observations of Dr Wright, who employed it in Jamaica, its effects are similar to those of the officinal cinchona. The Cinchona Floribunda, or St Lucia bark, has been also sometimes used. It is of a darker brown colour; its taste is sweetish, but becomes extremely bitter. It has been found more liable than the other species to produce nausea and purging.

ARISTOLOCHIA SERPENTARIA. Serpentaria Virginiana. Virginian Snake-root. *Gynand. Hexand. Sarmentosæ. Radix. Virginia, Carolina.*

THIS root consists of a number of small fibres, issuing from one stem, of a greyish-brown colour; it has a slightly aromatic smell, and a warm bitterish taste. Its active matter is extracted partially by water, and by alkohol; entirely by proof spirit. By distillation it affords a small quantity of an essential oil, somewhat fragrant, but not pungent.

Serpentaria is a stimulating aromatic tonic, which used formerly to be employed in fevers of the typhoid type, to support the powers of the system. It was given in a dose of from 10 to 20 grains every fourth or fifth hour; with this intention, it is now however very rarely prescribed, and in any power it possesses of obviating debility or febrile action, it is probably considerably inferior to cinchona. It is sometimes combined with cinchona in the treatment of intermittent fever, and it occasionally enters as an ingredient into the composition of bitter infusions and tinctures used in dyspepsia.

Offic. Prep.—T. Arist. Serpent. *Ed. L. D.*

DORSTENIA CONTRAYERVA. Contrayerva. *Tetrand. Monog. Scabridæ. Radix. Peru, West Indies.*

THIS root is in small twisted fibres of a yellowish colour; has an aromatic smell, and a bitterish taste; it yields its active matter to water and alkohol. Contrayerva, like serpentaria, was formerly used as a stimulant and diaphoretic in typhoid fevers, in a dose from 5 to 20 grains, but like it too has fallen into disuse. Mixed with carbonate of lime, it forms the compound powder of contrayerva of the London Pharmacopœia, which is used as a remedy in diarrhœa.

Offic. Prep.—P. Contrayerv. C. *Lond.*

CROTON ELEUTHERIA. Cascarilla. *Monoec. Monadelph. Tricoccæ. Cortex. Bahama Islands, North America.*

CASCARILLA bark is in small quills of a grey colour; has a slightly aromatic smell, and a warm bitter taste; it is highly inflammable. It has been used as a substitute for Peruvian bark, and has been employed too as a remedy in dysentery, and in obstinate diarhœa. Its usual dose is a scruple or half a drachm, but in modern practice it is little used.

Offic. Prep.—Infus. Casc. Tinct. Casc. *Lond.*—Extr. Casc. Resin: *Dub.*

CUSPARIA FEBRIFUGA. Angustura. *Pentand. Monogyn. South America.*

THIS bark was imported a few years ago from the Spanish West Indies, the botanical characters of the tree producing it being unknown. These have been lately determined by Humboldt, and the London College have adopted the name Cusparia Febrifuga, in order to distinguish it.

It is in flat pieces, externally grey and wrinkled, internally of a yellowish-brown colour, and smooth; it has little odour; its taste is bitter and slightly aromatic. Water, assisted by heat, takes up the greater part of its active matter, which does not seem to be injured by decoction. Alkohol dissolves its bitter and aromatic parts, but precipitates the extractive matter dissolved by water, and its solution is on the contrary decomposed by water. Proof spirit appears to be its proper menstruum. By distillation, it affords a small quantity of essential oil. The bark, triturated with lime or potash, and water, gives a smell of ammonia. Its watery infusion gives no precipitate with gelatin; but on the contrary, becomes turbid with infusion of galls. Its powder is powerful in counteracting putrefaction.

Angustura was originally introduced in the West Indies as a remedy in fevers, equal or even superior to the Peruvian bark. In this country it has not been much employed as a substitute for cinchona; and in the treatment of intermittent, it has in the trials that have been made of it failed. It has been used principally in obstinate diarrhœa, and in chronic dysentery, or as a remedy in dyspepsia. Its dose is from 10 to 20 grains of the powder, or one drachm in infusion or decoction. Its tincture with proof spirit is given in a dose of one or two drachms.

Offic. Prep.—Infus. Cuspar. *Lond.*—Tinct. Angust. *Dub.*

SWIETENIA FEBRIFUGA. Swietenia. *Decand. Monogyn. Trihilatæ. Cortex. East Indies.*

THE bark of the wood of this tree is of a red colour internally; externally it is covered with a gray epidermis; it has an astringent bitter taste; it yields its active matter to water by infusion or decoction, and by evaporation an extract is obtained, highly astringent. It was introduced as a substitute for Peruvian bark, and in India has been used as such with advantage in the treatment of intermittent and remittent fever. Its dose in substance is half a drachm.

SWIETENIA MAHAGONI. Mahogany. *Cortex. Spanish America, West Indies.*

THIS species, of the same genus as the preceding, has similar qualities and virtues, its bark being equally bitter and astringent. It has therefore been received into the Edinburgh Pharmacopœia, and may be employed to answer similar indications.

COLOMBA. (Calumba, *Pharm. Lond.*) Colomba.

OF the plant which furnishes this root, no botanical account has been obtained. It has been said to be brought from Ceylon; but from later accounts, it appears to be the produce of the Eastern coast of Africa, and to be imported from Mozambique. It is in round thin pieces, evidently formed by transverse sections of the root; the circumference of these is covered with a bark; the woody part is of a light yellow colour, spongy, and often worm-eaten. It has a faint aromatic smell, and a bitter taste. It yields its bitterness to water; proof spirit is its proper menstruum, though the tincture is not very strong.

Colomba is a powerful antiseptic and bitter; it is used with much advantage in affections of the stomach and intestinal canal, accompanied with redundance of bile; it is also employed in dyspepsia, and forms a more powerful and grateful stomachic than the common bitters. Its dose is half a drachm of the powder, which, in cases of cholera or bilious remitting fever, may be repeated every third or fourth hour.

Offic. Prep.—Tinct. Colomb. *Ed. Lond. Dub.*—Infus. Colomb. *Lond.*

Quassia Simarouba. Simarouba. *Decand. Monogyn. Gruinales. Cortex. South America.*

The bark of the root of this tree, which is the part medicinally employed, is in long pieces, of a fibrous texture and yellowish colour; destitute of odour, and having a strong bitter taste. It is however very variable in its sensible qualities, some specimens having scarcely any bitterness. Water and alkohol dissolve its active matter; the solution in either menstruum suffers no change from sulphate of iron.

Simarouba has been celebrated as a remedy in intermittent fever, dysentery and chronic diarrhœa, and has been given generally in the form of decoction: in substance the dose is one scruple. Though used in the countries of which it is a native, it is with us rarely prescribed. An infusion of it has a place in the London Pharmacopœia.

Offic. Prep.—Infus. Simaroub. *Lond.*

Quassia Excelsa. Quassia. *Decand. Monogyn. Gruinales. Lignum. West Indies.*

The wood of the root of this tree is of a yellowish-white colour; it has a taste intensely bitter, without any odour or aromatic flavour. The bitterness is extracted equally by water and by alkohol.

It is used as a remedy in dyspepsia, diarrhœa, and in remittent and intermittent fevers, and is also sometimes employed to check vomiting. It is commonly given under the form of the watery infusion when employed as a bitter; in substance, in which state it has been employed in the treatment of intermittents, its dose is from 10 to 30 grains.

Offic. Prep.—Infus. Quass. *Lond.*—Tinct. Quass. *Dub.*

GENTIANA LUTEA. Gentian. *Pentand. Digyn. Rotaceæ. Radix. Switzerland, Germany.*

THIS root is in long slender pieces, soft and flexible, of a yellowish colour, with a greyish epidermis. It has a very bitter taste, without any peculiar flavour. This bitterness is extracted both by water and alkohol. Diluted alkohol is its proper solvent. The liquor obtained by decoction with water, affords by inspissation an extract intensely bitter.

Gentian is a common remedy in dyspepsia, in the form of infusion or tincture; as a bitter, it usually forms the basis of stomachic remedies. In substance, it has been given, for the cure of intermittents, in a dose of half a drachm.

Offic. Prep.—Extr. Gent. Lut. Inf. Gent. C. T. Gent. C. *Ed. Lond. Dub.*—Vin. Gent. C. *Ed.*

ANTHEMIS NOBILIS. Chamæmelum. Chamomile. *Syngenes. Polygam. superfl. Compositæ. Flores. Indigenous.*

THE flower of this herb is collected before it is fully expanded, and dried. There are two varieties of it obtained by cultivation, the single and double flowered: the former is much stronger than the latter, the odour and taste residing not in the white petals, but in the disk or tubular florets. They have a bitter nauseous taste, and a strong unpleasant odour. The bitterness, with part of the odour, is extracted by water and alkohol, and if the infusion has been made with warm water, it is nauseous, probably from the extraction of a portion of the essential oil. This oil, strongly odorous, is afforded in small quantity by distillation with water.

Chamomile is a powerful bitter, and as such is useful in dyspepsia, primary or symptomatic, and forms a popular remedy which is in common use. It is equal perhaps to any of the vegetable bitters, and has even a superiority in the facility with which its bitterness is extracted by water. The cold infusion is most grateful, and hence it ought to be used under this form. The infusion in tepid water, when strong, acts as an emetic, and is often used to promote the action of other emetics. In substance, it has been given as a remedy in intermittent fever, in a dose of half a drachm three or four times a-day. Externally, the flowers steeped in water are employed as a fomentation. The extract, which is intensely bitter, is a convenient vehicle for forming pills, especially when it coincides in virtue with the substance prescribed under that form.

Offic. Prep.—Extr. Anth. N. *Edin. Dub. Lond.*—Inf. Anth. Ol. Anth. *Lond.*—Decoct. Anthem. *Ed. Dub.*

The following plants, possessing bitterness in a greater or less degree, were formerly much employed, but are now discarded from practice. They possess no virtues but those of bitters, and as they have all more or less of a nauseous flavour, gentian, colomba, or quassia is preferred to them. It is necessary to notice only their botanical characters.

Artemisia absinthium. Wormwood. *Syngenes. Polygam. superfl. Compositæ. Herba. Indigenous.*

Chironia centaurium. Centaury. *Pentand. Monogyn. Rotaceæ. Herba.*

MARRUBIUM VULGARE. Hoarhound. *Didynam. Gymnosperm. Verticillatæ. Herba.*

MENYANTHES TRIFOLIATA. Trefoil. *Pentand. Monog. Rotaceæ. Herba.*

CENTAUREA BENEDICTA. Blessed Thistle. *Syngenes. Polygam. frustran. Compositæ. Herba. Spain.*

THE remaining substances belonging to this class are those in which the aromatic quality predominates, blended in some of them with a degree of bitterness. They are much inferior in tonic power, and a number of them are employed only as grateful stimulants to the stomach.

CITRUS AURANTIUM. Orange. *Polyadelph. Icosand. Pomaceæ. Cortex flavus Fructus; Fructus; Fructus immaturus. India.*

THE Orange-tree is a native of India, but is abundantly cultivated in the south of Europe. The outer rind of the fruit, especially of that variety named the Seville or Bitter Orange, has a grateful aromatic flavour, and a warm bitterish taste, both of which depend on an essential oil, which, existing in the rind in distinct vesicles, may in part be obtained by expression, but more abundantly by distillation. It is dried for use; both taste and flavour are extracted by water by infusion, as well as by alkohol. Its qualities are those of an aromatic and bitter. It has been employed to restore the tone of the stomach; and is a very common addition to combinations of bitters used in dyspepsia, communicating to them its grateful odour, and coinciding with them in power. It has likewise been given in intermittents in a dose of a drachm twice or thrice a-day.

Offic. Prep.—Aq. Citri Aur. Cons. Citr. Aur. Syr. Citr. Aur. *Ed.*—T. Cort. Aur. *Lond. Dub.*—Inf. Citr. Aur. *Lond.*

The unripe fruit of the same variety, *Aurantia Curassla-ventia*, Curasso Oranges as they are named, retain when dried the aromatic flavour of the peel, with rather a larger share of bitterness, and are applied to the same uses.

The juice of the ripe fruit of the variety named the China Orange, consists principally of citric acid and saccharine matter, and so far as it has any medicinal virtue, is a refrigerant, and is to be afterwards considered.

Citrus Medica. Lemon. *Polyadelph. Icosand. Pomaceæ. Cortex fructus. Asia.*

The Lemon-tree, though a native of the warmer countries of Asia, has been long cultivated in the south of Europe. The exterior rind of the fruit contains a quantity of essential oil in distinct cells, whence it derives its aromatic quality. The dried rind is similar in flavour and taste to that of the orange, but is rather less bitter and aromatic; its flavour too is more perishable, and from both circumstances it is less frequently used, though it may be employed for similar purposes. The oil is in use as a perfume. The juice is strongly acid, consisting chiefly of citric acid; its medicinal applications fall to be considered under the class of refrigerants.

Offic. Prep.—Aq. Citr. Med.—Syr. Citr. Med. *Ed.*—Acid. Citric. *Lond.*

ACORUS CALAMUS. Sweet-scented Flag. *Hexand. Monogyn. Piperitæ. Radix. Indigenous.*

THIS plant grows in marshy situations in this and other countries of Europe. Its root, dried and covered with the bark, is kept in the shops. It is soft, flat, and jointed; has a faint aromatic smell, and a warm bitterish taste. By distillation it yields an essential oil, in which its flavour resides; and it contains a considerable quantity of fecula. It has been used as a tonic in intermittent fever; and sometimes it enters, as an aromatic and bitter, into the composition of bitter infusions and tinctures.

LAURUS CINNAMOMUM. Cinnamon. *Enneand. Monogyn. Oleraceæ. Cortex. Ceylon.*

THIS tree, a native of Ceylon, is now cultivated in India. The cinnamon is the interior bark of the branches of the tree; it is thin and much convoluted, of a texture somewhat fibrous, friable, of a light brown colour, having an agreeable pungent taste, with a degree of sweetness, and a grateful aromatic flavour. Its virtues chiefly depend on a small quantity of essential oil which it contains, and which, when obtained by distillation, is highly odorous and pungent. It yields its aromatic flavour and taste both to water, by infusion, and to alkohol; and water distilled from it has also its pungency.

Cinnamon is the most grateful of the aromatics. It is used to cover the unpleasant taste and flavour of other medicines, and to reconcile them to the stomach. It is also employed by itself as a moderate stimulant and cordial, given generally under the form of the watery infusion or distilled water. The former is more grateful, and is often successful in relieving nausea and checking vomiting.

Offic. Prep.—Aq. L. Cinn. Sp. L. Cinn. T. L. Cinn. T. L. Cinn. C. Pulv. Cinn. Comp. *Ed. Lond. Dub.*

LAURUS CASSIA. Cassia. *Enneand. Monogyn. Oleraceæ. Cortex. Flores nondum expliciti. India.*

THE Cassia-tree has been regarded as a variety of the cinnamon, but appears to be a distinct species. Its bark, however, resembles that of cinnamon in appearance, taste, and flavour; is distinguished by its taste being more pungent, less sweet, and more mucilaginous than that of the real cinnamon; by its texture being denser, or less shivery, so that it breaks close and smooth, and by the pieces of it being thicker and less convoluted. Its aromatic quality, like that of cinnamon, resides in an essential oil. It affords a distilled water, stronger than that of the genuine cinnamon, and yields also its taste and flavour to water by infusion. It is used for the same purposes as cinnamon; it is, however, much less agreeable to the stomach, and rather more pungent and stimulating. It cannot, therefore, be always with propriety substituted for the other, especially where the stomach is in an irritable state. The Cassia buds are collected before they are fully expanded, and are dried; they are of a dark grey colour, are similar in taste and flavour to the bark, and are often substituted for it in officinal preparations.

Offic. Prep.—Aq. L. Cass. *Ed.*

CANELLA ALBA. *Dodecand. Monogyn. Oloraceæ. Cortex. West Indies.*

THIS is the inner bark of the branches of the tree. It is in quills or flat pieces, of a light yellowish-grey colour; its flavour is somewhat aromatic, and its taste is pungent. By distillation it affords a thick essential oil. Alkohol extracts its aromatic quality; water does so very imperfectly.

Canella is employed principally on account of its aromatic quality, and generally in combination with other remedies to render them more grateful. It thus enters into the composition of several officinal tinctures, and has been supposed, in particular, well adapted to cover the flavour of aloes.

Offic. Prep.—V. Aloes cum Canella. *Ed.* Pulv. Aloes cum Canella. *Dub.*

MYRISTICA MOSCHATA. *Diœcia. Monadelphia. Fructus nucleus. Nux Moschata dictus; Macis; Hujus Oleum fixum. India.*

UNDER the officinal name Myristica, are comprehended Nux Moschata or Nutmeg, and Macis or Mace; the former being the seed or kernel of the fruit, the latter the covering with which it is immediately surrounded. The tree is a native of the Molucca islands. The external covering and pulp of the fruit are removed, and the nutmeg and mace are dried by exposure to the sun.

Nutmegs are round, of a greyish colour, streaked with brown lines, slightly unctuous; they have a strong aromatic flavour, and a pungent taste. They yield their active matter entirely to alkohol: distilled with water, they afford a fragrant and pungent essential oil; by expression, a sebaceous oil is obtained from them, retaining their fragrant odour, and part of their pungency, probably from part of the essential oil being expressed along with it.

Nutmeg is used in medicine as a grateful aromatic. It may be given in a dose from 5 to 15 grains, and is sometimes employed to relieve nausea or vomiting, or to check diarrhœa, taken generally in wine. It has been said to prove narcotic in a large dose. It is also frequently employed to conceal the taste and flavour of unpleasant medicines, and to obviate the nausea they might excite.

Mace is a membranous substance, unctuous, of an orange yellow colour, and having a flavour and taste similar to the nutmeg, but rather less strong. It is used for the same purposes.

The expressed oil of nutmeg, which is generally known by the name of Oil of Mace, is sometimes used as an external stimulating application, but in the shops is seldom found genuine.

Offic. Prep.—Ol. Myrist. Mosch. Sp. Myrist. Mosch.—*Ed. Lond. Dub.*

EUGENIA CARYOPHYLLATA. Caryophyllus Aromaticus. Clove. *Polyand. Monog. Hesperideæ. Flores cum pericarpio immaturo. India.*

THE tree producing cloves is a native of the Molucca islands, but is now cultivated in other parts of India. The cloves are the unexpanded flowers, which are dried by exposing them first to the smoke of fuel, and afterwards to the sun. They are somewhat round, the division of the petals of the corolla being perceptible, are of a greyish brown colour, slightly unctuous on the surface; they have a strong aromatic odour, and a warm pungent taste. They afford to water their flavour principally; to alkohol their taste. By distillation with water, they yield a fragrant essential oil, not very pungent. The oil of cloves commonly met with is rendered acrid by a portion of the resinous extract obtained by the action of alkohol on cloves being dissolved in it.

Cloves are among the most stimulating of the aromatics. They are employed principally as adjuvants or corrigents to other medicines, particularly in combination with bitters, or sometimes with the vegetable cathartics. The essential oil is used with the same intention, and likewise as a local application to severe toothach. The infusion in tepid water has been employed as a grateful stimulant to relieve the sense of coldness in the stomach, which attends some forms of dyspepsia.

Offic. Prep.—Infus. Caryoph. *Lond.*—Ol. Caryoph. Ar. *Ed.*

CAPSICUM ANNUUM. Capsicum. Guinea Pepper, or Capsicum. *Pentand. Monog. Solanaceæ. Fructus. East and West Indies.*

THE fruit of this plant is an oblong pod, of an orange colour, containing a pulp inclosing seeds. The membranous pod has an odour aromatic and penetrating, but which is impaired by drying; its taste is extremely hot and acrid, the sensation which it excites remaining long impressed on the palate. Its pungency is completely extracted by alkohol, and partially by water.

Capsicum is a very powerful stimulant. As such, it has been given in atonic gout, in palsy and dyspepsia, in tympanitis and dropsy, and in the latter stage of fever, where the powers of life are nearly exhausted. It is given in the dose of 5 or 10 grains, in the form of pill. In chronic affections it is combined with preparations of iron or other tonics. It is used as a condiment to food, especially in warm climates, and proves useful by obviating flatulence and promoting digestion. An infusion of it in diluted vinegar, with the addition of salt, has been used as a gargle in cynanche; but the practice, though it has been successful in the West Indies, is not without danger, from the violent inflammation it is liable to induce. The capsicum pod is sometimes employed as an ingredient in rubefacient cataplasms, applied to the soles of the feet, to relieve the coma of fever. The seeds have been found useful in obstinate intermittents, two grains being given at the approach of the cold paroxysm. The dose of the pod is from 5 to 10 grains.

Offic. Prep.—Tinct. Capsici. *Lond.*

PIPER NIGRUM. Black Pepper. *Diand. Trigyn. Piperitæ. Fruct. India.*

BLACK or Common Culinary Pepper is the unripe fruit of this plant dried in the sun. Its smell is aromatic; its taste pungent. Both taste and smell are extracted by water, and partially by alkohol. The essential oil, obtained by distillation, has little or no pungency.

Pepper, from its stimulating and aromatic quality, is employed as a condiment to promote digestion: as a medicine it is given to relieve nausea, or check vomiting, to remove singultus, and as a stimulant in retrocedent gout and paralysis. Its dose is 10 to 15 grains. Its infusion has been used as a gargle in relaxation of the uvula.

White Pepper is the ripe berries of the same plant, freed from the outer covering, and dried in the sun. It is less pungent than the black.

PIPER LONGUM. Long Pepper. *Diand. Trigyn. Piperitæ. Fructus. East Indies.*

THIS is the berry of the plant, gathered before it is fully ripened, and dried in the sun. It is oblong, indented on the surface, of a dark grey colour. In flavour, taste, and other qualities, it is similar to the black pepper, and may be used for the same purposes.

Piper cubeba. Cubebs. *Diand. Trigyn. Piperitæ. Fructus. East Indies.*

Cubebs are the dried fruit of this tree. They have an aromatic odour, and a moderately warm taste. Their virtues are similar to those of the other peppers, and being rather weaker, they are little used.

Myrtus pimenta. Piper Jamaicensis. Jamaica Pepper. *Icosand. Monog. Hesperideæ. Baccæ. West Indies.*

The berries of this tree are collected before they are ripe, and are died in the sun. Their taste, though pungent, is much less so than that of the peppers; their flavour is fragrant, and has often been compared to that of a mixture of cloves, nutmeg, and cinnamon. The flavour resides in an essential oil; the pungency in a resin. Pimento is used in medicine merely as an aromatic, and principally on account of its flavour.

Offic. Prep.—Aq. Myrt. Pim. Ol. Vol. Myrt. Pim. Sp. Myrt. Pim. *Ed. Lond. Dub.*

Amomum Zedoaria. Zedoaria. Zedoary. *Monand. Monog. Scitamineæ. Radix. India.*

This root is in oblong pieces, of an ash colour; its smell is aromatic; its taste pungent and bitterish. It contains a portion of camphor, which is deposited from its essential oil.

Its virtues are merely those of an aromatic, and as it is rather weak, it is little used.

Amomum Zingiber. Zingiber Officinale. Ginger. *Monand. Monog. Scitamineæ, Radix. India.*

This plant has been usually placed under the genus Amomum, but the London College have admitted the alteration proposed by Mr Roscoe, and insert it as the species of a different genus, under the name Zingiber Officinale. It is a native of India, but is now abundant in the West Indies, whence the dried root is imported. It is in small wrinkled pieces, of a greyish or white colour, having an aromatic odour, and a very pungent, somewhat acrid taste. The Black Ginger is the root prepared with less care than the White; the latter, previous to drying, being scraped and washed.

Ginger yields its active aromatic matter completely to alkohol, and in a great measure to water. By distillation it affords a small quantity of essential oil, which is fragrant, but not pungent, the pungency residing in a resino-extractive principle.

This root is frequently employed as a grateful and moderately powerful aromatic, either in combination with other remedies, to promote their efficacy, or obviate symptoms arising from their operation, or by itself as a stimulant. With the latter intention, it is used in dyspepsia, flatulence, and tympanitis. Its dose may be 10 grains. Chewed, it excites the salivary discharge.

Offic. Prep.—Syrup. Amom. Zingib. *Ed. Lond. Dub.*—Tinct. Zingib. *Lond. Dub.*

Amomum repens. Amomum Cardamomum. Ellettaria Cardamomum. Cardamomum minus. Lesser Cardamom. *Monand. Monogyn. Scitamineæ. Semen. India.*

Two species had been described as affording the lesser cardamom seeds; the Amomum Repens, and Amomum Cardamomum. The Edinburgh College refer to the former; but more lately, from a more accurate description of the plant, it has been entirely removed from the genus amomum, and placed under a new genus, named Elettaria, the name chosen for the species being Elettaria Cardamomum. This has been admitted by the London College.

The seeds are dried, and imported in their capsules, by which their flavour is better preserved. Their smell is aromatic, their taste pungent, and both are communicated by infusion to water, as well as to alkohol. They afford by distillation an essential oil. They are used merely as grateful aromatics, and are frequently combined with bitters, or with purgatives, to obviate flatulence.

Offic. Prep.—Tinct. Amom. R. *Ed. Lond. Dub.*—Tinct. Cardom. Comp. *Lond. Dub.*

CARUM CARUI. Caraway. *Pentand. Digyn. Umbellatæ. Semen. Indigenous.*

CARAWAY, though an indigenous plant, is usually cultivated for its seeds. They have an aromatic flavour, and a warm taste, depending principally on an essential oil, which they contain in considerable quantity. They are used to relieve flatulence, one or two drachms being swallowed entire; their essential oil, which has considerable pungency, and is grateful, is not unfrequently added to other medicines, to obviate nausea or griping.

Offic. Prep.—Sp. Car. Carv. *Ed. Lond. Dub.*—Aq. Car. *Lond.*—Ol. Car. *Lond. Dub.*

Coriandrum sativum. Coriander. *Pentand. Digyn. Umbellatæ. Semen. South of Europe.*

This plant is cultivated in our gardens for its seeds. They have a more pleasant odour when dried than when fresh; their taste is moderately warm. Their taste and flavour depend on an essential oil. Like caraway, they are used as carminative, and likewise to cover the taste and flavour of some medicines, particularly of senna, when given under the form of infusion or tincture.

Pimpinella anisum. Anise. *Pentand. Digyn. Umbellatæ. Semen. Egypt.*

This plant is cultivated in the South of Europe, and sometimes also in our gardens. Its seeds have an aromatic odour, and a warm taste, with a share of sweetness. They afford, by distillation with water, a considerable quantity of essential oil, having a strong, rather unpleasant odour, and a sweet taste, without much pungency, and distinguished by the property of congealing at a very moderate degree of cold. They are used chiefly as a carminative in dyspepsia, and in the flatulence to which infants are subject. A small quantity of the seeds may be taken, or, what is preferable, a powder composed of a few drops of the oil rubbed with sugar.

Offic. Prep.—Ol. Pimpin. Anis. *Ed. Lond. Dub.*—Sp. Anis. *Lond.*—Sp. Anis. C. *Dub.*

The seeds of the following plants have qualities and virtues so very similar to those of the anise or caraway, that they do not require distinct consideration. They are used for similar purposes, but are scarcely entitled to a place in the Materia Medica.

Anethum foeniculum. Fœniculum dulce. Sweet Fennel. *Pentand. Digyn. Umbellatæ. Semen. Indigenous.*

Anethum graveolens. Dill. *Pentand. Digyn. Umbellatæ. Semen. Spain and Portugal.*

Cuminum cyminum. Cumin. *Pentand. Digyn. Umbellatæ. Semen. South of Europe.*

Angelica archangelica. Angelica sativa. Garden Angelica. *Pentand. Digyn. Umbellatæ. Semen; Folia; Radix. North of Europe.*

Of this plant, the root possesses the greatest share of the aromatic quality, though it also belongs to the seeds and leaves.

Mentha piperita. Mentha Piperitis. Peppermint. *Didynam. Gymnosp. Verticillatæ. Herba. Indigenous.*

Of the different mints, this is the one which has the greatest degree of pungency. The leaves have a considerable degree of aromatic odour and taste; the taste being pungent, followed by a sensation of coolness on the tongue. They afford an essential oil, rich in the aromatic quality and pungency of the herb. Peppermint is used as a stimulant and carminative, to obviate nausea or griping, or to relieve the symptoms arising from flatulence, and very frequently to cover the taste and odour of other medicines. It is used for these purposes under the forms of the watery infusion, the distilled water, and the essential oil.

Offic. Prep.—Aq. Menth. P. Sp. Menth. P. Ol. Menth. *Ed.*

MENTHA VIRIDIS. Mentha sativa. Spearmint. *Didynam. Gymnosperm. Verticillatæ. Herba. Indigenous.*

MENTHA PULEGIUM. Pennyroyal. *Didynam. Gymnosp. Verticillatæ. Herba. Indigenous.*

THESE two mints, spearmint and pennyroyal, resemble the peppermint in their general qualities, and are used for the same purposes, but are rather less agreeable and pungent. Their essential oil and distilled water are also inserted in the Pharmacopœia.

HYSSOPUS OFFICINALIS. Hyssop. *Didynam. Gymnosp. Verticillatæ. Herba. Asia, South and East of Europe.*

THIS plant, which grows in our gardens, nearly allied to the preceding in botanical characters, is possessed of very similar qualities and virtues, and is sometimes employed for the purposes for which they are used. It has also been considered as a remedy in cattarh, but it can have no efficacy.

CHAP. VI.

OF ASTRINGENTS.

It has been supposed by medical theorists, that the fibres of the living body, either over the whole, or in part of the system, may become relaxed, or lose that density and contraction which is necessary for the due performance of the several functions. And this is considered as an affection of the matter of which the fibre is composed, not of the living or irritable principle connected with it. It has farther been imagined, that this relaxation may be removed by the application of those substances, which, when applied to dead animal matter, condense and constringe it; and such substances, classed as remedies, have received the appellation of Astringents. They are defined by Cullen: "Such substances as, applied to the human body, produce contraction and "condensation in the soft solids, and thereby encrease their "density and force of cohesion." By the operation of this corrugating power, either directly exerted on a part, or extended by sympathetic action, the morbid affections arising from a state of relaxation are supposed to be removed.

The arguments adduced in support of these medicines exerting such a power, appear more conclusive than those brought in proof of any of the other explanations of the operations of medicines, founded on the mechanical physiology: hence they have generally commanded assent. Astringents, it is observed, exert this corrugating power on dead matter;

they are serviceable as medicines in those affections which seem to depend on a relaxed state of the solids; they even corrugate the fibres of living matter, as is evident from the sensation they impress on the tongue and fauces; and applied to bleeding wounds, they restrain the flow of blood apparently by the same power.

We cannot, however, admit, without limitation, the supposition on which this hypothesis is founded,—that the affections which astringents obviate depend on mechanical laxity of the solids, and that these substances act solely by removing that laxity, by inducing a mechanical or chemical change. Debility was indeed once ascribed to such a cause; but it is now admitted, that every degree of strength or weakness depends much more on correspondent variations in the state of the powers peculiar to living matter; and substances capable of obviating disease dependent on any state of debility, must be such as are capable of acting on these powers. Many substances accordingly, arranged as Astringents, occasion very considerable alterations in some of the functions: they produce effects which cannot be referred to their condensing power, allowing them to possess it; and therefore, in all the changes they produce, part of their operation at least must be referred to actions which they exert, conformable to the laws of the living system.

For reasons of this kind, some have denied the existence of such a class of medicines as astringents. The substances which have received that appellation, they have considered as moderate stimulants, permanent in their action, and as differing little therefore from tonics.

It must be admitted, however, that there are substances which immediately restrain excessive evacuations; and that although between these and tonics there is in several respects a close resemblance, in others they differ widely. The most powerful astringents, oak bark for example, or galls, are much inferior in their tonic power to other substances, having little or no astringency; while there are powerful tonics which do not produce the immediate effects of astringents.

There appears, therefore, to be a foundation for establishing such a class as astringents, though it is very difficult to point out the precise nature of their operation. It must be admitted, perhaps, that astringents possess a power of corrugating or condensing the animal fibre. The very sensation they excite in the mouth appears to be a sufficient proof of this, and it is farther established by chemical facts. That they likewise act as permanent stimulants, is proved by their power of removing intermittent fever, and other states of the system connected with debility. The one power may be conceived to modify the other; and to this modification, or to their combined action, the effects of astringents may be ascribed.

Darwin advanced an hypothesis, that they act by producing absorption; this accounts for some of their effects, but not for others, particularly their power of stopping hæmorrhage.

Astringents, from the powers they possess, are applied extensively to the treatment of diseases.

As stimulants, acting with considerable permanence, they may be substituted for tonics in diseases of debility. It has been found accordingly, that they have power to stop the paroxysm of an intermittent fever, when given a short time before its accession: and in cases of debility, they seem to be often of utility, independent of their power of checking debilitating evacuations.

It is however for restraining evacuations that astringents are usually employed. Hæmorrhage, where it does not arise from a solution of continuity, depends on the contraction of the extreme arterial branches not being sufficient to resist the impulse of blood from the larger branches,—a deficiency of contraction generally owing to a debilitated state of these vessels. Astringents, as stimulants, slow and permanent in their action, and not sensibly encreasing the force of the circulation, are calculated to obviate such a state; and this may be farther promoted by their corrugating power, extended by sympathetic action to the vascular fibre. Hence their use in menorrhagia, hæmoptysis, and other discharges of blood; though they likewise frequently fail, from their operation being too slow and feeble, to resist the impetus of the circulation, or counteract the flow from a ruptured vessel. In epistaxis, or bleeding wounds, they are more powerful, as they can be more directly applied to the part.

By a similar operation, they check serous effusions; hence their use to restrain colliquative sweats. In diarrhœa too, they appear to operate by checking the effusion of fluid from the exhalent vessels of the intestines, and thus diminishing the encreased stimulant operation, which from this cause is exerted on the moving fibres of the canal, and encreases its peristaltic motion. In the latter stage of dysentery, where an encreased evacuation appears to be connected with debility of the exhalent vessels, their cautious administration is advantageous. And in passive inflammation, attended with encreased serous discharge, as in gleet, and in some forms of ophthalmia, the topical application of astringents affords the most successful mode of treatment.

In the administration of astringents, it is an obvious caution, that they ought not to be applied to check evacuations where these are critical, or where they are necessary to relieve a plethoric state of the vessels, or a state of encreased action; at least unless the evacuation proceed to an alarming extent.

Some narcotics, as opium, have sometimes effects apparently astringent. When encreased discharges take place from irritation, these remedies, by diminishing irritability, lessen the discharge; they are thus serviceable both in hæmorrhage, and in diarrhœa arising from that cause. But their mode of operation is obviously different from that of astringents; and in the cases in which they are of benefit, astringents would be less useful, and only by an indirect operation.

Astringents may be subdivided into those belonging to the mineral, and those belonging to the vegetable kingdoms, which differ considerably from each other in their chemical properties, and probably therefore in the mode in which they produce their astringent effect. All the vegetable astringents of any considerable power contain tannin, and hence it has been considered, perhaps with justice, as the principle in which their astringency resides.

ASTRINGENTS.

From the Mineral Kingdom.

Acidum sulphuricum.
Argilla.
Super-sulphas argillæ et potassæ.
Calx.
Ferrum.
Zincum.
Cuprum.
Plumbum.

From the Vegetable Kingdom.

Quercus robur.
Quercus cerris.
Tormentilla erecta.
Polygonum bistorta.
Anchusa tinctoria.
Hæmatoxylon campechianum.
Rosa gallica.
Arbutus uva ursi.
Mimosa catechu.
Kino.
Pterocarpus draco.
Pistacia lentiscus.

Of Astringents from the Mineral Kingdom.

Acidum sulphuricum. Sulphuric Acid. Acidum Vitriolicum. Vitriolic Acid.

Sulphur combines with oxygen in different proportions; when united with the largest proportion, it forms an acid extremely powerful from its state of concentration, the Sulphuric Acid. This acid used to be obtained from the decomposition of sulphate of iron, the Green Vitriol of commerce, by heat, and hence the name of Vitriolic Acid which was given to it. It is now formed by the combustion of sulphur. The sulphur, reduced to powder, is mixed with from one-eighth to one-tenth of its weight of nitrate of potash; the mixture, in small quantities, is kindled upon a hollow stone, placed within a large leaden chamber, the bottom of which contains water to the depth of two inches, and which is closed, or only occasionally opened to admit the renewal of the atmospheric air. The combustion of the sulphur is supported partly by the oxygen of the nitre, partly by that of the air which is admitted; the sulphuric acid which is produced, is absorbed by the water in the bottom of the chamber; and when the liquor has arrived at a certain degree of impregnation, it is withdrawn, and concentrated first by evaporation from leaden troughs, and afterwards by boiling in glass retorts. The use of the nitre in this mode of conducting the process is indispensible, and it was supposed to operate simply by affording oxygen to the sulphur, and thus enabling the combustion to proceed at a lower temperature, and with a less free exposure to the atmospheric air. The theory of its action however appears, from the very probable view of it given by Clement and Desormes, to be rather more complicated. The product of the combustion of the sulphur is principally sulphurous acid, which can scarcely be condensed. But by the partial abstraction of the oxygen of the nitric acid of the nitre during the combustion, nitric oxide gas is evolved; this diffused through the chamber combines with the oxygen of the atmospheric air, and forms nitrous acid vapour, which reacts on the sulphurous acid, communicates to it oxygen, and converts it into sulphuric acid.

Sulphuric acid prepared by this process is of the specific gravity of 1.850, and at this degree of concentration has been estimated to contain 21 of water in 100 parts: the real acid is composed of 42 of sulphur and 58 of oxygen. The acid, in its usual state of concentration, is of a thick consistence, and has an apparent unctuosity; it is colourless and transparent; is highly corrosive, and possesses all the general acid properties in an eminent degree. As obtained by this process, it is not perfectly pure, but contains a little sulphate of potash, and sometimes a little sulphate of lead. The quantities of these, however, especially of the latter, are very inconsiderable; they are in a great measure separated when the acid is diluted, and hence this dilution not only renders it more convenient for administration, but likewise more pure.

Sulphuric acid has a very strong attraction to water, so as to imbibe it rapidly from the atmosphere; and hence the necessity of its being kept in bottles well stopt. It is also liable to acquire a brown colour from the contact of the smallest quantity of vegetable matter.

As a medicine, this acid is employed as a refrigerant, but principally as an astringent, and in this property it is undoubtedly superior to any other acid. It is used as an astringent to check the flow of blood in hæmoptysis, and the colliquative sweat in hectic fever; indications which it fulfils better than any other article in the Materia Medica. It is sometimes also used in menorrhagia and diabetes; and as a tonic, founded on its astringent property, in dyspepsia. In its concentrated state, its dose can scarcely be measured. In the Pharmacopœias, it is therefore ordered to be diluted. According to the formula given by the Dublin and Edinburgh Colleges, the Acidum Sulphuricum Dilutum consists of one part of the strong acid with seven of water; it is given in a dose from 10 to 30 drops. The London College, without any sufficient reason for the deviation, have ordered, under the same name, an acid diluted with not much more than five parts of water. The Acidum Sulphuricum Aromaticum consists of the acid diluted with alkohol impregnated with aromatics, and is given in a similar dose. From its astringency, this acid is frequently added to gargles, which are employed to check salivation, or relieve relaxation of the uvula. Externally mixed with lard, in the proportion of half a drachm to an ounce, it has been used with advantage in psora, and it has also been given internally in the same disease.

Offic. Prep.—Acid. Sulph. Dil. *Ed. Lond. Dub.*—Acid. Sulph. Aromat. *Ed.*

ARGILLA. Argil.

THIS earth, in its pure form, is insipid and inert; but in its saline combinations, at least all of them which, from their solubility, are sufficiently active, there exists a greater or less degree of astringent power. The Boles, of which the Armenian Bole (Bolus Armena) is the chief, are argillaceous earth, impregnated with oxide of iron; they were at one time employed as astringents, but are entirely inert, and are now expunged from practice.

ALUMEN. SUPER-SULPHAS ARGILLÆ ET POTASSÆ. SULPHAS ALUMINÆ. Alum.

THIS salt is composed chiefly of argillaceous earth and sulphuric acid, the acid being in excess. It likewise always contains, however, a portion of potash, which is essential even to its constitution, and in some of the forms of it met with in commerce, a small quantity of ammonia. It is found native, efflorescing generally in the interstices of what is named alum slate; or it is prepared from what are named alum ores, which consist essentially of clay impregnated with sulphur, or sulphuret of iron. The ore being calcined is exposed to atmospheric air; the sulphur absorbing oxygen, forms sulphuric acid, which unites with the argillaceous earth of the clay, with a portion of potash which the ore often contains; or if this alkali is not present in sufficient quantity, carbonate or sulphate of potash, or sometimes even muriate of potash, is added to afford it: sometimes too a portion of impure ammonia, obtained by distilling urine or bones, is employed. The liquor after these additions is concentrated by boiling, so as to yield, on cooling, the alum in a solid state, of a crystalline structure, though of no regular form.

This salt is in large masses, transparent, colourless, and vitreous in appearance: it has a styptic taste, with a degree of sweetness. From the excess of its acid it reddens the vegetable colours. It is soluble in eighteen parts of cold, and in less than two of boiling water. The variety termed Roche or Rock Alum (Alumen Rupeum) is in smaller fragments, efflorescent on the surface, and of a reddish colour. Common alum consists of 26 of acid, 12.5 of argil, 10 of potash, and 51.5 of water. This water of crystallization causes it to liquify when exposed to moderate heat; when it is expelled by the continuance of the heat, a white spongy mass remains, named Calcined or Dried Alum.

Alum, from its astringent power, is employed to check hæmorrhagies and serous evacuations: it is thus given in menorrhagia, leucorrhœa, and diabetes; and in leucorrhœa, is perhaps more successful than any other astringent. It has likewise been used, though less frequently, in intermittent fever, and in colica pictonum. Its dose is from 5 to 10 grains. The addition of an aromatic is generally necessary, to prevent it from exciting nausea, when it is given in the solid form; but the best form of administering it, is that of Alum Whey (Serum Aluminosum), prepared by adding two drachms of pounded alum to a pint of hot milk; the dose of this is 3 or 4 ounces. Externally alum is frequently used as the basis of astringent gargles, and of injections used in gleet; and dissolved with sulphate of zinc or copper, it forms very styptic solutions, employed to check hæmorrhage by direct application.

Offic. Prep.—Sulph. Alum. Exs. Pulv. Sulph. Alum. C. *Ed.*—Liq. Alum. C. *Lond.*

Calx. Lime. Calx Viva. Quicklime. (Page 229.)

This earth is found abundantly in nature, in several states of combination. It is usually obtained by exposing any of its native compounds with carbonic acid, chalk, limestone, or marble, to a heat gradually raised to a degree of intensity sufficient to expel the acid: the lime remains more or less pure. It is soluble in water, in sparing quantity; about 700 parts being required for its solution. Yet even in this weak state of impregnation, the solution which is known by the name of Lime Water (Aqua Calcis), and which is prepared simply by agitating water with slaked calcined lime, has a strong styptic taste, and is capable of exerting important chemical agencies, as well as of acting on the living system. As an astringent, lime water is employed in diabetes, and in diarrhœa: the dose is one or two pounds in the course of the day. It is used likewise in dyspepsia, in which it proves useful, more by its tonic and astringent power, than by its effect in neutralizing acid in the stomach. Externally it is applied as a wash to ill-conditioned ulcers.

Offic. Prep.—Aq. Calc. Ol. Lini cum Calce. *Ed.*

Carbonas calcis. Carbonate of Lime.

The various kinds of carbonate of lime, Chalk (Creta Alba), Crabs Claws (Chelæ Cancrorum), Oyster Shells (Testæ Ostreorum), are not unfrequently used in diarrhœa, but they evidently prove useful, not by any real astringent power, but by correcting the acidity which so frequently occasions or aggravates that disease. They rather belong, therefore, to the class of Antacids.

Ferrum. Iron. (Page 209.)

This metal has been already considered as a tonic; it is likewise employed as an astringent to check increased evacuations. It is thus used with advantage in some forms of passive hæmorrhage, particularly menorrhagia. The advantages derived from it in such cases, may be supposed to depend on its tonic power; the styptic taste, however, of its saline preparations, is a sufficient proof of the presence of astringency to a certain extent; and it is not improbable that this may coincide with, or modify the operation connected with its action as a tonic. The sulphate and the muriate of iron are the preparations in which this astringent property is most obvious.

ZINCUM. Zinc. (Page 215.)

THIS metal has likewise been considered as a tonic. Its saline preparations have, however, a considerable degree of astringency, and there are several medicinal applications of them founded on this quality.

Sulphate of Zinc (Sulphas Zinci) has been employed internally as an astringent in chronic dysentery, and in the treatment of intermittent fever; but from its emetic power, its operation is liable to be harsh, and is not easily regulated. Its solution is in common use as an injection in gonorrhœa, when the inflammatory state has subsided, and in gleet, two grains being dissolved in an ounce of water; and it frequently succeeds in checking the discharge, apparently from its astringent power. A solution of nearly the same strength is used as a collyrium in ophthalmia; the astringent power of this being encreased, according to a formula in the Edinburgh Pharmacopœia, by the addition of a few drops of diluted sulphuric acid. Dissolved with alum, it forms a very styptic liquor, which is an officinal preparation, and has long been in use for stopping hæmorrhage, and checking encreased discharges, by external application.

Acetate of Zinc, under the form of solution (Solutio Acetitis Zinci), is obtained by adding a solution of acetate of lead to a solution of sulphate of zinc, a mutual decomposition immediately taking place, and sulphate of lead being precipitated, while acetate of zinc remains dissolved. This has been in use as a mild astringent injection in gonorrhœa, less liable to produce irritation, or to check the discharge suddenly, than the solution of sulphate of zinc, and rather more active than the solution of acetate of lead. It has therefore received a place in the Edinburgh Pharmacopœia. A solution of the salt in alkohol has been introduced into the Dublin Pharmacopœia, and when used is largely diluted with water.

CUPRUM. Copper. (Page 217.)

COPPER has so far an analogy to the preceding metals, that, along with the general action which it exerts on the system, capable of obviating spasmodic affections, it has a degree of astringent power. This too is conspicuous, principally in its combination with sulphuric acid, the sulphate of copper. This salt, in solution, is sometimes used externally as an astringent; and dissolved with alum in water, to which a portion of sulphuric acid is added, it forms a very styptic solution, formerly named Aqua Styptica, sometimes employed by direct application to restrain hæmorrhage. The formula has a place in the Edinburgh Pharmacopœia.

Offic. Prep.—Sol. Sulph. Cupr. Comp. *Ed.*

PLUMBUM. Lead.

THIS metal, when rendered capable of acting on the system by oxidation, or combination with acids, produces very deleterious effects, and proves a powerful, though insidious poison. Nor is it easy to explain its mode of action. It appears to act peculiarly on the muscular fibre, repressing action, and at length exhausting the irritability of the muscles. When introduced slowly into the system, the intestines are first affected, constipation from diminished action takes place, accompanied frequently with severe pain.

Tremor and debility of the voluntary muscles succeed, and are followed by paralysis, the muscles losing their firmness and cohesion. When a large quantity of any of the active preparations of lead is received into the stomach, these symptoms occur suddenly and with violence, giving rise to what is named Colica Pictonum, and the same disease is sometimes suddenly induced by the progressive accumulation of the metal in smaller quantities. A sense of constriction is felt in the stomach and bowels, with obstinate constipation and the most severe pain; the pulse is small and hard; respiration becomes laborious; there is general muscular debility and tremor, accompanied with cold sweats and convulsions, which have often a fatal termination.

From Dr Campbell's experiments, (Inaugural Dissertation), it appears, that lead, applied to an wound, is less active than the other mineral poisons. A saturated solution of acetate of lead, applied in small quantity, did not produce any deleterious effect; two drachms of the salt itself applied to an wound in the neck of a dog, occasioned little immediate injury. Still the kind of action appears to be nearly the same, though more slowly induced. In the latter experiment, after a number of days, the power of motion in the limbs was gradually impaired, the pulse became small and quick, the respiration difficult, the belly was swelled, and on the twenty-third day the animal died: On dissection the internal surface of the stomach appeared inflamed, and part of the intestinal canal was slightly inflamed, with into-susception. In the production of these local effects lead is analogous to other metallic poisons; and they farther display its peculiar determination to the intestines.

From the external application of lead, its usual deleterious effects have been stated to be produced, and numerous cases have been adduced in support of this. Infants have been observed to be afflicted with convulsions from the too free or incautious application of cerusse to the skin; and even in adults, pain in the abdomen, spasms of the muscles, and paralysis, have been induced from the application of saturnine solutions or cataplasms. Other facts again have been stated in opposition to these, proving, that from the most free external application of the preparations of lead, no injurious consequences whatever arise, and this appears to be confirmed by the freedom with which they are employed in common practice. The comparative inactivity too of the preparations of this metal, when applied even to an wound, would lead to the conclusion, that from mere application to the skin they can have little effect. Yet, as deleterious effects do result from the former mode of application, it is possible they may also from the latter, in very irritable or susceptible habits: and the facts which have been stated in proof of this, seem to rest on evidence which cannot well be denied. The explanation of this is probably to be found in the influence of idiosyncracy, which, with regard to the action of lead, exists to a very considerable extent, some individuals being much more susceptible of its action than others, as has been remarked in cases where it has been taken internally to nearly the same extent, from the use of articles of food or drink which have received an impregnation of the metal,—some suffering severely, while others have sustained much less apparent injury.

From its power of repressing muscular action, lead produces effects analogous in some respects to those of astringents, and it is usually ranked as an astringent, though its mode of operation is probably dissimilar.

The preparations of lead which have been applied to medicinal use, are the semi-vitrified oxide, the white oxide or sub-carbonate, and the acetate and super-acetate.

Lithargyrum. Litharge. The substance known under this name is the semi-vitrified oxide (Oxidum Plumbi Semi-Vitreum). It is usually obtained in the calcination to which lead is submitted, with the view of separating the silver which is frequently associated with it; the flame, with a current of air, being made to reverberate on the surface of the melted metal. It is in flakes of a yellow colour, with somewhat of a vitreous lustre. A small quantity of carbonic acid, not exceeding 4 parts in 100, exists in it, apparently, however, not essential to its constitution. It is used only in some pharmaceutical preparations, particularly for forming, when boiled with oil, a plaster which serves as the basis of other compound plasters, and which is itself sometimes applied as a healing dressing to wounds, proving useful by excluding the air.

Offic. Prep.—Emp. Oxid. Plumb. *Ed. Lond. Dub.*

Minium. Red Lead.—This is an oxide containing about 12 of oxygen in 100 parts. It is prepared by calcining lead with a fire gradually raised, stirring the oxide constantly, to expose it better to the action of the air. It is sometimes applied to the same purposes as litharge, and an ointment formerly in use as a cooling application was prepared by rubbing it with vinegar and oil. It might be discarded, however, from the Pharmacopœia.

Cerussa. Cerusse, or White Lead.—This is prepared by inclosing plates of lead with vinegar in earthen vessels, which are exposed to a gentle heat, so as to convert the vinegar into vapour; it acts chemically on the lead plates; and a white crust is formed on their surfaces, which, when it has accumulated sufficiently, is scraped off, and reduced to a fine powder by levigation. The nature of this substance has not been very well ascertained. It has been regarded merely as an oxide; hence the name Oxidum Plumbi Album, given to it by the Edinburgh College. A little carbonic acid being generally contained in it, either absorbed from the atmosphere, or formed from the partial decomposition of the acetic acid, it has been considered as a sub-carbonate; and the London College have defined it as such, while, for a reason not easily imagined, they have named it Carbonas Plumbi. From theory, it might be inferred to contain a portion of the acetic acid by which it is formed; the Dublin College have accordingly named it Sub-Acetas Plumbi, and it is not improbable that this is most correct. It is used only externally, being applied in fine powder to slight cases of excoriation or inflammation, and used particularly to relieve these affections in children,—a practice, however, which, from some observations, appears not to be altogether without danger, and which is unnecessary, as the levigated calamine stone answers equally well. It is used likewise as the basis of an ointment, which is sometimes applied as a cooling dressing to inflamed parts.

Offic. Prep.—Ungt. Oxid. Plumb. Alb. *Ed.*

ACETAS et SUPER-ACETAS PLUMBI. Acetate and Super-acetate of Lead.—There are two compounds of lead with acetic acid, medicinally employed. One is the salt which has been long known by the name of Sugar of Lead, (Saccharum Saturni); the other a solution, which was named Goulard's Extract of Lead; and it is only lately that the relation between these has been established.

The first had been regarded as the proper acetate of lead. Thenard found, that it is the super-acetate, or contains an excess of acid, which is necessary to give it its usual crystalline form, which is that of a slender four or six sided prism. When its solution is boiled with a little oxide of lead, the neutral acetate is formed, which crystallizes in plates. Goulard's Extract, which is prepared by boiling vinegar on litharge, Dr Bostock found to be a solution of the neutral acetate. And the terms of Acetate and Super-acetate are now employed by the London College to distinguish these preparations.

SUPER-ACETAS PLUMBI. Super-acetate of Lead.—This is still named Acetate of Lead (Acetas Plumbi) in the Edinburgh Pharmacopœia, the nature of it having only lately been ascertained. It is the sugar of lead of the old nomenclature. The process for preparing it consists in boiling distilled vinegar on cerusse, until the acid acquire a sweet taste, and evaporating the liquid, so that on cooling it affords crystals: it is usually prepared on a large scale. It is in masses composed of slender prismatic crystals, aggregated, of a yellowish colour, slightly efflorescent: it has a very sweet and styptic taste, is abundantly soluble in water, but scarcely forms a transparent solution even with distilled water, owing to a slight decomposition, in consequence of which a little sub-acetate is precipitated. It consists, according to Thenard's analysis, of 58 of oxide, 26 of acid, and 16 of water.

The medicinal use of this salt is nearly limited to its external application. Yet some practitioners have recommended it in different cases of profuse evacuation, particularly in hæmorrhage, where other remedies have failed: it has thus been given in menorrhagia, in the dose of half a grain repeated every four hours: it has likewise been employed in obstinate leucorrhœa, and to restrain the colliquative sweat accompanying hectic fever. From the deleterious agency, however, of lead on the system, it is a remedy which must be used with reluctance, and which is accordingly scarcely ever ventured on in modern practice. There is one circumstance too, that renders its administration more difficult,—its being liable to be considerably influenced by idiosyncracy; many facts having sufficiently established, that the action of lead is extremely unequal, quantities of it having been often taken without any injurious effect, which, in other cases, would have proved in the highest degree deleterious.

As an external application, Sugar of Lead, as it is named, is often employed to obtain its astringent effect. A solution of it, of the strength of three grains to an ounce of water, is used as an injection in gonorrhœa; and producing no irritation, is not liable to be attended with the injurious consequences which sometimes arise from preparations more active. A solution rather weaker is employed as a collyrium in ophthalmia, and can be applied with safety, even in the state of active inflammation. A solution somewhat stronger is a common application in superficial inflammation; and an ointment, of which it is the basis, is often employed as a dressing to inflamed or excoriated parts. Its saturated solution, combined with vinegar, is also frequently employed as a discutient. Facts have been brought forward, which apparently prove, that the general effects of lead on the system have been produced by the incautious or too long continued use of these external applications; while, in many cases, they have unquestionably been extensively employed without the production of any bad effect, and indeed are so in common practice; a discordance which, as has been already stated, is probably to be accounted for from the peculiar idiosyncracy with regard to the action of lead on the system, in consequence of which some individuals are more liable to be affected by it than others.

The neutral acetate of lead, it has been stated above, forms the basis of what has been named Goulard's Extract, —a preparation which has long been in use among surgeons. It is the Aqua Lithargyri Acetati of the former edition of the London Pharmacopœia, now named Liquor Plumbi Acetatis;

and is prepared by boiling vinegar on litharge. Although it differs in chemical composition from the preceding preparation, it does not appear to differ from it in medicinal powers. It is used diluted with water, as a lotion in cutaneous diseases, or as an application to inflamed surfaces. In the original formula for the preparation of this lotion given by Goulard, a little ardent spirit was added to it, and this being in common use, has been received as an officinal preparation by the London and Dublin Colleges.

Offic. Prep.—Ungt. Acet. Plumb. *Ed. Lond. Dub.*—Liq. Plumb. Acet. Dilut. *Lond. Dub.*—Cerat. Plumb. Composit. *Lond.*

Of Vegetable Astringents.

The property of astringency in vegetables, denoted by its effect of corrugating the animal fibre, appears to be dependent on a common chemical principle, or at least to be connected with some peculiarity of composition; since vegetable astringents uniformly possess certain common chemical properties. Thus, their astringency is extracted both by water and by alkohol; these infusions strike a purple or black colour with the salts of iron, deeper in general as the astringent is more powerful; and they are capable of corrugating, more or less strongly, dead animal matter, as is shewn in their operation in the process of tanning.

In the farther investigation of this subject, it was found, that a peculiar acid exists in the more powerful astringents; the acid which, from being contained abundantly in galls, has been named Gallic, and the general chemical characters of which, in the preliminary sketch on the principles of

Pharmaceutic Chemistry, have been enumerated. This acid having the property of striking a purple colour with the salts of iron,—the chemical change which had been more particularly considered as the test of astringency, was supposed to be the astringent principle.

To this, however, there existed a very obvious objection, that the acid, when obtained insulated, is possessed of no great astringency, and scarcely indeed of that property in any sensible degree; and farther, that the colour it strikes with the salts of iron is less deep than that from the infusions of the more powerful astringents.

The researches of Seguin, some years ago, threw more light on this subject by the discovery of a different principle existing in astringents, and having a better claim to be ranked as the principle of astringency. Applying the proper test to discover it, that of the animal matter, on which it peculiarly operates, he found, that on adding a solution of animal gelatin to the infusion of a vegetable astringent, as that of galls or oak bark, a copious precipitation takes place, arising from the combination of this principle with the gelatin. Being the agent which gives to astringents their property of tanning, it has received the name of Tannin, and its properties, as a proximate principle of vegetables, have been already stated.

That it is the principle of astringency in vegetables, admits now of little doubt. Gallic acid has no such power, while tannin has a harsh styptic taste, and the power of corrugating the animal fibre. Seguin had supposed, that in the operation of tanning, its action is facilitated by that of the gallic acid, the acid partially de-oxidizing the skin, and thus bringing it nearer to the state of gelatin, with which the tannin combines. A similar action might be supposed to be exerted on the animal fibre in the production of the astringent effect. The theory of Seguin, however, was established by no proof, and the fact that some of the most powerful astringents, as catechu or kino, contain no gallic acid, but tannin mixed only with mucilage or extract, is a proof that it is to the action of this principle that the whole effect is to be ascribed.

If astringency, as exerted by vegetables, is thus to be considered as the result of the chemical action of the principle on which it depends, there is considerable difficulty, as has been already remarked, in conceiving how it can be exerted in the animal system, especially in a distant part, when the astringent acts only on the stomach. It can only be conceived, that corrugation, or some similar change, is produced by it in the fibres of the stomach, which may be propagated by sympathy to distant parts, nearly in the same way as the impression of cold is communicated.

QUERCUS ROBUR. Oak. *Monoec. Polyand. Amentaceæ. Cortex. Indigenous.*

THE bark of this tree possesses a large share of astringency, which it yields to water. The infusion contains both gallic acid and the tanning principle, the latter in a considerable quantity, attached to the ligneous fibre, which forms the basis of the bark; an ounce of bark afforded, in Davy's experiments on the principal astringents, 111 grains of solid matter by lixiviation, of which 77 were tannin: but the quantity varies much according to the season and the age of the tree.

Oak bark has been used as a remedy in hæmorrhage, diarrhœa, and intermittent fever, given in a dose from 15 to 30 grains. In modern practice, its strong infusion or decoction is occasionally employed as an astringent gargle in cynanche, as an injection in leucorrhœa and profuse menorrhagia, and as a fomentation in hæmorrhoids and prolapsus ani.

Offic. Prep.—Extr. Cort. Querc. *Dub.*

QUERCUS CERRIS. *Monoec. Polyand. Amentaceæ. Cyniphis nidus. Galla. Galls. Asia Minor. South of Europe.*

THE tubercles named Galls, are found on the branches of this tree; their production is occasioned by the bark being pierced by an insect of the cynips genus, to deposite its egg. The juice exuding slowly, is inspissated, and hardens. The best galls are heavy, knotted on the surface, and of a blue colour. They are nearly entirely soluble in water, with the assistance of heat; the infusion reddens the vegetable colours from the action of the gallic acid, and this acid can be procured in considerable quantity, by allowing the infusion to remain exposed to the air until its other principles are decomposed, or by sublimation from the galls. The infusion too contains a large quantity of tannin, as it gives a very copious precipitate with solution of gelatin. It has farther been supposed to hold dissolved extract and mucilage; but the existence of extract is doubtful, and from Dr Bostock's experiments there appears to be no sensible portion of mucilage. The proportion of tannin varies considerably in different specimens of galls. In Davy's analysis of Aleppo galls, 500 grains afforded to water by lixiviation 185 grains of solid matter, of which 130 were tannin, 31 gallic acid, 12 saline and earthy matter, and 12 supposed to be mucilaginous and extractive matter.

In medical practice, galls, though so powerfully astringent, are not much employed, and are seldom internally administered. The strong infusion or decoction has been applied to the same purposes as the decoction of oak bark. And an ointment composed of the galls in fine powder with eight parts of simple ointment, is used as an astringent application to hæmorrhoidal affections.

Offic. Prep.—Tinct. Gallar. *Dub.*

TORMENTILLA ERECTA. Tormentil. *Icosand. Polygn. Senticosæ. Radix. Indigenous.*

THE root of tormentil, which is small and knotted, is strongly astringent, with little flavour or bitterness; and though it has not been chemically examined, it probably owes its astringency to tannin. It has been used in diarrhœa under the form of decoction, and in intermittent fever in substance, in the dose of from half a drachm to a drachm. But it is now nearly discarded from practice.

POLYGONUM BISTORTA. Bistort. *Octand. Trigyn. Oleraceæ. Radix. Indigenous.*

THE root of this plant is a pure and very strong astringent; as such it has been used in diarrhœa and in intermittent fever, in a dose from a scruple to a drachm. But having probably no superiority over other astringents, and no peculiar virtue, it has fallen into disuse.

ANCHUSA TINCTORIA. *Alkanet. Pentand. Monogyn. Asperifoliæ. Radix. South of Europe.*

THE cortical part of the root of this plant has a deep red colour, which has the singular property of not being extracted by water, but readily by expressed oils. Its watery infusion, however, strikes a dark colour with sulphate of iron, probably from the presence of tannin; and it possesses a slight degree of astringency; it is only employed to communicate colour to ointments.

HÆMATOXYLON CAMPECHIANUM. Lignum Campechense. Logwood. *Decand. Monog. Lomentaceæ. Lignum. South America.*

THE wood of this tree is of a very deep red colour; it has scarcely any smell; its taste is sweetish and astringent. Its active matter is extracted by water, and by alkohol, leaving the ligneous fibre which is its base undissolved; both solutions strike a deep purple colour with the salts of iron, and give a precipitate with gelatin. Logwood has been employed in medicine as an astringent, in diarrhœa and chronic dysentery, under the form of the decoction, or the watery extract. The extract has been proposed to be used as a substitute for kino.

Offic. Prep.—Ext. Hæmatoxyl. Camp. *Ed. Dub. Lond.*

ROSA GALLICA. Rosa Rubra. Red Rose. *Icosand. Polyg. Senticosæ. Petala. South of Europe.*

THE petals of this species of rose have a slight degree of astringency, which is most considerable before they are expanded, and it is in this state that they are collected and dried for use. The fresh leaves of the flowers are made into a conserve with sugar, which was at one time regarded as a remedy of some power in hæmoptysis and phthisis, but which has long been acknowledged to be perfectly inert. The infusion of the dried leaves, slightly acidulated by the addition of sulphuric acid, forms a pleasant astringent gargle.

Offic. Prep.—Inf. Ros. Gall. Cons. Ros. R. Syr. Rosæ. *Ed.*—Mel. Rosæ. *Lond. Dub.*

The petals of the Rosa Centifolia have no astringency, but are slightly laxative, and are employed from this quality in the preparation of a syrup, which is sometimes given to infants as a laxative. Their distilled water is recommended as a vehicle by its grateful flavour.

Arbutus uva ursi. Bears Whortle-Berry. *Decand. Monog. Bicornes. Folia. Europe, America.*

This shrubby plant is a native of this, as well as some of the other countries of Europe, and grows on our mountains. Its leaves, which are small, and of a dark green colour, have a bitter astringent taste, without any odour. Their watery infusion strikes a deep black colour with the salts of iron, and from their known astringency, which adapts them even to the purpose of tanning, they probably contain a large proportion of tannin.

From its astringency, uva ursi has been employed in menorrhagia and other fluxes. It has however been used more particularly in cystirrhœa, calculus, and ulcerations of the urinary organs. In checking the increased secretion of mucus from the bladder, which constitutes the first of these diseases, it appears to be superior to other astringents; in calculus, in common with other bitters and astringents, it affords relief, probably by its action on the stomach preventing the generation of acid. More lately it has been recommended in phthisis, and some cases of cough, accompanied with symptoms of hectic, in which advantage was derived from it, have been related. Its dose is half a drachm of the leaves in powder, twice or thrice a-day.

MIMOSA CATECHU. *Polygam. Monoec. Lomentaceæ. (Acacia Catechu. Ph. Lond.) India. Ligni Extractum. Catechu. Terra Japonica.*

To this substance, formerly known by the absurd name of Japan Earth, the appellation of Catechu is now appropriated. The tree which affords it (formerly regarded as a species of Mimosa, but referred by Wildenow to a new genus, and named by him Acacia Catechu) is a native of India. The catechu is an extract prepared from its interior hard wood, by boiling it, after it has been cut into chips, in water; the decoction is evaporated; it is inspissated by exposure to the heat of the sun, and by continued exposure is rendered concrete and dry. It is of a yellow or brown colour, has a bitter and astringent taste, leaving an impression of sweetishness; but its qualities vary considerably, owing to its being prepared with more or less care, or even, as has been affirmed, to its being obtained from different plants. Two kinds are at present met with in the shops; one is of a light yellowish brown colour, is smooth and uniform in texture, breaks short, is soft and light; the other is of a dark brown colour, more heterogeneous, heavier and considerably harder.

Catechu is almost entirely soluble in water with the assistance of heat, the residuum consisting of accidental impurities. It is nearly equally soluble in alkohol. Its solution strikes a deep black colour with the salts of iron, and gives an abundant precipitate with animal gelatin. From Davy's experiments, it appears to be composed of tannin, extractive matter, and mucilage; the proportions in the best catechu being 54.5 of the first, 34 of the second, 6.5 of the third, and 5 residual matter. Our knowledge with regard to the principle named Extract is so imperfect, that it is difficult to establish any certain conclusion with regard to it; and the subsequent experiments of Dr Bostock, as to the modes of separating what is called Extract from the Tannin of catechu, do not exactly accord with those of Davy. Dr Bostock has remarked, too, that catechu gives indications of the presence of gallic acid, and that its watery infusion even reddens the more delicate vegetable colours.

Catechu is in common use as an astringent, and in the uniformity and certainty of its operation is probably equal, or even superior to any of the vegetable astringents. It is the astringent most commonly and successfully employed in diarrhœa: it is also used in chronic dysentery, and sometimes in passive hæmorrhagies. It is given under the form of the infusion, or the tincture; or the officinal preparation, the electuary of catechu, consisting of catechu and kino, with some aromatics and a little opium, is diffused in water, forming what has been named the Japonic Mixture. In substance it may be given in a dose from 10 to 20 grains, which may be frequently repeated. Under the form of troches, it is sometimes used in relaxation of the uvula, or sponginess of the gums, being allowed to dissolve slowly in the mouth.

Offic. Prep.—Elect. Catechu. Inf. Catech. Tinct. Catech.—*Ed. Lond. Dub.*

KINO. Kino.

THE substance distinguished by this name was introduced a number of years ago into the Materia Medica as a powerful astringent, little being known with regard to its origin, farther than it was said to be the produce of Africa, and obtained probably from the plant affording it by exudation. Subsequent to its introduction, it was met with in the shops very various in its qualities; it still is so, and is obviously of different origin, though there is considerable obscurity with regard to the natural history of these varieties. The London College have described it merely as the produce of an African plant unknown. The Edinburgh College have inserted it in their catalogue of simples, as the concrete juice of the Eucalyptus Resinifera,—a tree a native of New Holland; and there is reason to believe that part of what is called Kino in the shops is imported from that country, and is the produce of this vegetable. The Dublin College have considered kino as the product of the Butea Frondosa, on the authority of Roxburgh; but incorrectly, as Dr Duncan has remarked. He has farther observed, what is just, that much of the kino of the shops bears all the appearance of an extract artificially prepared, and is known to be formed from different astringent vegetables.

It is not very easy to discriminate exactly among these various substances, and to assign to each its real origin. One variety, and which bears the highest price in the shops, has all the appearance of a natural production: slender twigs are intermixed in its substance; it is of a reddish brown colour, with a resinous lustre, is very brittle, feels gritty between the teeth, and has a bitterish taste. This corresponds in its characters with the substance first introduced as kino, and is said to be the produce of Africa, and to be imported from Senegal: the plant which affords it is still unknown. The kind from New Holland has also the appearance of a natural production, fragments of bark being intermixed with it; it is in more solid masses than the other, is less brittle, and with its astringency has a disagreeable mawkish sweetish taste. The third kind has the appearance of an extract thoroughly dried; it is in small fragments, with a resinous fracture, is of a brown colour, nearly black, and has a taste astringent and slightly bitter. This, Dr Duncan has stated, is said to be the produce of the Coccoloba Uvifera. I have been informed, that it is the Extract of the wood of the mahogany.

The analysis of kino has been executed; but from the difficulty of ascertaining exactly to what substance the name is applied, there is a difficulty in appropriating the results to any of the varieties that are met with. All of them appear to contain a large proportion of tannin; their solutions giving a deep colour, usually rather green than purple, with salts of iron, and a copious precipitate with gelatin. They are partially soluble in water and in alkohol. Diluted alkohol is their most perfect solvent. They appear to consist therefore of tannin, resinous matter, and mucilage.

Kino has been employed as an astringent for the same purposes as catechu, and they are often given in combination. The catechu, being more uniform in its qualities, ought perhaps to be preferred. Of the different varieties of kino, that to which the name was originally given, imported from Africa, is the most grateful, and appears too to be the most active astringent.

Offic. Prep.—Tinct. Kino. *Ed. Lond. Dub.*—Pulv. Kino. Comp. *Lond.*

PTEROCARPUS DRACO. Sanguis Draconis. *Dragon's Blood. Diadelph. Decand. Papilionaceæ. Resina. South America.*

THE substance to which the absurd name of Dragon's Blood has been given, is a resinous concrete of a dark red colour and heterogeneous texture, varying also frequently in its qualities as it is met with in the shops. When genuine, it is the produce, by exudation from incisions in the bark, of the above tree. It is insipid; and though it has been considered as an astringent, has probably no such power, nor is it now applied to any medical use.

Pterocarpus Santalinus. Santalum Rubrum. Red Saunders. *Diadelph. Decand. Papilionaceæ. India.*

The wood of this species is of a very deep red colour, which it yields to alkohol, but not to water. It was once supposed to be astringent; but it is altogether inert, and is used only to give a colour to tinctures.

Pistacia Lentiscus. Mastiche. Mastich. *Dioecia. Pentand. Amentaceæ. Resina. South of Europe.*

The resin named Mastiche is the produce of this shrub by exudation, and is imported from the island of Chios, where it is produced. It is in small rounded fragments of a light yellowish colour, nearly transparent, brittle, and hard, but when pressed or chewed becoming somewhat tenacious. It is chiefly resinous, and is hence dissolved by alkohol, a substance however remaining undissolved, tenacious and elastic, approaching in its characters to caoutchouc. Mastiche is insipid, and nearly inodorous, giving only a slightly fragrant smell when heated. Though it has been regarded as an astringent, and as such was at one time employed in medical practice, it has no sensible activity, and might be discarded from the lists of the Materia Medica. It is used, from its insolubility and tenacity, to fill up the cavity in carious teeth.

SECOND DIVISION.—OF LOCAL STIMULANTS.

UNDER this division are comprehended those remedies, the stimulant operation of which is directed to particular organs. This comprises Emetics, Cathartics, Diuretics, Sialogogues, and those various other classes that have usually been arranged under the title of Evacuants, their local operation giving rise to encreased secretion, or encreased evacuation.

CHAP. VII.

OF EMETICS.

EMETICS are defined, Medicines which excite vomiting, independent of any effect arising from the mere quantity of matter introduced into the stomach. This definition, however, requires to be still more limited; for there are many substances which occasionally induce vomiting, that are not usually ranked as emetics. All bitter and nauseous drugs have this effect, when given in large doses, or in an irritable state of the stomach; and it occurs frequently as the consequence of the action of many stimulants and narcotics. The emetic operation, however, in these cases, is neither uniform nor certain: there are, on the contrary, a number of substances, many of which have no very nauseous taste, or which can have that taste concealed, but which still excite vomiting when given in a sufficient dose, in every individual, and in every state of the stomach. To these substances the appellation of Emetics is exclusively applied. They may therefore be defined, Substances which excite vomiting, independent of any effect arising from the quantity of matter introduced into the stomach, of any nauseous taste or flavour, or of any narcotic or acrid power.

When an emetic has been given in a proper dose, the stomach remains for some time undisturbed. But in 10, 15, or 20 minutes, an uneasy sensation, with nausea, supervenes, which continues encreasing until vomiting begin. While the nausea only is present, the countenance is pale, the pulse is feeble, quick and irregular, and there is a feeling of cold; but during the action of vomiting the face becomes flushed, the pulse is quickened, though still feeble, and it remains so in the interval of vomiting. The vomiting generally recurs twice or thrice, and then ceases; a degree of nausea remains, which goes off only gradually; there is a degree of languor, and often a disposition to sleep; the pulse is weak and slow, but becomes gradually fuller; the skin is usually moist.

The general theory of the operation of vomiting is sufficiently evident. The vermicular or peristaltic motion of the stomach, by which the food is propelled through the pylorus, is inverted; the diaphragm and abdominal muscles are called into action by association; the pylorus is contracted, and the contents of the stomach are forcibly discharged upwards. In many cases of vomiting, especially when violent, the peristaltic motion even of the upper part of the intestinal canal is also inverted, and bile is brought into the stomach from the duodenum.

At the same time, it is difficult to explain how the peristaltic motion is inverted by emetics. It is a singular fact, that any substance acting as an unusual stimulus on the stomach seldom encreases its motion, so as to occasion a more speedy discharge of its contents by the pylorus. The motion, instead of being encreased, is more commonly inverted, and hence vomiting is the effect peculiarly resulting from such local stimulant action. Nor is it easy to assign any cause for this specific operation.

Dr Darwin gave a different explanation of the nature of vomiting. He considered it as the effect, not of encreased, but of decreased action of the fibres of the stomach. When an emetic is administered, it produces, he observes, the pain of sickness, as a disagreeable taste in the mouth produces the pain of nausea: these uneasy sensations not being acutely painful, do not excite the organ into greater action, but rather repress the motions already existing. The peristaltic motion of the fibres of the stomach becomes languid from the want of the usual stimulus of pleasurable sensation, and in consequence stops for a time, and then becomes inverted, which gives rise to the phenomena of vomiting. In this hypothesis, there is however equally a deficiency in explaining how the inversion of the motion is effected.

There is a considerable difference among individuals with regard to the facility with which vomiting is excited. This susceptibility is also liable to be altered by disease. In the greater number of febrile affections, vomiting is easily excited; while in several of the diseases of the class Neuroses, as mania, melancholia, and hypochondriasis, it is excited with much more difficulty. In the case of poisons, which induce inflammation of the stomach, vomiting is almost a constant symptom; while in those which act by a narcotic power, and in which the irritability of the stomach is impaired, a very powerful emetic is required to produce any effect.

Although nausea or sickness generally accompanies vomiting, this connection is not a necessary one. Some emetics, as sulphate of zinc, act without occasioning much nausea; while others, as tobacco, excite it in a greater degree than is proportioned to their emetic power,—a circumstance sometimes requiring to be attended to in the administration of individuals of this class.

The feeble and low state of the pulse, which attends vomiting, has been ascribed either to direct association between the motions of the stomach and those of the heart; or to the nausea excited, which, like other disagreeable sensations not acutely painful, have a depressing effect, being equivalent to an abstraction of stimulus.

Emetics, at least those which are mild in their operation, do not appear to waste the irritability of the stomach: they have rather an opposite effect: hence digestion is often vigorous after vomiting, and hence too gentle emetics are often serviceable in dyspepsia, and in the temporary diminished tone of the stomach occasioned by intoxication.

The state of the stomach produced by vomiting seems to be often extended to the vessels of the skin; it is therefore followed frequently by diaphoresis, and is one of the most powerful means of removing spasmodic stricture from the surface of the body.

Emetics have a remarkable power of increasing absorption: hence the benefit they afford in anasarca, and the sudden disappearance of tumors which sometimes happens after violent vomiting.

Emetics frequently occasion increased evacuation from the intestinal canal; and if they fail to excite vomiting, very generally operate as cathartics. Some are more apt to have this effect than others, as the preparations of antimony compared with ipecacuan.

From the different indications which emetics are capable of fulfilling, they are adapted to the treatment of many morbid affections.

Where disease depends on a disordered state of the stomach, arising from over-distention, the presence of acrid or indigestible matters, or any other cause, vomiting is the easiest and most effectual mode of affording at least present relief. Hence its utility in all cases of indigestion, impaired appetite, acidity in the stomach, pyrosis, or anorexia; in the symptoms arising from intoxication, and where poisons of any kind have been swallowed.

From the strong action of the diaphragm and abdominal muscles in vomiting, the gall-bladder and hepatic ducts are emptied of their contents; and hence jaundice, owing to obstruction from biliary calculi, is sometimes suddenly relieved by vomiting. A similar pressure is supposed to be exerted during vomiting on the thoracic viscera, and from this has been explained the expectorant effects of emetics, and the relief they afford in some varieties of asthma and catarrh.

In the different varieties of febrile diseases, much advantage is derived from the administration of an emetic, especially in the commencement of the disease. In synocha, where there are symptoms of highly encreased action, and particularly where there is determination of blood to the head, full vomiting may be attended with some danger; and in typhus, when it is fully established, it cannot be expected to be of much benefit. But in the slighter cases of pyrexia, it is often attended with marked advantage. The emetic should be given in the evening, as its operation leaves a tendency to sleep, and to diaphoresis, which it is useful to promote.

At one time, the practice of giving emetics in fever, in such doses as to excite nausea without producing vomiting, was common, but is now much less frequent. It is more distressing to the patient, and does not appear to be equally effectual in stopping the progress of the disease. This mode, however, of giving nauseating doses of emetics, is often useful in hæmorrhage, where full vomiting would be dangerous, the nausea excited diminishing the force of the circulation; it is therefore sometimes employed in hæmoptysis and menorrhagia.

From the powerful effects of emetics, their improper administration may be injurious, and there are various states of the system which either prohibit their use, or allow them to be employed only with caution. During the operation of vomiting, the blood returns with more difficulty from the head, owing partly to the pressure on the descending aorta, and partly to the interrupted respiration, by which the transmission of blood through the lungs is impeded; hence the redness of the countenance and the vertigo which sometimes accompany it. From this cause it must be attended with danger in all cases where there are symptoms of determination to the head, and more especially in plethoric habits. From the strong action of the abdominal muscles exerted in vomiting, it has been considered as not without risk in visceral inflammation, in the advanced stage of pregnancy, and in hernia and prolapsus uteri. In extreme debility, there is danger of the patient sinking under the violence of the operation. The frequent repetition of emetics in chronic diseases is in general prejudicial, by weakening the tone of the stomach, and rendering its motions more liable to be inverted by slight causes.

The mode of administering emetics does not admit of many general observations. They should be given in the form of draught; as if in a solid form, the emetic might pass from the stomach into the intestines, without exciting vomiting. A common practice is to promote the action of emetics by taking large draughts of tepid water, or of an infusion of chamomile. If an emetic is given in a large dose, this is not necessary, as it will excite vomiting repeatedly at intervals; but if given in a moderate dose, it may excite vomiting only once; nausea and efforts to vomit will recur, however, at intervals, and then vomiting may be renewed by a draught of tepid water, or of a bitter infusion. We thus obtain the advantages of repeated vomiting, without the risk attending a large dose of a powerful emetic. Too large a draught ought not to be taken, as it renders the operation more difficult or painful. Some acrid emetics, however, as mustard, require always to be largely diluted.

The most natural subdivision of this class is into Emetics from the Vegetable, and from the Mineral Kingdom.

EMETICS.

From the Mineral Kingdom.

Antimonium.
Zincum.
Cuprum.

Ammonia.
Hydro-sulphuretum ammoniæ.

From the Vegetable Kingdom.

Callicocca ipecacuanha.
Scilla maritima.
Anthemis nobilis.
Sinapis alba.
Asarum europæum.
Nicotiana tabacum.

EMETICS FROM THE MINERAL KINGDOM.

ANTIMONIUM. Stibium. Antimony.

THE metal to which this name is appropriated, is peculiarly distinguished as an evacuant, and under various forms of preparation furnishes some of our most powerful cathartics, diaphoretics, and expectorants. All its preparations in larger doses act as emetics, and several of them are in common use for their emetic power. It is therefore under this class that its general history may be introduced.

Antimony, in the modern chemical nomenclature, is the name applied to the pure metal. It is found in nature most abundantly combined with sulphur, and to this ore the name of Antimony was once generally given by chemical and medical writers; the epithet Crude being frequently added to distinguish it, when it is melted out from the impurities mingled with it. The ore in this state is now named Sulphuret of Antimony, and the simple name Antimony is appropriated to the metal itself.

The native sulphuret of antimony is of a grey or blue colour, with metallic lustre; it is opaque, and has usually a striated texture. To free it from the earthy matter with which it is mixed, as it is dug from the vein, it is fused: the fused sulphuret subsides and is run off. Its lustre is greater the more completely it is purified. The proportions of its principles are various; sometimes they are nearly equal; in other specimens the quantity of metal is larger; and there are some varieties unfit for medicinal use, as containing other metals, particularly lead, and sometimes copper. These have inferior lustre, and a less distinctly striated texture.

The pure metal is usually obtained from the ore by melting the latter with iron-filings, the iron combining with the sulphur, while the antimony, being very fusible, is run out. The metal is of a bluish-white colour, and a plated texture, has a specific gravity of 6.7, is moderately hard, and very brittle; it melts at a heat not much higher than that of ignition, and is volatilized by a heat not very intense; it is oxidated by exposure to the air at the temperature at which it is volatilized; and in the state of oxide, it is capable of combining with the greater number of the acids.

The sulphuret of antimony has little activity, and indeed produces scarcely any sensible effect on the system. The preparations of the metal are much more active, and though of very different degrees of strength, retain the same mode of action, and possess therefore the same medicinal virtues. They do not exert any general stimulant operation on the system, but are always directed in their action to particular parts, so as to occasion some sensible evacuation.

The principal general medicinal application of antimony, under its different forms of preparation, has been for the cure of febrile affections: and in the treatment of fever it has long been more or less extensively used. It is given either so as to induce vomiting or purging, or sometimes in smaller doses, so as to produce only gentle diaphoresis; and exhibited in either mode in the commencement of the disease, it has been considered as capable of cutting short its progress. The use of James's powder, which is an antimonial, has been extensive with this view, and both it, and the tartrate of antimony and potash, or the emetic tartar, continue to be used. Their efficacy has usually been ascribed to the evacuation they occasion, while others have considered antimony, apparently with little reason, as exerting an action specific or peculiar in itself in the removal of febrile action, and not explicable on the known effects it produces. The practice of giving antimonials in fever is unquestionably often attended with marked advantages; yet it is also liable to considerable difficulties, and is not without some hazard. The administration of the remedy, whatever antimonial be employed, is not easily regulated with precision; in small doses it often fails in producing the favourable crisis expected from its operation; and in larger doses it is liable to act with violence, and produce evacuations under which the powers of the system have sunk. It is principally in the commencement of fever that the practice is successful; in the more advanced stages, when the state of debility is induced, more hazard attends its employment, and less benefit is to be expected from it.

Antimonials have been found to have good effects in intermittent as well as in continued fever, in the phlegmasiæ and exanthemata, and even in several of the profluvia, probably from their evacuating operation.

As an emetic, antimony is distinguished by the certainty, extent, and permanence of its operation. The action it excites in the stomach is both more forcible, and continues for a longer time, than that from other emetics, and hence it produces more complete evacuations, and occasions in a greater degree all those effects which result from the action of vomiting. Its action is also less local. It is generally extended to the intestinal canal, so as to produce purging, and very frequently to the surface of the body, so as to occasion diaphoresis or sweat. It is used more particularly where the effects of full vomiting are required; but where these are not wished for, more gentle emetics are usually preferred: the antimonial emetics, even the emetic tartar, which is the mildest, and the one most easily regulated, are always liable to prove harsh in their operation; they occasion severe vomiting, debilitate the stomach, and are altogether unfit for administration to children, or to those of weak and irritable habits. The propriety of caution in the use of the preparations of antimony is rendered more obvious, perhaps, from the strict analogy which exists between it and arsenic in their operation. In Mr Brodie's experiments, emetic tartar produced, when applied to an wound, vomiting, reduction of the pulse, paralysis, insensibility, and death, and the stomach was sometimes found inflamed. And it is given with less immediate risk than arsenic, probably principally from its greater emetic power.

Of the preparations of antimony, it is necessary to take only a very cursory view, as they are to be more fully noticed in the pharmaceutical part of the work. They may be arranged under those in which the metal is combined with sulphur; those in which it is oxidated; and those in which it is brought into a saline state by combination with acids.

Of the first class, the Levigated Antimony (Antimonium Præparatum), which is merely the native sulphuret reduced to a state of mechanical division, is the only preparation. It has been given as a diaphoretic, especially in chronic rheumatism, and in some cutaneous affections, in a dose from 15 grains to 1 drachm; but it is so inert and uncertain, that it is now discarded from practice.

The oxides of antimony are more active, but they are liable to the inconvenience of being uncertain in their operation, partly perhaps from their activity being dependent on the state of the stomach with regard to acidity, partly from the various degrees of oxidation in which they may exist, and which are not easily rendered uniform, and partly too from their state of aggregation. Proust has supposed, that there are only two oxides of antimony, one at the *minimum*, containing 18.5 of oxygen in 100 parts, the other at the *maximum*, containing 23 of oxygen. This supposition rests principally, however, on the gratuitous assumption, that metals are susceptible only of two degrees of oxidation. Thenard has, on the contrary, endeavoured to prove, that there are at least six oxides of antimony capable of being distinguished by the proportions of oxygen which they contain; the one in the lowest degree of oxidation, containing not more than 0.02 of oxygen, that in the highest degree containing 0.32; and the others containing intermediate proportions. Berzelius contends for the existence of four oxides, and the one at the *maximum* of oxidation he even considers as an acid, and names it Acidum Stibicum. It is obtained by deflagrating antimony with a large quantity of nitre. He also supposes the existence of what he calls Acidum Stibiosum. It may be doubtful whether these degrees of oxidation can be established with precision; but it is sufficiently probable, that antimony may combine with very different quantities of oxygen.

The following oxides of antimony retain a place in one or other of the Pharmacopœias.

Oxidum Antimonii Sulphuretum. Sulphuretted Oxide of Antimony.—Of this there are two varieties, differing in the proportions of their elements, and in the state of aggregation. The first is what used to be named Crocus of Antimony (Crocus Antimonii), what is now named by the Edinburgh College, Oxidum Antimonii per Nitratem Potassæ. It is prepared by deflagrating sulphuret of antimony with an equal weight of nitrate of potash. The greater part of the sulphur is oxidated, and either dissipated in the state of sulphurous acid, or in the state of sulphuric acid remains combined with the potash of the nitre; a brown oxide of antimony remains, combined, according to Proust, with one-fourth of sulphuret of antimony, but which it is more probable is in direct combination with a portion of sulphur. It acts as a diaphoretic, emetic, or cathartic, but is so uncertain in its operation that it is never prescribed. It serves for the preparation of some other antimonials, and is employed by the Edinburgh College for the preparation of emetic tartar.

The second oxide of this family is what is named Oxidum Antimonii cum Sulphure Vitrificatum, formerly Vitrum Antimonii.—This is prepared by exposing sulphuret of antimony to the action of atmospheric air at a high temperature. The sulphur is dissipated, and the antimony oxidated, and by the intensity of the heat the oxide is vitrified. It still retains combined with it a portion of sulphur, or, according to Proust, one-ninth of sulphuret of antimony. The oxide which forms its basis, contains, according to Thenard, 16 of oxygen in 100 parts. It has always combined with it too a portion of silex, derived from the crucible in which it is melted, this earth probably promoting its vitrification. Its operation is extremely harsh, and at the same time so uncertain, that it cannot be medicinally employed.

Oxidum Antimonii Vitrificatum cum Cera.—This is prepared by exposing the powder of the vitrified oxide with an eighth part of wax to heat. It is thus rendered milder, probably by part of its oxygen being abstracted by the carbonaceous matter of the wax, or by a change in its state of aggregation. It is a preparation, however, which has no advantage, and though once celebrated in dysentery, in a dose of from 5 to 15 grains, has long been in disuse, and might be expunged from those Pharmacopœias in which it is retained.

Oxidum Antimonii Album, formerly named Antimonium Calcinatum.—This is prepared by deflagrating sulphuret of antimony with three times its weight of nitrate of potash; in consequence of this large quantity the sulphur is entirely abstracted, and the metal is saturated with oxygen. This oxide retains also combined with it a portion of the potash of the nitre. The preparation is one comparatively inactive, and does not excite vomiting in a dose less than a scruple or half a drachm. In smaller doses, it has been used as a diaphoretic in the treatment of fever; and from this application of it, received the name of Diaphoretic Antimony.

Oxidum Antimonii cum Phosphate Calcis, also named Pulvis Antimonialis.—This is prepared by exposing to heat sulphuret of antimony and bone-shavings, until they are converted into a grey-coloured substance, which is then exposed in a crucible to a more intense heat, until it become white. The Edinburgh and Dublin Colleges order equal weights of the sulphuret of antimony and bone-shavings: the London College have altered the proportions to two parts of the latter to one of the former, which must give rise to a diversity of strength in the product. By the high temperature the animal matter of the bones is decomposed, the sulphur of the sulphuret is dissipated, the metal is oxidated, and this oxide remains mixed or combined (part of it being also in a vitrified state) with the phosphate of lime of the bones. The preparation is similar in composition to the celebrated James's Powder, for which it is designed as a substitute. It acts as a diaphoretic, emetic, or cathartic, according to the dose in which it is administered, and is employed principally as a remedy in fever, to arrest the progress of the disease at its commencement, or in its more advanced stages to obtain a favourable crisis. It is given in a dose from 5 to 10 grains, repeated, if necessary, after an interval of five or six hours, until sweating, purging, or vomiting, is induced. Its peculiar advantages are, that with a considerable degree of activity, it is less harsh in its operation, and more uniform than some of the other antimonial oxides, while, from its insolubility, it acts less rapidly on the stomach than emetic tartar does; it is therefore less liable to excite nausea or vomiting, and can be given so as to obtain with more certainty the general action of antimonials on the system. Its exhibition is best adapted to those forms of fever in which there is increased vascular action; in typhus, less advantage can be expected from it, and it is even hazardous, from the excessive evacuations it is liable to induce.

Sulphurettum Antimonii Precipitatum.—This name, obviously incorrect, is given by the London and Edinburgh Colleges to a preparation formerly named Sulphur Auratum Antimonii. The Dublin College have named it Sulphur Antimoniatum Fuscum. It is prepared by boiling sulphuret of antimony with a solution of potash, and adding to the filtered liquor sulphuric acid, while any precipitate is thrown down. This precipitate is of a reddish yellow colour; it is a combination of oxide of antimony with sulphuretted hydrogen and sulphur, and might be named Hydro-sulphuretum Oxidi Antimonii. In a dose from 5 to 10 grains, it produces the usual effects of antimonials, and has been employed as a remedy in fever; but from the uncertainty of its operation, it is discarded from practice.

The preparation named Kermes Mineral, and which is used on the continent, is the precipitate that subsides on cooling from the liquor formed by the boiling a solution of potash on sulphuret of antimony; it differs from the former in containing less sulphur, and appears indeed to be merely a combination of oxide of antimony with sulphuretted hydrogen. It is given in a similar dose.

Antimonii Oxidum.—Under this name, which is far from being distinctive, a preparation is inserted in the London Pharmacopœia, formed by boiling sulphuret of antimony in muriatic acid, with the addition of nitric acid; straining the liquor, and adding to it a solution of sub-carbonate of potash. The precipitate is probably a sub-muriate. A similar preparation has a place in the Dublin Pharmacopœia, under the name of Oxydum Antimonii Nitro-Muriaticum. It is designed to be employed only in the preparation of other antimonials.

By combining the oxides of antimony with an acid, the sources of uncertainty in their operation are in a great measure removed, as their degree of oxidation is rendered determinate, and their activity is not influenced by the state of the stomach with regard to acidity. The greater number of these saline combinations, however, are too acrid to admit of internal administration, and there is one only, that in which the oxide of antimony is combined with tartaric acid, employed in practice. Of all the antimonials, this is most extensively used, and it is also the principal emetic derived from the mineral kingdom.

This preparation is the Emetic Tartar of the old nomenclature, the Tartrate of Antimony and Potash of Modern Chemistry (Tartras Antimonii et Potassæ), improperly named in the Pharmacopœias, Tartris Antimonii, and Antimonium Tartarizatum. It is obtained by boiling super-tartrate of potash with oxide of antimony: the brown oxide obtained by the deflagration of sulphuret of antimony with nitre, is ordered by the Edinburgh College; the white oxide, or rather sub-muriate, obtained from the decomposition of muriate of antimony, is employed by the London and Dublin Colleges. The excess of tartaric acid in the super-tartrate, is saturated by the antimonial oxide; and by evaporation and crystallization, a triple salt, tartrate of antimony and potash, is procured. Its crystals are triedral pyramids, generally small; and it is readily soluble in water. It consists, according to

Thenard's analysis of it, of 38 of oxide of antimony, 16 of potash, 34 of tartaric acid, and 8 of water of crystallization.

Tartrate of antimony and potash is superior to all the antimonials as an emetic; as with a degree of activity, which admits of its being administered with safety, its operation is sufficiently certain and uniform; hence it is the only antimonial emetic that is now used. It usually excites vomiting in the dose of a grain, or a grain and a half; but the proper mode of administering it is in divided doses, three or four grains being dissolved in four ounces of water, and an ounce of this solution being given every quarter of an hour until it operate. It generally excites full vomiting, and is liable to be somewhat more harsh in its operation than the milder emetics, such as ipecacuan, evacuating not only the contents of the stomach, but inverting even the motion of the duodenum, and either by this or by the compression exerted by the action of the muscles on the abdominal viscera causing bile to be discharged: it also frequently excites purging. In many cases, however, these are advantages, and in such cases, as well as in all morbid affections, where the stomach is not easily affected, it is the emetic properly employed; while, when the stomach is irritable, where its contents are merely to be evacuated, or when the system is in a debilitated state, the milder emetics are to be preferred. In smaller doses, it has been employed as a nauseating remedy in fever,—a practice, however, now nearly relinquished. Assisted in its operation by tepid diluents, it may be brought to operate as a diaphoretic, and to produce the effects of antimonials on the general system, though from its action being exerted at once on the stomach, owing to its solubility, it is more difficult to administer it with this intention, without occasioning nausea or vomiting, than some of the less active antimonials, as the phosphate of antimony and lime.

Emetic Tartar, applied to the skin by friction, acts on the system, and produces also its usual effects on the stomach. Applied to an wound it occasions vomiting, and if in a concentrated state produces insensibility, paralysis, and the other effects of mineral poisons: in its action, indeed, it bears a strict resemblance to arsenic, and this analogy undoubtedly suggests, as has already been remarked, the necessity of employing it with caution.

Vinum Tartritis Antimonii.—This name is given to a solution of tartrate of antimony and potash in white wine, in the proportion of two grains to the ounce. It is intended as a substitute to what was formerly named Antimonial Wine,—a preparation obtained by digesting wine on oxide of antimony, and which owed its power to the portion of oxide which the tartaric acid of the wine dissolved. A similar preparation is inserted in the London Pharmacopœia, under the name of Liquor Antimonii Tartarizati, in which the tartrate of antimony and potash is dissolved in wine diluted with water. The propriety of either is doubtful. It has no advantage over a solution of extemporaneous preparation; and there is some reason to believe, that the tartrate in this state of solution is liable to spontaneous decomposition. In the preparation of the London College, this will probably happen still more readily from the dilution of the wine. It is principally as a diaphoretic that antimonial wine has been employed, in a dose of one drachm, its operation being often promoted by combination with tincture of opium.

Murias Antimonii.—Muriate of Antimony is the only other saline preparation of this metal inserted in the Pharmacopœias; and it has a place as affording a product employed in the preparation of other antimonials. Sometimes it has been applied externally as an escharotic.

ZINCUM. Zinc. (P. 215.).

SULPHATE of Zinc, it has already been remarked, is a powerful emetic; and as it operates speedily, and with much force, it is sometimes employed in cases where it is of importance that the contents of the stomach should be immediately evacuated, but not where it is difficult to excite vomiting, as where any narcotic poison has been swallowed. Its dose is from 5 to 20 grains, according to the state of the stomach, and it should be given in solution, in three or four ounces of water.

CUPRUM. Copper. (Page 217.).

SULPHATE of Copper acts as an emetic, and its operation takes place almost as soon as it has reached the stomach, and without inducing much nausea. It has hence been recommended in some cases, where the object is merely to obtain the mechanical effects from the operation of vomiting, as incipient phthisis, in which advantage has been supposed to be derived from the compression exerted on the thoracic viscera. Its operation is, however, liable to be very harsh even in the small dose of 1 or 2 grains, in which it has been prescribed. In a larger dose, it has sometimes succeeded in producing vomiting, where the stomach, from the operation of a narcotic poison, has not been affected even by the sulphate of zinc. In such cases, where the irritability of the stomach is greatly impaired, and the patient is nearly in a state of insensibility, it has produced instantaneous vomiting, when given to the extent of 10 or 15 grains dissolved in water. The acetate or sub-acetate of copper has, like the sulphate, an emetic power, and has been employed in similar cases in a dose of one or two grains. They are liable to the same disadvantages.

AMMONIA. Ammonia. Volatile Alkali.

AMMONIA exists naturally in the gaseous form, but is condensed in very large quantity by water; and this solution, for the preparation of which a formula is given in the Pharmacopœias, is the form under which it is applied to different medicinal purposes. It is capable of fulfilling various indications; it in particular acts as a diaphoretic, antacid, and externally as a rubefacient. Under some of these classes it is to be more fully considered. It operates as an emetic when given in a pretty large dose, and is sometimes employed to quicken the operation of other emetics where they have failed, a tea-spoonful being given in a cupful of cold water, and a draught of tepid water being swallowed after it.

HYDRO-SULPHURETUM AMMONIÆ.—The Hydro-sulphuret of Ammonia, obtained by passing a current of sulphuretted hydrogen gas through a solution of ammonia in water, was introduced into practice by Dr Rollo, and has been received into the Edinburgh Pharmacopœia. It acts with much energy on the stomach, inducing nausea in a small dose, and in a larger dose occasioning vomiting. It is scarcely used as an emetic, but rather as a nauseating remedy; and the principal application of it has been in the treatment of diabetes, with the view of reducing the morbid appetite, and increased action of the stomach. It was given at its introduction in a dose of from 5 to 15 drops twice a-day, and in different cases with advantage, so far as related to the reduction of the increased action of the digestive organs.

Emetics from the Vegetable Kingdom.

Ipecacuanha. Ipecacuan. Callicocca Ipecacuanha. Cephaëlis Ipecacuanha. *Pentand. Monogyn. Aggregatæ. Radix. South America.*

The natural history of this vegetable is still somewhat obscure, and the obscurity is increased by the roots of different plants being sometimes met with in the shops as ipecacuan. Hence the plant affording it has been successively referred to different genera. It is now, by the Edinburgh and London Colleges, referred to the genus Callicocca, and distinguished as a species by the name Ipecacuanha; and as the genus Callicocca is united by Wildenow with that of Cephaëlis, the name Cephaëlis Ipecacuanha is also given to it. It is still uncertain, however, whether the two more common varieties of Ipecacuan, the Peruvian and the Brazilian, are the roots of the same vegetable: while the latter is the species referred to in the Pharmacopœias, the former has been said to be a different species; and the roots of other plants are also said to be sometimes mixed with these. That usually met with, the Grey Ipecacuan as it is named, is in small wrinkled pieces, externally grey, internally whiter; has a faint smell, more obvious in the powder, and a bitter, slightly acrid taste. It contains both a resinous and gummy matter, or at least a matter principally soluble in alkohol, and another more soluble in water. It is generally stated, that its emetic power, and indeed its principal virtues, reside in the former. Dr Irvine has affirmed that they depend on the latter. Its active matter is completely extracted by proof-spirit or wine. Vinegar likewise dissolves it, but at the same time greatly weakens its power. By decoction with water, its activity is greatly impaired, though the water distilled from it has scarcely any emetic effect. It is even injured by being kept long exposed in the state of powder to the air and light.

Ipecacuan is the mildest of those emetics which are at the same time sufficiently certain in their operation. It evacuates the contents of the stomach, without exciting violent vomiting, or extending its action beyond this organ; it is hence adapted to cases where any excess of effect would be prejudicial; and as a mere evacuant, is preferable to every other emetic. The mildness and certainty of its operation, render it also the emetic best adapted to children. The medium dose of it as an emetic is 15 grains to an adult, though 20 or 30 may be taken with perfect safety, as it only operates more speedily; and a full dose is even preferable to a smaller one, as more certain, and producing less nausea. The officinal infusion of it in white wine acts as an emetic in the dose of an ounce. Though principally employed as an emetic, ipecacuan is occasionally prescribed with other views. It was originally introduced as a remedy in dysentery, given either in such a dose as to produce full vomiting, or in the quantity of 2 or 3 grains repeated every three or four hours, till it occasioned vomiting, diaphoresis, or purging. It has been given in a similar mode in obstinate diarrhœa. In spasmodic asthma, it is exhibited in a full dose to relieve the paroxysm; and in a dose of 3 or 4 grains continued every morning for some weeks to prevent its recurrence. A singular idiosyncracy has been observed in some individuals with regard to it, difficulty of breathing being induced by the effluvia arising from it in powder, especially when it is diffused in the air. In hæmorrhagies it is given in nauseating doses, the nausea diminishing the force of the circulation. Combined with opium, it forms a very powerful sudorific.

Offic. Prep.—P. Ipecac. et Opii. Vin. Ipecac. *Edin. Lond.*

Scilla maritima. Squill. *Hexand. Monog. Liliaceæ. Radix. South of Europe.*

Squill is the bulbous root of a plant which grows on the sandy shores of Spain and Italy. It varies in size, and consists of concentric layers easily separable, and each covered with a thin membrane, of a white or purplish colour. It has little smell; its taste is bitter and acrid, and it is capable of inflaming the skin; its acrimony is lessened by drying; but its bitterness and active powers as a medicine are little impaired. In drying, it loses about four-fifths of its weight. Its active matter is extracted by water, alkohol, and vinegar. The latter is the solvent commonly employed, as it best covers its nauseous taste, and it does not appear to injure its powers.

Squill, when given in a sufficient dose, excites vomiting, though it is seldom used with that intention in substance. The vinegar of squill acts as an emetic in a dose of 2 or 3 drachms, as does the syrup when given in double that quantity; and either of them is sometimes given in pertussis; the syrup, in particular, from its sweetness, being easily given to children; and some advantage, it is supposed, being derived from the combination of its expectorant with its emetic power. The dose is a drachm to a child below five years of age, and its activity is advantageously promoted, so that its operation is more certain, by the addition of a little ipecacuan wine. This root is, however, much more used as a diuretic and expectorant; uses of it which are afterwards to be noticed.

Offic. Prep.—Acet. Scill. Mar. Pil. Scill. Syr. Scill. Mar. *Ed. Lond. Dub.*—Tinct. Scill. *Lond. Dub.*

ANTHEMIS NOBILIS. Chamomile. (See page 251.).

ALL bitter drugs are liable to excite nausea or vomiting. Chamomile has perhaps more peculiarly this effect; a strong infusion of the dried flowers in warm water excites vomiting, and a weaker infusion is often employed to quicken the action of ipecacuan or other emetics, a draught of it being taken instead of tepid water.

SINAPIS ALBA. Mustard. *Tetradyn. Siliq. Siloquosæ. Semen. Indigenous.*

THE seeds of mustard have a considerable degree of acrimony and pungency, which is apparent when they are bruised. This has been supposed, but without much certainty, to reside in an essential oil. They yield a portion of mild oil by expression, and the acrid matter remains with the fecula, which is the base of the seed.

The powder of the mustard seed, given in the dose of a large tea-spoonful, mixed with water, operates as an emetic. From its stimulant quality, it has been recommended in preference to other emetics in apoplexy and paralytic affections, and in such cases has sometimes been found to excite vomiting, when these had failed. It is convenient also as an auxiliary, when the dose of an emetic has not operated, a little of the powder of mustard being taken diffused in tepid water. The seeds unbruised are sometimes swallowed in the dose of half an ounce or an ounce, as affording a stimulant in chronic rheumatism and amenorrhœa. The flour of mustard is applied externally as a rubefacient and vesicatory.

Offic. Prep.—Catap. Sinapeos. *Lond. Dub.*

ASARUM EUROPÆUM. Asarabacca. *Dodecand. Monogyn. Sarmentaceæ. Folia. Indigenous.*

THE leaves and root of this vegetable, prior to the introduction of ipecacuan, were frequently employed on account of their emetic quality; the dose of the dried leaves was 20 grains; of the dried root, 10 grains. As they were occasionally violent in their operation, and at the same time uncertain, they have fallen altogether into disuse. The plant is still retained in the Materia Medica as an errhine.

NICOTIANA TABACUM. Tobacco. (See page 167.)

THE leaves of this plant, in a person unaccustomed to their use, by chewing or smoking, excite even in a small dose very severe and permanent nausea and vomiting: the same effects have followed even from their external application to the region of the stomach; and this method of exciting vomiting has been proposed to be employed in cases in which emetics cannot be easily administered by the mouth. Tobacco is also sometimes taken under the form of infusion as an emetic, but its operation is always harsh, and accompanied with severe sickness.

CHAP. VIII.

OF CATHARTICS.

Cathartics are those medicines which quicken or increase the evacuation from the intestines; or which, when given in a certain dose, produce purging. They are medicines of importance, but differ from each other very considerably in their powers.

Cathartics evidently act, by stimulating the intestines so as to increase the natural peristaltic motion, and thus cause their contents to be more quickly propelled and evacuated. The greater number of them have, however, a farther effect. They stimulate the extremities of the exhalent vessels, terminating on the inner surface of the intestines: they thus cause a larger portion of fluid to be poured out, and hence the evacuations are more copious, and of a thinner consistence. Some cathartics have this power of increasing the effusion of fluids from the exhalents much more than others; such, for instance, are the Saline Purgatives. Dr Cullen has even supposed that some may act solely in this way, and without increasing directly the peristaltic motion. There is, however, no proof of this; and it seems scarcely probable that a substance should act as a stimulant on these vessels, without at the same time stimulating the moving fibres of the intestines. Some seem to produce the latter effect with scarcely any of the former; such are aloes and rhubarb; hence they merely increase the natural discharge.

The action of cathartics is not confined to the parts to which they are directly applied. Their stimulus is extended to the neighbouring organs, and hence they promote the secretion, and increase the discharge of the bile and other fluids poured into the intestinal canal. These effects are produced in very different degrees, by different cathartics, and there seems some reason for admitting an opinion adopted by the ancients, that certain cathartics have peculiar powers in this respect; some, for instance, having the power more particularly of promoting the discharge of bile, others that of the mucus of the intestines, or of the serum; and it is not improbable, as Darwin supposed, that the pancreas and spleen may be peculiarly stimulated into action, by others of this class of medicines.

There is likewise a difference in cathartics with respect to the parts of the intestinal canal on which they act. Some increase its peristaltic motion through its whole length; others, as aloes, have their action more confined to the lower intestines.

Lastly, it is to be observed, that the action of many cathartics is extended even to the stomach; its peristaltic motion is increased, either from association with the motion of the intestinal canal, or from the direct stimulant action of the cathartic applied, and its contents are therefore more quickly discharged by the pylorus. From this cause, a full dose of a saline purgative will sometimes operate in half an hour after it is given.

There are several other differences between the medicines belonging to this class: some act slowly; others more quickly: some are liable to occasion nausea and griping, and in a large dose tenesmus; others, even when they operate effectually, are free from these disagreeable effects: some produce only one evacuation, others continue to act for a considerable time.

Besides the differences between particular cathartics, a general difference in their mode of operation has been supposed to exist, from which they have been classed under two divisions. Some operate mildly, without exciting any general affection of the system, without even stimulating perceptibly the vessels of the intestines, and hence they merely evacuate the contents of the canal. Others are more powerfully stimulant: they occasion an influx of fluids from the exhalent vessels, and from the neighbouring secreting organs: they even extend their stimulant effect to the system in general, and if taken in too large a dose are liable to excite much irritation, and even inflammation on the surface of the intestines. The former are distinguished by the title of Laxatives, the latter are named Purgatives, and the stronger of them, Drastic Purgatives. The distinction is not altogether correct, since it refers merely to a difference in power; yet neither is it one to be altogether neglected.

From the indications which cathartics are capable of fulfilling, their utility in many cases of morbid affection must be obvious. In some general affections of the system, they procure a speedy, copious, and therefore useful depletion. And wherever there exists retention of the contents of the intestinal canal, where these contents are acrid, or where extraneous bodies are present, their evacuation by the operation of a cathartic is the obvious method of treatment.

The valuable observations of Dr Hamilton have established still more clearly the importance of this class of remedies, have shewn that they admit of more extensive application, and have pointed out with more precision than had before been done, the principles which regulate their administration.

In many diseases, there exists a state of the intestinal canal giving rise to retention of its contents, which is not to be obviated by the occasional administration of a cathartic, but which requires a continuation of the operation short of that of purging, until the healthy state of the bowels be restored. By this practice the cure of diseases has been accomplished, which, previous to Dr Hamilton's publication, were treated by very different methods, and were not supposed to be so peculiarly connected with any state of the alvine evacuation.

Thus in fever, the peristaltic motion of the intestines is diminished, the fœculent matter is retained, and becomes a source of irritation; its evacuation, therefore, by the exhibition of purgatives is clearly indicated, nor has this been altogether neglected. Physicians, however, were scarcely aware of the necessity of producing it to a sufficient extent; and in fevers of the typhoid type in particular, were frequently deterred from doing so by the fear of reducing the strength of the system by an evacuation considered as debilitating. Dr Hamilton's observations establish the propriety of the freer use of purgatives in fever, so as to produce complete and regular evacuation of the bowels, through the whole progress of the disease; and the cases he has published afford striking proofs of the advantages derived from the practice. There are other forms of fever in which it is employed with equal advantage, and particularly so in scarlatina.

Several of the diseases comprehended under the class Neuroses appear to depend on, or to be very intimately connected with a torpid state of the intestines, from which an accumulation of their contents takes place, proving a source of irritation that often affects the general system. Chorea is proved by Dr Hamilton's observations to arise from this cause; and he has introduced with great success the mode of treatment, by the free use of purgatives, continued until the healthy state of the alvine evacuation has been established. The success of this method has indeed been such that scarcely any other is employed. The same practice, and with similar success, applies to hysteria, and, in Dr Hamilton's opinion, to that species of tetanus, which, prevailing in warm climates and in warm seasons, appears to have its origin in disorder of the stomach and bowels. And ample evidence has established the success of the same treatment in the marasmus which attacks the young of both sexes, which is marked by loss of appetite, weakness, wasting of the body, and at length total prostration of strength; likewise in chlorosis, and in that hæmatemesis to which females are liable between eighteen and thirty years of age. In some of these diseases, the quantity of matter accumulated in the intestines is extremely great; the extent to which the exhibition of purgatives must be carried, and the length of time during which they must be continued, much exceed what would be calculated on from the usual administration of remedies of this class. The whole practice requires therefore both decision and perseverance.

Analogies from some of these diseases lead to a similar exhibition of cathartics in other fevers, particularly in the bilious remitting fever of warm climates, in measles, erysipelas, and small-pox; likewise in scrofula, in dyspepsia, whether simple or complicated with hysterical or hypochondriacal mania; in cramp of the stomach, or of the extremities; in palpitation of the heart, and in those cases of hydrophobia which are not the effect of specific contagion. With regard to several of these, experience has established the soundness of the analogy.

In cholic, and in ileus, the exhibition of cathartics is required, though there is considerable caution necessary in their application, to avoid such irritation as would excite or increase inflammation. In dysentery, similar advantages are derived from them, and the same caution is requisite in their use.

Cathartics are farther employed with other intentions than merely to evacuate the intestinal canal. From the effusion of serous fluid which they occasion, by their stimulant action on the exhalent vessels, they are supposed to produce a diminution of fluids with regard to the whole body. This is in some measure an abstraction of the usual exciting powers acting on the system, and hence purging constitutes a part of what is named the Antiphlogistic Regimen, and is employed in inflammatory affections. By a similar operation, it increases absorption. There exists a certain relation between the exhaling and absorbing powers, so that when the action of the one is increased, that of the other is augmented: the increased exhalation of serous fluid, therefore, into the intestines, which cathartics occasion, causes an increased absorption; and thus the different species of dropsy are often cured by purging. It is evident that those cathartics which stimulate the exhalent vessels of the intestines are best calculated to fulfil this indication; hence saline purgatives are in general most serviceable in dropsy.

From the serous evacuation which cathartics occasion, from the derivation which they make from the head, and partly, no doubt, by removing a source of irritation, they are of utility in preventing and removing apoplexy; in all comatose affections, in mania, phrenitis, and the different species of headach.

Cathartics, especially the more powerful ones, require to be administered with caution even in diseases where they are indicated, when there is any tendency to inflammation or to extreme debility; also during pregnancy, immediately after delivery, during the flow of the menses, and in those liable to hæmorrhoidal affections. The too frequent use of them induces wasting of the body, and sometimes renders the intestines morbidly irritable, so that purging is easily excited, while in other habits it renders them more torpid, and induces costiveness. The saline cathartics have more peculiarly the former effect, and more quickly reduce the strength of the body, probably by the evacuation they occasion from the circulating mass.

Some cautions are requisite with respect to the mode of administering cathartics. Many of them are liable to excite nausea or vomiting,—effects which are prevented by giving them at intervals in repeated doses, or often by combining them with an aromatic. Such a combination also obviates the griping which they often occasion. The more acrid cathartics ought always to be given in divided doses: as in certain habits, even a small dose is liable to occasion unpleasant symptoms. In general also, these acrid cathartics ought to be given rather in combination, as the effect is obtained with more certainty. Colocynth, or scammony, or any other drastic purgative, may fail if given alone in such a dose as it is proper to venture on; but if smaller doses of two or three of them be mixed, their operation is more certain and easy. Another advantage derived from such a combination is, that the more peculiar effect of each, whether it be evacuating the larger intestines, or stimulating the exhalent vessels, and causing the effusion of fluid, is prevented, and the general effect, exclusive of these peculiarities, is better obtained. They irritate less when given in a liquid form: in that form too they act more speedily than when given in a solid state: hence, when it is wished that a cathartic shonld operate slowly, it is best given in the form of pill, and at bed-time, as the state of diminished susceptibility in sleep retards the operation. In general, however, it is preferable to give the dose of a cathartic in the morning, as the operation of it is less troublesome to the patient. Dr Hamilton has pointed out the common error in the exhibition of cathartics, that of their not being given to the requisite extent; and has given the general rule in all morbid affections, of repeating, and, if necessary, enlarging the dose while the evacuations are peculiarly offensive, or of an unnatural appearance, without however carrying their administration so far as to produce purging, unless this be the indication which is designed to be fulfilled.

Cathartics may be arranged in some measure according to their power, placing those first which operate mildly, and which have usually been denominated Laxatives, and proceeding to those which are more powerful, and have other effects than merely evacuating the contents of the canal. The Saline Cathartics may be placed under the latter division, though their operation, as has been already explained, is somewhat peculiar. To this class may also be added those substances which act as cathartics under the form of Enema.

CATHARTICS.

A.—*LAXATIVES.*

MANNA.
CASSIA FISTULA.
TAMARINDUS INDICA.
RIÇINUS COMMUNIS.
SULPHUR.
MAGNESIA.
CARBONAS MAGNESIÆ.

B.—*PURGATIVES.*

CASSIA SENNA.
RHEUM PALMATUM.
CONVOLVOLUS JALAPA.
HELLEBORUS NIGER.
BRYONIA ALBA.
CUCUMIS COLOCYNTHIS.
MOMORDICA ELATERIUM.
RHAMNUS CATHARTICUS.
ALOE PERFOLIATA.
CONVOLVOLUS SCAMMONIA.
STALAGMITIS CAMBOGIOIDES.
SUB-MURIAS HYDRARGYRI.
SULPHAS MAGNESIÆ.

Sulphas sodæ.
Sulphas potassæ.
Super-tartras potassæ.
Tartras potassæ.
Tartras potassæ et sodæ.
Phosphas sodæ.
Murias sodæ.

Terebinthina veneta.
Nicotiana tabacum.

LAXATIVES.

MANNA. Manna. Fraxinus Ornus. Fraxinus Rotundifolia. *Polygam. Diœc. Ascyroid. Succus concretus. South of Europe.*

THIS substance, though afforded by several vegetables, is usually obtained from different species of the ash-tree, particularly those mentioned above, which are cultivated in Sicily and Calabria. It is procured by spontaneous exudation, but more copiously by incisions made in the bark of the trunk. The juice, which exudes, soon becomes concrete. When it exudes slowly, the manna is more dry and white, and of a texture somewhat granulated; it is collected on chips of wood or straw, and forms what is named Flake Manna. When the exudation is more copious, the juice is of a darker colour, and concretes into a soft mass, less pure than the other, and composed of fragments of a grey and white colour intermixed.

Manna has a sweet, though somewhat unpleasant taste, and possesses the general chemical properties of saccharine matter; it is entirely soluble in water and alkohol. The chemical difference between it and pure sugar is not very well established. When dissolved in alkohol, with the aid of heat, the solution on cooling deposites crystals apparently purely saccharine; and by concentration of the residual liquor, a mucilaginous extractive matter remains not crystallizable, having the peculiar taste of the manna. Although sugar in its unrefined state proves laxative, manna does so in a greater degree.

The dose of manna, as a laxative, is from one to two ounces to an adult, but it scarcely operates with sufficient effect to admit of being employed alone. Though mild in its operation, it is apt too to produce flatulence and griping, and hence it is principally used in combination with other cathartics, particularly with senna, the bitter taste of which it covers. This combination is in common use as a purgative to children.

Offic. Prep.—Syrup. Mannæ. *Dub.*

CASSIA FISTULA. Purging Cassia, or Cassia in pods. *Decand. Monog. Lomentaceæ. Fructus; Pulpa Fructus. Egypt; East and West Indies.*

THE fruit of this tree is in cylindrical pods, nearly an inch in diameter, and ten or twelve inches in length. The external membranous part is firm and hard; it is divided within by septa between which the seeds are inclosed, imbedded in a soft pulp. This pulp is of a black colour, and has a sweet taste, with a slight degree of acidity. It is extracted by boiling the bruised pods in water, and evaporating the decoction. It is soluble in water. According to Vauquelin's analysis of it, it contains, besides the fibrous part, gluten, jelly, mucilage, and saccharine matter.

The pulp of cassia proves gently laxative in a dose of four or six drachms; in the large dose necessary to occasion purging, it is apt to induce nausea or griping, and even as a laxative it has no particular advantage. The sole consumption of it is in the composition of the officinal preparation known by the name of Electuarium Sennæ. There is another electuary in the Pharmacopœias, to which, as being the principal ingredient, it gives its name, and in which it is combined with manna and pulp of tamarinds, but this is never used.

Offic. Prep.—Elect. Cass. Fist. *Ed. Lond. Dub.*

TAMARINDUS INDICA. Tamarind. *Monadelph. Triand. Lomentaceæ. Fructus conditus. East and West Indies, America, Arabia.*

THE pod of this tree includes several large hard seeds, with a brown viscid pulp, very acid. This pulp, mixed with the seeds and small fibres, and with a quantity of unrefined sugar added to preserve it, forms the Tamarinds of the shops, the preparation of them being performed in the West Indies, by freeing the pod from its external covering, and pouring on the pulp and seeds, a strong syrup hot, so that on cooling it becomes nearly concrete. Vauquelin found this prepared fruit to contain, besides the sugar mixed with it, citric and malic acids, super-tartrate of potash, tartaric acid, jelly, mucilage, and fibrous matter. The citric acid is in largest quantity, about an ounce and a half being obtained from a pound of the pulp.

The pulp of tamarinds, besides its virtues as an acid, proves laxative, when taken to the extent of an ounce, or an ounce and a half, but is too weak to be employed alone. It is generally added to other cathartics, which are given in the form of infusion, with the view of promoting their operation, or of covering their taste. It is an ingredient in the Electuarium Sennæ, and there is an officinal infusion of it with senna, which affords a very pleasant purgative. An infusion of it in warm water forms, when cold, a grateful refrigerant beverage.

Offic. Prep.—Inf. Tam. Ind. cum Cass. Sen. *Ed.*

There are some other sweet fruits which have a laxative quality, as the Fig (Ficus Carica), and the Prune (Prunus Domestica). These are sometimes used in domestic practice, and they are also ingredients in the Electuary of Senna.

Ricinus communis. Palma Christi. *Monœc. Monadelph. Tricoceæ. Oleum; Semen. West Indies.*

The seeds of the capsules of this plant are farinaceous, with a considerable quantity of unctuous matter intermixed. They afford, by expression or by decoction, an oil which is used in medicine in this country under the name of Castor Oil. When obtained by decoction of the bruised seeds in water, it is purer and less acrimonious than when obtained by expression. It is of a yellowish colour, transparent, viscid, and has scarcely any peculiar taste or smell. It is the only example of an expressed oil having any medicinal activity.

As a laxative, castor oil acts mildly, and at the same time very effectually; it also operates in a shorter time than almost any other cathartic. Possessed of these advantages, it is a cathartic frequently employed; and is more peculiarly adapted for exhibition, where any degree of irritation is to be avoided: hence its use in colic, constipation, hæmorrhoids, and as a purge during pregnancy. Its dose is one ounce. It is taken floating on peppermint-water, mixed with any spiritous liquor, or any purgative tincture, as that of senna; or diffused in water by the medium of gum, sugar, or the yolk of an egg.

From the Mineral Kingdom, two laxatives are derived, Sulphur and Magnesia.

Sulphur is an inflammable substance, found in nature nearly pure, and likewise in combination with several of the metals. The greater part of the sulphur of commerce is the produce of volcanic countries. It is naturally mixed with earthy matter, from which it is freed by sublimation, forming the Ssulphur Sublimatm, Flores Sulphuris, or Flowers of Sulphur. When melted and run into cylindrical molds, it forms Roll Sulphur, which is usually less pure.

Sulphur, in its solid state, is brittle and hard, but it is capable of assuming a crystalline form; it is more generally used in the state of the loose powder in which it is obtained by the process of sublimation conducted on a large scale. It is of a light yellow colour; is insipid, or very slightly sour, from a small portion of acid adhering to it: it has a faint smell when rubbed or heated; is very fusible and volatile; and when heated in atmospheric air, burns with a blue flame, and the production of suffocating fumes. It is insoluble in water or alcohol, but is dissolved by oils, and combines with the alkalis, several of the earths, metals and metallic oxides. It was, until lately, regarded as a simple substance; there is reason to believe, however, that it contains a portion of hydrogen.

Sulphur, in a dose of 2 or 3 drachms, acts as a laxative, and so mildly, that it is often used in hæmorrhoidal affections, and in other cases where, though the operation of a purgative is indicated, any irritation would be injurious. It likewise passes off by the skin, and is hence administered internally, as well as applied externally in psora. In this disease it may be regarded as a specific. In habitual dyspnœa and in chronic cattarh, advantage has been derived from it, probably partly from its action as a laxative, and partly as a diaphoretic. The solution of it in oil has been used in these cases, but this preparation is both acrid and extremely nauseous. Sulphur is always best given in the form of electuary. The purification of sulphur by washing, is ordered in the Pharmacopœias, but is a process altogether unnecessary. Precipitated by an acid from its solution by an alkali or lime, it is obtained of a whiter colour than in its usual state, and this precipitated sulphur is used in preference to the sublimed sulphur in forming ointments. The combination of it with potash, Sulphurettum Potassæ, has also been introduced into the Pharmacopœias, principally with the view of affording a substance which has been supposed capable, by its chemical action, of counteracting the operation of metallic preparations where these have been taken in excess.

Offic. Prep.—Sulphur Lotum. Ol. Sulph. Ung. Sulph. *Ed. Lond. Dub.*—Sulph. Præcipit. *Lond.*—Sulph. Potass. *Ed. Dub.*

MAGNESIA. Magnesia. Carbonas Magnesiæ.

THIS earth is not found pure in nature, but exists abundantly combined with certain acids, and from these saline combinations it is obtained by processes to be afterwards noticed, either pure, or in the state of Carbonate. In either state, it is used as an antacid and laxative, in a dose of a drachm or more. Its laxative effect is generally considered as owing to its forming with the acid in the stomach a saline combination, which, like its other salts, is purgative, though, as it usually produced this effect, it probably has itself a weak cathartic quality. From being insipid and mild, it is well adapted for exhibition to infants.

PURGATIVES.

CASSIA SENNA. Senna. *Decand. Monog. Lomentaceæ. Folia. Egypt, Arabia.*

THE dried leaves of this plant are of a yellowish-green colour; have a faint smell, and a bitter taste. Their active matter is extracted both by water and by alkohol by infusion. By decoction with water, its strength is much impaired.

Senna is a purgative very frequently employed, having a considerable degree of activity, without being liable to be harsh in its operation. It is usually given in the form of the watery infusion, 2 drachms being infused in 4 or 6 ounces of tepid water, generally with the addition of a few coriander seeds, or a little ginger, to cover its flavour, and obviate griping. It is also frequently combined with manna, with tamarinds, or with super-tartrate of potash; and as its taste can be covered by sugar or manna, it is a purgative generally given to children. There is an officinal tincture of it which operates as a purgative in the dose of an ounce; there are also officinal infusions of it; and it enters into the composition of several other preparations employed as cathartics.

Offic. Prep.—Elect. Cass. Senn. Extr. Cass. Senn. Inf. Tam. Ind. cum Cass. Sen. T. Cass. Senn. C. *Ed.*—Inf. Senn. Pulv. Senn. C. *Lond.*—Syrup. Senn. *Lond. Dub.*

RHEUM PALMATUM. Rhubarb. *Enneand. Trigyn. Oleraceæ. Radix. Tartary.*

BESIDES the Rheum Palmatum, two other species, the Rheum Undulatum, and Rheum Compactum, are cultivated with the view of obtaining their roots, to be used in medicine; nor is any considerable difference, it is said, to be observed between the root obtained from any of them when it is properly dried and preserved. The best rhubarb is that named Russian or Turkey; it is the produce of Tartary; is in small pieces, with a large hole in the middle, this perforation having been made in the recent root to admit of its drying more quickly; it is of a lively yellow colour, with streaks of white and red; has a smell peculiar, and somewhat aromatic; and a bitter slightly astringent taste. Another kind is imported from China, where it is cultivated, and is known in the shops by the name of Indian Rhubarb; it is in larger masses, more compact and hard, heavier, and less friable and less fine in the grain than the other, and having less of an aromatic flavour. Rhubarb, cultivated in this country, has been prepared equal to either of the others, but in general it is inferior, probably from less care being bestowed on its cultivation and preparation.

The active principles of rhubarb are not very well ascertained. It is somewhat mucilaginous, and yields part of its powers to water by infusion. Alkohol likewise dissolves a considerable proportion of it; and diluted alkohol appears to be its most perfect solvent, dissolving all its active matter. It appears too to contain a portion of tannin, as it gives a deep colour with the salts of iron, and a precipitate with gelatin. It has been supposed to have the combination rather singular, of an astringent with a cathartic power; it is not apparent from any analysis of it, whether these reside in different proximate principles or not. The watery infusion is said to be more purgative than the spiritous, and by applying heat to the rhubarb in substance, its purgative quality is lessened, while its astringency remains. The Chinese rhubarb is supposed to be more astringent than the Turkey.

The astringency of rhubarb is not, however, very sensible in its medicinal operation, and has perhaps rather been inferred from the effects of chemical re-agents. Every kind of it contains a quantity of earthy matter, chiefly lime, combined with sulphuric and citric acids, forming the principal part of the white streaks. This is more abundant in the Turkey rhubarb than in the others.

The dose of rhubarb as a cathartic is one scruple or half a drachm. A dose such as this appears to be necessary to produce the full purgative effect; but a much smaller quantity, that of a few grains, is sufficient to excite the action of the intestines, so as to produce merely increase of the natural evacuation, and it is with this last intention, perhaps, that it is most properly employed. It is useful in this mode in dyspepsia, hypochondriasis, jaundice, and some similar affections, obviating the costiveness which frequently attends them, and further by its operation as a bitter contributing to restore the tone of the digestive organs. From its supposed astringent property, it has likewise been considered as peculiarly adapted for exhibition in diarrhœa, any acrid matter being evacuated by its purgative effect, before it acts as an astringent. It farther enters into a number of officinal preparations, in which it is either the principal medicine, or combined with aloes, which bears a considerable resemblance to it in its mode of operation, with bitters, or aromatics.

Offic. Prep.—Inf. Rhei P. T. Rhei P. *Ed. Lond. Dub.*—Vin. Rhei. T. Rhei et Aloes. Tinct. Rhei et Gent. Pil. Rhei. C. *Ed.*—Tinct. Rhei, C. Extr. Rhei, *Lond.*

CONVOLVOLUS JALAPA. Jalap. *Pentand. Monogyn. Campanaceæ. Radix. Mexico.*

THE dried root of jalap is imported in thin transverse slices or in round masses; it is solid, hard, and heavy; of a dark-grey colour, and striated texture. It has little smell; its taste is bitter and subacrid.

Jalap contains a resinous and a gummy matter, its purgative quality appearing to reside in the former, as it is extracted by alkohol, while its watery infusion is comparatively inert. Proof-spirit is its proper menstruum.

This root is an active purgative, producing full evacuation from the intestines; sometimes occasioning, however, nausea or griping. Its medium dose is half a drachm. Besides being given alone, it is very frequently used to quicken the action of other cathartics, of mild muriate of mercury for example; or it is combined with others, which are supposed to render it less stimulating, as with the super-tartrate of potash: This latter combination is in common use as a hydragogue cathartic; the former, that of jalap and calomel, affords a very safe active purgative, which is employed where it is difficult to excite the action of the intestinal canal. Jalap operates most mildly and effectually in substance, and is therefore seldom given under any form of preparation.

Offic. Prep.—T. Conv. Jal. *Ed. Lond. Dub.*—Extr. Conv. Jalap. *Ed. Dub.*—Pulv. Jalap. C. *Ed.*

HELLEBORUS NIGER. Melampodium. Black Hellebore. *Polyand. Polygn. Multisiliquæ. Radix. Austria, Italy.*

The root of this plant consists of short articulated fibres attached to one head, externally dark-coloured, internally white. Its taste is very acrid, but the acrimony is much impaired by drying and by age. Its active power seems principally to reside in its resinous part, which alkohol dissolves, the tincture affording, by evaporation, a very active extract. By decoction with water it yields half its weight of gummy matter, with some resin; and the extract obtained by inspissation of this, is milder than the spiritous extract, and milder even than the root itself. Its distilled water, it is affirmed, is acrid, and even cathartic.

Black hellebore root is a very powerful cathartic in a dose of a few grains; so violent, indeed, and at the same time uncertain is its operation, that it is scarcely ever used in substance: the watery extract of it, which is milder, has sometimes been employed. On its cathartic power probably depends any advantage that may be derived from its administration in mania and melancholia, in which diseases it was highly celebrated by the ancients. In dropsy it has been employed as a hydragogue cathartic, principally under the form of the spiritous extract. It was likewise strongly recommended by Mead as an emmenagogue, in the form of tincture, but with others has seldom been successful.

Offic. Prep.—T. Helleb. N. *Ed. Lond. Dub.*—Extr. Helleb. *Ed. Dub.*

BRYONIA ALBA. Bryony. *Monoec. Syngenes. Cucurbitaceæ. Radix. Indigenous.*

THE root of this plant, when recent, is highly acrid; by drying it becomes milder. In a dose of 20 grains of the dried root, it acts as a strong cathartic, and generally also as a diuretic. It is, however, somewhat uncertain, and liable to be violent in its operation, and is therefore little used.

CUCUMIS COLOCYNTHIS. Colocynth. *Monoec. Syngenes. Cucurbitaceæ. Fructus pulpa. Syria.*

THE part of this plant used in medicine, is the dried spongy or medullary part of the fruit. It is white, soft, and porous, and has the seeds, which are comparatively inert, mixed with it. Its taste is intensely bitter. Boiled in water, it gives out a large portion of mucilage, so as to form a liquor of a gelatinous consistence. This is less active than the colocynth itself. Alkohol also dissolves only part of its active matter.

Colocynth is one of the most drastic purgatives, so much so that its operation is not easily regulated. Its dose is from 3 to 6 grains, but it is so liable to occasion griping, tenesmus, and other symptoms, that it is scarcely ever given by itself, being rather used to promote the operation of other cathartics. Combinations of it with jalap, aloes, or mild muriate of mercury, are thus given in obstinate constipation, in mania, and coma; and in these combinations it operates more mildly and more effectually than if given alone. Its infusion has been recommended as an anthelmintic.

Offic. Prep.—Pil. Aloes cum Colocynth. *Ed.*—Extr. Colocynth. *Lond.*—Extr. Colocynth. Comp. *Lond. Dub.*

MOMORDICA ELATERIUM. Wild Cucumber. *Monoec. Syngenes. Cucurbitaceæ. Fecula Fructus. South of Europe.*

THE expressed juice of the fruit of this plant deposites a fecula, which, when dried, has been known by the name of Elaterium. It is a very powerful cathartic, and from the violence of its operation has been ventured to be exhibited only in the most obstinate cases. Its dose is half a grain, repeated every hour, or every second hour, till it operate. As a drastic purgative, it has sometimes been given in mania, and as a hydragogue cathartic in dropsy.

RHAMNUS CATHARTICUS. Buckthorn. *Pentand. Monogyn. Dumosæ. Baccarum succus. Indigenous.*

THE berries of this vegetable are very succulent, and the juice they afford by expression has a cathartic power. Made into a syrup by boiling with sugar, it operates in a dose of an ounce. It is disagreeable, however, in its operation, being liable to occasion thirst and griping, and is therefore seldom used.

Offic. Prep.—Syr. Rhamn. C. *Ed. Lond.*

ALOE. Aloe Socotorina. Aloe Barbadensis. Aloes Socotorine, and Barbadoes. Aloe Perfoliata, et Spicata. *Hexand. Monogyn. Liliaceæ. Succus spissatus. Africa, Asia, America.*

ALOES is a concrete resinous juice. Several varieties of it are met with in the shops, which differ in their purity, and likewise in their sensible qualities. The Socotorine, originally brought from the African island of Socotora, is considered as the purest. It is in small pieces of a reddish-brown colour, nearly black in the mass. The Barbadoes aloes is of a lighter colour, and has an odour stronger and more unpleasant than the former. It is also named Hepatic Aloes. The Cabbaline is still more impure, more fœtid, and is weaker in its power. There is still more uncertainty with regard to the species producing these varieties. The Aloe Perfoliata is that referred to by the Edinburgh College, as affording the varieties both of hepatic and socotorine aloes. The Dublin College refer to the Aloe Spicata, and it is said to be this species which is a native of the Cape of Good Hope, whence much of the aloes of the shops, sold under the name of Socotorine Aloes, is now imported. The London College give it as that which affords the Socotorine Aloes; while the Barbadoes Aloes, on the authority of Sibthorp, they consider as the produce of a species named Aloe Vulgaris. The Socotorine Aloes is the expressed juice of the leaves of the plant, inspissated by exposure to the air and sun. The Barbadoes Aloes is prepared by cutting the plant, and boiling it in water. The liquor is evaporated to the consistence of honey, and is run into large gourd shells, in which it becomes concrete.

The taste of all the kinds of aloes is intensely bitter; their odour is disagreeable. They consist of extract and resinous matter; the former being in larger quantity; the latter, obtained by the action of alkohol, has little smell or taste. Alkohol diluted with one, or even with two parts of water, dissolves all the active matter of this concrete juice. Boiling water also dissolves it, but a portion of resin is deposited as the solution cools.

Aloes, as a cathartic, has some peculiarities. It is slower in its operation than any other purgative; it merely evacuates the contents of the intestines, and no greater effect is obtained from a large dose than from one comparatively moderate. These have been regarded as proofs, and perhaps justly, that its operation is principally on the larger intestines. Its medium dose is from 5 to 10 grains, and its usual form of exhibition that of pill. As a purgative, it is often employed to obviate habitual costiveness; and from operating simply as an evacuant, and without any irritation, it is peculiarly adapted to this. Hence its use in hypochondriasis, in jaundice, and other cases attended with torpor of the intestinal canal. It is also often combined with other cathartics to produce more complete evacuation. From the supposition of its stimulant operation being more particularly exerted on the rectum, it has been supposed to have a tendency to occasion hæmorrhoids,—an opinion for which there does not appear much foundation. On the supposition too of its stimulating effect being extended to the uterus, it has been regarded as a purgative to be avoided during pregnancy, and on the same hypothesis it has been supposed to exert an emmenagogue power: and is not unfrequently used in amenorrhœa.

Offic. Prep.—Pil. Aloes. Pil. Al. cum Assafœt. Pil. Aloes cum Colocynth. P. Aloes cum Myrrh. T. Aloes Æth. T. Aloes cum Myrrh. Vin. Aloes Socc. *Ed.*—Pil. Aloes cum Zingib. Pulv. Al. cum Canella. Pulv. Al. cum Guaiac. *Dub.*—Pulv. Aloes Comp. T. Aloes C. Decoct. Aloes. Extract Aloes. *Lond.*

Convolvulus scammonia. Scammony. *Pentand. Monogyn. Campanaceæ. Gummi-resina. Syria.*

Scammony is obtained by cutting the root of the plant obliquely, a few inches above the ground. A milky juice exudes, which is collected, and inspissated by exposure to the sun and air. It is in small fragments, of a blackish grey colour, having little smell, and a bitter sub-acrid taste. It is however variable in its qualities, and is often adulterated by the intermixture of earthy matter. It is one of what are named Gum-resins, and consists of resin and gum in general nearly in equal proportions. Water dissolves about one-fourth of it; alkohol dissolves about two-thirds; proof-spirit almost entirely, the impurities excepted.

Scammony is one of the drastic purgatives, and is employed chiefly where the less powerful substances of this class would fail. Its dose is from 5 to 10 grains, but it is generally combined in a smaller dose with other cathartics. It is also used as a hydragogue purgative in dropsy, combined usually with super-tartrate of potash; and is frequently employed as an anthelmintic cathartic, combined with jalap and calomel.

Offic. Prep.—Pulv. Scamm. C. *Ed.*—Pulv. Scamm. C. Confect. Scamm. *Lond.*

GAMBOGIA. Gamboge. Stalagmitis Cambogiodes. *Polygam. Monoec. Tricoccæ. Gummi-resina. India.*

THIS gum-resin is obtained by exudation, from incisions made in the branches and trunk of the tree, and is afterwards inspissated. It is brittle, of a lively yellow colour and resinous fracture, has a taste bitter and acrid. Water and alkohol partially dissolve it, and its solution in alkohol becomes turbid on the addition of water; the alkalis also dissolve it. It affords one of the best examples of what is named a Gum-resin; the proportion of resin appears to exceed considerably that of gum, alkohol dissolving a much larger quantity of it than water does.

Gamboge is a very powerful cathartic, liable in large doses to excite vomiting, or to act with violence, and occasion profuse evacuations, with griping and tenesmus. Its medium dose is from 2 to 6 grains. It is seldom employed but in combination with some of the other powerful cathartics, in obstinate constipation. It is also used to expel the tapeworm, and as a powerful hydragogue cathartic in dropsy. In the latter application of it, it is frequently combined with super-tartrate of potash.

Offic. Prep.—Pil. Gambog. Comp. *Lond.*

SUB-MURIAS HYDRARGYRI. MURIAS HYDRARGYRI MITIS. CALOMELAS, Mild Muriate of Mercury. Sub-muriate of Mercury. Calomel.

THOUGH several of the preparations of mercury have a-degree of cathartic power, this is more considerable in the mild muriate than in the others, and it is in common use as a cathartic. It operates as such, when given alone in a dose of from 5 to 10 grains, but with more certainty and power when its operation is promoted by the addition of a little jalap or rhubarb. One valuable quality which it has, is that of promoting the operation of other cathartics, without exciting any additional irritation, or rendering them liable to act with violence: it is therefore, in more obstinate cases of constipation, or where it is an object to procure full evacuation, combined with colocynth, scammony, or gamboge; and such a combination affords the safest of the powerful cathartics. Calomel also appears to be adapted to answer particular indications, from its action on the liver, and its power of promoting the discharge of bile. Hence the advantage derived from it as a purgative in different forms of fever, particularly those of warm climates, and in chronic hepatitis.

A DIVISION of Cathartics remains, intermediate in their operation between the Laxatives and Purgatives, more powerful than the one, less acrid and stimulating than the other. These are the Compouud Salts. They appear to act principally by stimulating the exhalent vessels on the inner surface of the intestines, so as to cause a larger proportion of serous fluid to be poured out, which dilutes the contents of the canal, and by its operation, aided by the stimulus of the saline matter, accelerates the peristaltic motion. By the watery evacuation which they thus occasion from the general system, they are particularly adapted to those cases where inflammatory action or tendency to it exists.

SULPHAS MAGNESIÆ. Sulphate of Magnesia.

THIS salt, formerly known by the names of Bitter Purging Salt, and Epsom Salt, is found in mineral waters, whence it has been extracted, but at present is principally obtained from the liquor remaining after the crystallization of muriate of soda from sea-water, which holds a quantity of it and of muriate of magnesia dissolved. This is boiled down, and when exposed to sufficient cold affords acicular crystals of sulphate of magnesia; the quantity of which is sometimes increased by previously adding to the bittern sulphate of iron, by which part of the muriate of magnesia is decomposed. The crystals procured by this process are deliquescent from the presence of a little muriate of magnesia; the sulphate, when pure, forms large regular crystals, which are rather efflorescent. They are soluble in nearly an equal weight of water at 60°. Their taste is extremely bitter.

This salt is used as a purgative, in a dose of from one to two ounces, dissolved in water. Though its taste be bitter, it has been remarked that it remains better on the stomach than many other cathartics, especially when given in small repeated doses, and in a solution largely diluted. Exhibited in this manner, it has been particularly recommended in ileus and colica pictonum. It is often an ingredient also in purgative enemas.

Sulphas Sodæ, Sulphate of Soda, long known by the name of Glauber's Salt, is prepared by various processes on a large scale. In the process given in the Pharmacopœias, it is obtained from the residuum of the decomposition of muriate of soda, by sulphuric acid, in the preparation of muriatic acid. The saline mass is dissolved in water; any excess of acid is neutralized by the addition of lime, and the pure sulphate of soda is obtained by evaporation. Its crystals are six-sided prisms; they are efflorescent, soluble in three parts of cold, and in an equal part of boiling water. The taste of this salt is very bitter and nauseous; but operating effectually and mildly, it is one of the saline purgatives in most common use. Its medium dose is an ounce and a half, dissolved in six or eight ounces of water.

Sulphas Potassæ. Sulphate of Potash, formerly named Vitriolated Tartar, is prepared either by adding dilute sulphuric acid to a solution of sub-carbonate of potash, or by neutralizing the excess of acid, in the saline mass which is the residuum of the distillation of nitric acid from sulphuric acid and nitre. It forms in small irregular crystals, which require 17 parts of cold water for their solution. In a dose of 4 or 6 drachms, it acts as a purgative, but its comparatively sparing solubility prevents it from being much employed; in one of 2 or 3 drachms, it is given as an aperient, frequently in combination with rhubarb or other vegetable cathartics.

Super-tartras potassæ. Super-Tartrate of Potash, formerly Crystals or Cream of Tartar, (Crystalli vel Cremor Tartari).

This salt is gradually deposited from wine, in the progress of the slow fermentation which it suffers when kept. It appears to be derived from the juice of the grape, and is probably separated by the diminution of the solvent power of the juice by the evolution of its spirituous product. The tartar, as it is named, adheres to the sides of the casks in which wine is preserved; it is of a red colour, from part of the colouring matter adhering to it: from white wines it is deposited of a lighter shade, and hence the distinctions of red and white tartar in commerce. This saline matter consists essentially of tartaric acid and potash, the acid being in excess; it is therefore the Super-tartrate of Potash: it also usually contains a small portion of tartrate of lime. It is purified by boiling it in water with a portion of pure white clay, which appears to attract its colouring matter, and from the boiling liquor strained while hot, crystals are deposited on cooling, white and semi-transparent, of no very regular form. These used to be named Crystals of Tartar, while the crust collected from the surface of the boiling liquor was named Cream of Tartar. The crystals are reduced to powder for use, and to this powder the latter name is still frequently given. This salt consists, according to Thenard's analysis, of 57 of acid, 33 of potash, and 7 of water. Its taste is sour from its excess of acid. It is sparingly soluble in water, requiring about 60 parts of cold, or 30 of boiling water, for its solution. It operates as a purgative in a dose of 4 or 6 drachms, and being free from any unpleasant taste, it is not unfrequently used, more especially in inflammatory states of the system. It is, from its insolubility, given generally under the form of electuary; the only inconvenience attending its operation, is its being liable to occasion flatulence; and if habitually used, it is liable from its acidity to injure the tone of the stomach. It appears, at the same time, to increase the action of the absorbent system; hence, as a hydragogue and diuretic, it is employed in dropsy, and is also the cathartic most effectual in removing obesity. As a diuretic and refrigerant, it is to be afterwards noticed.

Tartras potassæ. Tartrate of Potash. Tartarum Solubile. Soluble Tartar.

This salt, the neutral tartrate of potash, formerly named Soluble Tartar from its greater solubility, is prepared by saturating the excess of acid in the super-tartrate by the addition of a solution of carbonate of potash. From its affinity to water, it is not easily crystallized with regularity; when obtained by evaporation in the state of a dry powder, it is even somewhat deliquescent; its taste is bitter. It is a mild purgative, and at the same time operates effectually, given in a dose of six drachms or an ounce.

TARTRAS SODÆ ET POTASSÆ. Tartrate of Soda and Potash.

THIS salt, formerly known by the name of Rochelle Salt, is a triple one, being prepared by saturating the excess of acid in the super-tartrate of potash by adding a solution of carbonate of soda. It crystallizes in large and regular transparent rhomboidal prisms, which are permanent in the air, and soluble in about six parts of cold water. Its taste is less unpleasant than that of the greater number of the saline purgatives, and it operates in a similar manner. Its medium dose is an ounce, given usually dissolved in tepid water.

PHOSPHAS SODÆ. Phosphate of Soda.

To prepare this salt, bones are calcined to whiteness, so as to consume the animal matter, and obtain the phosphate of lime, which is their base. The calcined bone in powder is submitted to the action of suphuric acid, which combines with part of the lime, and leaves a super-phosphate of lime, which is dissolved by water. To this solution, a solution of carbonate of soda is added, till there remain a slight excess of alkali; the soda combines with the excess of phosphoric acid of the super-phosphate; the neutral phosphate of lime, which the excess of acid held in solution, is precipitated, and by evaporation the phosphate of soda is obtained crystallized. Its crystals are rhomboidal prisms. Its taste is the least nauseous of all the saline purgatives, and is indeed perfectly mild, and its operation is equally mild and effectual. Hence it has been introduced into practice, and is peculiarly useful as a cathartic where there is any tendency to nausea. One ounce of it is given, dissolved generally in tepid water, or in soup made without salt.

MURIAS SODÆ. Muriate of Soda.

THIS salt, formed of soda and muriatic acid, is the most abundant saline natural product. It exists in a fossil state, forming what is named Rock Salt; it is the principal saline ingredient in the water of the ocean, and is a common ingredient in mineral waters. It is usually procured by evaporation from sea-water in small irregular crystals: when more regularly crystallized, the form of its crystals is a cube; its taste is purely saline. Like other salts, it excites thirst, an effect probably arising from its action on the absorbents: it also operates as a grateful stimulant on the stomach, and hence its universal use as a condiment. In large doses it proves purgative; but its strongly saline taste prevents it from being employed. It forms the active ingredient, however, of the common domestic enema; from half an ounce to an ounce of it being dissolved in a pound of tepid water, and a small quantity of expressed oil added.

MURIAS MAGNESIÆ. Muriate of Magnesia.

THIS salt is, next to muriate of soda, the principal saline ingredient in sea-water, and communicates to it its pungent quality. It frequently communicates the same quality to mineral waters, of which it is a common ingredient; but not being easily obtained crystallized, or even solid, owing to its strong affinity to water, it is not used in its pure form.

BESIDES the preceding Cathartics, there are some which are employed as such only under the form of Enema.

TEREBINTHINA VENETA. Venice Turpentine. *Pinus Larix. Monœc. Monadelph. Coniferæ.*

THE resinous juice of this tree, the Larch, exudes from incisions made in its trunk. It is of the consistence of honey, has the peculiar smell of the turpentines, and a bitter acrid taste. It consists of resin and essential oil; sometimes it is employed as a cathartic under the form of enema, half an ounce of it being triturated with the yolk of an egg, and suspended in a sufficient quantity of water. As it has a considerable share of acrimony, it is employed only where those of milder operation fail.

NICOTIANA TABACUM. Tobacco. (Page 167.)

THE smoke of tobacco, introduced into the intestines, has sometimes succeeded in producing evacuation in colic and ileus, after other purgatives have failed, not improbably from its narcotic operation inducing relaxation of the muscular fibre. An infusion of one drachm of it in a pint of warm water is more convenient; but much caution is requisite in the use of either, as tobacco, from its narcotic power, is apt to induce extreme sickness and debility. It is only where other methods have been unsuccessful, that its administration can be proper.

CHAP. IX.

OF EMMENAGOGUES.

The medicines distinguished by the appellation of Emmenagogues, are those which are capable of promoting the menstrual discharge.

The suppression of this discharge is supposed to arise from debility of the uterine vessels, or deficiency of action in them. Hence, it might be inferred, that the medicines capable of exciting it must be such as can stimulate these vessels.

General stimulants, or tonics, may to a certain degree have this effect, since, in consequence of their action, the uterine vessels must be stimulated in common with other parts. There are accordingly several stimulants, both diffusible and permanent, employed as emmenagogues.

It is doubtful whether there is farther any particular determination to these vessels. It is sufficiently certain, that there are many substances, which, when received into the stomach, have their stimulant operation more particularly determined to one part than to another; to the kidneys, for example, the bladder, or other organs. It seems possible, *à priori*, that there may be substances disposed to act more peculiarly on the uterus; yet experience does not confirm this supposition; there being perhaps no proof of any of the substances styled Emmenagogue, producing their effect from any specific power.

A stimulant effect, however, produced in neighbouring parts, seems to be in some degree propagated to the uterine vessels; and hence several medicines exert an emmenagogue power, greater than can be ascribed to any general action they exert on the system. It is thus that some substances, belonging to the class of cathartics, have been supposed to act, their stimulus being communicated from the larger intestines to the uterus. They are probably of advantage too in amenorrhœa, simply as cathartics, removing that state of torpor in the intestinal canal connected with the disease; and more advantage is derived from the emmenagogues of this class, than from any of the others.

There is also one stimulus, that of electricity, which can be brought to act directly on the uterine system, and it has been sometimes found, under the form of slight shocks transmitted through the pelvis, to operate as a powerful emmenagogue.

The individuals belonging to this class may be arranged in some measure according to these distinctions; the most active of them being substances belonging to other classes; and there being a few only supposed to be possessed of any specific emmenagogue power. With regard to all of them, it may be added, that there are no medicines so uncertain in their operation, and none in which the conclusions respecting their efficacy are more liable to fallacy.

EMMENAGOGUES.

From the Class of Antispasmodics.

Castoreum.
Ferula assafoetida.
Bubon galbanum.

From the Class of Tonics.

Ferrum.
Hydrargyrum.

From the Class of Cathartics.

Aloe.
Rheum palmatum.
Helleborus niger.

Sinapis alba.
Rubia tinctorum.
Ruta graveolens.
Juniperus sabina.

CASTOREUM. Castor. (Page 180.)

UNDER the history of Castor already given, it was remarked, that it appears to be a substance wholly inert. As an emmenagogue, it has been given in the dose of 10 grains in substance, or more frequently under the form of tincture in the dose of one drachm. No reliance is now placed on its powers.

ASSAFOETIDA. Assafœtida. (Page 183.)

ALL the fœtid gums have been supposed to possess, along with their antispasmodic property, the power of acting more peculiarly on the uterine system, and have been therefore employed as emmenagogues. Assafœtida, the strongest of them, has been given in amenorrhœa in a dose of 10 or 15 grains, or in the form of tincture in the dose of one drachm. GALBANUM, another of these fœtid gums already noticed, next in strength to assafœtida, has been given in a similar dose. Both of them are usually employed in that form of amenorrhœa connected with hysteria; they are also occasionally combined with aloes.

FERRUM. Iron. (Page 209.)

THE powers of iron as a tonic may be supposed capable of being exerted on the uterine system, and of removing suppression of the discharge arising from deficient action of the uterine vessels, more especially when this is connected with a state of general languor and debility. In such cases, accordingly, it is frequently employed as an emmenagogue. The carbonate of iron is given in a dose of 5 or 10 grains daily, continued for some time; the more active preparations of the sulphate and muriate are likewise prescribed, but in general there is some difficulty in continuing their administration, unless in small doses, from the irritation they are liable to occasion. The chalybeate mineral waters afford perhaps the best form of administering iron in amenorrhœa.

Hydrargyrum. Quicksilver. (Page 194.)

The general stimulant operation of this metal may, like that of iron, be supposed to be so far exerted on the uterine system, as to obviate any state of diminished action; some of its preparations are accordingly occasionally employed in amenorrhœa. The mild muriate or calomel is the preparation generally used. It is given in the dose of a grain; more frequently, however, in combination with other emmenagogues, to promote their action, than alone.

Aloe. Aloes. (Page 347.)

This cathartic, it has already been remarked, is supposed to operate more peculiarly on the larger intestines; and its stimulant operation, it has been imagined, is thence propagated to the uterus. Hence its celebrity as an emmenagogue, though what efficacy it has probably depends principally, if not entirely, on its cathartic power, and its effect in consequence of this, of removing the torpor of the intestinal canal. It is given under the form of pill or tincture; and frequently in combination with other remedies, particularly with myrrh, rhubarb, and the preparations of iron.

RHEUM PALMATUM. Rhubarb. (Page 341.)

RHUBARB has some analogy to aloes in its cathartic operation, and, like it, has been supposed to produce, probably in consequence of this operation, an emmenagogue effect. It is usually given combined with aloes, either under the form of the Compound Pills of Aloes and Rhubarb, or the Tincture of Aloes and Rhubarb. The latter forms a popular remedy usually employed in occasional suppression of the menses, being taken in the dose of two drachms at bed-time.

HELLEBORUS NIGER. Black Hellebore. (Page 344.)

BLACK Hellebore is a powerful cathartic; it was recommended by Mead as an emmenagogue under the form of tincture, one drachm of this being given as a dose at bed-time, and continued for some time. Its emmenagogue power might be supposed to depend on its cathartic operation; in this dose, however, and under this form, it has little sensible effect; and any advantage derived from it is extremely doubtful. The extract has been employed as a more active preparation in combination with aloes, or with carbonate of iron.

SINAPIS ALBA. Mustard. (Page 323.) *Semen.*

THE seeds of this plant have a considerable degree of pungency, and when taken unbruised to the extent of half an ounce or an ounce, have a purgative effect. This is a popular remedy, not unfrequently used in amenorrhœa and chlorosis, and may have some effect by its stimulant action on the intestinal canal.

Rubia tinctorum. Madder. *Tetrand. Monogyn. Stellatæ. Radix. South of Europe.*

The root of this plant, freed from its bark, is dried and prepared for its use in dyeing; it is in slender twigs, of a red colour; has a bitter taste, with little smell. Its colouring matter is extracted by water and alkohol. From the fact that the bones of animals are tinged of a red colour when it is taken mixed with their food, it was once supposed to be a medicine of great subtilty; but this appears to be an effect purely chemical, depending on the affinity exerted by the colouring matter to phosphate of lime. It has been celebrated as an emmenagogue, in a dose of half a drachm thrice a-day. It appears to be nearly inert, and its inefficacy is generally acknowledged.

Ruta graveolens. Ruta. Rue. *Decand. Monogyn. Multisiliquæ. Herba. South of Europe.*

This herb, when recent, has a strong unpleasant smell, and a bitter taste. By distillation it affords a pungent essential oil. It has been prescribed as an emmenagogue under the form of the watery infusion of the dried leaves; and the oil is sometimes combined with aloes, and other medicines of the same class, probably with little advantage.

Offic. Prep.—Extr. Rutæ Gr. *Ed. Dub.*—Ol. Rutæ, *Dub.*—Confect. Rutæ, *Lond.*

Juniperus sabina. Savin. *Dioecia. Monadelph. Coniferæ. Folia. South of Europe.*

The leaves of this shrub have a bitter penetrating taste, a strong unpleasant odour, and a considerable degree of acrimony. They afford a very large quantity of essential oil, possessing the general virtues of the plant.

Savin is a stimulant, the operation of which has been supposed to be powerfully directed to the uterine system; so much so, that, according to the common opinion, it is capable of procuring abortion. It has in conformity to this been considered as an emmenagogue, but it is scarcely ever administered internally. Externally, the powder of the dried leaves is used as an escharotic, and mixed with lard is applied as a stimulant to excite suppuration from inflamed surfaces.

Offic. Prep.—Extr. Sabinæ, *Dub.*—Cerat. Sabin. *Dub. Lond.*—Ol. Sabinæ, *Ed. Dub.*

CHAP. X.

OF DIURETICS.

DIURETICS are those medicines which increase the urinary discharge;—an effect which is probably produced by different modes of operation.

It is obvious, that any substance capable of stimulating the secreting vessels of the kidneys, by direct application to them, may increase their action, and thus produce a more copious discharge of urine. It is probably in this way that many of the saline diuretics act: the principal purpose of the urinary secretion seems to be to separate from the blood the saline matter it contains, and which would otherwise accumulate in the system; when substances of this kind, therefore, do not operate as cathartics, but are received into the circulating mass, they are brought to the kidneys in the course of the circulation, are secreted by their vessels, and exciting in them increased action, a larger portion of watery fluid is also secreted. Several of these substances, as nitre, or the fixed alkalis, can be detected in the urine by chemical tests after they have been administered, and therefore there can be little doubt of this being the mode in which they operate. There is evidence even of some vegetable diuretics passing off by the same emunctory. The flavour of asparagus, or of garlic, or turpentine, for example, may be observed in the urine discharged an hour or two after they have been received into the stomach.

It is also probable, however, that a diuretic effect is in other cases produced by substances acting only on the stomach, the action they excite being communicated by sympathy to the kidneys. Squill and tobacco appear to act in this manner; there is no proof that they are received into the circulating mass; they act very peculiarly on the stomach, and when they occasion vomiting or purging, they generally fail in their diuretic effect. It may be concluded, therefore, that they exert a peculiar action on the stomach, which, propagated to the kidneys, by means of the general connection subsisting between all the parts of the system, causes an increase in the urinary discharge. The different kinds of ardent spirits, diluted with water, seem to act in a similar manner, as their diuretic effect usually takes place very speedily.

There is still a third mode, in which it seems probable that some substances produce a diuretic effect, especially in a state of disease. It is known that persons who drink sparingly, discharge less urine than others; or that where the watery part of the blood is carried off by perspiration, the urinary discharge is diminished. It is farther known, that large draughts of water, or of any mild diluent, if not determined to the skin by external warmth, occasion an increased discharge of urine. It seems probable, therefore, that a similar effect may be produced, by the action of substances which powerfully stimulate the absorbent system, and thus bring an increased quantity of serous fluid into the circulating mass. Digitalis is probably a remedy of this kind. Its effect as a diuretic is more certain and powerful, when given to a person labouring under dropsy, than to one in health; in the latter state, indeed, any such effect is scarcely apparent. It appears too to be one of those medicines which stimulate most powerfully the absorbent system; its diuretic power in dropsy, therefore, is probably principally owing to its enabling the absorbents to take up the serous fluid effused; this is of course brought into the circulation, and like any other watery fluid is discharged by the kidneys.

On the same principle is explained the utility of a practice, which is often employed to promote the action of diuretics, that of conjoining mercury with them. Thus, the action of squill as a diuretic, is rendered more certain and powerful by combination with calomel; each of them being given in separate doses, or both being united in one formula. The efficacy of this is probably derived from the mercury stimulating the absorbents, and, by introducing the effused fluid into the system, promoting the direct diuretic action of the squill.

The effect of these remedies is promoted by drinking moderately of watery liquors; hence the practice that was formerly adopted in dropsy, of diminishing the allowance of drink, is exploded; it was of little benefit in preventing the accumulation of effused fluid, and the abstinence from liquids that was enjoined, rather prevented the action of the diuretic remedies that were employed for the cure of the disease. Many cases even have occurred, in which pure water, mineral waters, or mild diluents, have acted as diuretics, and affected a cure in dropsy.

The action of diuretics is also considerably dependent on the state of the vessels of the skin. If, when a medicine of this class has been given, these vessels are stimulated by external warmth, its action is rather determined to the surface, and sweat or diaphoresis takes place. But if the surface is kept cool, the diuretic effect is more certain; so much indeed does this state of the surface determine to the kidneys, that the usual diaphoretics may be brought to act as diuretics.

The general effects of diuretics are sufficiently evident. They discharge the watery part of the blood, and by that discharge they indirectly promote absorption. Dropsy is the disease in which they are principally employed, and they are adapted to every form of it. When the urinary discharge can be excited by their administration, the disease is removed with less debilitating effect, and with less injury to the patient, than by any other method. The success of diuretics in dropsy is however very precarious; sometimes none of them succeed; sometimes one acts more powerfully than another, though in this there is no uniformity; nor are the causes of this variety of operation well understood. In general it is obvious, that where a strong predisposition to the disease exists, or where it originates from organic affections of the liver, or other chylopoëtic viscera, no great advantage can be expected from the mere evacuation of the water by the action of diuretics: it is only in those cases where an accumulation of fluid has taken place from diminished absorption, or some similar cause, that they can be expected to effect a cure. It accordingly often happens in practice, that an increased discharge of urine is effected by the exhibition of diuretics, and still the dropsical swellings are not removed, or if they are, they speedily return. The combination of Tonics with Diuretics, is useful in preventing a relapse.

Diuretics have been used in calculous affections, with the view of preventing the increase of the calculus, by rendering the urine more watery: and they have occasionally, though rarely, been employed to lessen plethora, or check profuse perspiration. The use of diluents, so as to increase the quantity of urine, is of advantage in gonorrhœa, and other affections of the urinary passages, by lessening the acrimony of the urine, which excites pain from its action on these parts, when they are in an inflamed state.

The cautions with regard to the administration of diuretics, are obvious from what has been said of their operation. The surface of the body must be kept cool, and therefore the doses of the medicine ought to be given in the course of the day, and the patient should, if possible, be kept out of bed. The use of diluents ought to be permitted, at least this is more necessary with respect to those diuretics belonging to the class of salts, and which operate directly on the secreting vessels of the kidneys, and indeed is probably useful with regard to them all.

The individual diuretics may be considered under the subdivisions of Salts, Vegetable Diuretics, and one or two derived from the animal kingdom.

DIURETICS.

SALINE DIURETICS.

POTASSA.
ACETAS POTASSÆ.
SUPER-TARTRAS POTASSÆ.
NITRAS POTASSÆ.
SPIRITUS ETHERIS NITROSI.

FROM THE VEGETABLE KINGDOM.

SCILLA MARITIMA.
DIGITALIS PURPUREA.
NICOTIANA TABACUM.
SOLANUM DULCAMARA.
LACTUCA VIROSA.
COLCHICUM AUTUMNALE.
GRATIOLA OFFICINALIS.
SPARTIUM SCOPARIUM.
ULMUS CAMPESTRIS.
JUNIPERUS COMMUNIS.
COPAIFERA OFFICINALIS.
PINUS BALSAMEA.
PINUS LARIX.

FROM THE ANIMAL KINGDOM.

MELOE VESICATORIUS.

Saline Diuretics.

Potassa. Potash.

This alkali, the chemical history of which has been already given, (p. 21.), either pure, or in the state of sub-carbonate, is a diuretic; and, as has been already remarked, is secreted by the kidneys, so that when continued for a sufficient time, it renders the urine alkaline. In its pure state it is scarcely ever employed as a diuretic; but the saline matter from the ashes of broom, wormwood, and other plants, which is sub-carbonate of potash, more or less pure, used formerly to be frequently prescribed in dropsy. It is difficult to continue the administration of the alkali, however, even in this mild form, to the requisite extent, without occasioning irritation; and the sub-carbonate being inferior in diuretic power to the super-tartrate of potash, it has fallen into disuse. When employed, it is given in a dose of 20 or 30 grains dissolved in a large quantity of water, and repeated three or four times in the course of the day.

Acetas potassæ. Acetate of Potash. Sal Diureticus.

This salt, prepared according to the process of the Pharmacopœias, by saturating the potash of the sub-carbonate of potash with distilled vinegar, and evaporating the solution to dryness, is obtained in the state of a white foliated mass, deliquescent and very soluble in water. It has been considered as a powerful diuretic, and has been used in dropsy, half a drachm of it dissolved in water being given every hour or two until it operate. It is uncertain in its operation, however, and has therefore fallen into disuse.

SUPER-TARTRAS POTASSÆ. Crystalli vel Cremor Tartari. Super-tartrate of Potash. Cream of Tartar. (Page 353.)

THIS salt, of which the chemical history has been already given, and its applications as a cathartic noticed, is extensively employed as a remedy in dropsy, and is inferior in efficacy to few of the substances belonging to this class. There are two modes under which it is exhibited, either so as to obtain principally its diuretic effect, or along with this its action as a hydragogue cathartic. When given with the first intention, the form of exhibition is solution in water, from half an ounce to an ounce being dissolved in the due proportion of water, and this being taken in the course of the day, its operation on the kidneys being promoted by dilution. The more usual practice, however, is to give it in substance, either diffused in a little water, or made into an electuary with syrup, and in such doses as to occasion purging to a certain extent. The dose is various, its operation being apparently much dependent on the action of the absorbents being excited, and this, in different states of disease, being effected with more or less difficulty. Half an ounce is given at first, and this is increased to an ounce or even two ounces in twenty-four hours, the increase of dose being continued until its effects on the kidneys or bowels is obtained, and care being taken not to push it so far as to produce greater evacuation than the strength of the patient can support. It generally causes a considerable discharge of serous fluid into the intestinal canal, so as to produce watery evacuations, and at the same time augments the quantity of urine; the size of the dropsical swelling soon begins to be reduced; and the effused water, according to those practitioners who have represented its efficacy in the most favourable light, is not only removed, but any renewal of the effusion is prevented with more certainty than by the action of other diuretics: hence it has been regarded as in general superior to the other medicines of this class in the treatment of dropsy.

There can be no doubt that super-tartrate of potash proves often a powerful remedy in all the forms of dropsy, and more especially in ascites; yet the general remark applies to this as well as to the other diuretics, that it sometimes fails where others succeed. It has also some disadvantages. It is frequently necessary to give it in such large doses to obtain its diuretic or hydragogue effect, that it excites nausea and flatulence, weakens the appetite, and injures the tone of the stomach: and as a greater degree of debility is induced by the operation of purging than by merely exciting the urinary discharge, there is some risk of the powers of the system being exhausted under its protracted use. These effects, therefore, require to be guarded against, and sometimes lead to a preference of other diuretics, or render it necessary to substitute them where the super-tartrate has received a fair trial.

NITRAS POTASSÆ. Nitrate of Potash. Nitrum. Nitre.

THIS salt, consisting of nitric acid and potash, is frequently formed on the surface of the soil, in warm climates. In the South of Europe, its production is usually accelerated by artificial arrangements. Animal and vegetable substances, in a state of decomposition, are mixed with a quantity of carbonate of lime, the mass is exposed to the air, but protected from the rain, and is occasionally stirred up. After a number of months, the materials are found to contain nitrate of lime and nitrate of potash. These salts are extracted by lixiviation with water: impure sub-carbonate of potash is added, by which the nitrate of lime is decomposed, and the quantity of nitrate of potash increased; and this salt is purified by repeated solutions and crystallizations. During the process by which the nitrate of potash is formed, it appears that the oxygen of the atmospheric air, and probably also part of the oxygen of the vegetable matter, combine with the nitrogen of the animal matter, so as to form nitric acid; the affinities whence these combinations arise, being favoured by the affinities exerted by the lime. The acid is attracted in part by the lime, and in part by a quantity of potash, either contained in the materials, or, as some have supposed, formed during the process. The nitre used in this country is imported from India, where it occurs as a natural formation.

Nitrate of potash is crystallized in hexaedral prisms. Its crystals are soluble in six parts of cold, and in an equal weight of boiling water. It is decomposed by heat, affording a large quantity of oxygen gas; and from the facility of this decomposition, is an important pharmaceutic agent in oxidating bodies by deflagration.

This salt has a cool and sharp taste, and occasions a sense of coldness in the stomach when swallowed. When given in moderate doses, continued for some time, its presence can at length be detected in the urine by chemical tests. Its virtues are those of a refrigerant and diuretic, and, as possessing both, it has been used to relieve ardor urinæ in gonorrhœa. The practice, however, is now relinquished, either as inefficacious, or as rather hurtful, if the nitre is secreted with the urine, as it must render it more stimulating. From its refrigerant power it has likewise been used in hæmoptysis and in acute rheumatism. Its dose is from 5 to 20 grains repeated twice or thrice a-day, with the free use of diluents or demulcents. Its diuretic power is too inconsiderable to admit of its being employed as a remedy in dropsy.

Offic. Prep.—Troch. Nitrat. Pot. *Ed.*

SPIRITUS ETHERIS NITROSI. Spirit of Nitrous Ether.

NITRIC acid, added in due proportion to alkohol, converts it into a species of ether; but as the process is difficult, from the violent chemical action that takes place, it has long been the practice to use less acid than is required to change the whole alkohol into this product; a portion of nitric ether is formed, and this is obtained by distillation, combined with the unchanged alkohol, and generally also from the mutual action not having been complete with a portion of free acid. This process has a place in the Pharmacopœias, and forms what used to be named Spiritus Nitri Dulcis, what is now named Spiritus Etheris Nitrosi. Its odour is fragrant; its taste sharp and acidulous. In medicine it is employed as a refrigerant and diuretic, in a dose of 20 or 30 drops. Being grateful to the stomach, and relieving flatulence, it is often used to correct or promote the action of more powerful diuretics in dropsy.

Diuretics from the Vegetable Kingdom.

Scilla maritima. Squill. (Page 322.)

The medicinal applications of squill as an emetic have been already stated. Under this article are to be considered its powers as a diuretic.

Squill, foxglove, and super-tartrate of potash, are the diuretics principally employed in modern practice in the treatment of dropsy; and it is not easy to assign precisely their comparative powers, one frequently proving successful when either of the others has previously failed. Squill operates more directly as a diuretic than the super-tartrate of potash does, and is not liable, even if its administration has been carried rather far, to produce those injurious effects which arise from the action of foxglove in an over dose. Hence it is frequently preferred.

As a diuretic, Squill is always given in substance, under the form of the dried root. Its dose is from one to three grains. A grain may be given at first, morning and evening, in the form of pill, and this increased slowly until its diuretic effect is obtained. If the dose is too large, it is liable to excite nausea; and the rule has even been delivered, to give it always to the extent necessary to induce some degree of nausea. The production of this effect can be regarded, however, only as a test of the squill being in an active state; it is not necessary to its diuretic operation; it proves distressing to the patient; and it has been observed, that when it has once been given to such an extent as to induce this state of the stomach, the same state is more liable to recur even when after an interval it is given in smaller doses. Its nauseating operation, therefore, ought rather to be avoided by the due regulation of the dose.

The diuretic power of squill is much promoted by combination with mercury, and it is more frequently perhaps employed in this combination than alone. Of the mercurial preparations, either the common mercurial pill, or calomel, may be used; the usual medium dose from which we obtain the general action of either on the system, being added to the dose of the squill, or being given in the evening, while the squill is given in the morning. The superiority of their combined action probably depends on the mercury stimulating the absorbent system, while the squill excites the action of the vessels of the kidneys. This combination is farther well adapted to the treatment of dropsy, connected as it frequently is with obstruction or chronic inflammation of the liver or neighbouring organs, and is more successful in this case than any other diuretic. Where the mercurial preparation occasions purging, as this impedes the diuretic action of the squill, mercurial friction may be substituted.

DIGITALIS PURPUREA. Foxglove. (Page 162.)

FOXGLOVE has already been considered as a narcotic; it is a still more important article of the Materia Medica as a diuretic. It had frequently been used as an empirical remedy in dropsy; but the occasional violence of its narcotic operation, when not administered with due precaution, prevented it from being employed in practice, until Dr Withering pointed out, with more precision, the rules to be attended to in its exhibition.

It is difficult to compare the powers of the principal diuretics; yet, on the whole, perhaps foxglove is more powerful than any of them in evacuating the water in dropsy: and the conclusions of Withering are still nearly just, that "so "far as the removal of the water will contribute to cure the "patient, so far may be expected from this medicine;" and that "although digitalis does not act universally as a diure-"tic, it does so more generally than any other."—In hydrothorax, its superiority to other diuretics is more clearly established than in ascites or anasarca; and in the first of these states of dropsy, it is unquestionably superior to any other remedy. Withering remarked, that it was most successful in those cases of dropsy in which debility was completely marked, where the countenance is pale, the pulse weak, and the muscular energy reduced; while, in an opposite state of the system, it was more liable to fail. In the latter case, therefore, he recommended a previous exhibition of squill, or of super-tartrate of potash, by which some reduction of strength might be induced. The observation, however, has not altogether been confirmed by subsequent experience. If it were, it would afford a presumptive proof, that the efficacy of foxglove in dropsy depends on its stimulant action.

There is a peculiarity in the operation of this remedy, that it may be continued for some time without sensibly increasing the flow of urine; the increase then suddenly commences, and often continues of itself for several days, and to a very great extent, without requiring the continued administration of the remedy, so that the dropsical effusion is more speedily reduced by the action of it than by any other diuretic. Its diuretic power too appears only when it is administered in dropsy, and hence there can be little doubt that it operates principally, if not entirely, by exciting the action of the absorbents, the absorbed fluid being discharged by the kidneys. The diuretic effect is not connected with its nauseating operation, or with the reduction in the force of the circulation; it can, on the contrary, be obtained without either of these accompanying it; and Withering remarked even, that he had found the increased discharge of urine to be checked, when the doses had been imprudently urged so as to occasion sickness. He observed also, that if it purges, it almost certainly fails.

Foxglove is given under the form of the dried leaves in substance, or in infusion or tincture. The tincture has been supposed to be better adapted to its exhibition as a narcotic. The infusion is a preparation sufficiently uniform and active, and its dose is rather more easily regulated with precision, so as to admit of a gradual increase, than that of the powder. Its action too is at once exerted on the stomach, and there is therefore less risk of its effect being delayed until it is accumulated. The medium dose of the powder is at first from half a grain to a grain twice a-day: from half an ounce to an ounce of the infusion, prepared according to the formula of Withering, now received into the Pharmacopœias, is a similar medium dose.

The great desideratum with regard to this remedy, is to conduct its administration so as to obtain its full diuretic effect, without those consequences which arise from it when its action is accumulated in the system. The rules given by Withering for its administration, are to give it in a dose from 1 to 3 grains of the powder twice a-day, or one ounce of the infusion, which, if the symptoms be urgent, or the patient stronger than usual, may be given once in eight hours: and the dose is to be continued until the medicine either acts on the kidneys, the stomach, the pulse, or the bowels; and is to be stopped on the first appearance of any one of these effects.

Though Withering enjoined strictly the caution necessary in the use of foxglove, the doses prescribed in his directions are perhaps rather large; and the propriety of the method which has sometimes too been recommended, of progressively increasing the dose until the effects are obtained, is doubtful. If the dose be at first small, or at least if, having been raised to one grain of the powder, or one ounce of the infusion, twice in twenty-four hours, it be continued at this quantity, the diuretic operation will be obtained in no long time without any unpleasant symptom, and when it commences, will continue of itself, even though the dose be suspended. Or if, from peculiarity of habit, or state of disease, the dose requires to be increased, it ought to be done slowly, and without that regularly progressive augmentation which has been recommended. And if the effect begin to cease before the reduction of the dropsical swelling be completed, it may be easily renewed by a repetition of this moderate dose. This mode of administering foxglove is that suggested by the nature of its action. The peculiarity which has always been pointed out as characteristic of this medicine, is its tendency to accumulate in the system, its effects not appearing for a time, but at length being suddenly induced. There is no necessity, therefore, to increase its dose, or to give one that is large, with the view of speedily inducing its action, since, merely from its continued administration, this will in no long time be established, and without that hazard which is otherwise incurred from this peculiarity in its operation. The administration of it, however, ought not to be too long continued, if it fail in producing its diuretic effect. It always injures the tone of the stomach, even where it has not been pushed to that extent to occasion nausea; and there is reason to believe, that from its general debilitating operation, the powers of the system have sometimes sunk under its protracted use. The alarming symptoms which an over dose of foxglove is liable to produce, it has already been remarked, are best obviated by small doses of spiritous cordials warm; sulphuric ether, aromatic spirit of ammonia, bitter infusions, and aromatics. Vinegar, which is an antidote to other narcotics, might be tried.

There are other diseases in which foxglove has been supposed to prove useful by its diuretic power; as in insania, or in epilepsy connected with serous effusion in the brain; and more especially in dyspnœa arising from serous effusion in the bronchiæ,—anasarca pulmonum, as this affection is named.

It may, in the treatment of dropsy, be advantageously combined with other diuretics; and its action, like that of squill, is said to be promoted by mercury. An occasional dose of the spirit of nitrous ether is useful as counteracting nausea and flatulence, and aiding its diuretic effect.

NICOTIANA TABACUM. Tobacco. (See page 167.)

TOBACCO, in its general action, has some resemblance to foxglove, being narcotic, emetic, and diuretic. As a diuretic, it has been employed in dropsy, under the form of infusion, one ounce of the dried leaves being infused in a pint of water, and ten drops being given, and gradually increased to 60 or even 100. It possesses, however, no peculiar advantage to recommend it, and its diuretic effect is generally accompanied with much sickness and vertigo. It has been given with more advantage in dysuria, and probably where that disease is connected with spasmodic action, the tobacco may prove useful by its antispasmodic, added to its diuretic power.

Solanum dulcamara. Woody Nightshade. Bitter-Sweet. *Pentand. Monogyn. Solanaceæ. Stipites. Indigenous.*

The young shoots or branches are the part of this plant used in medicine; when first chewed, they have a bitter taste, which is soon followed by a degree of sweetishness, a peculiarity whence its name is derived; their smell is strong and disagreeable. By drying, their activity is much impaired. This plant has a degree of narcotic and of diuretic power. An infusion or decoction of the dried stalks in water has been recommended in dropsy, but it is a remedy of uncertain operation, and is scarcely ever prescribed.

Offic. Prep.—Decoct. Dulcamar. *Lond.*

Lactuca virosa. Strong-scented Lettuce. (Page 169.)

This plant, though it possesses a narcotic quality, is also a diuretic, and has been recommended under the form of the inspissated juice as a remedy in dropsy, the dose being gradually increased from 5 or 10 grains to 2 or 3 drachms. Though celebrated by the German practitioners, it is never used in this country.

Colchicum autumnale. Meadow Saffron. Colchicum. *Hexand. Trigyn. Liliaceæ. Radix. Indigenous.*

The root of this plant is bulbous; when recent, it is extremely acrid, a small quantity occasioning a sense of burning heat in the stomach, strangury, and tenesmus; at other times it is entirely void of acrimony; differences which are owing to climate, age, or season. Vinegar dissolves its active matter. It was recommended by Störk as a remedy in dropsy, under the form of oxymel or syrup; these have been received into the Pharmacopœias, the dose of either being 2 or 3 drachms. From the uncertainty, however, of its operation, colchicum has not been established in practice.

Offic. Prep.—Syr. Colch. A. *Ed.*—Oxymel. Colch. *Dub.*—Acet. Colch. *Lond.*

GRATIOLA OFFICINALIS. Hedge-Hyssop. *Diand. Monogyn. Personatæ. Herba. South of Europe.*

THIS plant is cultivated in our gardens. Its leaves have a strong bitter taste, with little smell. They prove emetic and cathartic, but in a smaller dose produce a diuretic effect, and have been recommended under the form of infusion in the treatment of dropsy, two drachms being infused in half a pint of warm water, and a table-spoonful being given twice or thrice a-day. Their operation, however, is always uncertain, and liable to be violent.

SPARTIUM SCOPARIUM. Broom. *Diadelph. Decand. Papilionaceæ. Summitates. Indigenous.*

THE tops of the young branches of the broom have a bitter taste, which is communicated both to water and alkohol. The watery decoction, prepared by boiling an ounce of the tops in a pint of water to half a pint, is used as a popular remedy in dropsy, and sometimes with success. It acts in general both as a cathartic and diuretic; being taken in divided doses through the day until its operation is obtained.

ULMUS CAMPESTRIS. Common Elm. *Pentandria. Digynia. Scabridæ, Cortex interior. Indigenous.*

THE interior bark of the elm has a place in the Pharmacopæias, though little employed. It has a slightly bitter taste, and when boiled with water affords a mucilaginous liquor. The decoction, which has been received as an officinal preparation, is the form under which it has been used. It is said to operate as a diuretic, but does not appear to be of sufficient activity to form a remedy of any value in the treatment of dropsy. Advantage has been said to be derived from it in some cutaneous affections, especially some forms of lepra. The dose of the decoction is 4 or 6 ounces twice a-day.

Offic. Prep.—Decoct. Ulmi. *Lond. Dub.*

JUNIPERUS COMMUNIS. Juniper. *Diœcia. Monadelph. Coniferæ. Baccæ. Indigenous.*

THE berries of this shrub have an aromatic smell, and a warm sweetish taste, with a degree of bitterness, the former qualities residing in the pulp, the last in the seeds. Distilled with water, they afford a considerable quantity of essential oil. The flavour and warmth are also extracted by water by infusion.

Juniper berries given in infusion prove diuretic. The essential oil retains this property; and the spirit of juniper, or diluted alkohol impregnated with it, forming the spiritous liquor known by the name of Gin, is prescribed, in a diluted state, as a côrdial and diuretic in dropsy.

Offic. Prep.—Ol. Juniper. Spir. Junip. C. Comp. *Ed. Lond. Dub.*

COPAIFERA OFFICINALIS. Balsamum Copaibæ. Balsam of Copaiba or Copaiva. *Decand. Monogyn. Dumosæ. South America.*

THIS resinous juice, for it is improperly named a balsam, is the produce by exudation from incisions made in the trunk of the tree. It flows thin, but becomes thick and tenacious, is transparent, with a yellow tinge; has a peculiar smell not disagreeable, and a pungent bitter taste. It is insoluble in water, soluble in alkohol, and in expressed and essential oils, and with alkalis forms a kind of saponaceous compound. Distilled with water, it affords nearly half its weight of an essential oil, an insipid resin being the residuum.

Balsam of Copaiba increases the urinary discharge, and communicates to the urine a violet odour. In too large a dose it is liable to excite inflammation of the urinary passages. From its power of stimulating these parts, it frequently proves successful in the cure of gleet, where the inflammation has entirely subsided, and the discharge continues from weakness of the exhalents or absorbents of the urethra. It has also been given in leucorrhœa, and in hæmorrhoidal affections. Its dose is 20 or 30 drops twice or thrice a-day, given in the form of bolus, or, what is preferable, as remaining more easily on the stomach, and less irritating, diffused in water by the medium of mucilage.

Pinus balsamea. Balsamum Canadense. Canadian Balsam. *Monœcia. Monadelph. Coniferæ. Balsamum. North America.*

This resinous juice, for, like the preceding, it is improperly named a balsam, as it affords no benzoic acid, exudes spontaneously from the trunk of the tree. It is of a light yellow colour, transparent, tenacious, and inflammable. By age it becomes thicker; its smell is agreeable; its taste pungent. It is soluble in alkohol and oils, and affords an essential oil by distillation, similar to the oil obtained from the other turpentines or resinous juices of the different species of pinus.

The medicinal virtues of this resinous juice seem to be the same as those of copaiba, and it is used for the same purposes. Its dose is from 30 to 50 drops. Of any of the turpentines it is the purest.

PINUS LARIX. Larch. Terebinthina Veneta. Venice Turpentine. Pinus Sylvestris. Scotch Fir. Common Turpentine. *Monoecia. Monadelph. Coniferæ.*

FROM these trees a resinous juice exudes spontaneously, and in still greater abundance from incisions in the trunk of the tree. It is thick and tenacious: that from the larch tree is semi-pellucid, of a yellowish colour, has a strong peculiar smell, and a bitter pungent taste; it is named Venice Turpentine: that from the Scotch Fir is thicker, less limpid, and its odour is less grateful; it is named Common Turpentine. Both of them, by distillation, with the addition of a small quantity of water, to prevent the temperature from rising too high, afford a large quantity of an essential oil, which is volatile and inflammable, but more sparingly soluble in alcohol than any other essential oil. The residuum is a resin nearly insipid. The Venice turpentine affords more oil than the other.

This oil, Oleum Terebinthinæ, Oil of Turpentine, is used in medicine much more frequently than the resinous juice itself. It is light, limpid, and volatile; has a strong penetrating smell, and a very pungent taste. It is a powerful stimulant, directed more particularly in its action to the urinary passages, as is evident from the violet odour it communicates to the urine, and from the inflammation it excites when given in too large a dose. From this specific action it has been employed in gleet in a dose from 5 to 10 drops, but its operation is always liable to be violent. It was highly recommended by Cheyne as a remedy in chronic rheumatism, especially lumbago, given to the extent of 2 or 3 drachms mixed with honey. It is difficult, however, to give it in such a dose without being rejected from the stomach, or acting violently on the urinary organs. This oil has lately been employed with much success as a remedy against the tænia or tape-worm, as is to be noticed under the class of anthelmintics. Externally it is applied by friction as a stimulant to parts affected with cramp and rheumatism; it forms one of the best applications to scalds; sometimes too it is used as a styptic to bleeding wounds. The Venice turpentine diffused in water by the yolk of an egg, forms a powerful cathartic enema.

Resina Alba vel Flava. White or yellow resin is the residuum of the distillation of turpentine; its various shades of colour arising from the purity of the juice, or from the degree of heat applied. It is fusible and inflammable; is soluble in oils and in alkohol, but insoluble in water. It has little smell or taste, but appears from the practice of the farriers, who give it to horses, to have some degree of diuretic power. It is only employed in the composition of ointments and plasters, which it renders more adhesive, and perhaps more stimulating. Various compositions of this kind have a place in the Pharmacopœias, as the Ceratum Resinæ, or Unguentum Resinosum, long known by the name of Basilicon, the Emplastrum Resinosum, and others.

From the wood of the different species of fir, exposed to a low smothered heat, Tar (Pix Liquida) is obtained. It is the resinous matter melted out, intermixed with empyreumatic acetic acid, empyreumatic oil, and a portion of carbonaceous matter. When water is macerated on it, it receives a considerable impregnation of taste and smell,—and this liquor, Tar-water, prepared from a gallon of water macerated on two pounds of tar, was at one period highly celebrated as a remedy in many diseases. It operates chiefly as a stimulating diuretic and diaphoretic. Tar by boiling loses its volatile principles, and acquires a stiffer consistence. This forms Pitch, (Pix Arida), which is sometimes employed externally as a stimulating application.

PISTACIA TEREBINTHINUS. Chio or Cyprus Turpentine. *Dioec. Pentand.*

THE Chio turpentine resembles the other turpentines, but is more limpid, fragrant, and grateful; its powers are the same, but not being easily procured, it is never used.

DIURETICS FROM THE ANIMAL KINGDOM.

MELOE VESICATORIUS. Cantharis. Spanish Fly. Lytta Vesicatoria. Blistering Fly. *Coleoptera.*

THIS insect is found adhering to the leaves of certain plants in Spain and Italy; they are detached by shaking the branches, are killed by being exposed to the vapours of vinegar, and are then dried in the sun. They are of a rich lively green and yellow colour; have a faint unpleasant smell, and a taste slightly acrid. Their acrid matter is extracted both by water and alkohol; and a process has been given by Rubiquet, by which, as he affirms, it can be obtained in a pure and concentrated form. It consists in reducing the aqueous decoction of cantharides to an extract by evaporation, digesting this repeatedly in boiling alkohol, evaporating this spiritous solution to a thick consistence, and digesting this in cold sulphuric ether; after a few days this is poured off from the undissolved residue, and by spontaneous evaporation it affords a matter in soft scales, with a little oil.

The latter is removed by cold alkohol; the former is the acrid vesicating principle pure; the smallest particle of it dissolved in oil, forms a liquor which, applied to the skin, quickly raises a blister.

Cantharides inflame and excoriate the skin, and are hence used as the basis of the common vesicatories. Their active matter appears to have a peculiar determination to the urinary organs, as even from external application strangury is sometimes induced; and a small dose of the cantharides internally administered acts with much violence on the kidneys and bladder, producing inflammation and a discharge of bloody urine. In dropsy, it has been given as a diuretic in a dose of one grain once or twice a-day, continued for some time, but it does not appear to be a safe or manageable diuretic: it has been prescribed in a similar dose in obstinate gleet and leucorrhœa, and in retention of urine arising from debility of the body of the bladder, or in the opposite affection of incontinence of urine. It is principally in the latter of these affections that the internal administration of cantharides is attempted,—where the inability to retain the urine arises from weakness of the sphincter vesicæ, a state which the cantharides by its local stimulant action is adapted to remove. Its action requires to be moderated by the free use of diluents. It has also been employed as a stimulant in amenorrhœa; and it is still more extensively used externally as an epispastic. The tincture is a milder form, and has been given in a dose of 15 or 20 drops; but it has failed in cases where the cantharides in substance have succeeded.

Offic. Prep.—Emp. Mel. Ves. T. Mel. Ves. Ung. Pulv. Mel. V. *Ed. Lond. Dub.*—Emp. Mel. Vesic. Comp. Ung. Inf. Mel. V. *Ed.*—Emp. Calefac. *Dub.*

CHAP. XI.

OF DIAPHORETICS.

Diaphoretics are those medicines which increase the natural exhalation by the skin. When they excite this so copiously as to produce sweat, they are named Sudorifics. The operation of both is the same, differing only in degree; diaphoretics in doses sufficiently large acting as sudorifics, and sudorifics in diminished doses, or under peculiar circumstances, occasioning only a slight diaphoresis. The fluid effused too is in both cases alike, being chiefly the watery part of the blood, with a slight impregnation of saline matter. In the one case it is discharged more slowly, and therefore passes off in the state of vapour; in the other it is discharged copiously from the exhalent vessels in the liquid form.

The operation of these medicines is not obscure; the natural exhalation is merely increased; the action of the exhalent vessels on the surface must therefore have been augmented, and the substances belonging to this class must be those which stimulate these vessels.

Of stimuli of this kind, external heat affords an example; it is directly applied to the vessels, and must occasion in them increased action; hence it often produces sweat, and always promotes the action of sudorifics.

The same effect may be produced by a different operation, —by increasing the general force of the circulation; this propelling the blood into the minute vessels more forcibly acts as a stimulus on the exhalents, and increases their discharge. Hence violent muscular exercise is attended with copious sweating.

In one or other of these modes, the medicines belonging to this class operate,—either by directly stimulating the cutaneous exhalent vessels, or by indirectly communicating to them increased action by increasing the force of the circulation.

The saline diaphoretics seem to act in the former manner; they have little or no action on the vascular system, neither increasing the velocity nor force of the circulation; their action therefore is exerted on the stomach, and thence communicated to the vessels of the skin. Perhaps they may likewise be absorbed into the mass of blood, as they readily pass with the chyle, or enter the absorbent vessels, and may act more directly on the cutaneous vessels.

Those diaphoretics, on the contrary, which are more stimulating, probably act by increasing the force of the vascular system, as they usually augment the force and frequency of the pulse, previous to occasioning sweat.

Diaphoresis is not, however, the necessary consequence of the circulation being increased in force; for it often happens that the pulse is frequent and hard, when the skin remains dry. In this case there seems to exist a constriction of the exhalents, sufficient to resist the impetus of the blood, and whatever can remove this, will favour sweating. Diaphoresis, therefore, it may in general be said, will follow from increased vascular action, when the exhalents of the skin are not morbidly constricted; and it will take place still more copiously when the circulation is increased in the larger vessels, while the exhalents themselves are relaxed. On this view is to be explained the operation of tepid diluents, and of external warmth in promoting sweat, the tendency of both being to increase the force of the circulation, and at the same time occasion relaxation of the cutaneous vessels. From producing the latter effect too, small doses of emetics are favourable to diaphoresis; and, from the same principle, the diaphoretic operation of the combination of opium with ipecacuan, or the preparations of antimony, may perhaps be accounted for; the primary effect of the opium being to increase the action of the vascular system; that of the ipecacuan or antimony, by its nauseating operation, to diminish the action at the surface, as is apparent from the paleness of the skin and the sense of coldness with which nausea is attended. Hence this combination is superior to any other remedy of this class in sudorific power.

The primary effects of diaphoretics are to evacuate the watery part of the blood, and thus lessen the quantity of it in the circulating system; to determine the blood to the surface from the internal parts; to increase the action of the absorbents, and to remove spasmodic stricture of the cutaneous vessels, and render the skin moist and relaxed.

It is doubtful whether the first of these effects takes place to any extent; for, during sweating, there is generally considerable thirst: as much fluid may therefore be taken in, as will supply what is thrown out; and besides, the other fluid secretions, particularly that of urine, are diminished during the operation. It is probable, therefore, that little alteration takes place in the quantity of fluid contained in the body from the action of diaphoretics; and we can scarcely, in any case, ascribe any beneficial effects they produce to this cause.

The last effect is perhaps the most important; at least it is on this principle,—the removing spasmodic stricture of the cutaneous vessels,—that the efficacy of diaphoretics in inflammatory diseases has been explained. In such affections the skin is dry, and the external heat augmented; but when diaphoresis has been induced, that state is removed, and the skin remains moist and cool. It is with the view of producing these effects that diaphoretics are used in synocha, acute rheumatism, and in the various phlegmasiæ.

Several circumstances contributed to lead physicians to the free use of diaphoretics in fevers. The skin is generally dry and hot; and it was often observed, that a spontaneous salutary crisis is marked by diaphoresis, or even by a copious sweat. Hence it was concluded, that by following the path nature pointed out, and inducing this relaxed state of the vessels of the skin, the disease might be removed. Theory too had its influence in carrying this practice to an immoderate extent, fever being supposed to arise from the presence of morbific matter in the system, and sweating being an evacuation by which it was supposed to be discharged. The limits to the practice have long been established; little advantage appears to be derived from it in the treatment of fevers of the typhoid type, and it is principally in the various phlegmasiæ that it is employed; in inflammatory catarrh particularly, and in acute rheumatism.

As evacuating the serous part of the blood, and as promoting absorption, sudorifics have been sometimes employed in the different species of dropsy, especially in anasarca, in which the circulation in the extreme vessels on the surface is more or less languid. Cases occur where it is not easy to increase the discharge by urine, and in these sweating has been had recourse to as less debilitating than purging, the only other evacuation that can be excited with advantage. It has been remarked too, that the operation of diaphoretics, when it has been excited, has been accompanied by an increase in the quantity of urine, a proof of absorption having been promoted. It is difficult, however, to excite sweating in dropsy, and the practice is rarely attempted.

By determining to the surface, and preserving a gentle diaphoresis, the remedies of this class are found serviceable in asthma, dyspepsia, habitual diarrhœa, chronic dysentery, and chronic rheumatism.

In various obstinate cutaneous affections, as herpes and lepra, advantage has been derived from the use of diaphoretics, probably from altering the morbid state of the extreme vessels on the surface. The use of the warm bath, and the antimonial and mercurial diaphoretics, are found more particularly serviceable in such affections.

Several circumstances require to be attended to in the administration of sudorifics. If the disease is inflammatory, the action of the vascular system strong, and the skin dry, with great heat on the surface, those which are of the stimulating kind are to be avoided, as if they fail in producing sweat, they may aggravate the symptoms. The free use of warm diluents is proper and even necessary, under the operation of full sweating. The patient should be covered with flannel, not only as preserving the temperature more uniform, but also as it absorbs the moisture, which would otherwise carry off the heat too rapidly, and cool the surface. The covering ought rather to be light, as there is no necessity for much external warmth. Too much heat, especially when unaccompanied by humidity, sometimes rather prevents sweating, probably by stimulating the exhalent vessels, and increasing their force of resistance. It is promoted by partial fomentation, as the application of flannel dipped in warm water, and pressed out, to the feet. Lastly, care is to be taken to avoid the application of cold, either by the admission of cold air to the surface, or the drinking of cold water while the sweat continues, or for some time after it has ceased. When the sweat is to be checked, it is best done by drying the skin, removing the patient into dry flannel, diminishing the covering, and allowing the hands and arms to be exposed to the air.

The particular diaphoretics may be arranged according to the affinity in their operation, as they operate by increasing the action of the vascular system, or as they act without any sensible stimulant operation, though it is somewhat difficult to trace the distinctions of these, or even with regard to every individual, to assign the kind of action it exerts. The saline diaphoretics act principally in the latter mode; the vegetable diaphoretics in the former.

DIAPHORETICS.

ACETAS AMMONIÆ.
CITRAS AMMONIÆ.
CARBONAS AMMONIÆ.
MURIAS AMMONIÆ.
SUB-MURIAS HYDRARGYRI.
ANTIMONIUM.
SULPHUR.
OPIUM.
CAMPHOR.
GUAIACUM OFFICINALE.
DAPHNE MEZEREUM.
LAURUS SASSAFRAS.
SALVIA OFFICINALIS.

ACETAS AMMONIÆ. Acetate of Ammonia.

ALL the ammoniacal salts are supposed to have a diaphoretic power. The acetate is the one which has been principally used; its solution (Aqua Acetatis Ammoniæ) having been celebrated under the name of Spirit of Mindererus (Spiritus Mindereri) as a diaphoretic in febrile affections. It is prepared, according to the formula of the Pharmacopœias, by neutralizing distilled vinegar, by adding to it carbonate of ammonia, the carbonic acid being disengaged with effervescence, and the acetate of ammonia remaining in solution. Its strength must be various, according to the degree of concentration of the vinegar; but as it is not an active substance, this is not of much importance, especially as it is usually given in divided doses. An ounce is given every hour or two, and its operation is promoted by tepid diluents and the sweating regimen. As it produces no increase of vascular action, it has been supposed well adapted to exhibition in inflammatory fevers, as synocha and acute rheumatism, and it is in such cases that it is usually employed. Its diaphoretic power, however, there is reason to suspect, is not very great; it may be employed with more advantage when its operation is promoted by the addition of small proportions of opium and antimony. Externally it is used as a discutient, and sometimes as an application to inflamed parts.

CITRAS AMMONIÆ. Citrate of Ammonia.

LEMON juice, neutralized by potash, affords a remedy, which has long been employed under the name of Saline Mixture, as a refrigerant in fever. When it is neutralized by ammonia, it is supposed, along with its refrigerant, to have a diaphoretic power. Citric acid being the chief constituent ingredient of the juice of the lemon, this preparation is of course a citrate of ammonia. In the diluted state in which the mixture is prepared, it can have no great power; but its diaphoretic operation is sometimes promoted by the addition of a few drops of tincture of opium and antimonial wine.

CARBONAS AMMONIÆ. Carbonate of Ammonia.

THIS salt is employed either under the solid form, or in a state of solution, for the preparation of both of which formulas are given in the Pharmacopœias. It is obtained in the solid state by sublimation from a mixture of muriate of ammonia and carbonate of lime, the heat applied giving rise to a double decomposition, and the carbonate of ammonia being sublimed. It forms a solid mass, white and efflorescent, which retains the pungent ammoniacal odour, and which, as it also changes the vegetable colours to a green, is rather to be regarded as a sub-carbonate than a carbonate. Its solution (Aqua Carbonatis Ammoniæ) is prepared, according to the formula in the Pharmacopœias, by distilling water from a mixture of muriate of ammonia and sub-carbonate of potash, carbonate of ammonia being formed, sublimed, and dissolved by the water which distils over. Under either form it is used as a stimulant, and sometimes as a sudorific, its dose being 10 or 15 grains of the concrete salt, and from half a drachm to a drachm of the solution. Its operation is promoted by the sweating regimen. As a stimulant, the solution is given in a similar dose in languor or faintness, or with this intention, it is used under the more grateful form of its solution in alkohol, with the addition of some of the more fragrant essential oils, forming the officinal preparation of the aromatic spirit of ammonia. The concrete salt is applied to the nostrils, forming what is named the pungent smelling salt.

MURIAS AMMONIÆ. Muriate of Ammonia. Sal Ammoniacus. Sal Ammoniac.

THIS salt is prepared by various processes, on a large scale, for the purposes to which it is applied in the arts. The ammonia, which is its base, is usually procured by distillation from urine or bones, and is combined with sulphuric acid, so as to form sulphate of ammonia; or sometimes this salt is procured by maceration from the soot of coal used as fuel, in which it exists in greater or less quantity. As obtained in either way, it is mixed with muriate of soda; the two salts are decomposed by double affinity, the sulphuric acid uniting with the soda, the muriatic acid with the ammonia, and the muriate of ammonia is sublimed. It is thus obtained in a solid dense mass, of a striated texture, somewhat ductile and semi-transparent. It is soluble in about three parts of cold water, and may be crystallized from its hot solution. In medical practice it is little employed. It has been supposed, in the dose of one drachm, to act either as a diuretic or diaphoretic, according to the mode in which it is administered; the first effect being obtained when the surface of the body is kept cool; the other when external warmth is applied, with the use of tepid diluents. It is also applied externally as a discutient to indolent tumors, dissolved in distilled vinegar, with sometimes the addition of a little alkohol; and a similar solution is used as an application in some forms of inflammation, to chilblains, and to some cutaneous eruptions. But it has a place in the Pharmacopœias principally as being employed in pharmacy.

Hydrargyri murias mitis. Sub-murias Hydrargyri. Mild Muriate of Mercury. Sub-muriate of Mercury. Calomel. (Page 206.)

This preparation of mercury is sometimes employed to obtain its action on the cutaneous vessels; and in certain diseases, particularly eruptions on the surface, and chronic rheumatism, has been supposed to prove useful by increasing the insensible perspiration. Combined with opium, or with guaiac, it has been supposed to exert a still greater degree of diaphoretic power.

Antimonium. Antimony. (Page 307.)

A sympathy appears to exist between the stomach and the surface of the body, in consequence of which, the state of the one is to a certain extent communicated to the other; the nauseating effect, for example, of emetics being accompanied with diminished action at the surface. This effect is apparently produced by the preparations of antimony; and some of them, particularly the oxide of antimony with phosphate of lime, and the tartrate of antimony and potash, are hence employed as diaphoretics in febrile affections. The former is given in a dose from 3 to 8 grains, repeated every third or fourth hour, until its operation as a sudorific, cathartic, or emetic, is produced; the latter being given in a dose of one-half or one-fourth of a grain in a similar manner. The action of both is aided by warm diluents; the phosphate of antimony and lime, being less liable to excite vomiting, and its action being more general in the system, is to be preferred, wherever the object is to cut short the progress of fever, by obtaining a favourable crisis. Where the intention is merely to determine to the surface so as to produce diaphoresis, the tartrate of antimony and potash, given in divided doses, is more manageable, and is rendered more certain and powerful by combination with opium. The sulphuret of antimony levigated has been employed as a remedy in some cutaneous diseases, and chronic rheumatism; and has been supposed to operate by increasing the insensible perspiration.

SULPHUR. Sulphur. (Page 339.)

SULPHUR, it has already been remarked, passes off by the cutaneous vessels, and with some increase, it has been supposed, of the insensible perspiration. Hence has been explained the advantage sometimes derived from it in habitual dyspnœa, and in chronic catarrh. The solution of it in oil, Oleum Sulphuratum, has been used in the same cases, but is a preparation both acrid and nauseous.

OPIUM. Opium. (Page 139.)

OPIUM, in a large dose, produces sweat, particularly when its operation is promoted by diluents and external warmth. It is difficult, however, to employ it alone as a sudorific, from its narcotic power being necessarily exerted at the same time. But by combination with antimony or ipecacuan, a modification of power is produced, more important perhaps than any other arising from the combination of remedies: the narcotic operation of the opium is in a great measure counteracted, the nauseating effect of the ipecacuan or antimony is also diminished, and we obtain a sudorific more powerful and certain than any other. In the combination with antimony, thirty-five drops of antimonial wine are usually added to twenty-five of tincture of opium. The combination with ipecacuan is still more powerful. It is an officinal preparation (Pulvis Ipecacuanhæ et Opii), and consists of one part of ipecacuan, one of opium, and eight parts of sulphate of potash: these are rubbed together into a fine powder, the sulphate of potash rendering this more easy by dividing the opium, and lessening its tenacity. This has long been celebrated as a sudorific, under the name of Dover's Powder, and is the medicine which is employed where copious sweating is to be induced, as in acute rheumatism, in anasarca, and in every other disease in which this indication is to be fulfilled. Its medium dose is ten grains, given generally in a bolus; its operation is promoted by tepid diluents and external warmth, the patient being confined to bed. If it fail in producing sweat, other five grains may be given at the end of an hour, and sometimes even it is necessary to give a larger dose. When it operates, the sweating is generally profuse, and by the proper management can be kept up for several hours. The power of the combination probably depends on the joint action of the opium and ipecacuan, the former increasing the force of the circulation, the latter, by its action, propagated to the surface of the body, diminishing the resistance in the exhalent vessels, and causing, therefore, the fluid to be more easily and copiously poured out. Such is the effect of this modification, that the combination can be given with safety in pure inflammatory affections, attended with increased vascular action, where the exhibition of opium alone would be attended with hazard.

Camphora. Camphor. (Page 136.)

Camphor has been employed as a diaphoretic in acute rheumatism, in different forms of fever, and in several of the exanthemata, particularly small-pox, in a dose from 5 to 15 grains. Its operation as a sudorific is not sufficiently certain, however, when it is given alone. Sometimes it is combined with nitre, with antimonials, mild muriate of mercury, or opium.

GUAIACUM OFFICINALE. Guaiac. *Decand. Monogyn. Gruinales. Lignum et Gummi-resina. South America and West Indies.*

THE wood of this tree, and a concrete resinous substance obtained by exudation from incisions in its trunk, are the parts of it used in medicine.

The wood is hard and heavy, of a yellowish colour, has little smell, and a slightly warm bitter taste. Its virtues depend on the small portion of resinous matter which it contains. It is rasped for medicinal use: by boiling in water, its virtues appear to be extracted, and it is under the form of decoction, a formula for which is inserted in the Pharmacopœias, that it is always employed.

Guaiac wood was introduced into practice as a remedy in the treatment of lues venerea, and was at one time even considered capable of effecting a radical cure. It has however no such power; but it is employed as an auxiliary, and sometimes with evident advantage, in promoting the action of mercury in the confirmed state of the disease, and in alleviating the various symptoms which arise from a protracted mercurial course. It is likewise occasionally prescribed in cutaneous diseases, in scrofulous affections, and in chronic rheumatism. The dose in which it is given is a quart of the decoction drunk in the course of the day. If taken warm, it produces diaphoresis.

Offic. Prep.—Dec. Guaiac. Off. Comp. *Ed.*

GUAIACUM. Gummi-Resina.

This is obtained by exudation from incisions made in the trunk of the guaiac tree, the juice being inspissated by exposure to the sun. It is also extracted by another process, probably not without some injury, that of placing billets of the wood, bored longitudinally, across a fire; the resinous matter is melted, runs into the internal cavity, and is collected at the extremity. It is friable, of a greenish or greyish colour, variegated when it has been obtained by exudation; it has a resinous lustre, an odour somewhat fragrant, and a warm bitterish taste. It was usually regarded as a gum-resin, but, according to the experiments of Brande, it possesses some peculiar properties, whence it has been regarded as a distinct principle. It is in particular very liable to changes of colour, apparently from the action of oxygen. Its powder is at first of a grey colour, but becomes green from exposure to the air; and when its solution in alkohol is decomposed by acids, the precipitate assumes various tints of colour. When acted on by concentrated nitric acid, it affords oxalic acid; by the diluted acid a product is formed more highly resinous. It is almost entirely soluble in alkohol. Water by digestion on it dissolves a little extractive matter.

Guaiac is a stimulating medicine, proving diaphoretic in a dose of about half a drachm, and purgative in a larger dose. It is a remedy employed in chronic rheumatism, being given so as to excite sweat, or more usually in smaller doses to keep up a gentle diaphoresis. Its sudorific power is promoted by opium or the preparations of antimony. It is given either in substance in the form of bolus, or diffused in water by the medium of mucilage, or in tincture. The tincture of it in spirit of ammonia is more highly stimulating than that in proof-spirit, and is generally preferred.

Offic. Prep.—T. Guajac. T. Guajac. Amm. *Ed. Lond. Dub.*—Mist. Guaiac. *Lond.*

Daphne mezereum. Mezereon. *Octand. Monogyn. Veprecul*æ. *Cortex radicis. Indigenous.*

The bark of the root of this plant is the part of it used in medicine: the entire slender twigs of the root are, however, often found in the shops: its taste when it is chewed for some time is extremely acrid; but this acrimony is somewhat impaired by drying; it is extracted by water and by vinegar.

Mezereon is a stimulating diaphoretic, which has been found of service in chronic rheumatism, and in cutaneous diseases. Its principal medicinal application has been, however, in the treatment of some syphilitic affections; and it has in particular been regarded as efficacious in removing venereal nodes, and thickening of the ligaments and periosteum, and in disposing ulcerations to heal. It is given in the form of decoction; two drachms of the bark, with half an ounce of liquorice root, being boiled in three pounds of water, to two pounds, and 4 or 6 ounces of this decoction being given four times a-day. From its acrimony it is somewhat liable to excite nausea, hence it is often given in a weaker decoction, and combined with guaiac and sarsaparilla. Such a combination forms the Decoctum Sarsaparillæ Compositum, an improved formula for the Lisbon diet drink, a preparation which at one period was highly celebrated in the treatment of these affections.

Offic. Prep.—Dec. Daphn. Mez. *Ed.*

Laurus sassafras. Sassafras. *Enneand. Monogyn. Oleraceæ. Lignum. America.*

This wood has a moderately fragrant smell, and a sweetish aromatic taste. It affords an essential oil by distillation, and yields to water, by infusion or decoction, its flavour, and part of its taste. It is slightly stimulant and diaphoretic. Its infusion has been drunk freely in cutaneous diseases, and in chronic rheumatism; it has even been celebrated for its efficacy in the removal of some of the symptoms of syphilis, and it is frequently added to decoctions of sarsaparilla, guaiac, and mezereon, employed in the treatment of protracted syphilitic affections, probably without communicating any real virtue.

Offic. Prep.—Ol. Laur. Sassaf. *Ed.*

Salvia officinalis. Sage. *Diand. Monogyn. Verticillatæ. Folia. South of Europe.*

The leaves of this shrub have an aromatic smell, and a warm bitterish taste. Its aqueous infusion, drunk warm, has been used to produce sweat, or to promote the action of sudorifics; the aromatic quality of the sage adding something perhaps to the power of the warm diluent.

CHAP. XII.

OF EXPECTORANTS.

Expectorants have been defined, those medicines which facilitate or promote the rejection of mucus, or other fluids, from the lungs and trachea. The theory that has been given of their mode of operation is extremely obscure and hypothetical. It has been supposed, that in certain diseases, a greater quantity of serous fluid is thrown out by the exhalent vessels in the lungs than the absorbents can take up, and that expectorants facilitate the rejection of this fluid. But as expectoration of this kind is a complicated, and partly voluntary operation, dependent on the action of a variety of muscles, it is difficult to perceive how these remedies can produce any such effect. There are only two classes of medicines which seem capable of promoting expectoration in this manner; powerful stimulants, which, when extreme debility is present, may promote it by giving vigour to the voluntary muscles exerted in the operation, and emetics, which, by exciting vomiting, compress the thoracic viscera, and by calling all the neighbouring muscles into strong action, and rendering both expiration and inspiration more forcible, may facilitate the expulsion of matter from the cavity of the lungs. But these exert no specific action, and are therefore not entitled to the appellation of expectorants; nor indeed are they usually considered as such.

If, therefore, by expectorants, are understood substances capable of promoting, by some specific action on the parts concerned, the expulsion of fluid from the lungs, there appears to be no reason to believe in the existence of such remedies.

Dr Cullen, after admitting the difficulty of giving a satisfactory theory on this subject, supposes that the promoting of expectoration by these remedies may be owing to their "increasing the secretion of the liquid, that is, to afford a mucus; this, as it is poured from the arteries into the follicles, being always a thin fluid, it may dilate the mucus in the follicles, and may cause it to be poured out from these in a less viscid state, and thereby render it more easy to be brought up by coughing, that is, to be more freely expectorated."

It is possible that some expectorants may act in this manner; but the action of the different individuals belonging to the class, and especially their action in different diseases, cannot always be explained on this principle. There appear indeed to be several modes of operation, by which certain medicines promote expectoration, and which give them a claim to the title of expectorants.

In the first place, by removing constriction on the exhalent vessels in the lungs, expectoration will appear to be promoted. From this constricted state, the usual quantity of fluid is not thrown out to lubricate these parts: expectoration must of course be more scanty than usual; and if medicines are given capable of removing the constriction, expectoration will become more copious. At the same time, the disease will be at least partially relieved, as that morbid state of the vessels, from which some of its symptoms originate, is removed. It is apparently by such a mode of operation that the promoting of expectoration is of service in pneumonia, inflammatory catarrh, and asthma, the principal diseases in which expectorants are employed.

The remedies by which such an effect is induced, according to this mode of operation, must be principally those belonging to the class of antispasmodics, or those which have the power of inducing nausea, either of these being capable by their action of removing constriction of the exhalent vessels. The antimonial preparations, which are perhaps the most powerful expectorants, appear to operate on this principle. Opium must operate in a similar manner.

It is not possible, however, to explain the effect of all the medicines ranked as expectorants from this mode of operation. On the contrary, some of them seem to act on a very different principle. In certain diseases, as in humoral asthma and catarrhus senilis, there is, from debility of the exhalents, or from deficient action of the absorbents, an increased quantity of fluid in the lungs. Some medicines have been supposed to promote its expectoration: but it is more probable that any relief they afford is by diminishing its quantity. There appear to be certain substances more peculiarly determined to the pulmonary vessels, as their odour is discernible in the air expired. These may stimulate the exhalent vessels through which they pass, and by this stimulus may moderate the effusion of fluid, and thus render the expectoration of the remainder more easy. Any medicine promoting absorption of this effused fluid, will to a certain extent have a similar effect. There is another mode, too, in which the quantity of fluid in the lungs may be diminished, that of determining to the surface of the body, so as to increase the insensible perspiration; and it is probable, that some of the substances which have been used as expectorants, particularly those connected with the class of diaphoretics, owe what virtues they have to this operation.

Expectorants are not, then, to be regarded as medicines which assist the rejection of a fluid already secreted, or which, according to Dr Cullen's opinion, alter its consistence, and render it thin where it is too viscid, by which its expulsion is rendered more easy. They are rather to be considered either as increasing the natural exhalation where it has been deficient, in which case the expectoration that takes place is the consequence of this, and not the cause of any relief that is afforded; or as diminishing the quantity of fluid where it is too copious, either by stimulating the exhalent vessels, increasing the action of the pulmonary absorbents, or determining to the surface of the body, by which diminution the expulsion of the remaining fluid is facilitated. On one or other of these principles we may, with sufficient probability, explain the effects of this class of remedies, and their application to the treatment of diseases.

From this diversity of operation, it is evident that expectorants will prove useful in opposite diseases, and that in some morbid affections advantage may be derived from those belonging to one division, but not from the others.

In pneumonia, where the expectoration is deficient, as this arises not from any deficiency of power to expectorate, but from a diminution of the fluid usually thrown out into the bronchiæ, owing to a constricted state of the exhalent vessels, it is evident that those expectorants which act by removing such a state, will be most useful, while such expectorants as stimulate these vessels would be rather prejudicial. Hence the utility in this case of nauseating doses of tartrate of antimony, or of ipecacuan; and similar advantage may be derived from the use of these remedies in catarrh, and perhaps also in spasmodic asthma. On the contrary, where the effusion of fluids into the bronchiæ is too great, as in humoral asthma, or in the chronic catarrh to which old people are subject, those expectorants which are more directly stimulant, as the different balsams, and several of the gum-resins, as myrrh or ammoniacum, so far as they have any efficacy, or those which promote absorption, as squill or foxglove, will be found more useful. In considering the particular expectorants, they may be arranged as nearly as possible according to these subdivisions.

EXPECTORANTS.

ANTIMONIUM.
IPECACUANHA.
DIGITALIS PURPUREA.
NICOTIANA TABACUM.
SCILLA MARITIMA.
ALLIUM SATIVUM.
POLYGALA SENEGA.
AMMONIACUM.
MYRRHA.
MYLOXYLON PERUIFERUM.
TOLUIFERA BALSAMUM.
STYRAX BENZOIN.
STYRAX OFFICINALE.
AMYRIS GILEADENSIS.

ANTIMONIUM. Antimony. (Page 307.)

ANTIMONY, it has already been remarked, is in use as an expectorant, and probably operates by its power of removing constriction of the exhalents, and thereby favouring the effusion of fluid into the mucous cells of the lungs, when from an inflammatory state this secretion had been suppressed. It of course then apparently causes expectoration. Of the preparations of it which have been employed as expectorants, the principal are the hydro-sulphuretted oxide, and the tartrate of antimony and potash. The first, under the forms of what are named kermes mineral, and precipitated sulphuret of antimony, was at one time celebrated as a remedy in pertussis and in pneumonia, in a dose of from 5 to 10 grains; but being uncertain in its strength, has fallen into disuse. The tartrate of antimony and potash is used in the same cases, and in some cases of asthma and catarrh, in the dose of one-eighth of a grain, repeated every second or third hour. It is also frequently combined with squill and other expectorants, to promote their operation.

IPECACUANHA. Ipecacuan. (Page 320.)

IPECACUAN, operating in the same manner nearly as antimony, has like it been used as an expectorant in a dose of two or three grains. It is, however, less frequently employed. Advantage is sometimes derived from it in this dose continued for some time in chronic asthma.

DIGITALIS PURPUREA. Foxglove. (Page 162.)

DIGITALIS is employed with advantage in humoral asthma, —dyspnœa aquosa, and in catarrhus senilis, obviously from its power of promoting absorption, by which it removes the fluid accumulated in the lungs from diminished action of the absorbents. By diminishing the quantity of this fluid, it facilitates the expectoration of the remainder, and hence appears to act as an expectorant, and it relieves the difficulty of breathing, and the irritation to which this accumulation gives rise. In such cases, it is proper to give it rather in small doses, than to push its operation to any great extent; a grain of the dried leaves, twenty drops of the tincture, or half an ounce of the infusion daily, will be a sufficient dose.

NICOTIANA TABACUM. Tobacco. (Page 167.)

TOBACCO has been celebrated as an expectorant in chronic catarrh and humoral asthma, under the form of the watery extract, the dose of which is two or three grains. Its general action being similar to that of foxglove, it probably operates in these morbid affections on the same principle, though it is much inferior in efficacy.

SCILLA MARITIMA. Squill. (Page 322.)

SQUILL, the history of which has been given as a diuretic, is one of the principal expectorants. It is used more peculiarly in those cases where there is an accumulation of the pulmonary mucus; hence it probably operates by its power of promoting absorption, thereby diminishing the quantity of fluid effused, and thus facilitating the expectoration of the remainder. By stimulating the exhalents of the lungs, where they are in a debilitated state, it may also lessen the secretion where it is too abundant. In inflammatory states of the system, where, from constriction of the pulmonary vessels, the exhalation is diminished, it is less useful; it has even, from its acrimony and stimulating quality, been considered injurious in pneumonia, unless when the state of active inflammation has subsided, or when it is given so as to have its stimulating operation diminished by combination with nitre, or with tartrate of antimony. As an expectorant, it is also used in pertussis, and when the removal of that disease is attempted by exciting vomiting at intervals, it is the emetic usually prescribed. In all these cases it is generally used under the form of the vinegar or the syrup of squill, the dose of the former being half a drachm, of the latter a drachm, repeated every third or fourth hour, with the view of promoting expectoration, or considerably larger when it is intended to produce vomiting. The squill pill is sometimes used in chronic catarrh in a dose of 10 grains daily.

Allium sativum. Garlic. *Hexand. Monogyn. Liliaceæ. Radix. South of Europe.*

The bulbs of the root of this plant have, when recent, a fœtid smell and acrid taste. By being long kept, they become shrivelled and inert. Their taste and smell are extracted by water by infusion; by decoction they are nearly lost. By distillation they afford an essential oil odorous and acrid.

Garlic has a considerable analogy to squill in its qualities and operation: it acts as a diuretic, diaphoretic, and expectorant; hence its use in dropsy, rheumatalgia, and humoral asthma: it has also been employed with some success in the treatment of intermittent fever; and as a stimulant in dyspepsia. Its dose is half a drachm or 2 scruples, swallowed whole, or made into pills with soap. A syrup prepared by digesting it in vinegar, and boiling the liquid with the due proportion of sugar, has been used as an expectorant. Externally, garlic bruised is used as a stimulant and rubefacient: it is applied to the soles of the feet, to relieve coma in fever; its juice is sometimes introduced into the ear in cases of deafness.

Offic. Prep.—Syr. Alii, *Dub.*

POLYGALA SENEGA. Seneka. Rattlesnake-root. *Diadelph. Octand. Lomentac. Radix. North America.*

THIS root is in articulated shoots, of a greyish yellow colour; its taste is bitter and pungent. Its active matter is extracted principally by water with the assistance of heat, and completely by alkohol.

Seneka has been employed as an expectorant in pneumonia, after the highly inflammatory stage of the disease has been subdued, and also in pertussis and chronic catarrh. Its dose in substance is from 10 to 20 grains, but it is generally used in the form of decoction, of which, when prepared according to the formula of the Edinburgh College, an ounce, or an ounce and a half, may be given every second or third hour. As it operates also as a diuretic, it is probable that its efficacy depends on its power of increasing absorption, and hence that it is more adapted to those cases where there is an accumulation of fluid in the bronchiæ, than to affections of an opposite nature. It is however little used.

Offic. Prep.—Dec. Polygal. Seneg. *Ed. Lond.*

AMMONIACUM. Ammoniac. Heracleum Gummiferum. *Pentand. Digyn. Umbellatæ. Gummi-resina.*

THIS gum-resin is brought from Egypt and the East Indies; but the tree which produces it has not been accurately described. Wildenow, however, succeeded in raising, from the seeds often found mixed in the gum-ammoniac of the shops, a vegetable which he has described, and named Heracleum Gummiferum; and the London College have, on his authority, inserted it as the plant which affords ammoniac. It appears that the gum-resin is yielded by exudation. It is in large masses, or, when of the best quality, in small round fragments, yellow on the surface, and white within. It has a faint smell, and a nauseous taste. It is partially soluble in alkohol. Water triturated with it forms a milky-like mixture, from which, on standing, a resinous matter subsides.

Ammoniac is principally employed as an expectorant, and is sometimes prescribed in asthma and chronic catarrh, probably with little benefit. Its dose is from 10 to 20 grains; either given under the form of pill, or diffused in water, and frequently combined with squill or tartrate of antimony. Sometimes, too, it is used as an emmenagogue, usually combined with myrrh, or with preparations of iron. Externally it is applied as a discutient, under the form of plaster, to white swelling of the knee, and to indolent tumors, being beat into a soft mass with vinegar, and spread on leather.

Offic. Prep.—Emp. Amm. Emp. Ammon. cum Hydr. *Lond.*—Mist. Ammon. *Lond. Dub.*

MYRRHA. Myrrh. *Gummi-resina.*

MYRRH is the produce of Arabia and Abyssinia; the plant from which it is obtained has never yet been accurately described. It is in small irregular pieces of a reddish-brown colour, has a smell rather fragrant, and a warm bitter taste. It consists of gum and resin; the latter appearing to constirate its active matter. Alkohol dissolves the resin, and the solution is rendered turbid by the affusion of water. Water boiled on the myrrh dissolves the mucilaginous matter, to which part of the resin adheres, and this evaporated affords the watery extract, which is less active than the myrrh itself.

Myrrh is an expectorant, which has been regarded as too stimulating to be employed in pneumonic inflammation, but which has been often employed in asthma and chronic catarrh, and sometimes in phthisis where there is little tendency to inflammatory action. Its dose is from 10 to 20 grains: and to lessen its stimulating operation, it is not unfrequently combined with nitre, or with super-tartrate of potash. The watery extract, which has been preferred by many physicians to the myrrh itself, and which is a form under which it has been used in phthisis, seems to be an injudicious preparation, as the myrrh is merely weakened in power. Myrrh is also sometimes employed in amenorrhœa, usually combined with iron. Its tincture is in common use as a stimulating application in sponginess of the gums, and sometimes also to foul ulcers.

Offic. Prep.—Tinct. Myrrh. *Ed. Lond. Dub.*

Myroxylon peruiferum. Balsamum Peruvianum. Peruvian Balsam. *Decand. Monogyn. Lomentaceæ. South America.*

This balsam is said to be extracted by boiling the bark and young branches of the tree with water; it has also been affirmed that it is obtained by exudation. It is thick and viscid, of a reddish-brown colour, has a strong smell somewhat fragrant, and a bitter pungent taste. It affords a small portion of essential oil by distillation, and of acid of benzoin by sublimation. Its remaining matter is resinous. It is entirely soluble in alkohol.

Peruvian balsam is considerably stimulant. It has been employed as an expectorant in catarrh and dyspnœa, more particularly in those forms of these diseases where the secretion of pulmonary mucus is increased; and from its stimulating action on the stomach, or from a similar action on the exhalents or absorbents of the lungs, may be attended with some advantage. It has likewise been prescribed as a remedy in paralysis, chronic rheumatism, and leucorrhœa. Its dose is from 5 to 15 grains, and it is best given diffused by mucilage, or made into pills by any vegetable powder. Its tincture has been employed as a stimulating application to foul ulcers.

Offic. Prep.—T. Bals. Per. *Lond.*

TOLUIFERA BALSAMUM. Balsamum Tolutanum. Balsam of Tolu. *Decand. Monogyn. Lomentaceæ. South America.*

TOLU balsam is obtained from incisions in the trunk of the tree; it thickens, and in time becomes concrete, and of a resinous fracture and appearance; it is of a brown colour, has a fragrant odour, and a warm sweetish taste. It dissolves entirely in alkohol, and communicates its odour and taste to water by boiling. It contains a small quantity of acid of benzoin, which is expelled from it by the application of heat.

This is the mildest of all the balsams. It has been used as an expectorant, and its tincture or syrup sometimes enters into the composition of mucilaginous mixtures used in catarrh, but its powers are very inconsiderable, and it is employed principally on account of its flavour.

Offic. Prep.—Syr. Toluif. Bals. *Ed. Lond.*—Tinct. Toluif. B. *Ed. Dub.*

STYRAX BENZOIN. Benzoinum. Benzoin or Benjamin. *Decand. Monogyn. Bicornes. Balsamum. India.*

THE tree which affords the concrete balsam named Benzoin, is a native of Sumatra. It yields it by exudation from incisions which are made in the bark of the stem. Benzoin is in brittle masses, composed of brown and white fragments; its smell is fragrant; it has little taste. It consists almost wholly of resin, and is therefore nearly entirely soluble in alkohol. It likewise contains a considerable portion of that peculiar acid, which, as it exists in greater quantity in it than in any other vegetable matter, is named Benzoic acid. This is obtained from it by sublimation, or by decoction with water, and likewise by boiling it with potash or lime, with either of which it combines, and is afterwards separated by the addition of an acid. It is in white brilliant scales, retains the flavour of the benzoin, and with acidity has likewise a degree of pungency.

Benzoin is rarely employed in medicine. Its acid has been prescribed as an expectorant in asthma, in a dose of 10 or 15 grains; but it is probably a medicine of little power. It enters into the composition of the ammoniated and camphorated tinctures of opium, and is scarcely applied to any other use.

Offic. Prep.—T. Benz. C. *Ed. Lond. Dub.*

STYRAX OFFICINALE. Storax. *Decand. Monogyn. Bicornes. Balsamum. South of Europe, Asia.*

THE resinous juice afforded by the storax-tree, from incisions made in the bark of the stem, is, in the state in which it is imported from the Levant, very impure, from the intermixture of saw-dust, and sometimes of earthy matter. It is in masses soft and slightly unctuous, of a brown colour, with scarcely any resinous lustre or appearance; it retains, however, a strong fragrant odour, and has a bitterish pungent taste. It consists principally of resin, with a small portion of benzoic acid. It resembles benzoin in its virtues; was formerly used as an expectorant, but is now little regarded.

Offic. Prep.—Styrax. Purif. *Lond. Dub.*—Pil. Styrac. *Dub.*

AMYRIS GILEADENSIS. Balsamum Gileadense. Balsam of Gilead. *Octand. Monogyn. Dumosæ. Arabia.*

THIS balsam is obtained from incisions made in the bark of the trunk of the tree; it is in the form of a milky juice, highly fragrant, and is so much valued in the East, that it is said not to be imported into Europe. A coarser kind is obtained by strong decoction of the branches and leaves, of a yellow colour and thick consistence; its taste is warm and bitter; and its flavour is fragrant. What is met with in the shops, under the name of Balsam of Gilead, is a resinous juice having none of these qualities, and probably the produce of a different plant. It seems little superior to the finer kinds of turpentine.

The medicinal virtues of the genuine balsam of Gilead have been very highly extolled, undoubtedly with much exaggeration. Even the inferior balsam, that said to be procured by decoction, is not easily procured, so that it is never used in European practice; but its qualities seem to be similar to those of the balsam of Peru, with more acrimony.

CHAP. XIII.

OF SIALAGOGUES.

Sialagogues are those medicines which increase the salivary discharge. This may be effected either by the mastication of substances, which, by their acrimony and pungency, excite the action of the vessels which secrete the saliva, or by the internal exhibition of certain medicines. Of the latter, mercury is the only sialagogue; and such is the certainty of this operation of it, that all its preparations, when administered in certain quantities, produce salivation to a greater or less extent.

As a class of remedies, sialagogues are of little importance. The sialagogue operation of mercury, it has already been remarked, does not appear essential to its efficacy in any disease, but is regarded merely as a test of the mercury acting on the system. The acrid sialagogues, which are applied locally, by increasing the secretion of saliva, and by their pungency, sometimes relieve the pain of toothach; they have been supposed useful, by the derivation they occasion, in some kinds of headach; and their pungency has been supposed to operate with some advantage in paralysis of the tongue, or of the muscles concerned in deglutition.

SIALAGOGUES.

HYDRARGYRUS.
ANTHEMIS PYRETHRUM.
ARUM MACULATUM.
COCHLEARIA ARMORACIA.
DAPHNE MEZEREUM.
AMOMUM ZINGIBER.
NICOTIANA TABACUM.

HYDRARGYRUS. Quicksilver. (Page 194.)

No satisfactory explanation has been given of the peculiarity which mercury, under every form of preparation, has of exciting the secretion of the saliva. Some have remarked, that in consequence of the gravity of this metal, by which, when received into the circulation, it is disposed to retain the "direct line in which it is propelled from the heart, it is more certainly determined to the vessels of the head," a solution of the difficulty which is altogether absurd. It has likewise been supposed to act by lessening the consistence of the blood, and disposing it to pass more easily into the salivary glands, so as to increase their secretion,—an opinion equally gratuitous and imperfect. Dr Cullen endeavoured to solve the problem, by supposing that mercury has "a particular disposition to unite with ammoniacal salts, and that such salts are disposed to pass off by the salivary glands more copiously than by any other excretion." But mercury has no peculiar tendency of this kind; and if it had, these salts are not more abundant in the saliva, than in some other secretions. If another hypothesis might be hazarded, the following perhaps may afford some explanation of this singular property. The urine appears more peculiarly designed to convey matter which has been received into the circulating mass, but which is excrementitious, from the system. To pass with this fluid, it is necessary that the matter conveyed should be dissolved; and when it is so, we can discover it in the secretion by chemical tests. If there is any property connected with it which shall prevent this solution, this probably will prevent its secretion. Now, the phosphoric acid, which is abundant in urine, must in this mode counteract the secretion of mercury in any form of preparation, by forming with it a compound insoluble, and to which the slight excess of acid cannot communicate solubility. The mercury, therefore, when brought, in the course of the circulation, to the secreting vessels of the kidneys, will not pass through their whole course, but if conveyed so far as to be combined with phosphoric acid, will, from this combination, be incapable of being conveyed onwards, but will be retained in the composition of that part of the blood which does not enter into the secretion, and return into the circulation. It must be discharged by some other emunctory: a portion of it appears to pass off by the insensible perspiration; but the tenuity of this secretion, if the term may be employed, must be unfavourable to this mode of discharge. The salivary secretion is one by which it may be more easily transmitted; and this transmission may even be facilitated by the affinity exerted to the oxide of mercury by the muriatic acid, the soda, and ammonia, which are the chief saline ingredients in saliva; for it deserves to be remarked, that triple compounds of these substances,—a soda-muriate, and ammoniaco-muriate of mercury, are to a certain extent soluble in water. If the mercury is thus secreted, it will of course stimulate the secreting vessels through which it passes, and increase the salivary discharge.

The increase in this discharge, effected by mercury, is attended with pain and a sense of heat in the mouth, with softness and swelling of the gums, or even slight ulceration; sometimes with a considerable degree of swelling, extending over the throat and face. These effects, when excessive, are best checked by the use of opium, of purgatives, of a blister applied to the throat, and, as Mr Pearson has recommended, free exposure to a cool dry air. From theory, the administration of sulphur, or sulphuret of potash, has been recommended.

The remaining Sialagogues act by topical application.

Anthemis pyrethrum. Pellitory of Spain. *Syngenes. Polygam. superfl. Compositæ. Radix. South of Europe.*

This plant is cultivated in this country, but the root found in the shops is generally imported from Spain. Its taste is hot and acrid, its acrimony residing in a resinous principle, which alkohol dissolves, forming a very acrid tincture. It is a remedy which, from stimulating the salivary glands, and exciting a discharge of saliva, is used in toothach, and sometimes gives relief. It has also been chewed in palsy of the muscles of the throat.

Arum maculatum. Wake-Robin. *Gynand. Polyand. Piperitæ. Radix. Indigenous.*

The root of this plant, when recent, is extremely acrid; by drying, its acrimony is much impaired. In chewing it, it impresses at first a sense of sweetishness, but soon afterwards of great acrimony on the tongue; and applied moist to the skin, it inflames or excoriates it. In digesting it with alkohol, or with water, and evaporating either solution, an extract is obtained less acrid than the root itself, the vapour condensed has not much acrimony, and hence the principle in which this property resides appears to be one very easily decomposed. By merely washing the root, too, the acrid matter is removed, and a mild fecula is obtained. Arum resembles pellitory, and may be applied to the same purposes, but its pungency is unpleasant. Internally, it has sometimes been used as a stimulant in palsy and rheumatism.

Cochlearia armoracia. Raphanus Rusticanus. Horse-radish. *Tetradyn. Silic. Siliquosæ. Radix. Indigenous.*

The root of this plant, when recent, has a penetrating taste, with a degree of sweetness. It excites, when chewed, a sense of heat, and a discharge of saliva. Its pungency resides in an essential oil, and is lost by drying. Water and alkohol may be impregnated with it, but it is lost by boiling; and by distillation with water a portion of oil is procured, pungent and acrid.

Horse-radish is a stimulant, which, as a sialagogue, has been used in paralysis of the tongue. It has also been used internally in paralysis and rheumatism as a stimulating diaphoretic, in asthma as an expectorant, and in dropsy as a diuretic. Its dose is about a drachm of the recent root cut in small pieces, and swallowed entire. Externally it has been applied as a rubefacient, and its syrup has been used as a remedy for hoarseness.

Offic. Prep.—Infus. Armorac. Comp. *Lond. Dub.*—Spir. Armorac. Comp. *Lond.*

DAPHNE MEZEREUM. Mezereon. (Page 405.)

THE bark of the root of mezereon has a very considerable degree of acrimony, so that when chewed it impresses a sense of heat and irritation in the mouth and upper part of the throat, and at the same time excites the salivary discharge. A case of paralysis of the muscles of the throat, causing difficulty of swallowing, is related by Withering, in which, from chewing frequently small pieces of the mezereon, a cure was obtained.

AMOMUM ZINGIBER. Ginger. (Page 262.)

GINGER-ROOT, from its pungency, excites, when masticated, a sense of heat and increased discharge of saliva, and is sometimes, like other sialagogues, employed to remove the pain of toothach.

NICOTIANA TABACUM. Tobacco. (Page 167.)

TOBACCO, when chewed, increases the action of the salivary glands, and the same effect is produced in the usual method of smoking it. Partly from this, and partly from its narcotic operation, exerted at the same time to a certain extent, it sometimes relieves, especially in the latter mode of using it, the pain of toothach, or of earach.

CHAP. XIV.

OF ERRHINES.

Errhines or Sternutatories, are substances which occasion a discharge from the nostrils, either of a mucous or serous fluid. They all operate by direct application, and generally in consequence of a slightly acrid quality. Any substance in fine powder snuffed up the nostrils has this effect in a certain degree; but it is, as is to be expected, more copious as the substance is more acrid or stimulating. The discharge, as produced by different errhines, varies in extent, and in the time during which it continues. Some also occasion a sense of heat, or even inflame the membrane to which they are applied, while others have no such effects.

It is evident, that the effects of this class of remedies must be very limited, as applied to the treatment of disease. By the evacuation they occasion, it has been supposed that they diminish the quantity of fluid circulating in the neighbouring vessels; hence they have been inferred to be useful in rheumatic affections of the muscles of these parts, and in toothach. It has even been supposed, that their effects may extend to all the branches of the external carotid, and Dr Cullen mentions, that he has, apparently from this operation, known headach, pain of the ear, and some cases of ophthalmia, cured or relieved by the use of errhines. He has likewise supposed, that they may have been of use in preventing apoplexy or palsy: this at least should, he remarks, be so far attended to, that whenever any approach to these diseases is suspected, the drying up of the mucous discharge should be attended to, and if possible obviated.

ERRHINES.

Iris florentina.
Æsculus hippocastanum.
Origanum majorana.
Lavandula spica.
Rorismarinus officinalis.
Asarum europæum.
Veratrum album.
Nicotiana tabacum.
Euphorbia officinalis.
Sub-sulphas hydrargyri.

Iris florentina. Florentine Orris. *Triand. Monogyn.*—*Ensatæ. Radix. South of Europe.*

The root of this plant, freed from its outer bark, is of a white colour, has a pleasant odour, and slightly bitter taste. It is a mild sternutatory, and enters into the composition of some cephalic snuffs.

Æsculus hippocastanum. Horse-Chesnut. *Heptand. Monogyn. Trihilatæ. Semen. Cortex. North of Asia.*

The fruit of this tree is principally farinaceous; and this farina acts as a sternutatory. The bark is bitter, and has been proposed as a substitute for Peruvian Bark.

Origanum majorana. Sweet Majoram. *Didynam. Gymnosperm. Verticillatæ. Herba. South of Europe.*

The leaves of this herb have an aromatic odour, and, when dried and reduced to powder, a slight errhine power.

Rosmarinus officinalis. Rosemary. *Diand. Monogyn. Verticillatæ. Summitates florentes. South of Europe.*

The flowers and flowering tops of this plant have a fragrant odour, which resides in an essential oil. It is used as a stimulating perfume, under the form of the distilled spirit, and the powder is sometimes mixed with other errhines.

Offic. Prep.—Ol. Ess. Rorism. Spirit. Rorism. *Lond. Dub. Ed.*

Lavandula spica. Lavender. *Didynam. Gymnosperm. Verticillatæ. Spicæ florentes. South of Europe.*

Lavender is cultivated in our gardens. Its flowers have a fragrant smell, and a warm bitterish taste. They yield a quantity of essential oil, which is employed in medicine as a stimulant, when combined with alkohol, and other aromatics, under the form of what is named Compound Spirit of Lavender. The simple spirit or solution of the oil in alkohol is used as a perfume, and the dried leaves in powder are errhine.

Offic. Prep.—Spir. Lavand. T. Lav. C. Ol. Lavand. *Ed. Lond. Dub.*

NICOTIANA. Tobacco. (Page 167.)

THE leaves of tobacco are in common use as an errhine; their powder forming the different kinds of snuff.

ASARUM EUROPÆUM. Asarabacca. *Dodecand. Monogyn. Sarmentaceæ. Folia. Indigenous.*

THIS plant has been already noticed as an emetic, but is now retained in the Pharmacopœias only as an errhine. Its leaves possess rather more errhine power than those hitherto noticed, while they are less acrid than some other substances belonging to this class. They are on the whole therefore best adapted to the purposes which errhines serve, and are hence employed as the basis of the officinal sternutatory powders.

Offic. Prep.—P. Assar. Europ. C. *Ed. Dub.*

VERATRUM ALBUM. Helleborus Albus. White Hellebore. *Polygam. Monœc. Liliaceæ. South of Europe.*

THE root of this plant has a strong disagreeable smell when fresh, which is lost by drying, and an acrid taste which is retained. Snuffed up the nostrils in very small quantity, it excites violent sneezing, with a sense of heat, and a copious discharge of thin mucus. It is therefore sometimes used as a sternutatory, mixed with some of the milder and more fragrant errhines. Taken internally, in the dose of a few grains, it acts as a violent emetic and cathartic. Externally, when mixed with lard, so as to form an ointment, or in the form of decoction, it is used as an application in psora and some other cutaneous diseases.

Offic. Prep.—T. Verat. A. *Ed.*—Dec. Verat. Ungt. Verat. *Lond.*—Ung. Helleb. A. *Dub.*

EUPHORBIA OFFICINALIS. *Dodecand. Trigynia. Gummi-resina. Africa.*

THIS substance, which is of a resinous nature, is said to be obtained by exudation from incisions in the branches of the plant producing it, which is a native of different countries of Africa: it is usually imported from Barbary. It is in small round fragments, having scarcely any smell, but a very acrimonious taste. Its operation as a drastic purgative is so violent, that it is never given internally. Its powder is the most violent of all the errhines, occasioning a copious discharge of mucus, with a sense of heat, and sometimes hæmorrhage or inflammation. Hence it is scarcely ever employed. Externally it is used as a rubefacient or vesicatory.

SUB-SULPHAS HYDRARGYRI. Sub-Sulphate of Mercury.

THIS preparation of mercury is an errhine, and has been employed in chronic ophthalmia and amaurosis; one grain of it being mixed with a few grains of any mild vegetable powder, and snuffed up the nostrils occasionally.

CHAP. XV.

RUBEFACIENTS AND EPISPASTICS.

Rubefacients and Epispastics operate nearly on the same principle, and produce similar effects, differing only in degree. They may therefore be considered as subdivisions of one class.

The term Epispastic has been applied to whatever application has the power of producing a serous or puriform discharge, by exciting a previous state of inflammation or suppuration. The term includes blisters, issues, and setons; but it is more commonly restricted to the first of these, and it is this which chiefly falls under the department of Materia Medica.

Blisters are those external applications which by their acrimony excite inflammation on the skin, and which, occasioning a thin serous fluid to be poured from the exhalents, separate the cuticle from the true skin, and form the appearance of a vesicle or blister.

The mode in which they produce this effect is sufficiently evident; it is to be referred to the stimulating power of the substances applied, which exciting increased action in the extreme blood-vessels, induces inflammation, and causes the pouring out of the serous fluid with which the vesicle is filled. Hence may be deduced the primary effects of these applications on the general system. By the increased action they excite, and the pain they occasion, they act as stimulants, and they may also act, it has been supposed, as evacuants, by the quantity of fluid which they cause to be poured out.

There can be little dispute by which of these modes of operation blisters are used with advantage in the treatment of diseases. The quantity of fluid discharged is so inconsiderable, while the relief obtained is often so sudden and complete, that it would be assigning a very inadequate cause for their effects, if we should ascribe these to any evacuating power.

Some have imagined that the substance of cantharides, which forms the basis of the common blistering applications, is absorbed in part by the inflamed surface, and that it is to the peculiar action of this acrid matter stimulating the system, that many of the effects of blisters are owing. But there is no proof, nor indeed any reason to believe, that this absorption is uniform or frequent; the same effects are obtained from blistering applications into the composition of which cantharides do not enter, while they are not obtained from the internal administration of cantharides. The effects of blisters are therefore to be ascribed to the pain and inflammation they excite in the part to which they are applied, and the stimulus which is thence propagated to the general system.

It is a principle with regard to the living body, demonstrated by many facts, that where a morbid action exists, it may be often removed by inducing a different action, even of a morbid kind, in the same part, or in parts as contiguous to it as possible; and where the morbid action extends to the whole system, it may be removed by one of a different kind being excited either generally, or in any particular part of the body.

From this principle is explained the efficacy of blisters in all cases of inflammation and of spasmodic constriction; a new inflammation being excited by the blister which occasions derivation of action. Hence, too, the advantage obtained is greater when the blister is applied as near as possible to the part affected. This principle regulates the application of blisters in pneumonia, hepatitis, phrenitis, angina, ophthalmia, rheumatism, and every other case of active inflammation. In these affections, blisters are used with very evident advantage; the local inflammation which is excited more than counterbalancing, by this operation, the stimulant effects at the same time produced.

A similar principle exists with respect to the pain excited by blisters, which may be applied to the explanation of the advantages derived from them in other diseases. It has long been remarked, that exciting one pain often relieves another, and hence blisters afford relief in toothach, and other painful affections. Epilepsy and hysteria arising from irritation have been removed by blisters; apparently from their exciting pain, engaging the attention, and diminishing the sensibility to the morbid irritation.

Lastly, blisters exert a stimulant operation on the general system, and raise the vigour of the circulation. Hence their utility in fevers of the typhoid kind, where extreme debility prevails. From their peculiar operation too, they are the only remedy that can be used to obviate the local inflammation of the brain, or other parts, that sometimes exists in fevers of this kind, as they contribute to resolve it without reducing the strength of the system.

It is also from their stimulating power, and perhaps from exciting pain, that blisters are of advantage in apoplexy and paralysis.

RUBEFACIENTS operate precisely in the same manner as blisters; they excite pain and inflammation, but only in an inferior degree; the skin merely is inflamed, and no vesicle raised so that any fluid shall be discharged. By these effects they more peculiarly obviate local inflammation. They are used, therefore, for the same purposes.

EPISPASTICS AND RUBEFACIENTS.

MELOE VESICATORIUS.
SINAPIS ALBA.
ALLIUM SATIVUM.
EUPHORBIUM.
PIX BURGUNDICA.
ELEMI.
AMMONIA.

CANTHARIDES. Meloe Vesicatorius. Lytta Vesicatoria.

THE natural history of this substance has been given under the class of Diuretics, to which it belongs. It is, however, a more important article of the Materia Medica as an epispastic, and is the substance, indeed, which is now almost exclusively employed to raise a blister, as it acts with certainty, and is not liable to induce that deep-seated ulceration which sometimes follows the application of other acrid substances that have been used for the same purpose. The cantharides in powder is mixed with lard and wax, so as to form a plaster of a proper consistence, which is applied to the part, generally for 10 or 12 hours: at the end of that time, the cuticle is raised, forming a vesicle; this is then cut, to allow the serous fluid to be discharged, and the inflamed part is dressed with any mild ointment. The principal circumstance which requires caution in the application of the cantharides plaster, is that determination of action to the neck of the bladder which gives rise to strangury. This is more peculiarly liable to occur where the system is uncommonly irritable, where the blister is large, or where it is applied to a newly abraded surface, as to the head recently shaved; and as it is a very painful affection, not easily removed, care ought to be taken to guard against it. Camphor has been sometimes added to the blistering plaster, with the view of obviating this. But it is doubtful if it has any such effect: the plentiful use of diluents, while the blister is applied, prevents it much more certainly; and it is always proper when a blister is applied, especially if large, or in inflammatory diseases, to order the patient to drink freely of any mild diluent liquor. Where the strangury does occur from the application of a blister, it is best relieved by an enema of tepid water, with a little expressed oil, and 30 or 40 drops of tincture of opium, and by the use of the warm bath, or warm fomentations.

In some diseases, as in apoplexy, it is of importance to be certain of the operation of an epispastic, and to have its effect produced in a short time. To attain these, a compound plaster is ordered by the Edinburgh College, Emplast. Meloes Vesicat. Comp. in which the stimulating power of the cantharides is increased by the addition of other acrid substances, burgundy pitch, turpentine, verdigrease, mustard, and pepper. In the application of this still more caution is necessary to guard against the occurrence of strangury.

After a blister has been raised, it is often of advantage to convert the serous discharge into one of a purulent nature, by exciting suppuration, or to form what is termed an Issue: this can easily be effected by the application of any acrid stimulating ointment; one composed of wax and oil, with a small proportion of cantharides, is commonly used for this purpose, as by the irritation it excites, it keeps up the inflammation, and at length produces suppuration. Any foreign body retained on the inflamed part answers the same purpose. What are named Orange Peas, the small unripe fruit of the orange, polished, are usually employed, as by their odour they cover the fœtor of the discharge. One of these is retained on the blistered part by a slip of adhesive plaster, and by the irritation it occasions, keeps up a constant discharge. A seton, or cord introduced by a needle, answers the same purpose. When a puriform discharge is thus established in a part, considerable effects arise from the morbid action which it continues, and the evacuation it occasions. It is a practice often employed with advantage in asthma, paralysis, and a number of chronic affections.

Sinapis. Mustard. (See page 323.)—The flour of mustard-seed, mixed with an equal part of wheat-flour or crumbs of bread, and made into a paste with vinegar, forms what is named a Sinapism, an application which acts as a powerful rubefacient. It is applied to the soles of the feet in typhoid fevers, where there is extreme debility, or determination to the head. It is used in the same manner in comatose affections; the application of it in either case being continued for an hour or two. It soon excites a sense of pain, and if applied long produces inflammation.

Offic. Prep.—Catap. Sinapeos. *Lond. Dub.*

Allium. Garlic. (See p. 414.)—The bruised root of this plant, applied to the soles of the feet, produces effects similar to those of the sinapism, and is used for the same purpose. It is less powerful, and its odour is ungrateful.

Euphorbium. Euphorbia Officinalis. (Page 431.)

This resinous substance, already considered as an errhine, is a powerful vesicatory. It enters into the epispastic compositions of the farrier, and might be employed, mixed with other epispastics, when it is of importance to obtain the effects of a blister in their full extent, speedily and with certainty. As a rubefacient, it has the advantage over cantharides, that from its fusibility, it can be diffused uniformly through the resinous matter which forms the composition of plasters, while cantharides can only be mixed in powder. The action of a rubefacient plaster prepared with it is therefore more equal. Twelve parts of burgundy pitch or of litharge plaster with resin, with one of euphorbium, forms an excellent rubefacient of this kind.

Pix Burgundica. Burgundy Pitch. Resina Pini Abietis. Pinus Abies. *Monœcia Monadelph. Coniferæ.*

This substance is obtained by exudation from incisions made in the trunk of the tree. It is boiled with water; is strained; and when cold forms a concrete resinous matter, retaining a little essential oil. As a rubefacient, it is spread upon leather, and applied to the skin: it excites a slight degree of inflammation, and an exudation of serous fluid, without separating the cuticle, so as to produce a blister. Hence it is less painful in its operation, and the application of it can be continued for a considerable time. It is used with advantage in catarrh, pertussis and dyspnœa.

Offic. Prep.—Emp. Pic. Burg. *Dub.*

Elemi. Amyris Elemifera. *Octand. Monogyn.*

This resinous substance is obtained by exudation from incisions which are made in the bark of the tree. It is in large masses of a greenish colour, has an odour slightly fragrant, and a warm bitterish taste. It consists of resin with essential oil. It is used to promote the purulent discharge from an issue, and as a stimulating application to foul ulcers, under the form of an ointment which is officinal in the London and Dublin Pharmacopœias.

Offic. Prep.—Ungent. Elemi. Compos. *Lond. Dub.*

Ammonia. Ammonia. (Page 319.)

The solution of ammonia in water of the usual strength, (Aq. Ammoniæ), applied to the skin, acts as a rubefacient. The common form under which it has been employed, is mixed with two or three parts of expressed oil, with which it forms a thick saponaceous compound, (Oleum Ammoniatum), formerly known by the name of Volatile Liniment. A piece of flannel moistened with this, and applied to the skin, soon excites superficial inflammation. It is often employed instead of a blister to the throat, in angina tonsillaris, being less painful, yet frequently effectual. It is also sometimes applied by friction to relieve the pain of rheumatism.

Offic. Prep.—Ol. Ammon. *Ed. Dub.*

THIRD DIVISION.—OF CHEMICAL REMEDIES.

UNDER this division are comprised those few classes of medicines, the operation of which either depends on the chemical changes they produce, or is materially modified by these changes. I have placed under it the classes of Refrigerants, Antacids, Lithontriptics, and Escharotics.

CHAP. XVI.

OF REFRIGERANTS.

THE substances arranged by authors on the Materia Medica under the appellation of Refrigerants, have been defined, Such medicines as directly diminish the force of the circulation, and reduce the heat of the body, without occasioning any diminution of sensibility or nervous energy. The theory delivered of their operation is unsatisfactory and obscure; nor are even the facts adduced to establish the existence of such a class of remedies altogether precise. It is acknowledged by Cullen, that "in many trials made on purpose, it did not appear that the supposed refrigerants diminished that temperature of the body, which is the ordinary temperature of it in health." He concludes, therefore, that the definition should apply only to the reduction of the temperature when it has been morbidly increased; and even in this case the effect of these medicines is allowed by practical writers not to be considerable.

It is not necessary to review the opinions that have been advanced on the mode of operation of these substances; they are in general absurd and unintelligible. Dr Cullen, in particular, gives an explanation on this subject, founded on the most obscure and hypothetical ideas, and which, indeed, it is scarcely possible to understand. Its basis, he remarks, is a doctrine delivered by Needham, "that there is every where in nature an expansive force and a resisting power; and that, particularly under a certain degree of heat, the expansive power appears in all the parts of organized bodies, in consequence of which they shew a singular vegetating power; while, at the same time, in other bodies there is a power resisting and preventing the action of this vegetating power, and at least of diminishing its force." This power, it is added, is found in those saline substances commonly supposed to be refrigerants; and "as an increase of heat is no other than an increase of the expansive force in the heated parts, it may be understood, how resisting powers may diminish any preternatural expansive force and heat in our bodies."

The discoveries of Modern Chemistry furnish some facts, which may perhaps be applied to this subject; and indeed it is only to those discoveries which establish the source of animal temperature, that we are to look for an explanation of the changes to which it is subject.

It is established by experiment, that the consumption of oxygen in the lungs is materially influenced by the nature of the ingesta received into the stomach. When the food and drink are composed of substances which contain a small proportion of oxygen, the consumption of oxygen is increased, and this even in a short time after the aliment has been received. Thus Mr Spalding, the celebrated diver, observed, that when he used a diet of animal food, or drunk spiritous liquors, he consumed in a much shorter time the oxygen of the atmospheric air in his diving-bell; and therefore he had learned from experience to confine himself to a vegetable diet, and water for drink, when following his profession. During digestion too, it was established by the experiments of Lavoisier and Seguin, that a larger proportion of oxygen than usual is consumed.

The animal temperature is derived from the consumption of oxygen gas by respiration; and an increase in that consumption will occasion a greater evolution of caloric in the system, and consequently an increase of temperature in the body, while a diminution in the consumption of oxygen will have an opposite effect. If, then, when the temperature of the body is morbidly increased, we introduce into the stomach substances containing a large proportion of oxygen, especially in a loose state of combination, we may succeed in reducing the general temperature. This we accomplish in part by a vegetable diet, but still more effectually by the free use of *acids*. The vegetable acids in particular, which by experience are found to be the best refrigerants, are readily acted on by the digestive powers, and assimilated with the food. And as the large quantity of oxygen they contain is already in a concrete state, little sensible heat can be produced by the combination of that element with the other principles of the food. The nutritious matter which is received into the blood, containing thus a larger proportion of oxygen than usual, will be disposed to abstract less of it from the air in the lungs, and consequently less caloric will be evolved. The temperature of the body will be reduced, and this again operating as a reduction of stimulus, will lessen the number and force of the contractions of the heart.

It might be supposed, that any effect of this kind must be very trivial; and it actually is so; for we find in practice that refrigerants produce no sudden or great change. They operate slowly, and have little other effect than moderating the morbidly increased temperature. The whole of their effects, as Dr Cullen remarks, are so slowly produced, as not to be very evident to our senses, nor easily subjected to experiment, being found only in consequence of frequent repetition.

This is probably the action of acids. The other refrigerants, the neutral salts, perhaps act in a similar manner; the acid they contain may yield oxygen, but they are still less effectual than acids, and their refrigerant power is even problematical, except in so far as they operate on a principle different from that which has been pointed out,—the power they have of producing in the stomach a sensation of cold. If a draught of cold water be swallowed, the sensation of cold it produces in the stomach is equivalent to a partial abstraction of stimulus, which being extended by sympathy to the heart, occasions a transient reduction in the force of the circulation, and by this, or by a similar sympathetic affection, causes a sensation of cold over the body. Nitre is an example perhaps of a refrigerant acting in this manner. It excites a sensation of cold in the stomach even when taken dissolved, and still more in the solid state; and this is quickly followed by a reduction in the number and force of the pulsations. Hence nitre acts more suddenly than any of the other refrigerants, and is more transient in its operation. It may also, however, operate in some degree more permanently, in the same manner as the vegetable acids; as it is probable that nitre, from the florid colour which it gives to blood, parts with oxygen readily.

It is evident that the indication to be fulfilled in the treatment of disease by the use of refrigerants, is the reduction of the morbidly increased temperature. Hence the propriety of their administration in synocha and other pure inflammatory diseases, and in typhus fever; in both of which the temperature of the body is increased, though from different causes. In inflammatory diseases, the circulation being so much more rapid than usual, a greater quantity of blood is sent both through the whole body and through the lungs in a given time; and the usual alterations of the blood taking place, the evolution of caloric, which is the consequence of these alterations, must be increased, and the temperature raised. In such cases, the use of acids, by lessening the disposition of the blood to consume oxygen in the lungs, may be useful in reducing the temperature; and nitre may be of advantage, as it diminishes the force of the contractions of the heart; but these means, it is evident, can have only a trivial effect, compared with those direct evacuations by which the force of the circulation is lessened.

The increased temperature in typhus fever cannot be ascribed to the same cause, but seems rather owing to the absorption of the animal solids, which, containing comparatively little oxygen, cause the blood to consume more of it in the lungs. The introduction of acids into the system, by affording this element in a concrete state to that matter, will lessen the consumption of it in respiration, and will of course moderate the morbidly increased temperature. In either of these forms of disease, therefore, refrigerants may be useful, and accordingly we find them very generally used in all the species of febrile affection; though they are still to be regarded as medicines of weak power.

REFRIGERANTS.

CITRUS MEDICA.
CITRUS AURANTIUM.
TAMARINDUS INDICA.
OXALIS ACETOSELLA.
ACETUM.
SUPER-TARTRAS POTASSÆ.
NITRAS POTASSÆ.
BORAS SODÆ.

ALL Acids are supposed to be Refrigerants; but the vegetable acids are allowed to possess this power in a more eminent degree,—a superiority which, according to the preceding view, must be founded on their being more easy of assimilation, and of being acted on by the chemical processes of the living system.

The native vegetable acids are found chiefly in the fruits of vegetables. The sour juice of these fruits consists of the Citric or Malic Acid, or more frequently of a mixture of both, sometimes with the addition of tartaric acid. The citric acid is that which is most largely employed, as it forms the acid juice of the orange and lemon, the two acid fruits in common medicinal use.

Citrus medica. Lemonum. Lemon. (Page 254.) *Succus fructus. Acidum concretum.*

The juice of the fruit of the lemon consists almost entirely of citric acid, diluted with a portion of saccharine and mucilaginous or gelatinous matter. As the fruit cannot always be procured, various methods have been employed to preserve the juice. The most effectual is to add to it when newly expressed a portion of alkohol, and to put it aside until the mucilaginous matter is deposited, then by a moderate heat to evaporate the alkohol, and preserve the acid in bottles carefully closed. Even as prepared in this method, however, the juice is liable to chemical change.

By a different process, the citric acid can be procured pure and in a crystallized state. To the expressed lemon juice gently heated, carbonate of lime is added so as to neutralize it; citrate of lime is formed, and being insoluble is precipitated; it is washed with water to carry off the extractive and mucilaginous matter, and is then submitted to the action of sulphuric acid; which, when digested or boiled on it for a short time, combines with the lime, and disengages the citric acid; and by evaporation and cooling, this is obtained in a crystallized form. This process was originally given by Scheele, and it has been received into the London Pharmacopœia.

Lemon juice may be regarded as the principal refrigerant; it is preferable to all the other acids, being more mild and grateful, and deriving perhaps some advantage from being more easily assimilated. It is therefore used for the general purposes of refrigerants,—to cool and quench thirst in febrile affections. A grateful beverage is formed from it, diluted largely with water, and sweetened a little with sugar: or the fruit sliced down is added to any mild diluent. A preparation from it, which is used as a refrigerant in fever, is what is named the Saline Mixture, formed by neutralizing lemon juice by the addition of a sufficient quantity of carbonate of potash, adding to this water, with a little sugar and a small portion of any distilled water. Of this mixture, a table-spoonful is taken occasionally; it is grateful, but cannot be considered as possessed of much power, any refrigerant quality which may belong to the acid being probably lost by its neutralization.

Another form under which lemon juice is used in fever, principally with the view of relieving nausea or checking vomiting, is that of the Effervescing Draught, as it has been named. A solution of carbonate of potash, and diluted lemon juice are mingled together, and while in the act of effervescence, the mixture is swallowed. The efficacy of it is probably dependent on the pungency and stimulant operation of the carbonic acid, but it affords a grateful form under which this can be administered.

The juice of the lemon, and indeed the citric acid, as it exists in any vegetable fruit, has been long known as nearly an infallible remedy in scurvy. A theory of its operation in removing this disease has been given, founded on its chemical agency, and particularly on the supposition that it imparts oxygen to the system, which is not without probability. In some forms of urinary calculus it affords relief.

Lemon juice was employed as a remedy in syphilis, at the time nitric acid received a trial, and cases were given in which it proved successful. These are doubtful, and it has never been established in practice.

The crystallized citric acid may be supposed to have the same power as the native lemon juice. This, however, is somewhat uncertain, especially with regard to the treatment of scurvy, the disease in which the medicinal efficacy of this acid is most important. It is also deprived of the agreeable flavour of the lemon juice, and is hence even a less grateful refrigerant in fever. The flavour may be communicated to it, however, to a certain extent, by infusing a little of the rind of the lemon in the water in which it is dissolved. It is used medicinally, principally in forming the effervescing draught, its solution being added to the solution of carbonate of potash. One ounce of it, dissolved in a pint of water, is said, by Dr Powell, to be equal in strength to one pint of common lemon juice.

CITRUS AURANTIUM. The Orange. *Succus fructus.* (Page 253.)

THE juice of the orange has a certain degree of sourness, accompanied in the variety named the China Orange, when ripe, with a sweetness; in that named the Seville Orange, with slight bitterness; and this sourness appears to depend on citric acid. The former is used as a refrigerant in febrile affections, more grateful, but less powerful than the fruit of the lemon. It is also used as a remedy in scurvy.

TAMARINDUS INDICA. Tamarind. (Page 337.)

THE fruit of the tamarind contains an acid pulp, which is preserved by the addition of a quantity of unrefined sugar, this forming the Tamarinds of the shops. The acid is principally the citric, sixteen ounces of the prepared pulp containing, according to Vauquelin's analysis, an ounce and a half of citric acid, half an ounce of super-tartrate of potash, two drachms of tartaric acid, and half a drachm of malic acid. This pulp forms a grateful refrigerant beverage, a little of it being infused in tepid water, which is often taken in febrile affections.

OXALIS ACETOSELLA. Wood Sorrel. *Decand. Pentagyn. Gruinal. Folia. Indigenous.*

THE leaves of this plant have a very sensible sourness, and by expression they afford a juice strongly acid. Its acidity is owing to the presence of oxalic acid, combined with potash, the acid being in excess; and this salt,—the super-oxalate of potash, is sometimes extracted from it, and purified by crystallization. It forms the Salt of Lemons of the shops. The leaves of sorrel have sometimes been used from their acidity as refrigerant, under the form of the whey obtained by boiling them in milk. They have also been employed with advantage, in their recent state, as a stimulating application to scrofulous ulcers.

ACETUM. Vinegar. Acidum Aceticum Dilutum.

VINEGAR is a weak acid, formed by that species of fermentation which succeeds to the vinous fermentation, when the fermented liquor is submitted to the due degree of temperature. The temperature which is most favourable, is between 60° and 70°; the presence of a portion of the yeast formed during the vinous fermentation promotes the process, and the air must not be excluded. The spiritous flavour and pungency, and intoxicating quality of the fermented liquor, are lost, and it becomes more or less sour. While this state of fermentation, denominated the Acetous, proceeds, the oxygen of the air is absorbed; according to the experiments of Saussure, carbonic acid is also formed; and the formation of the acid appears therefore to be owing to these changes of composition in the principles peculiar to the vinous fermented liquor. The product differs according to the kind of fermented liquor from which it has been obtained. In general it is more acid as this has been more spiritous. Vinegar from wine, therefore, is strongest, and its odour too is more grateful. It is obtained of inferior quality, both with regard to purity and strength, from fermented malt liquors, or from a solution of sugar, in which fermentation is excited by yeast.

Vinegar when fully fermented is limpid, of a yellowish colour, has an odour which is agreeable and somewhat pungent, and a sour taste. The acid existing in it is very largely diluted with water, and there are also present portions of gluten, mucilage, and extractive matter, and frequently malic and tartaric acids. The presence of the vegetable gluten renders it peculiarly liable to that kind of decomposition whence it becomes mouldy on the surface; and hence the rationale of the process by which this may be counteracted, and vinegar preserved,—that of boiling it gently for a few minutes,—the gluten being separated by coagulation.

It is freed from its impurities by distillation, the process for which has a place in the pharmacopœias. The distilled vinegar is colourless, but its odour is less grateful than that of common vinegar. It is however purer, and is not liable to spontaneous decomposition; hence it is preferable for the preparation of medicated vinegars, and for other purposes in pharmacy.

The acid which is the basis of vinegar, the Acetic as it is named, can be obtained in a concentrated state by various methods, principally by the decomposition of its saline combinations; and processes of this kind are now received into the pharmacopœias. As obtained from the metallic acetates by heat, it is extremely strong and pungent; and at one time, the acid thus procured was supposed to differ in composition from that obtained by other methods, and was distinguished by the appellation of Acetic, while the other was named Acetous Acid. It has been established, however, that they differ only in the degree of concentration, and the name Acetic is applied to the acid in all its states. When concentrated it is highly odorous and pungent, and is used principally as a stimulating perfume.

Common vinegar is sometimes employed as a refrigerant in febrile affections, being added to any common diluent. It is also much celebrated as an antidote to the vegetable narcotics, being swallowed in large draughts. Externally, it is used as an application to burns, and as a discutient. Its odour is grateful when it is sprinkled on the floor of the chamber of the sick in typhoid fevers, though it is not possessed of the virtue which has been ascribed to it, of neutralizing noxious or contagious effluvia. In pharmacy, distilled vinegar is employed as the solvent of the active matter of several vegetable substances.

Offic. Prep.—Acid. Acet. Dist. Acid. Acet. Arom. Acid. Acet. Camph. Syr. Acid. Acet. *Ed. Lond. Dub.*

SUPER-TARTRAS POTASSÆ. Super-Tartrate of Potash.

FROM the excess of acid which this salt contains, it possesses the virtues of a refrigerant. A solution of it in a large quantity of water, sweetened with sugar, and receiving flavour from the infusion of a small quantity of the rind of lemon, forms a cooling beverage, used in febrile affections, and recommended, especially in hospital practice, by its cheapness. Its only disadvantage is its being liable to prove purgative.

NITRAS POTASSÆ. Nitrate of Potash. Nitre. (Page 374.)

THIS salt impresses a sense of coolness in the mouth, and when taken in small doses frequently repeated, appears to have the effect of reducing the force of the circulation. It is hence sometimes used as a refrigerant in inflammatory diseases, particularly in acute rheumatism, and in hæmoptysis. It is given in a dose of from 5 to 15 grains repeated every four or five hours. When given in larger doses, it occasions nausea, and pain of the stomach. It is often used as a refrigerant, under the form of gargle, in the different species of cynanche, one drachm being dissolved in six or eight ounces of water: or the nitre troches are allowed to dissolve slowly in the mouth.

Offic. Prep.—Troch. Nitr. Pot. *Ed.*

Sub-boras sodæ. Sub-Borate of Soda. Borax.

This salt consists of boracic acid, united with soda, the soda being slightly in excess; it is brought from Thibet, where it is found in a native state, being dug from a lake in which it is spontaneously deposited. It is impure, but is purified in Europe by crystallization, and is usually in the form of crystalline masses of no regular figure; its taste is cool; it is soluble in eighteen parts of cold, and six of hot water.

Borax is not used internally in modern practice, nor does it appear to possess any activity. Its solution is in common use as a cooling gargle, to relieve the sense of heat in the mouth which attends salivation; and mixed with an equal part of sugar, it is used in the form of powder to remove the aphthous crust from the tongue in children. Mixed with honey, it forms an officinal preparation in the London Pharmacopœia, applied to the same purpose.

Offic. Prep.—Mel. Boracis. *Lond.*

CHAP. XVII.

OF ANTACIDS.

THESE are remedies which obviate acidity in the stomach, by combining with the acid and neutralizing it. The substances most powerful in exerting this kind of action, and which can be employed, are the alkalis, and among the earths magnesia and lime. They are all used both in their pure state and in that of carbonate, the carbonic acid being easily disengaged by the acid in the stomach, and the base therefore exerting its neutralizing power. They can be regarded only as palliatives, the production of the acid being to be prevented by the administration of remedies capable of restoring the tone of the stomach. They are employed in dyspepsia, and in diarrhœa arising from acidity. The principal distinction among them is, that some, such as magnesia, form with the acid in the stomach a salt having a purgative effect; others, as lime, a salt apparently inert.

ANTACIDS.

Potassa.
Soda.
Ammonia.
Calx.
Magnesia.

Potassa. Potash. (Page 21. 372.)

This alkali, the chemical characters of which have been already noticed, is obtained from the incineration of the woody parts of vegetables. The ashes are lixiviated, and by evaporation the saline matter, consisting chiefly of sub-carbonate of potash, is procured. This forms the potash of commerce; it is purified by a second solution in water and evaporation; and to procure the alkali, lime is added to the solution of this sub-carbonate: the whole is put upon a filtre, so that the alkaline solution may pass slowly through the mass of lime; the carbonic acid is abstracted by the lime, and the potash passes through in solution, sufficiently pure for any medicinal application. This solution (Aq. Potassæ) is sometimes employed to relieve the symptoms from acidity, where the generation of acid is constant and abundant, being given in a dose of 15 drops diluted in water. Its acrimony renders it, however, an unpleasant remedy. The sub-carbonate is occasionally employed in solution, and the crystallized neutral carbonate, being more mild, has been introduced as a substitute, and has a place in the London Pharmacopœia. It is still more frequently used as an antacid, under the form of the super-carbonate, (Aq. Super-carbonatis Potassæ), prepared according to a formula inserted in the Edinburgh Pharmacopœia, in which an ounce of sub-carbonate of potash is dissolved in ten pounds of water, and this is combined under a moderate pressure, with an excess of carbonic acid. By this impregnation, the acrid alkaline taste is concealed, and an agreeable pungency communicated. The liquor is taken as an antacid, in the dose of half a pound occasionally; and proves useful in relieving the symptoms connected with acidity in the stomach, not only by the chemical agency of the alkali, but also by the grateful stimulus of the carbonic acid.

Soda. Soda.

This alkali is obtained in the state of carbonate, from the saline matter, formed in the combustion of marine vegetables, the barilla of commerce. In its pure state it is not employed in medicine; the crystallized sub-carbonate is used as a lithontriptic, and as an antacid, in a dose of ten or fifteen grains dissolved in water: the crystallized neutral carbonate, which has a place in the London Pharmacopœia, is more mild and grateful, and may therefore be preferred. Supersaturated with carbonic acid, under the form of the super-carbonated soda water, it is still more grateful, and is an antacid in common use. It is prepared in the same manner as the super-carbonate of potash, the proportions being so adjusted, that the alkaline strength of each solution is nearly the same. It is therefore taken in the same dose, and is usually preferred to the super-carbonate of potash water, as being supposed to be more mild.

AMMONIA. Ammonia. (Page 319.)

THE solution of ammonia in water (Aq. Ammoniæ) is sometimes used as an antacid, and it has been recommended by Dr Sims as superior to the other alkalis in relieving cardialgia, and other symptoms from acidity: so much so, that he has been led to suppose that these symptoms frequently arise, not from the liquid contents of the stomach being acid, but from an elastic fluid, having a degree of acidity, on which the ammonia from its volatility more readily acts. From 20 to 30 drops of the solution are given in a cupful of water.

The solution of the carbonate of ammonia is also used in a dose of half a drachm; and the aromatic ammoniated alkohol forms a still more grateful antacid and stimulant.

CALX. Lime. (Page 277.)

LIME, under the form of lime water, (Aqua Calcis), is occasionally used as an antacid, in a dose of four or six ounces. It operates, not only chemically, neutralizing the acid, but by its astringent and tonic power contributes to restore the tone of the stomach. It is also employed under the form of carbonate of lime, of which there are two varieties in use: the one named by the Edinburgh College Carbonas Calcis Mollior, the other, Carbonas Calcis Durior.

CARBONAS CALCIS MOLLIOR. Creta Alba. White Chalk.

THIS is a carbonate of lime found abundantly in nature, nearly pure, or containing only minute quantities of other earths. It is soft and earthy, of a white colour. From the grosser impurities with which it is mixed, it is freed by levigation and washing, and is then named Prepared Chalk, (Creta Præparata). This is an antacid in very common use. As the compound it forms with the acid in the stomach has no purgative quality, but appears to be quite inert, it is the antacid commonly employed to check diarrhœa from acidity. It is given in a dose of 1 or 2 drachms, with the addition of a small quantity ofaomaic. The chalk mix-tr an y ture of the Edinburgh Pharmacopœia affords a very good form for administering it.

Offic. Prep.—Pulv. Carb. Calc. Comp. Mist. Carb. Calc. *Ed. Lond.*—Pulv. Cret. C. et Opio. *Lond.*—Troch. Carb. Calc. *Ed.*

Carbonas calcis durior. Cancrorum Lapilli et Chelæ. Crabs' Stones, Crabs' Claws. Cancer Astacus. Cancer Pagurus. Insecta. Aptera.

In the head and stomach of the river craw-fish, (cancer astacus), are found concretions, consisting principally of carbonate of lime, with a little phosphate of lime and animal gelatin. They are prepared by levigation, and washing with water, and are named Lapilli Cancrorum præparati, formerly Oculi Cancrorum præparati. The tips of the claws of the common sea-crab (cancer pagurus) are similar in composition, and are prepared in the same manner. They are named Chelæ Cancrorum præparatæ. Both are medicinally employed as carbonates of lime, and being prepared with more care, are in general smoother, and more easily diffused in water than the common prepared chalk, though there is reason to believe, that as met with in the shops, they are merely chalk with a little gelatin.

MAGNESIA. Magnesia. (Page 340.)

MAGNESIA is usually obtained in the state of carbonate, by decomposing its sulphate or muriate by an alkaline carbonate; and from this, again, the magnesia is obtained in a pure state, by expelling the carbonic acid by the application of heat. In either state it is used as an antacid: the carbonate has the inconvenience, where large quantities of it require to be taken, of occasioning flatulence from the disengagement of its carbonic acid, and this leads to the preference of the pure magnesia. It is given in a dose of a scruple or half a drachm. The salt which magnesia forms with the acid in the stomach proves slightly purgative; and this is the only reason for distinction in practice between this earth and the carbonate of lime; the one being used where diarrhœa accompanies acidity, the other where a laxative effect is wished to be obtained. To obviate the flatulence which it is liable to occasion, or which of itself attends the dyspeptic affections in which it is used, it is advantageously combined with a small quantity of an aromatic, as ginger or cinnamon.

CHAP. XVIII.

OF LITHONTRIPTICS.

Lithontriptics are medicines supposed to have the power of dissolving urinary calculi: their operation, it is obvious, must be purely chemical.

The alkalis, it has been long known, relieve the painful symptoms arising from these calculi; and it was found by experiment, that they are capable of dissolving these concretions out of the body; hence it was concluded, apparently with justice, that their efficacy depends on their solvent power.

The discoveries of Modern Chemistry have thrown farther light on this subject; it has been proved that these urinary concretions consist frequently of a peculiar animal acid, the lithic or uric acid, either nearly pure, or in a state of intermixture. With this acid, the alkalis, in their pure state, are capable of combining, forming a compound soluble in water.

It has been ascertained too, that from the internal administration of the fixed alkalis, either potash or soda, the urine becomes impregnated with them so as to be sensibly alkaline. Experiments have farther proved, that either of them may be given to such an extent, as to enable the urine applied to a calculus out of the body to dissolve part of it; and it appears therefore to follow, that the same solvent power may be exerted on a concretion in the bladder or kidney. Their use, however, to this extent cannot long be persisted in, from the irritation they occasion in the stomach and the bladder; and we have scarcely, perhaps, any decisive proof of a urinary calculus of any considerable size being dissolved, nor is the practice now frequently employed.

The use of these agents in a moderate quantity may, however, it has been supposed, prevent the increase of a calculus; and, as it may be at length covered by matter deposited from the urine, by which its surface is rendered more smooth, this practice may alleviate the symptoms. When the alkalis are used in this manner merely as palliatives, they are generally employed in the form of carbonate, or super-carbonate, as in that state they are more mild and pleasant. Their solvent power is thus impaired; but still in this mild form they retain the power of preventing the increase of the urinary concretion. The deposition of uric acid, to which that increase is owing, depends in a great measure on the generation of acidity in the primæ viæ. The acid which is there formed passes off by the kidneys, and causes the precipitation of the uric acid; the use of the alkaline carbonates, by correcting this acidity, prevents this deposition, and of course prevents the increase of the urinary concretion, and lessens the irritating quality of the urine. It has accordingly been found, that under a course of alkaline remedies, the deposition of uric acid, so frequently abundant from the urine of those who are liable to calculus, diminishes rapidly. With this intention, moderate doses of the alkali in its mildest form, saturated or super-saturated with carbonic acid, are taken as they are required.

These were the views generally entertained of the operation of lithontriptic medicines, after the discoveries of Scheele and Bergman had made known the properties of uric acid.

More recent investigations have extended our knowledge of this subject, and preclude still more the hope of the alkaline lithontriptics being employed with advantage as actual solvents.

It had always been known, that urinary calculi are not of uniform appearance and qualities. Dr Wollaston's researches proved, that they are of very different chemical constitution, and his experiments were confirmed by those of Fourcroy and Vauquelin.

Besides the uric acid calculus, which is generally of a brown or yellowish colour, of a compact or radiated structure, smooth on the surface, and perfectly soluble in alkaline solutions, another had been observed, composed principally of a matter frequently disposed in layers, white, of a lamellated structure, soft and smooth to the touch, and giving a light powder of a brilliant whiteness. This, the fusible calculus, as it has been named, is not soluble in alkaline solutions, but dissolves very easily in diluted acids, and it melts before the blowpipe into an enamel. The substance composing it is phosphate of magnesia and ammonia, and though it seldom forms an entire calculus in its pure state, it is often intermixed with the other usual ingredients, or disposed with these in alternate layers.

Phosphate of lime forms another variety of calculus, sometimes alone, but more generally mixed with uric acid, or with phosphate of magnesia and ammonia. Calculi of this kind have usually no great induration, feel dry and rough, and are without any lamellated or spathose structure; they are not dissolved by the alkalis, but are soluble more or less in diluted acids.

Lastly, a calculus had been known to surgeons, under the name of Mulberry Calculus, derived from its purplish colour, and its rough irregular surface. This is composed principally of oxalate of lime, with portions of uric acid, phosphate of lime, and animal matter. It is harder and heavier than any of the others; and is less affected by the usual solvents, alkaline solutions having no effect upon it, and acids dissolving it with great difficulty; the alkaline carbonates slowly decompose it.

From these diversities in chemical constitution, among the urinary concretions, it is obvious, that we cannot expect uniform advantage from the use of any active solvent as a lithontriptic, since what dissolves one calculus will have no effect upon another; and cases have accordingly occurred, where, instead of relief being obtained, as it frequently is, from the use of alkalis, it has been obtained from weak acids, while in many cases they have been productive of no benefit whatever.

A particular source of difficulty has farther been pointed out by Mr Brande, attending the attempt to exhibit lithontriptics as solvents. The phosphates of lime and magnesia, which exist in the urine, are retained in solution principally by its excess of acid: if, therefore, with the view of dissolving a uric acid calculus, or preventing its increase, alkalis be given so as to neutralize this acid, the deposition of these phosphates may be favoured, and a layer of them may even form on the existing calculus. And there is reason to believe, that the softness and sponginess which have been observed not unfrequently on the surface of calculi, in patients who have continued for a long period the use of alkalis, and which have been regarded as proofs of at least partial solution, have arisen from a deposition of this kind. If, on the other hand, from the state of the urine, or from the information afforded by a small calculus being discharged, there were reason to believe that a calculus in the bladder consisted chiefly of phosphate of ammonia and magnesia, if we attempted the solution of this by the administration of weak acids, we run the hazard of causing the deposition of uric acid. It is accordingly found, that these effects take place. In different cases it has been remarked, that when alkalis have been given to correct the deposition of uric acid, or the *red* sediment or gravel from the urine, they have, when continued too long after having produced this effect, caused the deposition of the *white* sediment or gravel,—the phosphate of ammonia and magnesia; and on the other hand, Mr Brande has remarked, that when acids were given with the view of removing the deposition of the phosphates, they have, after some time, caused a separation of uric acid. These circumstances render it necessary to employ these remedies with caution, and with a strict attention to their operation even as palliatives, and seem in a great measure to preclude their use as solvents, since we can scarcely hope, even by an alternation of acids and alkalis, so to adjust them as to obtain to any extent their solvent effects, without these counteracting results.

There is another mode, in which it has been supposed that lithontriptics may exert a solvent power. In all urinary calculi, there exists a quantity of animal matter, supposed to be of the nature of albumen, which has been regarded as the cementing ingredient, giving induration to the calculus. On this it has been conceived solvents may act, so as to destroy the cohesion of the aggregate. The experiments of Dr Egan confirm this, he having found that lime-water is more effectual in destroying the cohesion of a urinary calculus, than an alkaline solution,—a result which, on repeating his experiments, I have likewise obtained. Now, this superiority cannot be ascribed to any action of the lime on the saline ingredients of the calculus, but must arise rather from its chemical action on the albumen or animal mucus, of which it is known to be the solvent; and it may therefore be supposed that lime-water, from this operation, might be used with advantage as a lithontriptic. It would of course require to be given in combination with alkalis, the latter neutralizing the excess of acid in the urine, which would otherwise combine with the lime, and render it inert. But it may be doubted if this could be managed, so as to obtain any important effect, or that lime could be secreted in its pure form by the kidneys.

From these observations, the advantages to be expected from lithontriptics, it is obvious, must be very limited. They probably cannot be given with greater benefit than simply to correct the excess of acidity in the urine, so frequent in those who labour under calculus, and thus diminish or remove that deposition of gravel as it is named, or small crystalline grains, which often proves a source of irritation. They may even thus perhaps prevent the increase in the size of a concretion. Or it is possible, in cases of the mulberry calculus, which produces much pain from its rough and pointed surface, that pushing the use of them even a little farther might prove useful, by giving rise to the formation of a layer of the phosphate of ammonia and magnesia, which would at least render the surface of the calculus soft and smooth. But we can never hope, by even the most careful administration of them, to dissolve a calculus of any size. In their administration, it may be of advantage to attend to the state of the urine, so far as regards its chemical constitution, and to suspend or vary the remedies as this may change. And in all cases the continuance of the remedies, and the length to which they are carried, ought to be regulated principally by the relief from pain which the patient receives.

LITHONTRIPTICS.

POTASSA.
SODA.
SAPO ALBUS.
CALX.
MAGNESIA.
ACIDA.

POTASSA. Potash. (Page 372.)

THIS alkali is used as a lithontriptic, either pure or combined with carbonic acid. The pure alkali in the state of solution (Aq. Potassæ) has been given in a dose of 15 or 20 drops, morning and evening, increasing this gradually as far as the stomach can bear it, until the urine is rendered alkaline; and at the same time diminishing the irritation it is liable to produce, by the free use of diluents, and of any mucilaginous or gelatinous liquid. The action of the pure potash being more powerful than that of the carbonate on uric acid calculi, it is under this form that it has been employed when the actual solution of the calculus has been attempted.

Independent, however, of the difficulties which attend this, from the circumstances which have been pointed out under the general observations on the action of lithontriptics, it is scarcely possible to continue the use of the pure alkali to the requisite extent, from the irritation it occasions both in the stomach and bladder; and when it is to be used as a palliative, it is better to employ it under the form of the super-carbonate.

The super-carbonated potash water, already noticed, (page 455.), affords the most effectual palliative in cases of urinary calculi; the relief obtained from it appears to arise from its neutralizing the free acid in the urine, and thus rendering it less irritating. From half a pound to a pound is given in the course of the day; and it has the important advantage, that, from its mildness, it can be continued for any length of time without reluctance. There is another advantage perhaps belonging to the super-carbonated alkalis compared with the pure alkalis. The latter, if pushed too far, are liable to occasion the separation of the earthy phosphates from the urine; and where the urine is in that state in which these predominate, they must prove injurious. But when super-saturated with carbonic acid, the excess of acid will retain the phosphates dissolved, for this effect is obtained even from water impregnated with carbonic acid alone; and thus all the advantage that can be derived from the alkali will be obtained, without the injurious consequences that may arise from the use of it in its pure form.

SODA. Soda. (Page 455.)

SODA, like potash, is used as a lithontriptic, seldom, however, in its pure state. The carbonate, or rather sub-carbonate, is obtained from the barilla of commerce by solution in water and crystallization. The crystals contain half their weight of water of crystallization, and are soluble in two parts of cold, and in an equal part of boiling water. This crystallized salt affords a very excellent form under which the alkali may be administered, so as to give the advantages of a palliative, and which is less expensive than any other. This forms what has been named the Soda Pill. The crystals are exposed to a very gentle heat, until they lose their water of crystallization, and the dry powder is made into pills with soap. Of these, half a drachm or a drachm are taken in the course of the day.

Soda is likewise employed under the form of the super-carbonated soda water, the powers of which are similar to those of the super-carbonated potash water, and which is taken in the same manner.

Sapo albus.—Soap is a form under which the fixed alkalis have been administered in calculous affections. It is a chemical combination of expressed oil with potash, or soda. Potash forms only a soft soap, soda gives one that becomes hard; and to form the purer soap which is fit for medicinal use, it is combined with the mildest vegetable expressed oil, as that of the olive. The soap is white, but sometimes is designedly coloured by the addition to it, while soft, of a solution of sulphate of iron.

The acrimony of the alkali is much diminished by its combination with the oil, and on this account soap has been preferred as a lithontriptic, one or two ounces being taken in the course of the day. From the oil it contains, however, it is nauseous, and in such large doses generally offensive to the stomach, and the super-saturation with carbonic acid affords a much better method of rendering the alkali mild.

Soap is sometimes used in pharmacy, to give consistence to powders when they are to be formed into pills.

CALX. Lime. (Page 229.)

LIME, in the form of lime-water, has been used in calculus, in the quantity of a quart or more daily: it may prove useful by correcting acidity; but in the small quantity in which it can be taken, it can scarcely be supposed, that any of it will be secreted by the kidneys, so as to change the composition of the urine. Were it secreted, indeed, it would be rendered insoluble by the free phosphoric and uric acids. The only method in which it could be brought to act on a calculus, would be by conjoining its administration with that of the alkalis, so that the urine should be rendered alkaline. This combination constituted the celebrated remedies of Stephens; but even with every precaution, it may be doubted if the lime could be made to exert any real lithontriptic power.

MAGNESIA. Magnesia. (Page 340.)

THE advantage derived from lithontriptics being in a great measure confined to their neutralizing acidity in the stomach, as above explained, magnesia has been employed for this purpose as equally effectual, and as possessed of some peculiar advantage over the alkalis. From its insolubility it will remain longer in the stomach, and from this, it has been supposed, will more certainly neutralize the acid; it has accordingly been affirmed on the authority of Mr Home, that it diminishes more effectually the deposition of uric acid from the urine; and some cases have been stated by Mr Brande, in which magnesia had proved effectual, where the alkalis previously given had failed to relieve the too abundant secretion of this acid. It has also been supposed, that even if it be taken in excess, it will not, from its insolubility, be secreted by the kidneys, and hence will be less liable than the alkalis, to cause a deposition of the urinary phosphates; and its mildness admits of its continued use. The dose in which it has been given, is from a scruple to half a drachm twice a-day. In some cases in which it was employed, in which gout was connected with gravel, the symptoms of the former disease were at the same time alleviated.

ACIDA. ACIDS have sometimes been employed as lithontriptics. In those cases where the state of the urinary secretion is such that there is a separation of phosphate of lime, or phosphate of ammonia and magnesia, they prevent this by their solvent power; but this is comparatively rare. Where there is a too copious secretion of uric acid, they must increase it, and prove prejudicial, and in such cases accordingly they almost uniformly occasion irritation and pain. It is singular, however, that in some cases they have afforded relief, even when they caused a deposition of matter from the urine. If this consisted of phosphate of magnesia and ammonia, it might be supposed that the acid had acted on a calculus composed of this, and by its solvent power had so far weakened its aggregation, as to cause it to fall down. In some cases, however, even where relief was obtained, the sediment has been found to be uric acid; and scarcely any other supposition can be made with regard to this, to account for the relief received, than that it had formed part of a concretion, of which the phosphates had been the principal ingredients; and that the latter being dissolved by the acid secreted with the urine, the former had been evacuated in a state of suspension. But this occurrence must be rare; and the use of acids as lithontriptics, must be in a great measure limited to those cases in which the earthy phosphates are too abundantly secreted. And in employing them even in these cases, care must always be taken to guard against the separation of uric acid by their too free or long continued use. The obvious rule is, to give the acid to that extent which shall afford relief from irritation, and remove the deposite of phosphate of lime, or the more common one of phosphate of magnesia and lime, easily recognized by its white colour, and to diminish the dose, or rather intermit the use of them, whenever any deposite of uric acid appears.

Different acids have been employed. Much relief has been obtained from some of the vegetable acids, particularly the citric acid, under the form of lemon juice, taken to the extent of half an ounce daily. The muriatic acid has been used with advantage in a dose of from 30 to 50 drops twice or thrice a-day, and the diluted nitric acid of the usual strength, in a dose of 40 drops. According to Mr Brande's observations, the vegetable acids, particularly the citric and tartaric, are less liable than the mineral acids to produce the separation of uric acid, even when they are taken in large doses for a considerable time. Carbonic acid was at one time employed, but had fallen into disuse, probably from the belief of its action being too weak to produce any lithontriptic effect. It has been found, however, that water impregnated with it, taken as common beverage, diminishes the deposition of earthy phosphates, particularly the phosphate of ammonia and magnesia, rendering the urine transparent, which had before been turbid. Where it does so far succeed, it must be preferable to any of the other acids, both as being less likely to cause any separation of uric acid, and as having the advantage that it can be taken for any length of time without any reluctance, has no injurious effect on the stomach, and admits of being used in that irritable state of the bladder which sometimes precludes the use of the others.

Bitters and astringents, such as Uva Ursi, have been found of service in calculous cases, evidently by restoring the tone of the stomach, and thus preventing the generation of acid. But they cannot be considered as Lithontriptics.

CHAP. XIX.

OF ESCHAROTICS.

ESCHAROTICS are substances which erode or dissolve the animal solids. This they do, either by combining with the animal matter, and forming a soft pulp, or a species of eschar, or by a resulting affinity, causing the elements of the soft solids to enter into new combinations, whence their cohesion is subverted, and their composition is changed. In both cases the life of the part is destroyed. They are employed principally to remove excrescences, to establish an ulcer, or to change the surface of an ulcerated part, converting it into a simple sore; and the principal distinction among them is that founded on the energy of their action,—some eroding merely the cuticle or external surface to which they may be applied, as nitrate of silver, or sulphate of copper; others, as potash, producing the decomposition of the animal matter to a much greater depth. The action of some of them too, that of arsenic for example, appears to be so far specific, that effects are obtained from their operation, not easily obtained from the others.

ESCHAROTICS.

ACIDA MINERALIA.
SUPER-SULPHAS ALUMINÆ ET POTASSÆ.
POTASSA.
NITRAS ARGENTI.
MURIAS ANTIMONII.
SULPHAS CUPRI.
ACETAS CUPRI.
MURIAS HYDRARGYRI.
SUB-NITRAS HYDRARGYRI.
OXIDUM ARSENICI ALBUM.
JUNIPERUS SABINA.

THE MINERAL ACIDS act rapidly as escharotics, especially the sulphuric and nitric acids; but, from their fluidity, they can seldom be conveniently applied.

SUPER-SULPHAS ALUMINÆ ET POTASSÆ. Alumen. Alum. (Page 276.)

ALUM, from its excess of acid, has a degree of escharotic power; and under the form of dried alum, in which its water of crystallization is expelled, is sometimes used in fine powder, to check the growth of fungous excrescences from ulcers. This powder, rubbed with a little sugar, is, from the same property, applied to remove opaque specks from the cornea.

POTASSA. Potash. (Page 21. 372.)

PURE potash, in its solid state, forms a powerful escharotic, which has long been in use under the name of Causticum Commune Acerrimum. When its solution, before being evaporated entirely to dryness, is mixed with a portion of lime, its operation is rendered rather weaker: this preparation is named Causticum Commune Mitius. Either of them is made into a paste with soap, and applied to the part. This application is frequently employed to establish an ulcer, and sometimes in preference to incision to open a tumor: its action is attended with a considerable degree of pain, and a sense of burning heat; after it is removed, a cataplasm is applied, by which this is relieved, and suppuration established. Mr Simmons has recommended potash in preference to other escharotics, to prevent the effects from the bite of a rabid animal; it is applied freely to the bitten part; and the preventative operation of excision, he has supposed, may be rendered more certain by touching the surface with potash.

NITRAS ARGENTI. Nitrate of Silver. Causticum Lunare. Lunar Caustic.

THIS preparation is obtained by dissolving silver in nitric acid, evaporating the solution to dryness, melting the mass by a gentle heat, and while liquid running it into cylindrical moulds, in which, as it cools, it becomes concrete. It is the caustic which is in most common use for checking the growth of fungous excrescences, or changing the diseased surface of an ulcer, a little of it being dissolved in as small a portion of water as is sufficient, and being applied by a pencil to the part.

MURIAS ANTIMONII. Muriate of Antimony. (Page 317.)

THIS preparation of antimony has been used as an escharotic, but being liquid, it is not easily confined to the part on which it is designed to act, and it has no particular advantage to recommend it.

SULPHAS CUPRI. Sulphate of Copper. Vitriolum Cœruleum. Blue Vitriol. (Page 217.)

THIS salt is a mild escharotic, and from this mildness of its operation is adapted to particular cases. Its solution in water is sometimes employed to change the diseased surface of sores, especially of venereal sores; and either in solution, or in powder mixed with any mild vegetable powder, it is applied to remove specks on the cornea.

SUB-ACETAS CUPRI. Sub-acetate of Copper. Ærugo Æris. Verdigrease. (Page 218.)

THIS preparation is in frequent use as an escharotic, principally to change the surface of foul ulcers, being applied under the form of ointment mixed with lard. In the same form, it is applied as a stimulant in some kinds of ophthalmia.

Offic. Prep.—Ungt. Sub-acet. Cupr. *Ed. Dub.*—Oxymel Æruginis. *Dub. Lond.*

Murias hydrargyri corrosivus. Corrosive Muriate of Mercury. (Page 204.)

This preparation of mercury is occasionally employed as an escharotic. Its solution in water, in the proportion of one grain to the ounce, is in particular applied to venereal ulcers. And still more dilute, it is sometimes used as a lotion to herpetic eruptions.

Sub-nitras hydrargyri. Sub-nitrate of Mercury.—(Page 202.)

This, the red precipitate of mercury as it has been named, has long been in common use as an escharotic, and as a stimulant application to foul and languid ulcers. Reduced to fine powder, it is sprinkled on the part, or it is applied mixed with lard in the form of ointment; for the preparation of which, a formula is given in the Pharmacopœias.

Offic. Prep.—Ungt. Sub-nitr. Hydrargyr. *Dub. Lond. Ed.*

Oxidum arsenici album. White Oxide of Arsenic. (Page 220.)

White oxide of arsenic has been frequently employed as an external application to cancer, and though it has been regarded as in some measure specific, its immediate action is that of an escharotic. It was first introduced as an empirical remedy, and was applied, mixed with vegetable matter; a drachm of white arsenic, five scruples of sulphur, an ounce of the leaves of Meadow Crowfoot, and an ounce of Dogs-fennel, being rubbed together, and a little of the powder being made into a paste with the yolk of an egg: this, in a few hours, formed an eschar, by which the diseased surface was changed; and by exciting suppuration by the application of cataplasms, this was thrown off. It has since been used under the form of ointment or solution. The latter has been supposed the least painful form, though perhaps it is not the most effectual. Ten grains are dissolved in one ounce of water, and this solution is applied by a pencil to the sore. It not unfrequently amends the discharge, causes the sore to contract in size, and cases have even been related of its having effected a cure. Violent lancinating pain is sometimes produced by its application; and in some cases, from its continuance, the general system appears to be affected, and symptoms occur indicating affection of the stomach and lungs, which cannot be relieved but by suspending the application. When these appear, the use of the arsenic ought to be stopt: and the effects already stated under the general history of arsenic, (page 221.), as produced by its application to an wound, suggest the propriety of employing it with much caution even externally, especially when it is applied to an excoriated surface. Cases are on record, in which, from the too free application of it in this manner, violent constitutional symptoms, with even a fatal termination, have been induced. Still, even with these disadvantages, the benefit derived from the application of arsenic in scirrhus and cancer, has often been so striking as to lead to its occasional employment, especially with the view of reducing the size of a cancerous tumor or sore, or in those cases where either the patient will not submit to the operation, or where it cannot be properly performed. The original mode of applying it by cataplasm is probably the most effectual, as changing the whole diseased surface more perfectly.

JUNIPERUS SABINA. Savine. (See page 364.)

THE leaves of savine possess an acrid power, whence they are employed as escharotic. The powder sprinkled on warts or excrescences removes them, by what kind of operation is not very obvious. When made into an ointment with lard, it is used as an application to old ulcers, and to some obstinate cutaneous affections: it has also been recommended as superior to any other stimulating application in exciting that degree of suppuration necessary to keep up a purulent discharge from an issue. This ointment has been received as officinal in the London and Dublin Pharmacopœias.

Offic. Prep.—Cerat. Sabinæ, *Lond. Dub.*—Ol. Sabinæ, *Ed. Dub.*

FOURTH DIVISION.—OF MECHANICAL REMEDIES.

THE last subdivision of the classification includes those classes of remedies, the operation of which is merely mechanical. Under this I have placed Diluents, Demulcents, Emollients, and Anthelmintics. They are classes of comparatively little importance.

CHAP. XX.

OF DILUENTS.

DILUENTS have been defined, Substances which increase the fluidity of the blood, by augmenting the proportion of fluid in it. Watery liquors, it is obvious, will have this operation to a certain extent, and, strictly speaking, water is the only proper diluent. But different mild substances are added to it to render it pleasant, and frequently to communicate to it a demulcent quality, diluents and demulcents being generally employed to answer the same indications. With the former intention water is infused on scorched bread; or a decoction of bran is used. Gruel, which is a decoction of the grains of the oat, freed from their husk, is the most common lubricating diluent.

Diluents are prescribed principally in acute inflammatory diseases, with the views of quenching thirst, and diminishing the stimulating quality of the blood. They are employed too to favour the operation of sweating, being given tepid; and sometimes to promote the action of diuretics, especially of those which are saline. And there are some chronic diseases, more particularly affections of the glandular system, in which diluents appear to be advantageous. Some mineral waters, celebrated for their efficacy, are water uncommonly pure; and the advantage derived from these in scrofula, and some other morbid affections, can scarcely be attributed to any other operation than mere dilution.

CHAP. XXI.

OF DEMULCENTS.

DEMULCENTS are defined, "Medicines suited to obviate and prevent the action of acrid and stimulant matters; and that, not by correcting or changing their acrimony, but by involving it in a mild and viscid matter, which prevents it from acting upon the sensible parts of the body," or by covering the surface to which they may be applied. Their action has been supposed to be exemplified in catarrh, where the irritation at the top of the trachea, occasioning coughing, is removed by mucilaginous substances; or in gonorrhœa, where the sense of heat and pain from the application of the stimulus of urine to the inflamed surface of the urethra is prevented by similar means.

Where these substances are directly applied to the part, it may be understood how this operation is obtained from them. But where they are received by the medium of the stomach into the circulating system, it has been supposed that they can have no such effect. They must be changed by the process of digestion, and lose that viscidity by which only they operate, so that they cannot afterwards be separated by any secretion in their original form. Hence their utility in gonorrhœa and similar affections has been altogether denied.

It is not clear, however, that such a conclusion is just. It is sufficiently certain, that many substances, which undergo the process of digestion, are afterwards separated in their entire state from the blood, by particular secreting organs. There is no gland which has this power more particularly than the kidneys; substances received into the stomach and digested, afterwards passing off in the urine with all their peculiar properties. Saccharine matter for example, there is reason to believe, can be separated in this manner; and it is equally probable, that mucilaginous or oily substances, which form the principal demulcents, are capable of such a separation. There can be no doubt, however, but that a great share of the relief demulcents afford in irritation, or inflammation of the urinary passages, is owing to the large quantity of water in which they are diffused, by which the urine is diluted, and rendered less stimulating. Perhaps the relief is to be ascribed solely to this dilution; since no alteration is perceived in the quality of the urine, from the use of these substances. And, in general, demulcents may be considered as substances less stimulating than the fluids usually applied to the parts that are in a state of irritation.

The diseases in which demulcents are used, are principally catarrh, diarrhœa, dysentery, calculus, and gonorrhœa. They are evidently not medicines of any great power; they are only calculated to alleviate symptoms, and may be freely used in as large quantities as the stomach will receive them.

Demulcents may be arranged under the two divisions of Mucilages, and Expressed Oils; to which may be added some substances of a similar nature.

DEMULCENTS.

MIMOSA NILOTICA.
ASTRAGALUS TRAGACANTHA.
LINUM USITATISSIMUM.
ALTHÆA OFFICINALIS.
MALVA SYLVESTRIS.
GLYCYRRHIZA GLABRA.
SMILAX SARSAPARILLA.
CYCAS CIRCINALIS.
ORCHIS MASCULA.
MARANTA ARUNDINACEA.
TRITICUM HYBERNUM.
LICHEN ISLANDICUS.
CORNU CERVI.
ICHTHYOCOLLA.
AMYGDALUS COMMUNIS.
OLEA EUROPÆA.
SEVUM CETI.
CERA.

Arabicum gummi. Gum Arabic. Mimosa Nilotica. *Polygam. Monœc. Lomentaceæ. (Acacia Vera, Ph. Lond.) Africa.*

Gum is a proximate vegetable principle, which is obtained by exudation, more or less pure, from a number of plants. The Gum Arabic of commerce is not exclusively the produce of one vegetable: that which is most pure, and used to be imported from Egypt, is from a species of mimosa. The London College admit, on the authority of Wildenow, a different genus, Acacia, as substituted for that of Mimosa; they refer, therefore, to the species producing this gum by the name of Acacia Vera, and name the gum itself Gummi Acaciæ, while the Edinburgh College name it Gummi Mimosæ Niloticæ. The trivial name, Gummi Arabicum, is retained perhaps with propriety by the Dublin College. The greater part of the gum arabic of commerce, it appears, is imported from Barbary, being the produce of Morocco, and principally of the mountains of Atlas. It is an exudation in the form of a viscid pellucid juice, from the bark of the trunk and branches of the tree, which hardens by exposure to the air and sun. The purest gum of the shops is in small irregular pieces, white or yellowish, semi-pellucid, without taste or smell: there are other varieties coarser, of a yellow or red colour; these are sometimes named Gum Senegal, and appear to be of different origin. All of them have the properties of gum; are insoluble in alkohol or oils, and soluble in water, forming a viscid solution named Mucilage.

Gum Arabic is in common use as a demulcent. In catarrh it is allowed to dissolve slowly in the mouth, and its mucilage is the basis of the mixtures usually employed to allay coughing. Sometimes, too, it is employed in tenesmus, strangury, and *ardor urinæ*. In Pharmacy, mucilage of gum arabic is employed for a variety of purposes. It serves to suspend heavy powders in waters; to diffuse oils, balsams, and resins in water, and give tenacity to substances made into pills.

Offic. Prep.—Emuls. Gummi Mimosæ Nil: *Ed. Dub.*—Muc. Gum. Mim. Nil. *Ed. Lond. Dub.*—Troch. Gum. *Ed.*

Astragalus tragacantha. (Astragalus Verus, *Ph. Lond.*) Tragacanth. *Diadelph. Decand. Papilionaceæ. Gummi. South of Europe, Asia.*

Tragacanth is a gum obtained by exudation. The plant which was supposed to afford it, was described by Linnæus as a species under the name of Astragalus Tragacantha. According to Olivier, it is a different species, which he describes under the name of Astragalus Verus; and this is admitted by the London College. Tragacanth is the produce of Persia and of Asia Minor; it is in small wrinkled pieces, semi-transparent and brittle, and has neither taste nor smell. It is regarded as a gum, yet it differs from the other pure gums in not being perfectly soluble in cold water: it is softened and diffused, but remains flocculent and turbid. When heat is applied, it communicates to the water a great degree of viscidity, but still the solution remains turbid; it appears, therefore, to be intermediate between gum and fecula. It is greatly superior to all the gums, in giving viscidity to water; its power in this respect being to that of gum Arabic as 1 to 24.

Tragacanth has virtues similar to gum Arabic. It is less employed, except in some pharmaceutical processes, in which, from its greater viscidity, it is preferred, as in making of troches.

Offic. Prep.—Mucil. Astrag. Trag. *Ed. Dub.*—Pulv. Trag. C. *Lond.*

LINUM USITATISSIMUM. Flax. *Pentand. Pentagyn. Gruinales. Semen. Indigenous.*

THE seeds of this plant afford a strong mucilage by infusion or decoction in water; by expression they afford a quantity of oil. This being inferior in purity to the olive or almond oil, is little used in medicine. But the mucilage having no unpleasant taste or smell, the infusion is frequently used as a demulcent in catarrh and gonorrhœa, being rendered more grateful by the addition of a little sugar and lemon juice. The decoction, containing a portion of the oil diffused in the mucilage, is less grateful.

Offic. Prep.—Infus. Lini. *Lond.*

ALTHÆA OFFICINALIS. Althæa. Marsh-mallow. *Monadelph. Polyand. Columniferæ. Radix. Indigenous.*

THIS indigenous plant grows, as the name implies, in marshy situations. All the parts of it yield a mucilage by infusion or decoction in water: the root does so most abundantly, and freed from the outer bark, is kept in the shops. It is white, inodorous, and insipid. Its mucilage is similar to that from lintseed, and is used for the same purposes. It is even preferable, as being more pure.

Offic. Prep.—Decoct. Alth. *Ed.*—Syr. Alth. *Ed. Lond.*

MALVA SYLVESTRIS. Common Mallow. *Monadelph. Polyand. Columniferæ. Folia. Indigenous.*

THE leaves of this plant afford a mucilage by infusion in water, which is weaker, however, than that from lintseed or althæa, and is therefore little used. The leaves have also been used for the purpose of fomentation, and their decoction affords an emollient enema.

Offic. Prep.—Decoct. Malv. Comp. *Lond.*

GLYCYRRHIZA GLABRA. Liquorice. *Diadelph. Decand. Papilionac. Radix. South of Europe.*

THE root of this plant, which is long, slender, and flexible, covered with a thin epidermis, has a sweet agreeable taste, with no flavour. This sweetness is extracted by water by infusion or decoction; and by evaporation a dark-coloured extract of the same sweet taste is obtained, consisting principally of saccharine and mucilaginous matter. Alkohol likewise extracts the sweetness of liquorice, with less of the mucilage.

Liquorice-root is employed as a demulcent, and on account of its sweet taste is frequently added to infusions of lintseed or althea. Its watery extract is also in common use as a demulcent in catarrh, being allowed to dissolve slowly in the mouth, to allay the irritation which produces coughing.

Offic. Prep.—Extr. Glycyrrh. Gl. *Ed. Dub.*—Troch. Glycyrrh. Troch. Glycyrrh. cum Opio, *Ed.*

SMILAX SARSAPARILLA. Sarsaparilla. *Diœcia Hexand. Sarmentaceæ. Radix. South America.*

THIS root, which is imported from the Spanish West Indies, is in long slender twigs, which for pharmaceutic preparation are split and cut into small pieces. It is internally white, and covered with a brownish bark; has scarcely any smell; its taste is mucilaginous, and slightly bitter. Water extracts its bitterness; by beating it with water, a portion of fecula is separated, white and insipid, in which the virtues of the root appear to reside.

Sarsaparilla produces no sensible effect on the system, and it can scarcely be regarded in any other light than as a demulcent. It has, however, been considered as a specific in the treatment of some venereal affections, particularly those of the bones or periosteum, and as a restorative in that state of debility which is the consequence of the disease protracted, or of the mercurial irritation. Without allowing to it any specific power, it appears in such cases to be sometimes productive of benefit, probably from its mild demulcent and nutritious quality, and partly perhaps from the suspension of the use of mercury during its administration. It has also been recommended in extensive ulceration, in cutaneous affections, and in chronic rheumatism. It is always given in the form of decoction, and is very frequently joined with guaiac and mezereon, the pungency of which it covers.

Offic. Prep.—Dec. Sarsap. *Ed. Lond. Dub.*—Dec. Sarsap. Comp. *Lond. Dub.*—Extr. Sarsaparill. *Lond.*

CYCAS CIRCINALIS. Sago. *Cryptogamia. Filices. East Indies.*

SAGO is a fecula obtained from the pith or medullary part of the branches of the plant, by maceration in water. It is in small grains of a brownish colour, without taste or smell. Boiled in milk or water, it dissolves entirely; and this with sugar, and the addition frequently of a little wine, forms a nutritious jelly, prescribed in diarrhœa as a demulcent, and in convalescence as a nutritious article of diet, easy of digestion.

ORCHIS MASCULA. Salop. *Gynand. Diand. Orchideæ. Indigenous.*

THE root of this plant, by maceration in water and beating, affords the fecula known by the name of Salop. Its qualities and virtues are similar to those of Sago.

MARANTA ARUNDINACEA. Indian Arrow. *Monand. Monogyn. Scitamineæ. South America.*

THIS plant is abundantly cultivated in several of the West India islands, for the preparation of the fecula which is extracted from its root. The root, freed from its cuticle, is grated down in water, which is poured off repeatedly, allowing the fecula to subside: when it appears to be perfectly purified, the remaining water is strained off on a linen cloth, and the fecula is dried. It forms a powder in fine grains, of a brilliant whiteness. It is used as a demulcent in diarrhœa and dysentery, and as a nutritious article of diet for convalescents. A jelly is prepared by boiling with water or milk, and it is under this form that it is taken.

TRITICUM HYBERNUM. Wheat. *Triand. Digyn. Gramina. Fecula seminum. Amylum.*

STARCH, the fecula of wheat, obtained by beating the grains previously soaked in water, forms a gelatinous solution when boiled with water, which is used as a demulcent. This, Starch Mucilage as it is named, is sometimes given as an enema in tenesmus, and is the common vehicle for giving opium under that form. Starch powder is sometimes used to facilitate friction.

Offic. Prep.—Mucilag. Amyli, *Ed. Lond. Dub.*

LICHEN ISLANDICUS. Iceland Liverwort. *Cryptogamia Algæ. Iceland.*

THE different lichens contain a fecula, which is extracted by boiling in water. The lichen islandicus, so named as being abundant in Iceland, though it is a native also of other countries of the North of Europe, consists principally of this, with a portion of extractive matter, having a degree of bitterness. This bitterness is removed by maceration in cold water, and then by decoction with water a gelatinous solution is obtained. This is used as an article of diet in the countries of which this lichen is a native; and it has been introduced into medical practice as a demulcent, and a nutritious substance easy of digestion: it has from these qualities been used with some advantage in hæmoptysis and phthisis; and from its supposed efficacy, the decoction has received a place in the London Pharmacopœia.

Offic. Prep.—Decoct. Lichenis, *Lond. Dub.*

CORNU CERVI RASURA. Hartshorn Shavings. Cervus Elaphus. Cornu. *Mammalia. Pecora.*

HORN consists chiefly of indurated albumen; the horns of the deer, however, it is singular, are similar to bone in composition, and contain a considerable quantity of gelatin, along with phosphate of lime; they have therefore been received into the Materia Medica. They are freed from their outer rough covering, and the internal white part is rasped down for use. The shavings afford, by decoction in water, a transparent, colourless, and inodorous jelly, which, rendered grateful by sugar and a little wine, is used in diarrhœa and dysentery as a demulcent, and in convalescence as a light nutritious article of diet.

ICHTHYOCOLLA. Isinglass. Acipenser Sturio. *Pisces. Chondropterygii.*

ISINGLASS is obtained from the sound and other parts of the sturgeon, as well as several other kinds of fish caught in the Volga, the Oby, and other rivers, which flow into the Caspian or the Northern Ocean. The sound being well cleansed, is freed from the thin membrane which covers it, is dried by exposure to the air, and is rolled up in a twisted form. It is of a fibrous texture, insipid and inodorous. It is nearly pure gelatin, is therefore almost entirely soluble in water by boiling, and forms a gelatinous solution, which has sometimes been employed as a demulcent; and when rendered grateful by a little sugar and lemon juice, as a nutritive jelly, easy of digestion.

AMYGDALUS COMMUNIS. *Icosandria. Monog. Pomaceæ. Fructus; Nucleus; Ol. Express. Syria, Barbary.*

THE kernel of the fruit of the almond is farinaceous, with a portion of expressed oil. There are two varieties of it, the one sweet, the other bitter, and these are the produce of mere varieties of the same species, their production being dependent, it is said, on culture. The expressed oil afforded by both is the same; the principal part of each, too, appears to be fecula; but with this, in the sweet almond, there is a portion of saccharine matter; the nature of the principle in which the bitterness of the other resides, is not well ascertained: it contains, however, a portion of prussic acid, on which its odour depends, and which appears to communicate to it some degree of narcotic power. The oil is obtained by expression from the seeds, or by decoction of them in water. It is very similar to the olive oil, but purer, and more free from any rancidity. In common with expressed oils, it has the properties of a demulcent; and diffused in water by the medium of mucilage, or a few drops of an alkaline solution, it is given in catarrh.

There is another mode in which this oil is given as a demulcent, more grateful, that of emulsion. The sweet almonds, the external rind being removed by immersion in warm water, are triturated with water; the oil is diffused in the water by the medium of the mucilage and fecula of the almond, and a milky-like liquor is formed, which is used as a pleasant demulcent and diluent, particularly to obviate strangury from the application of a blister.

Offic. Prep.—Emuls. Amygd. *Ed. Lond. Dub.*—Confect. Amygd. *Lond.*

OLEA EUROPÆA. Olive Oil. Oleum Olivarum. *Diand. Monogyn. Sepiariæ. Oleum Expressum. South of Europe.*

THE oil obtained from the fruit of the olive by expression, is of a light yellowish or greenish colour, without either taste or smell, and is possessed of all the general properties of expressed oil. It is the oil of this class which is most commonly used in medicine. It is employed as a demulcent in catarrh, and some other affections, diffused in water by the medium of mucilage, or by a very small quantity of one of the alkalis, and is thus taken in as large quantities as the stomach can bear; it may be doubted, however, whether with any advantage. It is employed to involve acrid substances which may have been introduced into the stomach. It is also given as an anthelmintic. Externally it is used as an emollient, applied by friction, or forming the basis of liniments and ointments.

SEVUM CETI. Spermaceti. Physeter Macrocephalus. *Mammalia. Cetaceæ.*

THIS fatty matter is obtained from the head of the particular species of whale above stated. The cavity of the head contains a large quantity of an oily fluid, from which, on standing, a concrete substance separates. This, freed from the oil by expression, and purified by melting and boiling with a weak alkaline solution, is the common spermaceti. It is in masses of a flaky texture, unctuous and friable; white, with some degree of lustre; and has neither taste nor smell. It is fusible and inflammable, and its chemical properties and relations are the same as those of the expressed oils and fats, except that it does not easily unite with the alkalis, and that it is soluble to a certain extent in alkohol and ether. Its medicinal virtues are those of a mild demulcent, and as such it is given in catarrh and gonorrhœa, mixed with sugar, or sometimes diffused in water by the medium of the yolk of an egg. It enters as an unctuous substance into the composition of ointments.

Offic. Prep.—Cerat. Cetacei, Unguent. Cetaceæ, *Lond.*

CERA. Wax.—THIS is a concrete substance of a particular nature, which, applied by the bee to the construction of the cells in which the honey is deposited, was supposed to be collected by that insect from the antheræ of vegetables.

The experiments of Huber appear, however, to have proved, that it can be formed by the bee, from changes produced on its saccharine food. Still it is to be regarded as a vegetable product. It forms a covering on the leaves, fruit, and flowers of many plants, and some, as the Myrica Cerifera, afford a substance perfectly analogous in large quantity. Wax, in its chemical properties, resembles most nearly the expressed oils, differing from them principally in solidity, and in combining less readily with the alkalis. When merely melted from the comb, it retains a portion of colouring matter, and forms yellow wax; it has also an agreeable odour. It may be deprived of both by bleaching,—the wax being melted and cast into thin cakes, which are exposed to the action of light, air, and humidity. It then forms white wax, which is harder and more brittle than the yellow, and rather less fusible.

Wax has been used as a demulcent in dysentery, being diffused in water by means of mucilage of gum Arabic, the wax being first melted with a little oil, to facilitate its trituration; but it has no particular quality to recommend it. It is used in the composition of ointments and plasters, communicating to them consistence and tenacity.

Offic. Prep.—Emp. Ceræ, *Ed. Lond.*

CHAP. XXII.

OF EMOLLIENTS.

The class of Emollients, according to the definition given by Cullen, includes those medicines which diminish the force of cohesion in the particles of the solid matter of the human body, and thereby render them more lax and flexible. Their operation is evidently mechanical; they are insinuated into the matter of the solid fibre, and either diminish its density, or lessen the friction between its particles. Hence they are useful where the fibres are rigid, or where they are preternaturally extended, and therefore afford relief when topically applied to inflamed parts, to tumors distending the skin, or where the skin is dry and rigid. There may be included under the same class, those substances which, applied to the surface, by their bland quality, afford relief from irritation.

Heat, conjoined with moisture, is the principal emollient. Warm water is of itself useful; but when applied by the medium of some vegetable substances, as in the different fomentations and cataplasms, it is more advantageous, as the heat is longer retained; bread in crumbs, or the flour or meal of the common grains, forms the basis of the common cataplasm; the flowers of the chamomile, or the mallow, are often used as the vehicle for fomentations. The emollient power is little increased by such additions, though some have supposed that the mucilaginous vegetables have some efficacy of this kind.

The other emollients are the oils, or unctuous substances: they are merely introduced by friction; and in distension of the animal fibre, as in dropsical swelling, afford some relief. Axungia Porcina, Hog's Lard, is the principal substance of this kind not hitherto noticed. It is the fat of the hog, freed from the cellular fibre with which it is intermingled. This is done by melting it with the addition of a little water to prevent the heat from rising too high. When cold, it becomes concrete; has all the properties of animal fat; and from its softness is adapted to the purposes of an external emollient application. It forms the basis of ointments, which are applied as a dressing to inflamed parts. Such compositions too are formed from the expressed oils, melted with a due proportion of spermaceti or wax: they prove useful in a great measure by excluding the air, while, from their smoothness and softness, they excite no irritation. The thick and bland liquid formed by the combination of lime-water with expressed oils, (Linimentum Aquæ Calcis), is another emollient composition, usually employed as a soothing application to burns, and proving useful by a similar operation. There are some other unctuous substances which have been introduced for similar purposes; such as Palm Oil, an expressed oil nearly concrete, obtained from the kernel of the fruit of the Cocos BUTYRACEA, a native of Brazil. It is obtained by decoction of the kernels bruised in water, the oily matter separating: it is of a lively yellow colour and rather agreeable odour, and is sometimes applied as an emollient by friction. The Oil of the Laurel Berry, (LAURUS NOBILIS), is of similar qualities, and is obtained in the same manner, the berries bruised being boiled in water. It is concrete, of a yellowish-green colour, and has an odour slightly fragrant.

CHAP. XXIII.

OF ANTHELMINTICS.

Anthelmintics are remedies which expel worms from the intestinal canal. They have been supposed to produce this effect by various modes of operation, principally mechanical.

Some, which are in coarse rough particles, as iron or tin-filings, or consist of sharp spiculæ, as the down of the dolichos pruriens, are supposed, by mechanical action, to dislodge from the mucus of the intestines the worms which are evacuated.

Other substances ranked as anthelmintics seem to have no other property than bitterness. By this quality they have been supposed to prove noxious to these animals: it has also been imagined, that so far as they prove useful, they do so by restoring the tone of the digestive organs; the production of worms being supposed to proceed from debility of these organs, in consequence of which, either the food is not properly assimilated, or the secreted fluids poured into the intestines are not properly prepared.

Lastly, other remedies of this class apparently operate by their cathartic power. Those cathartics which discharge the mucus of the intestines, as gamboge, scammony, or calomel, are supposed more peculiarly to have this effect: and perhaps it is this sub-division of anthelmintics that have most efficacy. Some anthelmintics, it is observed by Dr Hamilton, "have been considered as specific poison to the insect, and others are conceived to destroy it by mechanical triture. Most of them have had their partisans for the day, and have passed in succession through the ordeal of experience into oblivion. The utility of such anthelmintics as have been found to be most beneficial, has, in my opinion, been in proportion to the purgative powers which they possessed."

After a course of those anthelmintics, which are not directly cathartic, it is usual to give a full dose of a purgative, which is even repeated two or three times, and to this a considerable share of the effect, when worms are evacuated, is probably to be ascribed. Calomel, with jalap, gamboge, or scammony, is the cathartic usually employed.

ANTHELMINTICS.

HYDRARGYRUM.
FERRUM.
STANNUM.
OLEUM OLEÆ EUROPÆÆ.
OLEUM TEREBINTHINÆ.
DOLICHOS PRURIENS.
ARTEMISIA SANTONICA.
SPIGELIA MARILANDICA.
POLYPODIUM FILIX MAS.
TANACETUM VULGARE.
GEOFFRÆA INERMIS.
CAMBOGIA GUTTA.

HYDRARGYRUM. Quicksilver. (Page 194.)

SEVERAL mercurial preparations have been employed on account of their anthelmintic power. The black sulphuret, ethiops mineral, as it was named, prepared by triturating sulphur and quicksilver in equal parts, has been given in the dose of a few grains to children, and of a scruple or half a drachm to adults. Mercury has been supposed to prove noxious to the class of vermes, and from this any efficacy belonging to this preparation has been inferred to arise. There is another mode in which it may operate. Sulphuretted hydrogen is deleterious to animals of this class, and the natural sulphurous waters impregnated with it, hence sometimes prove powerfully anthelmintic. The sulphuretted mercury may, by its chemical action on the fluids of the intestines, cause a production of sulphuretted hydrogen, whence may arise its anthelmintic power. Of the other mercurials, calomel has the advantage, besides any direct anthelmintic power it may exert, of exciting the action of the intestines, and evacuating the intestinal mucus. It is given alone in a dose of one or two grains to children, and of from 5 to 10 grains to an adult; or in smaller doses combined with jalap, scammony, or gamboge. It is also generally the basis of the cathartic which is usually administered after a course of any other anthelmintic remedy.

FERRUM. Iron. (Page 209.)

THE filings of this metal have been given as an anthelmintic, in a dose of one or two drachms; and the sub-carbonate or rust of iron, was highly recommended by Rush as a remedy against the tape-worm, when taken to the extent of three or four drachms.

STANNUM. Tin.

TIN is reduced to a powder, consisting of small rounded particles, by heating it nearly to its melting point, and agitating it briskly. Either this powder, or what has been recommended in preference, the metal, in filings, is used as an anthelmintic, in a dose of one or two drachms, or even in a much larger quantity. It is taken repeatedly in the morning, and a cathartic is afterwards administered. Its effect, so far as it operates, has been supposed to be mechanical, dislodging the worm from the mucus of the intestines by the grittiness of its particles. It is not improbable, too, that it may act by generating hydrogen gas in the intestinal canal, which proves noxious to the animal; and its efficacy has been said to be increased by combination with sulphur, by which sulphuretted hydrogen gas will be evolved. The sulphuretted oxide of tin, *aurum musivum*, was once in use as an anthelmintic, and there is an empirical preparation, Blane's powder, celebrated as an anthelmintic, of which it is said to be the basis.

OLEUM OLEÆ EUROPÆÆ. Olive Oil. Oleum Olivarum.
Diand. Monogyn. Sepiariæ. South of Europe.

OLIVE Oil, or any other expressed oil, taken in the morning to the extent of half a pound, or as much as the stomach can bear, has been said to prove anthelmintic, but in the state of diffusion and mixture in which it must act on worms in the intestines, it can scarcely be expected to have any certain power.

OLEUM PINI LARICIS. Oleum Terebinthinæ. Oil of Turpentine. (Page 387.)

THIS essential oil has lately been introduced as an anthelmintic of great power, in expelling the tape-worm when iven in large doses,—doses indeed so large, compared with those in which it has usually been given, that the practice would appear hazardous, though it is affirmed to be perfectly safe. The practice was first mentioned by Dr Fenwick. From half an ounce to an ounce, an ounce and an half, or even two ounces, have been taken at once, and in some cases this has been repeated in six or eight hours; these quantities generally produce purging, and frequently sickness. The worm is evacuated, and is usually lifeless on its expulsion; while, when evacuated by other methods, it generally retains signs of life. The turpentine therefore evidently operates by its deleterious power. Though these large doses have been taken without any injurious consequence, in some cases they have occasioned severe nausea, tenesmus, and strangury, while similar quantities, as that of a tea-spoonful repeated every three hours for three or four times, have proved successful. In other cases again, these have been unsuccessful, and it has been necessary to employ the larger doses frequently repeated. Its operation on the bowels as a cathartic in the larger quantity, seems to prevent its absorption; and therefore obviates its action on the urinary organs; and it has been stated in conformity to this, that this action giving rise to strangury, is more liable to happen from small than from large doses. Analogy leads to the employment of the remedy for the expulsion of the other worms which lodge in the intestinal canal, and in one or two cases the lumbrici have been expelled by it. It has also been employed under the form of enema, half an ounce being diffused in starch, mucilage, or in water by the medium of the yolk of an egg. The nauseating effect on the stomach is thus avoided, but this mode of application is frequently productive of considerable pain.

Dolichos pruriens. Cowhage. *Diadelph. Decand. Papilionaceæ. Pubes leguminis rigida. East and West Indies.*

The down which covers the outer surface of the pods of this plant, consists of spiculæ, so sharp, that if incautiously handled, they penetrate the cuticle, and occasion very severe itching and inflammation. It is this down which is used as an anthelmintic. It is made into an electuary, with syrup or molasses, of which two tea-spoonfuls are given to an adult, and repeated two or three times, a strong cathartic being afterwards exhibited. Its action is entirely mechanical, the spiculæ producing irritation in the body of the animal, causing its motion, and perhaps also exciting the action of the intestines. In the West India islands it is the common anthelmintic, and is described as being given with much advantage, more so than when used in this country, a difference which has been explained from the state of the mucous secretion in the intestinal canal, which appears to be more abundant in warm climates; and hence more powerful remedies are required to produce an anthelmintic effect. The electuary ought to be prepared only when it is to be used.

Artemisia santonica. Wormseed. *Syngen. Polygam. superfl. Compositæ. Semen. Persia.*

The seeds of this plant have a faint disagreeable smell, and a very bitter taste. They are in common use as an anthelmintic, and probably operate merely as a bitter; the dose is half a drachm, or a drachm of the powder to an adult. This, after being continued for some time, is followed by a dose of a strong cathartic.

Spigelia marilandica. Indian Pink. *Pentand. Monogyn. Stellatæ. Radix. North America.*

This plant is a native of Virginia and Maryland. The slender stalks of its root have a bitter taste and are used in medicine, on the supposition of their anthelmintic power; in a large dose they prove purgative, and also sometimes narcotic. They are usually administered in the form of the watery infusion; in the quantity of half a drachm, or even to the extent of two or three drachms to an adult. Its operation as a narcotic has been said to occur from its administration; and to prevent this, it has been recommended to be given rather in large doses, so as to obtain its cathartic operation, by which its narcotic power is obviated. In its dried state, however, in which it is employed in this country, no alarming symptom appears to follow from its administration.

Polypodium filix mas. Aspidium Filix Mas. Male Fern. *Cryptogamia. Filices. Radix. Indigenous.*

The root of this plant was once highly celebrated as a remedy against the tape worm; two or three drachms of the powder of it being taken in the morning, and a strong cathartic of jalap or gamboge given soon after it. The efficacy of the prescription probably depended entirely on the cathartic.

Tanacetum vulgare. Tansy. *Syngen. Polyg. superf. Compositæ. Folia et flores. Indigenous.*

The leaves and flowers of this plant have a strong bitter taste. They have been recommended as anthelmintic, and especially as capable of expelling the lumbrici, and are sometimes used as a popular remedy. The dose, in powder, is from one scruple to one drachm.

Geoffræa inermis. Cabbage Tree. *Diadelph. Decand. Papilionac. Cortex. Jamaica.*

The bark of this tree is flat and thin, of a brownish colour; it has an unpleasant smell, with a sweetish taste. It is used as an anthelmintic, and has been considered as one of considerable power, especially in expelling the lumbrici. It is usually given under the form of decoction, an ounce being boiled in two pounds of water, to one pound, and from one to two ounces of this being given as a dose to an adult. It usually operates as a cathartic, and in an over-dose is liable to occasion sickness and vomiting. The same symptoms are said to be induced by the incautious drinking of cold water during its operation. When they occur from either cause, they are relieved by a dose of castor oil. Others, however, have not observed these effects from it, even when it has operated powerfully as an anthelmintic, and have hence concluded, that it acts as a specific poison to worms.

Offic. Prep.—Decoct. Geoffr. Inerm. *Ed.*

Cambogia. Gamboge. (Page 350.)

Gamboge has been celebrated as a remedy against the tape-worm, and by its powerful cathartic operation is sometimes successful in expelling it. It is given in a dose from 5 to 20 grains alone, or combined with two parts of supertartrate of potash. It is frequently also given as a cathartic after other anthelmintics.

APPENDIX

TO

VOLUME FIRST.

In concluding the history of the articles of the Materia Medica, I have thought it proper to present a view of that arrangement in which they are associated, according to their natural characters, this being the arrangement I follow in my course of Lectures, and a view of it therefore will facilitate a reference to the present work. In classing them on this principle, they have usually been comprised under the three leading divisions of Mineral, Vegetable, and Animal substances. The first of these divisions, however, is either not sufficiently comprehensive, or too great an extension must be given to the signification of the term applied to the class, so as to bring under it substances which cannot be referred to either of the others, and which, at the same time, cannot be regarded as belonging to what is strictly denominated the Mineral Kingdom.

A more correct division is, into the two great Classes of Unorganized Substances, and of Substances which are the Products of Organization, the latter comprizing the vegetable and animal products, while the former may include all the other articles of the Materia Medica. The substances belonging to the first, may be subdivided according to their chemical relations; those belonging to the second, according to their natural affinities. Thus, under the one will be placed the orders of Salts, Earths, Inflammables, Metals, Waters, and Airs. Under the other, both Vegetable and Animal Substances may be arranged according to the usual classes of the Linnæan System. With regard to vegetables, some have preferred associating them as they belong to the natural families or orders of plants; for as in these the arrangement is founded not on arbitrary characters, but on similarity of structure and organization, those substances, it has been imagined, will be brought together, which are possessed of similar powers. But this system of natural classification is still so defective, that this has been hitherto very imperfectly attained, and, under the same order, plants of the most discordant qualities are placed. There is therefore no advantage in departing from the usual arrangement.

There are some substances, such as the vegetable acids, which may be placed under either general division. They are strictly products of operations depending on organization: they can also, however, be formed by artificial processes; and from their chemical constitution, I have judged it preferable to associate them with the substances to which they appear to have the most strict relation.

From the progress of botanical knowledge, changes are necessarily made with regard to the specific or generic distinctions of the plants employed in medicine. Wherever these appear to be fully established, I have admitted them in the following tables: but where they have been only lately introduced, and remain somewhat doubtful, I have thought it preferable to retain the old name and arrangement, indicating only in a note the change that has been proposed, and the Pharmacopœia in which it has been adopted. Under the history of the substance referred to in the body of the work, will be found the authority on which the proposed alteration rests.

TABULA MATERIÆ MEDICÆ.

I. INORGANICA.

CLASSIS I.—SALES.

ORDO—ACIDA.

Acidum sulphuricum
——— nitrosum
——— nitricum
——— muriaticum
——— oxy-muriaticum
——— phosphoricum
——— carbonicum
——— aceticum
——— tartaricum
——— citricum
——— benzoicum

ORD.—ALKALIA.

Potassa
Soda
Ammonia

ORD.—SALES NEUTRI.

Sulphas potassæ
Sulphas sodæ
Nitras potassæ
Murias sodæ
Murias ammoniæ
Oxy-murias potassæ
Phosphas sodæ
Carbonas potassæ
Sub-carbonas potassæ
Super-carbonas potassæ
Carbonas sodæ
Sub-carbonas sodæ
Super-carbonas sodæ
Carbonas ammoniæ
Sub-carbonas ammoniæ
Sub-boras sodæ
Acetas potassæ
Acetas ammoniæ
Super-tartras potassæ
Tartras potassæ
Tartras potassæ et sodæ
Citras potassæ
Citras ammoniæ

Cl. II.—TERRÆ.

Calx
Carbonas calcis
Murias calcis
Phosphas calcis

Baryta
Murias barytæ

Magnesia
Carbonas magnesiæ
Sulphas magnesiæ
Murias magnesiæ

Argilla
Super-sulphas argillæ et potassæ

Cl. III.—INFLAMMABILIA.

Sulphur
Sulphuretum potassæ
Hydro-sulphuretum ammoniæ

Phosphorus

Carbo

Petroleum

Alkohol
Ether sulphuricus
Ether nitricus

Cl. IV.—METALLA.

Argentum
Nitras argenti

Hydrargyrum
Oxidum hydrargyri per triturationem
Oxidum hydrargyri cinereum
Oxidum hydrargyri rubrum
Sub-sulphas hydrargyri flavus
Nitras hydrargyri
Sub-nitras hydrargyri ruber
Murias hydrargyri corrosivus
Murias hydrargyri mitis
Murias hydrargyri et ammoniæ
Acetas hydrargyri
Sulphuretum hydrargyri nigrum
Sulphuretum hydrargyri rubrum

Ferrum
Oxidum ferri nigrum
Oxidum ferri rubrum
Sulphas ferri
Murias ferri
Murias ferri et ammoniæ
Carbonas ferri
Acetas ferri
Tartras ferri et potassæ
Carbonas ferri et potassæ

Cuprum
Sulphas cupri
Sub-acetas cupri
Ammoniuretum cupri

Plumbum
Oxidum plumbi semi-vitreum
Sub-acetas plumbi
Acetas plumbi
Super-acetas plumbi

Stannum

Zincum
Oxidum zinci
Carbonas zinci
Sulphas zinci
Acetas zinci

Bismuthum

Antimonium
Sulphuretum antimonii
Oxidum antimonii sulphuretum
Oxidum antimonii hydro-sulphuretum
Oxidum antimonii vitrificatum
Oxidum antimonii album
Oxidum antimonii cum phosphate calcis
Murias antimonii
Tartras antimonii et potassæ

Arsenicum
Oxidum arsenici album
Arsenias potassæ

Cl. V.—AQUÆ.

Aqua pura

Aquæ minerales
—— —— carbonatæ
—— —— salinæ
—— —— sulphureæ
—— —— ferrugineæ

Aqua marina

Cl. VI.—GASEA.

Gas oxygenium
Gas oxidum nitrosum
Gas nitrogenium
Gas hydrogenium
Gas acidum carbonicum
Gas hydrogenium carburetum

ELECTRICITAS.

GALVANISMUS.

II. ORGANICA.

VEGETABILIA.

CLASSIS—MONANDRIA.

ORD.—MONOGYNIA.

Amomum repens *
Amomum zingiber †
Amomum zedoaria
Maranta arundinacea

Cl.—DIANDRIA.

ORD.—MONOGYNIA.

Olea Europæa
Rosmarinus officinalis
Salvia officinalis
Gratiola officinalis

ORD.—TRIGYNIA.

Piper nigrum
—— longum
—— caudatum

Cl.—TRIANDRIA.

ORD.—MONOGYNIA.

Valeriana officinalis
Crocus sativus
Iris florentina

ORD.—DIGYNIA.

Saccharum officinarum
Triticum hybernum

Cl.—TETRANDRIA.

ORD.—MONOGYNIA.

Rubia tinctorum
Santalum album
Dorstenia contrayerva

Cl.—PENTANDRIA.

ORD.—MONOGYNIA.

Hyoscyamus niger
Atropa belladona
Nicotiana tabacum
Datura stramonium
Solanum dulcamara
Strychnos nux vomica
Capsicum annuum
Cinchona officinalis ‡
Anchusa tinctoria
Spigelia marilandica
Callicocca ipecacuanha
Convolvulus jalapa
Convolvulus scammonium
Rhamnus catharticus

ORD.—DIGYNIA.

Gentiana lutea
Conium maculatum
Ferula assafœtida
Bubon galbanum

* Elettaria Cardamomum, Ph. Lond. † Zingiber Officinalis, Ph. Lond.
‡ Cinchona cordifolia, lancifolia, et oblongifolia, Ph. Lond.

Carum carui
Coriandrium sativum
Pimpinella anisum
Anethum fœniculum
Angelica archangelica

ORD.—TRIGYNIA.

Rhus toxicodendron

ORD.—PENTAGYNIA.

Linum usitatissimum

Cl.—HEXANDRIA.

ORD.—MONOGYNIA.

Calamus acorus
Allium sativum
Scilla maritima
Aloe spicata

Cl.—HEPTANDRIA.

ORD.—MONOGYNIA.

Æsculus hippocastanum

Cl.—OCTANDRIA.

ORD.—MONOGYNIA.

Amyris opobalsamum
Daphne mezereum

ORD.—TRIGYNIA.

Polygonum bistorta

Cl.—ENNEANDRIA.

ORD.—MONOGYNIA.

Laurus cinnamomum
Laurus cassia
Laurus camphora
Laurus sassafras

ORD.—TRIGYNIA.

Rheum palmatum

Cl.—DECANDRIA.

ORD.—MONOGYNIA.

Cassia senna
Cassia fistula
Ruta graveolens
Guaiacum officinale
Toluifera balsamum
Myroxylon peruiferum
Styrax officinale
Styrax benzoinum
Copaifera officinalis
Hæmatoxylon Campechianum
Swietenia febrifuga
Swietenia mahagoni
Quassia amara
Quassia simarouba
Arbutus uva ursi
Rhododendron chrysanthum

Cl.—DODECANDRIA.

ORD.—MONOGYNIA.

Asarum Europæum
Canella alba

ORD.—TRIGYNIA.

Euphorbia officinalis

Cl.—ICOSANDRIA.

ORD.—MONOGYNIA.

Myrtus pimenta
Prunus lauro-cerasus
Amygdalus communis
Eugenia caryophyllata

ORD.—POLYGYNIA.

Rosa centifolia
Rosa rubra
Tormentilla erecta *

* Tormentilla officinalis.

Cl.—POLYANDRIA.

ORD.—MONOGYNIA.

Papaver somniferum

ORD.—TRIGYNIA.

Aconitum napellus

ORD.—POLYGYNIA.

Helleborus niger

Cl.—DIDYNAMIA.

ORD.—GYMNOSPERMIA.

Hyssopus officinalis
Mentha piperita
Mentha viridis
Mentha pulegium
Lavandula spica

ORD.—ANGIOSPERMIA.

Digitalis purpurea

Cl.—TETRADYNAMIA.

ORD.—SILICULOSÆ.

Cochlearia armoracia

ORD.—SILIQUOSÆ.

Sinapis alba

Cl.—MONADELPHIA.

ORD.—TRIANDRIA.

Tamarindus Indica

ORD.—POLYANDRIA.

Althæa officinalis
Malva sylvestris

Cl.—DIADELPHIA.

ORD.—OCTANDRIA.

Polygala senega

ORD.—DECANDRIA.

Pterocarpus santolinus
Pterocarpus draco
Dolichos pruriens
Geoffrœa inermis
Glycyrrhiza glabra
Astragalus tragacantha *

Cl.—POLYADELPHIA.

ORD.—ICOSANDRIA.

Citrus aurantium
Citrus medica

ORD.—POLYANDRIA.

Melaleuca leucadendron †

Cl.—SYNGENESIA.

ORD.—POLYGAMIA ÆQUALIS.

Lactuca virosa

ORD.—POLYGAMIA SUPERFLUA.

Artemisia santonica
Artemisia absinthium
Anthemis nobilis
Anthemis Pyrethrum
Arnica montana

Cl.—GYNANDRIA.

ORD.—DIANDRIA.

Orchis mascula

ORD.—HEXANDRIA.

Aristolochia serpentaria

ORD.—POLYANDRIA.

Arum maculatum

Cl.—MONOECIA.

ORD.—POLYANDRIA.

Quercus pedunculata
Quercus cerris

ORD.—MONADELPHIA.

Pinus balsamea

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* Astragalus verus, Ph. Lond. † Melaleuca cajuputi, Ph. Lond.

Pinus larix
Pinus sylvestris
Pinus abies
Pinus picea
Croton elutheria
Ricinus communis

ORD.—SYNGENESIA.

Momordica elaterium
Cucumis colocynthis
Bryonia alba

CL.—DIOECIA.

ORD.—PENTANDRIA.

Pistacia lentiscus
Humulus lupulus

ORD.—HEXANDRIA.

Smilax sarsaparilla

ORD.—MONADELPHIA.

Juniperus communis
Juniperus sabina
Myristica moschata

CL.—POLYGAMIA.

ORD.—MONOECIA.

Veratrum album
Stalagmitis cambogioides
Mimosa nilotica *
Mimosa catechu †

ORD.—DIOECIA.

Fraxinus ornus

CL.—CRYPTOGAMIA.

ORD.—FILICES.

Polypodium filix mas ‡
Cycas circinalis

ORD.—ALGÆ.

Lichen Islandicus

Ammoniacum §
Sagapenum
Myrrha
Kino ||
Angustura ¶
Colombo

ANIMALIA.

CLASSIS.—MAMMALIA.

Moschus
Castoreum
Cornu cervi
Sevum ceti
Axungia porcina

CL.—PISCES.

Ichthyocolla

CL.—INSECTA.

Meloe vesicatorius **
Cera
Coccinella
Lapilli et chelæ cancrorum

CL.—VERMES.

Os sæpiæ
Corallium
Spongia

* Acacia vera, Ph. Lond.
† Acacia catechu, Ph. Lond.
‡ Aspidium filix mas, Ph. Lond.
§ Heracleum gummiferum, Ph. Lond.
|| Eucalyptus resinifera, Ph, Ed. Butea frondosa, Ph. Dub.
¶ Cusparia febrifuga, Ph. Lond.
** Lytta vesicatoria, Lond.

END OF VOL. FIRST.