CHAP. XX.

METALLICA.—METALLIC PREPARATIONS.

METALS are distinguished by their opacity, brilliancy, and density. They are fusible and volatile at very different degrees of heat; and at various temperatures they combine with oxygen, forming oxides, and, in two or three cases, compounds possessed of acid properties.

The metals used in medicine are, Silver, Quicksilver, Copper, Iron, Lead, Tin, Zinc, Bismuth, Antimony, and Arsenic.

Metals in their pure state being insoluble in the animal fluids, can scarcely exert any action on the system. Tin, by a mechanical action, is supposed to have an anthelmintic power: some of the others, as iron, copper, and lead, have been supposed to be capable of being acted on by the gastric fluids, so as to produce certain effects; but in general they must be combined with other agents to render their action powerful and certain; and it is their preparations only that are used in medicine.

The general changes which metals are made to undergo, to fit them for medicinal purposes, are, combining them with oxygen, and farther, combining the oxides thus formed with acids. In general it is true, that the metal is more active as a medicine, the more highly it is oxidated, though to this there are some exceptions; and its activity is still farther increased by combination with an acid. In general also, where the metal is combined with an acid, it is more certain in its operation than where it is merely oxidated, as its action is independent of the state of the stomach with respect to acidity, which influences the activity of the oxide; and, besides, uniformity of composition is in general more easily attained in the saline compound than in the oxide alone, and from its solubility, its state of aggregation has usually less influence on its action.

The metallic preparations form some of our most important remedies. They are those most liable to uncertainty in their operation, from variations in the processes to which they are subjected: they are at the same time those which, from their activity, it is necessary to have least variable in strength. The principles, therefore, which regulate their combinations, so far as these are connected with their pharmaceutic preparation, are highly important; and require some illustration, before proceeding to the individual preparations.

The simplest form of combination in which metals are administered, is in the state of oxide. Their oxidation is generally effected by the action of atmospheric air, assisted by heat, sometimes by deflagration with nitre, and sometimes also by acids, the acid being afterwards abstracted by the action of a substance exerting an affinity to it. The first mode always gives the oxide in its purest form; in the second mode, a portion of the alkali of the nitre often combines with the oxide; in the third, a portion of acid often adheres to it.

The principal objection to this form of preparation is the uncertainty to which it is liable in the uniformity of its composition. Every metal, in exerting an affinity to oxygen, is capable of combining with that principle in different proportions; and its power of acting on the living system in common with all its qualities, is much influenced by the quantity with which it is combined. The degrees of oxidation of which a metal is susceptible, if not indefinite, as some facts appear to prove, are at least numerous, and they are liable to be varied by slight diversities of circumstances in the operation by which they are formed. Hence the uncertainty to which such preparations are liable.

The only case in which oxides of uniform and determinate composition can be expected to be obtained, are where they are formed under circumstances which establish a perfect uniformity in the process. Thus, if a metal be oxidated by the atmospheric air, exactly at the point at which it melts, as that point is uniform, or always the same, the oxide will likewise be uniform; and for the same reason, if an oxide is formed at the vaporific point, it will be always of the same composition. But where such a uniformity of external circumstances does not exist, the degree of oxidation may be variable. The state of aggregation too, which is not less dependent on external circumstances, gives rise to a considerable diversity in the action of metallic oxides.

These considerations ought to establish a rule in Pharmacy, which has unquestionably been too much neglected, that when a process for the preparation of any metallic oxide has once been established, and practitioners have become accustomed to its powers and strength, the process ought not to be varied or changed, from the idea of some trivial improvement; as an alteration of circumstances, apparently of little importance, may give rise to a very important change in the result. And it is nearly demonstrable, that the oxides of a metal formed by different processes, as, for example, by a process conducted in the humid way, or by one with the application of heat, cannot be precisely the same.

The other form of preparation under which metals are administered, is that in which the metallic oxide is combined with an acid. Compounds of this kind are generally more active than those in which the metal is merely oxidated. The acid perhaps imparts an additional activity, and the compound being generally more or less soluble, must act more powerfully on the stomach, and be more readily received into the circulating mass, than the oxides which are usually insoluble.

These combinations are generally formed by subjecting the metal to the action of the acid. The acid first yields to it oxygen, either directly, by parting with a portion of what it contains, or by a resulting affinity, enabling it to attract oxygen from the water which may be present, or from the atmospheric air. With the oxide formed in either of these modes, the acid combines.

As a metal can exist in different degrees of oxidation, so it may enter into combination with acids with different proportions of oxygen, and, from this circumstance, very important differences in their medicinal powers are established. No preparations can differ more widely than the corrosive muriate, or corrosive sublimate, as it is named, of mercury, and the mild muriate or calomel. Yet the primary difference between them is in the degree of oxidation of the metal, the proportion of oxygen being less in the latter than in the former.

In general, when a metal is acted on by a weak acid, or one much diluted, it forms a compound, in which it is less oxidated than when it has been subjected to the action of a more powerful or concentrated acid. Or if heat has been employed to favour the mutual action, the metal passes to a higher state of oxidation than when it has been dissolved in the cold. It even sometimes happens, that after a metal has been oxidated and combined with an acid, it continues to attract oxygen, either from the acid, or from the atmospheric air,—a circumstance which may give rise to alterations in metallic preparations.

It has been stated, that a metal combines with oxygen in numerous, if not in altogether indefinite proportions. It is an important question in Pharmacy, whether this is the case also when they combine with acids; or do they enter into such combinations only in a few determinate degrees of oxidation? According as one or other of these happens, either uniformity of composition, or much uncertainty may be expected to be found in saline metallic preparations; and if the latter be the case, much more attention will be required, than might be supposed necessary, in establishing a strict uniformity in the processes by which they are formed.

In general, it appears, that the acid, by the energy of the affinity it exerts, has a very powerful effect in rendering the degree of oxidation determinate, and that these combinations are, therefore, usually established in a few uniform proportions. We have an example of this in the two muriates of mercury. In each of these the metal is in a certain state of oxidation, and whatever process be followed, no intermediate combination appears to be formed. At the same time, it must be admitted, that the degree of oxidation of the metallic oxide, in combining with the metal, is often less definite. Thus, in crystallizing a solution of iron in dilute sulphuric acid, the crystals which are first formed are of a pale green colour; those formed by a second or third evaporation are deeper, and there remains a liquid incapable of crystallizing. In all these there are different states of oxidation. In like manner, in the solution of mercury in nitric acid, the acid may exist in a number of degrees of oxidation, according to the manner in which the solution has been performed, and these solutions will give rise to very different compounds in the decompositions and new combinations to which they may be subjected.

Another source of uncertainty in the composition of the metallic salts, is, that the metallic oxide can combine with various and apparently indefinite proportions of acid. We can have the compound with the acid and metallic oxide combined in those proportions which give rise to neutralization, but we can have it also with various degrees of excess of acid, or excess of base; and each of these will give a preparation different in power, and liable to be very differently affected by other chemical agents.

This is in particular often displayed in preparing metallic compounds by the medium of acids. From the uncertainty to which the oxidation of metals, by the application of heat, is liable, it has frequently been proposed to obtain the product in the humid way, the metal being dissolved in an acid, and this acid being abstracted afterwards by a substance exerting an affinity to it, and the metal precipitated in its oxidated state. But in almost every case these precipitates are not pure oxides, as they have been supposed to be: they retain a portion of the acid with which the oxide was combined, and are therefore sub-salts. They are sometimes thrown down merely by water, and they then retain a considerable proportion of acid in combination; and even when subjected to the more powerful action of an alkali, the whole of the acid is not abstracted, the influence of quantity adding so much to the force of affinity, that a portion of it is retained by the oxide.

In these precipitations from the decomposition of metallic salts, the composition of the precipitate is frequently rendered still more complicated, from part of the precipitating substance entering into the combination.

The influence of the proportions in which a metallic oxide and acid may combine, is shewn in another case,—that where, by applying heat, the acid may have its solvent power so far aided, and be from this cause so saturated with the oxide, as to be incapable of retaining the whole of it in solution when diluted. When water is added, therefore, to a solution of this kind, a partial decomposition ensues; part of the metallic oxide is precipitated, retaining a portion of acid united with it, forming a sub-salt, while the other portion remains dissolved with a slight excess of acid. Now, if such a solution is to be decomposed by adding a neutral salt with the acid of which the metallic oxide is designed to be combined, the mere water in which the salt is dissolved will at the same time act on the metallic solution, and throw down a quantity of this precipitate, which will mingle with the precipitate formed by the metallic oxide and the acid of the decomposing salt, and will of course modify its powers. Hence, a metallic solution is liable to afford, when decomposed, very different products, both from the different states of oxidation in which it may hold the metal dissolved, and the different proportions of oxide with which the acid may be combined.

Metallic preparations, it is thus obvious, are liable to uncertainty of composition; and this suggests the conclusion, that processes with regard to them, once established, ought not to be hastily altered, even in circumstances apparently trivial. It is equally obvious how important it is, that for every active metallic preparation, the same process should be adopted in every country.

The nomenclature of the metallic saline preparations is attended with considerable difficulty, especially in discriminating between the different salts formed from the same acid, united with the same metal, but existing in different states of oxidation. This difference gives rise to very different medicinal properties, or at least very different degrees of activity, and renders it necessary, therefore, that the names ought to be so far distinct, that the one salt cannot be mistaken for the other. Now, the chemical nomenclature is, with regard to this case, defective, and it is difficult to render it more precise. The system of nomenclature requires that the name of each compound salt should be derived from the acid and the base of which it is composed, the acid affording the radical of the generic name, the base giving the specific appellation. But the names of the species of metallic salts have been derived, not from the metallic oxide which is strictly their base or the substance in direct combination with the acid, but from the metal itself. We thus speak of sulphate of iron, muriate of mercury, and others, though the substances to which these names are applied, are rather sulphate of oxide of iron, muriate of oxide of mercury, &c. Did the metal exist always in one state of oxidation as it is combined with the acid, this nomenclature would give rise to no inconvenience. But as it is often in different states of oxidation, the nomenclature is deficient, or something more is required to distinguish between the different salts which, from these different states of oxidation, may be formed from the same metal and the same acid.

In general, not more than two salts are formed from diversity of oxidation in the same metal combined with the same acid; and one method which has been employed to mark their distinction, is to apply the usual generic name to the salt formed from the metal in the low state of oxidation, and to prefix to the same generic name applied to the other salt, the syllable *oxy*, as denoting the higher degree of oxidation. Thus there are two muriates of mercury, one containing the metal at a low, the other at a high degree of oxidation, and these, according to this method, would be distinguished, the one by the name of Muriate, the other by that of Oxymuriate of Mercury. But, independent of the objection, that this violates the principles on which the nomenclature is constructed, since the one salt is just as much a muriate as the other; the syllable *oxy* is appropriated, in the language of Modern Chemistry, to denote the compounds of an oxygenated acid; and Oxymuriate of Mercury, a name now sanctioned by the London College, expresses therefore, not a compound of muriatic acid, but a compound of oxymuriatic acid. Besides, as a medical nomenclature, the merely prefixing the syllable to the same term is far from being sufficient to distinguish between salts totally different, and which it is in the highest degree dangerous to confound. Another method employed, is to apply the generic term to the salt formed from the oxide at the maximum of oxidation, and to prefix to the same term applied to the salt at the minimum, the syllable *sub*; naming, for example, one of the salts of mercury now referred to, Muriate of Mercury, the other Submuriate of Mercury. This has been adopted by the Edinburgh College; but it is equally incorrect. The principles on which the modern nomenclature is founded, require that the epithet *sub* should be appropriated to the names of those salts in which there is a deficiency of acid or excess of base; the base still being the same as that of the corresponding salt, to the name of which this epithet is not prefixed. But in the metallic salts to which this mode has been applied, there is no deficiency of acid, and the base is not the same; the salt to which the epithet *sub* is applied may contain less acid than the other, but this is because the oxide, which is its base, requires less for its saturation: it is altogether a different species, and by the addition of acid, it cannot be converted into the other, which it would be, were it, as the name implies, a Sub-salt. This mode too is liable to the same objection as the other, the merely prefixing to the name common to both, the epithet *sub*, to distinguish one of them, not being sufficiently distinctive, where it is of so much importance that they should be distinguished.

Any nomenclature founded on the supposition of specific degrees of oxidation being established, would be equally improper; for, even supposing them not to be altogether indefinite, the propriety of the appellation in any case would depend on the perfect accuracy of the analysis, and the discovery of a different degree of oxidation with regard to any metal would require the change of the nomenclature of its salts, and, what is still worse, would cause a name, which had been appropriated to one, to be transferred to another.

The only mode that appears practicable, if names altogether arbitrary are not adopted, is to derive the distinctive appellations of these salts from properties in which they differ. If two salts, formed from the same metal and the same acid, but only in different states of oxidation, differ in colour, as is frequently the case, this affords a ground of discrimination in their names, and it is accordingly sometimes had recourse to. Thus, we speak of the green and the brown sulphate of iron. If the colour be the same in each, which may be the case, then the distinction may be drawn from any other property in which they differ. Thus the two muriates of mercury may be distinguished, the one by the appellation of Corrosive Muriate, the other by that of Mild Muriate. This nomenclature, while it violates no principle, has the advantage, that being founded on the properties of the substances, it is permanent; and as applied to medicinal substances, it has the not less important advantage, that it serves in the more important cases to point out the difference to which it is most essential to attend.

Metals are sometimes employed medicinally, combined with sulphur or with sulphuretted hydrogen. When the sulphur is united with the metal itself, the preparation is generally inactive. When the metal is oxidated, and farther combined, either with sulphur or sulphuretted hydrogen, it is more active; but as the degree of oxidation may be various, and as the affinities exerted by sulphur or sulphuretted hydrogen are not sufficiently energetic to render them definite, these preparations are liable to be variable in strength. Hence few of them are retained.

ARGENTUM.—SILVER.

NITRAS ARGENTI, *olim Causticum Lunare.* Nitrate of Silver. Ed.

Take of the Purest Silver, extended in plates and cut, four ounces; Diluted Nitrous Acid, eight ounces; Distilled Water, four ounces. Dissolve the silver in a phial with a gentle heat, and evaporate the solution to dryness. The mass being put into a large crucible, let this be placed on the fire, which must be at first gentle, and gradually increased until the matter flow like oil. Then pour it into iron pipes, heated and rubbed with grease. Lastly, keep it in a glass vessel well stopt.

ARGENTI NITRAS. Nitrate of Silver. Lond.

Take of Silver, an ounce; Nitric Acid, a fluidounce and a half; Distilled Water, two fluidounces. Mix the nitric acid with the water, and dissolve the silver in it in a sand-bath, and gradually increase the heat, that the nitrate of silver may be dried. Melt in a crucible, with a gentle heat, until the water being expelled, ebullition ceases, then immediately pour it into proper moulds.

NITRAS ARGENTI. Nitrate of Silver. Dub.

Take of Silver in thin plates and cut, Nitrous Acid, each an ounce; Distilled Water, two ounces. Put the silver into a glass vessel, placed on sand, and pour on it the acid previously diluted with the water. By a heat gradually increased dissolve the metal, and evaporate the liquor to dryness. The residual matter being put into a crucible, melt it with a gentle heat; lastly, pour it into proper moulds, and keep it in a glass vessel well stopt.

The silver in this process is oxidated and dissolved by the nitrous acid. By the subsequent fusion, a considerable part of the acid is expelled, so that the product is rather a sub-nitrate than a nitrate of silver. The metal ought to be free from all alloy of copper, which gives to the preparation a green colour, and renders it more deliquescent; more acid is ordered in the above formulas, especially in that of the London College, than is necessary. The product is a powerful escharotic, and has the advantage of being easily applied, and confined, and of acting quickly. It is therefore the one in general use for the common purposes for which escharotics are employed.

ANTIMONIUM.—ANTIMONY.

SULPHURETUM ANTIMONII PRÆPARATUM, *olim Antimonium Præparatum.* Prepared Sulphuret of Antimony. Ed.

Let Sulphuret of Antimony be prepared in the same manner as Carbonate of Lime.

SULPHURETUM ANTIMONII PRÆPARATUM. Prepared Sulphuret of Antimony. Dub.

Reduce to powder, and in the manner prescribed for the preparation of chalk, separate the finest particles which are to be reserved for use.

This preparation is merely levigation, and when the sulphuret of antimony is levigated, it has been supposed to act with more certainty than when given in a coarser powder. It is still, however, very inactive. As a remedy in chronic rheumatism, it has been given in a dose of five or ten grains daily.

OXIDUM ANTIMONII CUM SULPHURE VITRIFICATUM, *olim Vitrum Antimonii.* Vitrified Sulphuretted Oxide of Antimony. Ed.

Strew Sulphuret of Antimony, rubbed to a coarse powder like sand, on a shallow unglazed earthen vessel, and apply to it a gentle fire, that the sulphuret of antimony may be slowly heated; at the same time stirring constantly the powder, that it may not run into lumps. White vapours, smelling of sulphur, will arise from it. When these, while the same degree of heat is kept up, cease, increase the heat a little, that vapours may again exhale; and proceed in this manner, until the powder, raised at length to a red heat, exhales no more vapours. This powder being put into a crucible, is to be melted with a strong fire, until it assume the appearance of fused glass; then pour it upon a heated brass plate.

In the first stage of this process, the greater part of the sulphur of the sulphuret of antimony is dissipated, and the antimony is imperfectly oxidated. In the second, the heat applied being more intense, the sulphur is more completely expelled, the antimony is more highly oxidated, and the oxide is vitrified. According to Thenard's analysis, this oxide contains 16 of oxygen in 100 parts. Proust has farther shewn, that it retains a portion of sulphur combined with it, or, as he states it, a portion of the metallic sulphuret, (about one part in nine of the preparation), and lastly, Vauquelin found, that it always contains siliceous earth, which is discoverable by the gelatinous residuum obtained on evaporation of any saline compound formed from this oxide. The quantity appears to be about 9 or 10 parts in 100; it is derived from the earthy matter of the crucible, and probably promotes the vitrification of the oxide. The product is a perfect glass, being transparent in thin pieces, hard and brittle, of a reddish brown colour. It is extremely harsh, and at the same time uncertain in its operation, and is hence not used but in preparing some of the other antimonials.

OXIDUM ANTIMONII VITRIFICATUM CUM CERA, *olim Vitrum Antimonii Ceratum.* Vitrified Oxide of Antimony with Wax. Ed.

Take of Yellow Wax, one part; Vitrified Oxide of Antimony with sulphur, eight parts. To the wax, melted in an iron vessel, add the oxide rubbed to powder, and roast them with a gentle fire, for a quarter of an hour, stirring constantly with a spatula; then pour out the matter, which, when it is cold, rub to powder.

It is probable, that during this process, the oxide of antimony loses part of its oxygen, from the carbonaceous matter of the wax attracting it, as it diminishes in weight; and it is probable also, that its state of vitrification is changed. It becomes much milder in operation. Though once highly recommended in dysentery, it may be regarded as an obsolete remedy. The dose in which it was given, was from five to fifteen grains, and its principal operation was that of a cathartic, from which probably any benefit received from it was derived.

OXIDUM ANTIMONII CUM PHOSPHATE CALCIS, *olim Pulvis Antimonialis.* Oxide of Antimony with Phosphate of Lime. Ed.

Take of Sulphuret of Antimony, rubbed to a coarse powder, Hartshorn Shavings, of each equal parts. Mix and throw them into a wide iron pot, red hot, and stir them constantly until they are burnt into a matter of a grey colour, which remove from the fire, rub to powder, and put into a coated crucible. Lute to this crucible another inverted, in the bottom of which a small hole is drilled; apply the fire, which is to be gradually raised to a white heat, and kept at this increased heat for two hours. Lastly, triturate the matter, when cold, into a very fine powder.

PULVIS ANTIMONIALIS. Antimonial Powder. Lond.

Take of Sulphuret of Antimony in powder, a pound; Shavings of Horn, two pounds. Mix, and throw them into a broad iron pot at a red heat, stirring constantly, until they become of a grey colour. Removing the matter, rub it to powder, and put it into a coated crucible, with another crucible inverted, in the bottom of which is a small hole, joining them with lute. Then apply heat, and increase it gradually to a white heat for two hours. Rub the residuum, so that it shall form a very fine powder.

PULVIS ANTIMONIALIS. Antimonial Powder. Dub.

Take of Sulphuret of Antimony in coarse powder, Shavings of Hartshorn, of each, two pounds. Boil the hartshorn in a quantity of water sufficient to separate the animal gluten, then dry and mix it with the antimony; throw the mixture into an open iron pot heated to redness, stirring constantly, until the vapours of sulphur cease to exhale, and the matter becomes of a grey colour. Rub the matter when cold into powder, and put it into a coated crucible. Adapt to this another inverted, in the bottom of which is a small hole, and secure the joining with lute. Calcine the matter with a heat gradually raised to a white heat, for two hours; when cold, rub it into a very fine powder.

With regard to these processes, the only variation in that in the Dublin, from that in the Edinburgh Pharmacopœia, is, that the hartshorn is previously boiled to extract from it the gelatin,—a circumstance of little importance, as this gelatin is decomposed by the heat. The London College have changed the strength of the preparation, two parts of shavings of horn being employed to one of sulphuret of antimony. The reasons which have been assigned for this are, that the preparation is brought nearer to the strength of *James's* powder, for which this is designed as a substitute, and that it is rendered more manageable in its administration. With regard to the first, there is some doubt, as with the enlarged proportion of antimony, a preparation different in the proportions of its constituent parts from those of the James's powder, as analysed by Pearson, must be obtained. And though it were just, it was of more importance to preserve an active preparation, now officinal, of the same strength in all the Pharmacopœias, than to assimilate it to the strength of an empirical remedy. With regard to the other, the powder appears to be just as manageable of the one strength as of the other. The product of the process of the London

Pharmacopœia is said to be perfectly white, in which circumstance it resembles James's powder: that prepared with the larger proportion of sulphuret of antimony has always a yellow shade.

This process has been introduced into the Pharmacopœias, as affording a preparation similar to the empirical medicine, *James's Powder*, justly celebrated as a remedy in fever. Nothing more was known with regard to this, than that it was an antimonial, until its analysis was undertaken by Dr Pearson. He found the genuine powder of James to consist of 43 parts of phosphate of lime, and 57 of an oxide of antimony, part of which was vitrified; and by the above formula, he was able to prepare a powder similar to it in qualities and chemical composition. The theory of the process is sufficiently obvious. During the first stage, the animal matter of the bones is decomposed and burnt out; the sulphur of the sulphuret of antimony is expelled, and the metal is imperfectly oxidated. In the second stage of the process, the metal is more completely oxidated, the oxide is partially vitrified, and is perhaps brought into combination with the phosphate of lime, which is the residuum of the bones. This latter supposition remains, however, uncertain. That portion at least of the oxide which is vitrified cannot be combined with the phosphate; the other perhaps may be in this state of combination, as Dr Pearson supposed. Chenevix, from his experiments on the powder, supposed them rather to be merely intimately mixed. He found too, that in the preparation obtained by Pearson's process, more of the oxide of antimony is vitrified than in the genuine James's powder, the proportion in the one being not less than 44 in 100 of the oxide, in the other only 28.

Mr Chenevix proposed a method of obtaining this preparation in the humid way,—taking equal weights of the white powder precipitated by water, from muriate of antimony, and of pure phosphate of lime, obtained by dissolving calcined bone in muriatic acid, and precipitating the phosphate by ammonia; dissolving these in as much muriatic acid as may be necessary, with the assistance of a moderate heat, and pouring this solution into ammonia diluted with distilled water. The ammonia combines with the muriatic acid, and the oxide of antimony and phosphate of lime are thrown down intimately mixed. This preparation may be more uniform in composition than that obtained by heat, as, in the latter, variations are liable to be introduced from the different degrees of oxidation of which antimony is susceptible, and also from the vitrification and volatility of the antimonial oxide; but it cannot be the same compound as the other: it is indeed merely a mixture of sub-muriate of antimony and phosphate of lime. It appeared, from some trials made of it, to be milder in its operation than the other preparation; but it would require more extensive experience, to determine if it has the same medicinal effects.

The medical history of these preparations has been already delivered. James's powder has been celebrated as a remedy in febrile affections. It acts as a general evacuant, occasioning sweat, purging, and frequently vomiting; and, by this general action, appears sometimes to arrest the progress of fever, if given at its commencement, or to produce a more favourable crisis. Its dose is five or six grains, repeated every six hours, till its effects are obtained. It has been affirmed, that the preparation obtained by the process of the Pharmacopœias is not so certain nor so powerful in its operation as the powder of James, eight grains of the former being not more than equal to six of the latter.

The difference, if it exist, may be owing to some peculiarity in the process, by which a difference of oxygenation, or of vitrification of the oxide may be occasioned; and, as has been already stated, it does appear that the proportion of oxide vitrified is not the same in the one as in the other. It remains to be determined, how far the preparation from the proportions, as given now by the London College, differs from the others, or is similar to the James's powder.

SULPHURETUM ANTIMONII PRÆCIPITATUM. Precipitated Sulphuret of Antimony. Ed.

Take of Water of Potash, four pounds; Water, three pounds; Prepared Sulphuret of Antimony, two pounds. Boil them in a covered iron pot, on a gentle fire, for three hours, stirring frequently with an iron spatula, and adding water as it may be necessary. Strain the hot liquor through a double linen cloth, and to this strained liquor, add as much diluted sulphuric acid as may be necessary to precipitate the sulphuret, which is to be carefully washed with warm water.

ANTIMONII SULPHURETUM PRÆCIPITATUM. Precipitated Sulphuret of Antimony. Lond.

Take of Sulphuret of Antimony in powder, two pounds; Liquor of Potash, four pints; Distilled Water, three pints. Mix, and boil with a gentle heat for three hours, stirring constantly, and adding occasionally distilled water, so that it may keep up the same measure. Strain the liquor immediately through a double linen cloth; gradually drop into it, while still warm, diluted sulphuric acid, as much as is sufficient to precipitate the powder; then remove the sulphate of potash, by washing with warm water; dry the precipitated sulphuret of antimony, and rub it to powder.

SULPHUR ANTIMONIATUM FUSCUM. Brown Antimoniated Sulphur. Dub.

Take of Sub-carbonate of Potash, Prepared Sulphuret of

Antimony, each equal parts. Melt them mixed together in a crucible, then reduce the cold matter to powder. Put this into a matrass with four pints of water, and boil for a quarter of an hour; remove the vessel from the fire and close it; allow it to remain at rest for a short time, and as soon as the liquor has become clear, opening the vessel, pour it cautiously from the sediment: the antimoniated sulphur will separate in part, as the liquor cools; add of diluted sulphuric acid as much as may be sufficient to throw it down entirely, which leaves an excess of acid; shake the mixture, that the matter last thrown down (which will be of a yellowish red colour) may be mixed with the rest; then, after due subsidence, pour off the liquor from the sediment, which wash with cold water as long as the decanted liquor appear acid by the test of litmus. Lastly, dry it on bibulous paper.

The only variation of any apparent consequence in these processes is in that of the Dublin Pharmacopœia, in which the sulphuret of antimony and sub-carbonate of potash are fused together, and the matter is lixiviated afterwards with water; the liquor thus obtained, however, appears to be essentially the same with that formed by boiling the water of potash on the sulphuret; and the successive steps being similar, there is no essential difference in the product.

From the analysis of this preparation by Thenard, it appears to be composed of 68.3 of the orange-coloured oxide of antimony, (which consists of 18 of oxygen, and 82 of antimony), 17.8 of sulphuretted hydrogen, and 11 or 12 of sulphur. The theory of its formation is somewhat intricate. In boiling the sulphuret of antimony with the potash, a sulphuret of potash is formed, and this decomposing part of the water, a sulphuretted hydro-sulphuret of potash, that is a compound of potash, sulphur and sulphuretted hydrogen, is also produced; the antimony appears to be at the same time oxidated, probably by the sulphuretted hydrogen acting as a weak acid, and by a disposing affinity enabling it to attract part of the oxygen of the water. This oxide is retained in solution by the sulphuretted hydro-sulphuret of potash. When sulphuric acid is added, it unites with the potash; a little of the sulphuretted hydrogen is disengaged with effervescence, and the antimonial oxide, combined with the remaining sulphuretted hydrogen and with the sulphur, is precipitated. The compound, therefore, is a sulphuretted hydro-sulphuret of oxide of antimony, or a compound of oxide of antimony, sulphur and sulphuretted hydrogen, as stated above. The name given to it in the Pharmacopœias does not at all express its real nature.

When the liquor obtained by boiling the solution of potash on the sulphuret of antimony is strained, and allowed to cool, it deposites a red-coloured powder, which has been known by the name of *Kermes Mineral*, and has been much used on the Continent. From the analysis of it by Thenard, it appears to be a compound of brown oxide of antimony and sulphuretted hydrogen, with a small portion of sulphur; the proportions being 73 of oxide of antimony, 20 of sulphuretted hydrogen, and 4 of sulphur; the last, as Thenard supposes, being accidental. Trommsdorff attributes the difference between these two preparations to the one *essentially* containing sulphur combined with the oxide of antimony and sulphuretted hydrogen; the other not. Thenard ascribes it rather to a difference of oxygenation, the oxide in the *kermes* being less highly oxidated than in the other; but as both can be obtained from the same solution, either as we allow it merely to cool, or as we add sulphuric acid, which cannot change the state of oxidation, this is not probable, while the difference in the proportion of sulphur must, from the nature of the process, necessarily exist; for in the one case, the oxide can be combined only with those portions of sulphur and sulphuretted hydrogen which it can attract, while in the other, the sulphur precipitated by the addition of the acid must be also added to it. The kermes mineral is probably therefore essentially a compound of oxide of antimony and sulphuretted hydrogen, with a small and variable proportion of sulphur. The one preparation, the Kermes Mineral, may be distinguished, though not perfectly correctly, by the name Hydro-Sulphuretum Oxidi Antimonii Rubrum; the other by that of Hydro-Sulphuretum Oxidi Antimonii Luteum. The quantity of both products, from a given weight of sulphuret of antimony, may be considerably increased by adding a portion of sulphur, and increasing the quantity of alkali, the proportion of sulphur in the native sulphuret not being sufficient to render the whole of the metal soluble, and a quantity of it, therefore, without this addition, remaining undissolved.

These preparations agree nearly in their medicinal qualities, which are similar to those of the other antimonials. They have been used principally as diaphoretics and sudorifics, but are always uncertain in their operation, and in this country are scarcely used. The dose of the precipitated sulphuret of antimony, as it is named, is five or six grains, that of the Kermes may be the same.

OXIDUM ANTIMONII CUM SULPHURE PER NITRATEM POTASSÆ, *olim Crocus Antimonii.* Oxide of Antimony with Sulphur, by Nitrate of Potash. Ed.

Take of Sulphuret of Antimony, Nitrate of Potash, of each the same weight. Triturate them separately, and, having mixed them well together, throw them into a crucible red hot. The deflagration being over, separate the reddish matter from the white crust, and rub it to a powder, which is to be frequently washed with warm water, until it remain insipid.

During the deflagration, the nitric acid of the nitrate of potash is decomposed, and its oxygen is attracted, partly by the sulphur, and partly by the antimony. The sulphurous acid, which is the principal product of the oxygenation of the sulphur, is in part dissipated, and in part combined with the potash; and with a little sulphuric acid likewise produced, forms the white crust which is directed to be removed. By the union of another portion of the oxygen with the antimony, a brown or reddish oxide is formed. It appears also that part of the sulphuret of antimony escapes decomposition or oxygenation, and remains combined with the oxide, in the proportion of about two parts to eight; or rather, perhaps, the oxide retains a little sulphur combined with it. The preparation, therefore, is an imperfect oxide of antimony with sulphur or sulphuret of antimony. It is of a brick red colour: what is to be found in the shops is generally of a grey colour, and is usually prepared very improperly, with a diminished proportion of nitre.

As an antimonial, this preparation is so uncertain in its operation, that it is never prescribed; it is used in making some of the other preparations of this metal.

MURIAS ANTIMONII. Muriate of Antimony. Ed.

Take of Oxide of Antimony with Sulphur by Nitrate of Potash, Sulphuric Acid, of each one pound; Dried Muriate of Soda, two pounds. Pour the Sulphuric Acid into a retort, adding gradually the muriate of soda and the oxide of antimony, previously mixed. Then distil from warm sand. Expose the distilled matter for some days to the air, that it may deliquesce; then pour the liquid part from the impurities.

In this mode of forming muriate of antimony, the muriate of soda is decomposed by the sulphuric acid combining with the soda; the muriatic acid disengaged, unites with the oxide of antimony, and the compound is volatilized. The same product is obtained by the direct action of oxymuriatic acid gas on metallic antimony, the oxygen communicated to the metal forming the oxide with which the muriatic acid combines. According to the hypothesis lately maintained with regard to muriatic acid, the compound is one merely of antimony with oxymuriatic gas or chlorine. It is at first of a soft consistence, whence its old name of Butter of Antimony, and cannot be dissolved by pouring water upon it, the mass of water acting on it, by its quantity, and decomposing it, separating a sub-muriate. But, when left exposed to the air, it slowly imbibes as much water as is sufficient for its solution without decomposition, and then forms a dense heavy liquid of a brown colour. By the addition of water to this, the same decomposition is produced, and sub-muriate of antimony is precipitated.

This preparation is, from its acrimony, unfit for internal use; externally it has sometimes been used as a caustic. Decomposed by potash, it affords an oxide which has been used in preparing the tartrate of antimony.

Muriate of Antimony has not directly a place in the London or Dublin Pharmacopœias, but a process is given for preparing it, with the view of obtaining from it the following antimonial preparation, — probably a sub-muriate, though denominated an oxide.

ANTIMONII OXYDUM. Oxide of Antimony. Lond.

Take of Sulphuret of Antimony in powder, two ounces; Muriatic Acid, eleven fluidounces; Nitric Acid, one fluidounce. To the acids mixed together in a glass vessel, add gradually the antimony, and digest with a boiling heat for an hour; then strain, and pour the strained liquor into a gallon of water, in which two ounces of sub-carbonate of potash have been previously dissolved. Wash the precipitated powder, by pouring water frequently upon it, until no acid remain, then dry it on bibulous paper.

OXYDUM ANTIMONII NITRO-MURIATICUM. Nitro-Muriatic Oxide of Antimony. Dub.

Take of Prepared Sulphuret of Antimony, two ounces; Muriatic Acid by measure, eleven ounces; Nitrous Acid by measure, one drachm. Add the sulphuret gradually to the acids, previously mixed in a glass vessel, avoiding the vapours; then digest with a heat gradually raised until the mixture cease to effervesce; lastly, boil for an hour. Strain the liquor when cold, and receive it strained in a gallon of water; the oxide of antimony is precipitated; wash it with a sufficient quantity of water, until the decanted liquor appear by the test of litmus to be free from acid; lastly, dry the oxide on bibulous paper.

Muriatic acid acts very feebly on antimony, not being capable of communicating to it oxygen directly, and the affinity of the metal to this principle not being sufficiently strong as to be able, even when aided by the resulting affinity of the acid, to decompose water. By the addition of nitric acid, the oxidation and solution are more easily effected, the nitric acid yielding oxygen to the metal, and the oxide combining with the muriatic acid: the sulphur of the sulphuret appears to suffer little change. The strained liquor, therefore, is a muriate of antimony, and this undoubtedly appears a simple method of procuring it. Of the two processes, that given by the Dublin Pharmacopœia was first introduced as an officinal one. The principal objection to it is its being too expensive, from the large quantity of muriatic acid employed, in proportion to the quantity of antimony; a larger quantity of the metal probably might be dissolved, especially with a small increase in the proportion of nitric acid, and the product be increased. The London College in adopting the formula have altered the proportions, so as altogether to defeat the success of the process. The proportion of nitric acid is much more than is necessary to afford oxygen to the antimony; and it renders the action so violent, that the operation can scarcely be conducted, the extrication of offensive vapours being so rapid, and the materials, by the violence of the effervescence, being sometimes even thrown from the vessel. Part of the sulphur too of the sulphuret appears to be acted on, and brought into a state in which it is not easily separated from the oxidated antimony. Lastly, the digesting the liquor at a boiling heat for so long a time, is not only unnecessary, but inconvenient, as rendering the liquor so thick, that it is difficult to strain it. Considered therefore as a process for affording a muriate of antimony, that of the Dublin College is unnecessarily expensive and inconvenient, and that of the London College is altogether defective. It is not less so in relation to the object of the preparation, that of affording an oxide to be employed in the preparation of emetic tartar, as for that purpose it is, as is immediately to be stated, quite unfit.

The subsequent stage of the process, that of the decomposition of the muriate to afford the oxide, is effected, according to the one formula, by the action of a weak solution of sub-carbonate of potash; according to the other, by the addition of water. The precipitate thrown down from muriate of antimony by water used to be regarded as an oxide, but it was long ago shewn by Rouelle to be a sub-muriate; the water, by its affinity to the acid, abstracting the greater portion of it; but the oxide still, in conformity to the law which usually regulates these decompositions, retaining a portion of the acid combined. If the sub-muriate, after being precipitated, is thoroughly washed with water, and then digested with a solution of potash or sub-carbonate of potash, a considerable portion of this acid is abstracted, though probably not the whole of it; for the influence of quantity on the affinity exerted by the oxide to the acid is becoming more powerful as the abstraction proceeds, and will cause part of the acid to be retained. The method of applying the sub-carbonate of potash directed by the London College is designed probably to abstract the acid more effectually from the oxide; but it is of no advantage in this respect, though it may increase a little the quantity of precipitate. By the agency of the water of the solution the muriate is decomposed, and the sub-muriate is thrown down, the liquor above retaining the excess of muriatic acid. This excess of acid the alkali will be spent in neutralizing, and is even insufficient for this: it will thus be prevented from acting on the precipitate, so as to abstract any of the acid it contains, at least unless it were employed in much larger quantity than is ordered by the College. The method of applying with effect the quantity they use, would be to precipitate the muriate with water, remove the acidulous liquor above, wash the precipitate, and then submit it to the agency of the sub-carbonate, by digesting them with a small portion of water. A considerable part of the acid might then be abstracted. But there is some reason to believe, that, for the purpose to which this oxide is designed to be applied, that of preparing emetic tartar, the presence of a little muriatic acid, instead of being detrimental, is useful.

This preparation is not designed for internal administration, but for the preparation of other antimonials, particularly that of the tartrate of antimony and potash. Its application to this is to be immediately noticed.

TARTRIS ANTIMONII, *olim Tartarus Emeticus.* Tartrite of Antimony, formerly Emetic Tartar. Ed.

Take of Oxide of Antimony with Sulphur by Nitrate of Potash, three parts; Super-Tartrate of Potash, four parts; Distilled Water, thirty-two parts. Boil them in a glass vessel for a quarter of an hour. Strain through paper, and put aside the strained liquor that crystals may form.

ANTIMONIUM TARTARIZATUM. Tartarized Antimony. Lond.

Take of Oxide of Antimony, two ounces; Super-Tartrate of Potash in powder, three ounces; Distilled Water, eighteen fluidounces. To the water boiling in a glass vessel throw in gradually the antimony and super-tartrate of potash mixed together, and boil for half an hour; then strain the liquor through paper, and boil it down with a gentle heat in a glass vessel, so that while it cools slowly, crystals shall form.

TARTARUM ANTIMONIATUM, *sive Emeticum.* Antimoniated or Emetic Tartar. Dub.

Take of Nitro-Muriatic Oxide of Antimony, two ounces; Crystals of Tartar in very fine powder, two ounces and a half; Distilled Water, eighteen ounces. Cause the water to boil in a glass vessel, then throw into it gradually the oxide and tartar previously mixed together, and boil for half an hour; strain the liquor through paper, and let it cool slowly that crystals may form.

The excess of tartaric acid in the super-tartrate of potash is capable of combining with a number of metallic oxides, and of forming ternary compounds. With oxide of antimony, when not too highly oxidated, it unites with facility, forming a combination of this kind, which constitutes the present preparation, the tartaric acid of the super-tartrate, dissolving a portion of the oxide of antimony, and a triple compound of oxide, acid and potash crystallizing; it is not therefore a pure tartrate of antimony, but a tartrate of antimony and potash, and the name given to it in all the

Pharmacopœias is chemically incorrect, and is so without any necessity or advantage. Tartras Antimonii et Potassæ is its proper appellation. According to the analysis of it by Thenard, it consists of 38 parts of oxide of antimony, 34 of tartaric acid, 16 of potash, and 8 of water. It is liable, however, to vary considerably in the proportions of its constituent principles, according to the process by which it has been prepared.

These processes have been very various, this being the most important of all the antimonials, and having therefore much engaged the attention of chemists. The principal object of their researches has been to obtain an oxide, not too expensive in its preparation, and which shall combine with facility with the tartaric acid. The oxide precipitated by potash from muriate of antimony was recommended by Bergman, and employed in the process given in the preceding edition of the Edinburgh Pharmacopœia, but was liable to the former objection, being obtained by a process somewhat difficult, and therefore expensive, and hence not being employed by the apothecary. The College have, therefore, substituted the brown oxide prepared by deflagration of sulphuret of antimony with nitre, the *Crocus of antimony* as it is named. This, however, is liable to several objections. The crocus of antimony found in the shops, which in general will be used by the apothecary, is usually prepared by the trading chemist, and the fraud has gradually been established of preparing it without the due proportion of nitre, so that it is not sufficiently oxidated to be easily soluble in the tartaric acid. Even when it is properly prepared, its state of aggregation, as Mr Phillips has remarked, prevents it from being dissolved so as to saturate the tartaric acid, unless it be reduced to a very fine powder by levigation, which renders the process expensive.

The sub-muriate of antimony is free from these objections; and the process introduced by the Dublin, and followed by the London College, is designed to afford it by a method more easy of execution, and more economical than the usual method recommended by Bergman. These advantages, however, are not attained by it, even in the formula given by the Dublin College, and still less in that of the London College, as has been already stated. It farther appears, that the oxide or sub-muriate obtained by the London process is often in such a state as to be altogether unfit for the preparation of emetic tartar, being not soluble in the solution of super-tartrate of potash; and some results with regard to this, singular, and not easily explained, have been established. Several chemists had found the process altogether to fail; the oxide when boiled with the super-tartrate of potash not being dissolved, but being retained in that state of minute division and suspension, that the liquor does not by filtration become clear; it also remains acid, and does not yield crystals by evaporation. With others, again, the process has succeeded. From the experiments of Mr Phillips, it appears, that much of the difference in the state of the oxide depends on the manner in which the digestion of the mixed nitric and muriatic acids on the sulphuret of antimony is performed, and on the extent of the evaporation, a precipitate being obtained from the solution prepared by digestion in a flask, which is dissolved by super-tartrate of potash, and furnishes emetic tartar in its proper state; while, when the digestion has been performed in a shallow vessel, the precipitate is nearly or altogether insoluble. And so liable is the preparation to variation of strength, that, as Mr Phillips has stated, products may be obtained, the strength of which varies as widely as from one to sixty. It is obvious, that a process liable to such uncertainty ought to be altogether discarded. The precipitate from the muriate, as prepared by the process of the Dublin Pharmacopœia, is more soluble, and affords, it has been stated, tartrate of antimony and potash of proper strength. The failure of the London process is therefore apparently owing to the excess of nitric acid causing the antimony to pass to too high a degree of oxidation, and thereby rendering it incapable of being dissolved by the tartaric acid. If it should be thought, that an oxide precipitated from muriate of antimony is best adapted to the formation of emetic tartar, perhaps the simplest mode of preparing the muriate, for this purpose, is to dissolve the crocus of antimony by boiling in muriatic acid, to decompose this solution by the affusion of water, and then, if necessary, to digest the sub-muriate precipitated with a dilute solution of sub-carbonate of potash, previous to boiling it with the super-tartrate of potash.

Some chemists have considered another oxide, the vitrified oxide or glass of antimony, as the one best adapted to the preparation of emetic tartar. It cannot be in an improper state of preparation; being prepared on a large scale, it is not expensive; it is dissolved by the super-tartrate, and is capable of sufficiently saturating the tartaric acid. It was accordingly recommended by Dr Black. The principal objection to it is, that it contains a portion of siliceous earth; this enters with the oxide of antimony into combination with the tartaric acid, and, when the liquor is considerably evaporated, gives to it a gelatinous consistence, and prevents the crystallization. This, however, scarcely forms a just objection, for it is always proper in the crystallization of this salt not to carry the evaporation of its solution too far. The process of crystallization itself appears to produce a division in the principles of the combination, the crystals which form first containing more oxide of antimony than those produced by a farther evaporation, and there remaining at length an uncrystallizable liquid, in which there appears to be an excess of potash combined with the acid and a portion of oxide. As the silex, therefore, does not impede the first crystallization, and as any further crystallization ought not to be attempted, its presence can scarcely be regarded as injurious, and the vitrified oxide is still perhaps the best on the whole that can be employed.

Mr Phillips has lately proposed the subsulphate of antimony, prepared by boiling two parts of sulphuric acid on one of antimony, and decomposing this by the affusion of water,—three parts of this sub-sulphate being dissolved by four of super-tartrate of potash, and affording emetic tartar of proper strength.

Another source of diversity in this preparation, to which all the methods are liable, is the extent to which the solution is evaporated to cause it to crystallize; the farther the evaporation is carried, more of the potash entering into the composition of the crystals, and the crystals obtained by a second crystallization, when this is practised, being from this cause, too, of a different composition from those of the first. Some degree of impurity is produced also, from the presence of tartrate of lime in the super-tartrate of potash; it crystallizes when the excess of tartaric acid is neutralized by the antimonial oxide, and forms the groups of acicular crystals, diverging from a common centre, which often appear in the crystallized mass. One advantage of employing a submuriate of antimony in the preparation, it is remarked by Mr Phillips, is, preventing this intermixture of tartrate of lime, the lime being retained by the muriatic acid.

These observations will shew the difficulty of preparing this salt, so as to obtain a uniform product, and how desirable it is that a proper process should be selected, affording a product as nearly as possible of the same strength as that to which practitioners have been accustomed, and which all the colleges should adopt.

Tartrate of antimony and potash crystallizes in small triedral pyramids, which are efflorescent. Its solubility has been variously stated, and appears to vary according to the quantity of antimonial oxide contained in it, from proper preparation. On an average, it is soluble in fifteen parts of water at 60°. According to Dr Saunders, one ounce of water at 60° dissolves fifty-two grains of the fully saturated salt; while of that generally met with, it dissolves from thirty-two to thirty-five. This affords even a mode of judging of the strength of this preparation. It is very susceptible of decomposition, suffering it not only from alkalis, earths, acids, and a number of neutral salts, but even from vegetable infusions and decoctions, the vegetable matter attracting apparently part of the oxygen of the oxide,—decompositions the occurrence of which requires to be guarded against in extemporaneous prescription. If kept dissolved in water, it is also decomposed, from the spontaneous decomposition of the tartaric acid.

This preparation is superior to the other antimonials, in the certainty of its operation, at least as an emetic, and, from its solubility, is more manageable with regard to dose. Its medicinal applications have been already noticed. It is given as an emetic in a dose of from one to three grains, dissolved in water; and, in smaller doses, as an expectorant and diaphoretic.

VINUM TARTRITIS ANTIMONII, *olim Vinum Antimoniale.* Wine of Tartrite of Antimony. Ed.

Take of Tartrite of Antimony, twenty-four grains; White Wine, one pound. Mix, so that the tartrite of antimony may be dissolved.

Antimonial Wine, as it was named, was formerly prepared by macerating white wine on the vitrified oxide of antimony in powder, the tartaric acid of the wine dissolving a portion of the oxide, so that the wine acquired the powers of an antimonial preparation. It was liable, however, to be variable in strength, from the proportion of acid in the wine not being uniform. The present preparation was therefore substituted for it. It may be doubted, however, whether it is properly officinal. The salt, dissolved in wine, can indeed be preserved longer without decomposition than when dissolved in water; but still on long keeping, part of the antimonial oxide is deposited. It is given as an emetic in the dose of one ounce; as a diaphoretic, in a dose of one or two drachms.

LIQUOR ANTIMONII TARTARIZATI. Solution of Tartarized Antimony. Lond.

Take of Tartarized Antimony, a scruple; Boiling Distilled Water, four fluidounces; Wine, six fluidounces. Dissolve the tartarized antimony in the boiling distilled water; then add the wine.

A preparation similar to this in the former edition of the London Pharmacopœia contained four grains of the tartrate of antimony and potash in an ounce of wine. The proportion is now reduced to one half, and it is thus with advantage rendered of the same strength as the analogous preparation in the Edinburgh Pharmacopœia, and more similar in strength also to the old antimonial wine. The dilution of the wine renders it a little more economical, but it is not improbable may have the disadvantage of admitting more readily of the spontaneous decomposition of the metallic salt.

CUPRUM.—COPPER.

AMMONIARETUM CUPRI, *olim Cuprum Ammoniacum.* Ammoniuret of Copper.

Take of Sulphate of Copper, two parts; Carbonate of Ammonia, three parts. Rub them thoroughly in a glass mortar, until all effervescence is finished, and they unite uniformly into a violet-coloured mass, which being wrapt in bibulous paper, is to be dried, first on a chalk stone, and afterwards with a gentle heat. It is to be kept in a glass phial well stopt.

CUPRUM AMMONIATUM. Ammoniated Copper. Lond.

Take of Sulphate of Copper, half an ounce; of Sub-carbonate of Ammonia, six drachms. Rub them together in a glass mortar, until effervescence cease; then dry the ammoniated copper wrapt up in bibulous paper with a gentle heat.

CUPRUM AMMONIATUM. Ammoniated Copper. Dub.

Take of Sulphate of Copper, an ounce; Carbonate of Ammonia, an ounce and a half. Beat them together in an earthen mortar until all effervescence cease, and they unite into a mass, which being wrapt up in bibulous paper is to be dried, and kept in a phial closed with a glass stopper.

The sulphate of copper is decomposed by the carbonate of ammonia. One portion of ammonia combines with the sulphuric acid; another portion of it unites with the oxide of copper, and the violet-coloured mass which is formed is a mixture of the two resulting compounds; or perhaps, what is more probable, the sulphuric acid is in combination with the two bases, forming a ternary compound; the water of the two salts rubbed together, renders the new compound, when it is formed, soft or moist; hence the necessity of drying it: the carbonic acid is disengaged with effervescence. The preparation is of a dark-blue colour, which it retains when dried. It has been chiefly employed as a remedy in epilepsy. It is given in a dose of at first half a grain twice a-day, which is gradually and slowly increased to two or three grains, and continued for some time; and for internal administration, it has the advantage, over the salts of copper, of being less liable to excite vomiting.

LIQUOR CUPRI AMMONIATI. Solution of Ammoniated Copper. Lond.

Take of Ammoniuret of Copper, a drachm; Distilled Water, a pint. Dissolve the ammoniuret of copper in the water, and filter the solution through paper.

This is a simpler mode of obtaining a preparation which has had a place in the Pharmacopœias, and which used to be obtained by an indirect mode given in the following formula, which retains its place in the Dublin Pharmacopœia. The quantity of ammonia, however, is not sufficient to retain the whole oxide of copper dissolved in this large quantity of water, and therefore a portion of the oxide is precipitated.

AQUA CUPRI AMMONIATI. Water of Ammoniated Copper. Dub.

Take of Lime Water, eight ounces; Muriate of Ammonia, two scruples; Prepared Verdigrease, four grains. Mix them together, and digest for twenty-four hours; then pour off the pure liquor.

In this indirect mode of combining oxide of copper with ammonia, the lime decomposes the muriate of ammonia, by combining with the muriatic acid, and the disengaged ammonia combines with the oxide of copper of the verdigrease or sub-acetate of copper, forming a dilute solution of ammoniureted oxide of copper. The preparation is therefore essentially the same with that of the preceding formula. It has been applied, diluted with an equal part of water, as a mild escharotic, to remove specks from the cornea, and sometimes, in its undiluted state, as a stimulant and escharotic to ulcers.

SOLUTIO SULPHATIS CUPRI COMPOSITA, *olim Aqua Styptica.* Compound Solution of Sulphate of Copper. Ed.

Take of Sulphate of Copper, Sulphate of Alumine, of each three ounces; Water, two pounds; Sulphuric Acid, one ounce and a half. Boil the sulphates in water, that they may be dissolved; then to the liquor strained through paper add the acid.

This is a combination of powerful astringents. It has been applied topically to check hæmorrhage, and, largely diluted with water, as a wash in purulent ophthalmia.

FERRUM.—IRON.

FERRI LIMATURA PURIFICATA. Purified Filings of Iron. Ed.

A sieve being placed over the filings, let a magnet be applied, that the filings may be drawn through the sieve upwards.

The iron, from the facility with which it is attracted by the magnet, is by this operation obtained pure, the interposition of the sieve in a great measure preventing particles of other metals, or impurities which are generally mixed with iron-filings got from the work-shops, from being entangled in the cluster which adheres to the magnet. The process, though not always attended to in the shops, is a necessary one, where iron is to be medicinally employed in this form, or where it is to serve for other preparations of this metal.

OXIDUM FERRI NIGRUM PURIFICATUM, *olim Ferri Squamæ Purificatæ*. Purified Black Oxide of Iron. Ed.

Let the Scales of Black Oxide of Iron, which are found at the anvils of the workmen, be purified by the application of the magnet; for the magnet attracts only the more thin and pure scales, leaving those which are larger and less pure.

OXIDUM FERRI NIGRUM. Black Oxide of Iron. Dub.

Purify the Scales of Oxide of Iron which are found at the anvils of the workmen, by applying a magnet; then reduce them into powder, of which the finer particles are to be separated in the manner directed in the preparation of chalk.

The scales of iron are the small fragments struck off from the metal when it is heated red hot. Passing through the atmosphere, at this temperature, they are oxidated, but so imperfectly, as to retain their magnetic quality, and therefore to admit of this mode of purification by the magnet. They are used only in making some of the other chalybeate preparations.

CARBONAS FERRI PRÆPARATUS, *olim Rubigo Ferri Præparata.*

Prepared Carbonate of Iron. Ed.

Purified Filings of Iron are to be frequently moistened with water till they fall into rust, which is to be rubbed to a fine powder.

FERRI RUBIGO. Rust of Iron. Dub.

Take of Iron Wire, any quantity; cut it into small parts, which being exposed to the air, moisten frequently with water until they pass into rust; then rub them in an iron mortar, and by the affusion of water, wash away the finest powder; which dry.

During exposure to air and moisture, iron is oxidated, and this oxide is found to be combined with carbonic acid, absorbed probably from the atmosphere; it is not a carbonate, however, but a sub-carbonate: As a chalybeate it is rather more active than the pure metal, and more mild than the other saline combinations of iron. Its dose is from 10 to 20 grains. In a large dose it is liable to occasion uneasiness at the stomach. As an external application it has been employed in cancerous ulceration, the levigated powder being formed into a paste with water: this is spread over the surface of the sore, and is removed every twelve hours: its efficacy in real cancer is very doubtful; but in some forms of ulceration it appears to mitigate the pain, correct the acrimony and fœtor of the discharge, and cause the ulcer to heal. Its operation is promoted by its internal exhibition in the usual dose.

Carbonas ferri præcipitatus. Precipitated Carbonate of Iron. Ed.

Take of Sulphate of Iron, four ounces; Carbonate of Soda, five ounces; Water, ten pounds. Dissolve the sulphate of iron in the water; then add the carbonate of soda, previously dissolved in as much water as may be necessary, and mix them well together. Let the carbonate of iron, which is precipitated, be washed with warm water, and afterwards dried.

Ferri carbonas. Carbonate of Iron. Lond.

Take of Sulphate of Iron, eight ounces; Sub-carbonate of Soda, ten ounces; Boiling Water, a gallon; dissolve separately the sulphate of iron and sub-carbonate of soda in four pints of the water; mix the liquors together, and put aside, that the powder may subside; then having poured off the liquor above, wash the carbonate of iron with warm water, and having wrapt it up in blotting paper, dry it with a gentle heat.

Carbonas ferri. Carbonate of Iron. Dub.

Take of Sulphate of Iron, four ounces; Carbonate of Soda, five ounces; Water, ten pints. Dissolve the sulphate of iron in the water; then add the soda previously dissolved in a sufficient quantity of water, and mix them together. Wash the carbonate of iron which is precipitated with tepid water, and afterwards dry it.

On mixing the solutions of carbonate of soda and sulphate of iron, the soda attracts the sulphuric acid; the carbonic acid in whole or in part combines with the oxide of iron; the sulphate of soda remains in solution; the carbonate of iron is precipitated. It is to be remarked, however, with regard to this, and all the saline combinations of iron, that the metal enters into them in different states of oxidation, and thus produces very different salts. There is one oxide, the black, nearly at the *minimum*, containing, according to Lavoisier's estimate, 27 of oxygen in 100, which forms one order of salts; there is another, the red oxide, at the maximum, which, according to Proust, contains 0.48, which is the base of another series of saline compounds, and between these are probably also intermediate combinations. In the present process, the sulphate of iron which is employed containing the metal in the low state of oxidation, it is this oxide which combines with the carbonic acid; but the compound attracts very rapidly oxygen from the atmospheric air, so as to pass to a higher state of oxidation, and it appears at the same time to lose the greater part of its carbonic acid. From these changes the precipitate of carbonate of iron, in washing and drying, changes its colour, from a dark green to a reddish brown. It differs ultimately, therefore, in little from the rust of iron, except that it may be somewhat purer. Both are probably sub-carbonates, and the quantity of carbonic acid appears even to be inconsiderable. Sub-carbonate of potash is more economical than carbonate of soda in producing the precipitate, and it gives even a larger precipitate, as the excess of carbonic acid derived from the latter retains a portion of the product dissolved. For the same reason it is advantageous to mingle the solutions warm. On the other hand, the precipitate by carbonate of soda retains a larger quantity of carbonic acid.

Carbonate of iron, containing the metal at a low state of oxidation, is a mild and not inactive preparation, preferable to the carbonate or rust, in which the iron is in a higher state of oxidation, as sitting easier on the stomach. The formula of Griffith, which has been highly celebrated as a chalybeate, it has already been remarked, is a preparation of this kind; and as introduced into the London Pharmacopœia, under the name of Mistura Ferri Composita, has been already considered, (page 33.). It is as an extemporaneous preparation (in which only it is obtained at the low state of oxidation) that it ought to be used; and in the state in which it is obtained by the present process, it has probably little advantage over the common rust of iron.

SULPHAS FERRI, *olim Vitriolum Viride.* Sulphate of Iron. Ed.

Take of Purified Filings of Iron, six ounces; Sulphuric Acid, eight ounces; Water, two pounds and a half. Mix them; and the effervescence being over, digest for a short time in a sand-bath; then strain the liquor through paper, and, after due evaporation, put it aside that crystals may form.

FERRI SULPHAS. Sulphate of Iron. Lond.

Take of Iron, of Sulphuric Acid, each eight ounces; of Water, four pints. Mix the sulphuric acid with the water in a glass vessel, and add to them the iron; then, when effervescence has ceased, strain the liquor through paper, and evaporate it, so that, when it cools, crystals may form. Having poured off the water, dry these on bibulous paper.

SULPHAS FERRI. Sulphate of Iron. Dub.

Take of Iron Wire, two ounces; Sulphuric Acid, three ounces and a half; Water, a pint. Mix the acid slowly with the water in a glass vessel; add gradually the iron wire cut down; digest the mixture so as to dissolve the metal, and strain the liquor through paper; lastly, after due evaporation, put it aside, so that by slow cooling crystals may form.

Iron decomposes water very slowly at a low temperature, but when aided by the action of sulphuric acid the decomposition goes on rapidly. The effect in this case may be ascribed, according to the doctrine of disposing affinity, to the concurrent affinities of the iron to oxygen, of the acid or rather the base of the acid to oxygen, and of the acid to iron. These co-operating prevail over the single affinity of the oxygen to the hydrogen of the water: the water therefore is decomposed; its oxygen, the iron, and the acid unite, and the hydrogen is disengaged in the elastic form. The iron in this combination is at a low state of oxidation, the *minimum* nearly; and the salt which it forms is the Green Sulphate of Iron, so named, to distinguish it from the Red Sulphate, in which the metal is more highly oxidated. This green sulphate is prepared for the various purposes to which it is applied in the arts, on a large scale, by exposing the native sulphuret of iron to air and moisture; by the absorption of oxygen, the iron is oxidated, the sulphur is converted into sulphuric acid, and by lixiviation the sulphate of iron is extracted. By the present process, however, it is obtained in a purer state, and fitter therefore for medicinal use. Its crystals are of a light green colour; the residual liquor, by a second evaporation, affords crystals of a darker green, in which the metal appears to exist more highly oxidated. In the shops there is often substituted for this salt the common green vitriol, purified by a second crystallization, a little acid having been added to the solution, to dissolve any excess of oxide.

Sulphate of iron is one of the most active preparations of the metal. Its medium dose is from three to five grains: its medicinal applications have been already noticed. The red sulphate, in which the metal is more highly oxidated, appears to be still more active. Its preparation and properties have also been stated under the general history of iron.

SULPHAS FERRI EXSICCATUS. Dried Sulphate of Iron. Ed.

Take of Sulphate of Iron, any quantity. Heat it in an unglazed earthen vessel, on a gentle fire, until it become white and perfectly dry.

SULPHAS FERRI EXSICCATUM. Dried Sulphate of Iron. Dub.

Take of Sulphate of Iron, any quantity. Render it dry and white by exposing it to a strong heat in an unglazed earthen vessel.

This is the sulphate of iron freed from its water of crystallization by the application of heat. It is not medicinally employed, but has a place in the Pharmacopœia from being used in one or two pharmaceutical preparations.

OXIDUM FERRI RUBRUM. Red Oxide of Iron. Ed.

Let dried Sulphate of Iron be exposed to a violent heat, until it is converted into a red coloured matter.

OXIDUM FERRI RUBRUM. Red Oxide of Iron. Dub.

Calcine dried Sulphate of Iron, with a very strong fire, until it is converted into a red coloured matter; wash this, until by the test of litmus the water poured off appears to be free from acid; dry it on bibulous paper.

By an intense heat, sulphate of iron is decomposed; its acid its partly expelled, and in part suffers decomposition, being evolved in the state of sulphurous acid; the metal at the same time becomes more highly oxidated. The red oxide is the residuum. To free it more completely from any adhering acid, the Dublin College order it to be washed with water. It is scarcely medicinally employed, but is used in some pharmaceutical preparations.

TINCTURA MURIATIS FERRI. Tincture of Muriate of Iron. Ed.

Take of Purified Black Oxide of Iron, in powder, three ounces; Muriatic Acid, about ten ounces, or as much as may be sufficient to dissolve the powder. Digest with a gentle heat, and, when the powder is dissolved, add as much alkohol as that there shall be of the whole liquor two pounds and a half.

TINCTURA FERRI MURIATIS. Tincture of Muriate of Iron. Lond.

Take of Carbonate of Iron, half a pound; Muriatic Acid, a pint; Rectified Spirit, three pints. On the carbonate of iron, in a glass vessel, pour the muriatic acid, and agitate them occasionally for the space of three days. Put aside, that the impurities, if there are any, may subside, and having poured the liquor off, add to it the spirit.

TINCTURA FERRI MURIATIS. Tincture of Muriate of Iron. Dub.

Take of Rust of Iron, half a pound; Muriatic Acid, three pounds; Rectified Spirit of Wine, three pints. To the rust, put into a glass vessel, add the acid, and agitate occasionally during three days. Put aside, that the impurities may subside, and pour off the clear liquor. Reduce this by slow evaporation to a pint, and when cold add the spirit.

Iron, in combining with acids, it has already been remarked, unites with them in different degrees of oxidation; and when at the two extremes, or the *minimum* and *maximum*, forms with the same acid very different salts. This is well displayed in its combination with muriatic acid. When metallic iron is dissolved in the acid, the solution is of a pale green colour, and affords crystals of a similar colour on evaporation. This salt is soluble in water, but is insoluble in alkohol. When the red oxide or the carbonate is dissolved in the acid, the solution is of a yellow colour; it is not crystallizable, but by evaporation is reduced to a deliquescent mass; it is soluble in water, and is abundantly soluble in alkohol. Of course, it must be this salt which forms the basis of the tincture formed by the present process. In the process, as performed according to the formula of the Edinburgh Pharmacopœia, the black oxide which is employed combines with the muriatic acid, and during the solution acquires more oxygen, principally from a partial decomposition of the water, which is promoted by the heat applied. The muriate of iron, in which this more perfect oxide is contained, is soluble in the alkohol, diluted as it is to a certain extent by the water of the acid; yet even with this, the metal is scarcely sufficiently oxidated to form the salt, which is entirely soluble in alkohol. The tincture formed is of a pale green colour; and it even sometimes happens, that if the solution of the iron has been slowly performed, on adding the alkohol to it, a great part of the salt is precipitated in crystalline grains. But in a short time, from exposure to the air, oxygen is absorbed, the colour deepens to a yellow, and the precipitate is dissolved. In the process given in the other Pharmacopœias, the metal is submitted to the action of the acid in a higher state of oxidation, as it exists in such a state in the rust which is ordered; and the compound is at once formed, which is soluble in alkohol. It may therefore be supposed to be preferable, as there is some risk of the other not being properly prepared, from the tincture being perhaps poured off from the precipitate, instead of being allowed to remain over it until it is dissolved. It appears, however, that the metal may be too highly oxidated to remain in combination with the acid, this tincture always depositing a sediment of oxide when long kept, and this is perhaps more liable to happen when the metal is even at the first in a highly oxidated state. From the proportions in the Dublin formula, the tincture prepared by it must have a considerable excess of acid, and this may perhaps prevent any such precipitation of the oxide.

This tincture of red muriate of iron is a very grateful preparation; the alkohol appears to suffer some chemical change from the action of the acid and the metallic oxide, the odour becoming ethereal. It is a preparation also highly active. It is given, as has been already stated, in the diseases in which iron is employed, in a dose from ten to twenty drops, largely diluted with water, or, what is more grateful, in wine. If it produce irritation at the stomach, as it is liable to do from its activity, the dose must be diminished.

TINCTURA MURIATIS FERRI CUM OXYDO RUBRO. Tincture of Muriate of Red Oxide of Iron. Dub.

Take of Red Oxide of Iron, an ounce; Muriatic Acid, four ounces; Rectified Spirit of Wine, as much as may be sufficient. Digest the oxide with the acid for twenty-four hours; then boil for half an hour; evaporate the strained liquor until it attain the consistence of syrup, and when cold, add to it rectified spirit of wine, shaking frequently, until the specific gravity of the tincture is to that of distilled water as 1050 to 1000.

This tincture being prepared from the red oxide may perhaps be more active than the other; yet it is probable, that the degree of oxidation in the rust of iron is not much inferior, and that the two tinctures will not differ greatly in power.

MURIAS AMMONIÆ ET FERRI, *olim Flores Martiales.* Muriate of Ammonia and Iron. Ed.

Take of Red Oxide of Iron, washed and again dried, Muriate of Ammonia, of each equal weights. Mix them well together, and sublime.

FERRUM AMMONIATUM. Ammoniated Iron. Lond.

Take of Carbonate of Iron, Muriate of Ammonia, each a pound; mix them thoroughly; then applying a strong heat, sublime quickly; lastly, rub into powder.

MURIAS AMMONIÆ et FERRI. Muriate of Ammonia and Iron. Dub.

Take of Red Oxide of Iron, Muriate of Ammonia, each equal weights. Having mixed them well, sublime with a sudden heat sufficiently strong.

Oxide of iron decomposes muriate of ammonia, by attracting the muriatic acid, and, in the present process, this decomposition takes place, ammoniacal gas being exhaled. But, from the proportions of the substances employed, part of the muriate of ammonia escapes decomposition, is sublimed by the heat applied, and elevates with it part of the muriate of iron that had been formed; or rather, perhaps, the oxide of iron enters into combination with the acid and part of the ammonia, forming a triple compound. Whichever of these is the result, the process is an unscientific mode of obtaining a muriate of iron; the product, too, has been found uncertain in strength, more of the muriate of iron being sublimed, according as the heat is applied strongly and quickly. The variation introduced by the London College of employing carbonate of iron appears to be improper, as probably carbonate of ammonia will be formed and sublimed. Muriate of ammonia and iron is in crystalline grains, of a yellow colour, and somewhat deliquescent. It was principally employed as a remedy in rickets, in a dose to children of two or three grains; but is now little used.

TINCTURA FERRI AMMONIATI. Lond.

Take of Ammoniated Iron, four ounces; Proof-spirit, one pint. Digest and strain.

This solution of the preceding compound is an unnecessary preparation, as it differs little from the tincture of muriate of iron, and must be less certain with regard to strength.

FERRUM TARTARISATUM. Tartarised Iron. Lond.

Take of Iron, one pound; Super-tartrate of Potash in powder, two pounds; Distilled Water, one pint. Rub them together, and expose the mixture to the air in an open glass vessel for eight days; then dry it by a sand-bath, and rub it into a very fine powder. Put aside this powder, having again added to it a pint of water, for eight days, then dry it, and rub it into a powder.

By exposure to air and moisture, the iron is oxidated, and its oxide combines with the excess of acid in the super-tartrate of potash, a triple compound resulting, composed of potash, oxide of iron, and tartaric acid, though a considerable portion still remains metallic. It forms a powder of a greenish brown colour, which attracts moisture from the air, but does not deliquesce. By repeating the trituration and exposure to the air in a humid state, the oxidation of the iron is rendered more complete. The Dublin College give the following formula, by which the saline combination is rendered more perfect.

TARTARUM FERRI. Tartar of Iron. Dub.

Take of Carbonate of Iron, half an ounce; Crystals of Tartar in fine powder, one ounce; Distilled Water, a pint. Boil them together in a glass vessel, over a slow fire, for an hour, and filtrate the liquor through paper. After it has cooled, and has been filtrated a second time, evaporate it until a pellicle appear on its surface. The liquor, by cooling, forms a saline mass, which is to be reduced to powder, and kept in close vessels.

This is the proper tartrate of iron and potash, as much of the oxide of iron of the carbonate, as the free tartaric acid of the super-tartrate of potash requires for saturation, being dissolved, and the ternary compound being obtained by evaporation. Both this, and the less perfect analogous compound obtained by the preceding process, have been introduced as mild, and, at the same time, active preparations of the metal. It is soluble in water, and may therefore be given in a state of solution, and considersbly diluted, a form in which the saline preparations of iron always prove less irritating. It is stated, too, by Mr Phillips, that when the acid of the super-tartrate is fully saturated with the iron, the taste of the metal is scarcely perceptible : the preparation is therefore less nauseous than other chalybeates in the liquid form. The dose is from five to fifteen grains. The preparation obtained by this formula of the Dublin College has not only been employed in the usual diseases in which iron is prescribed, but has also been highly recommended as a remedy in dropsy, from the combination of its tonic with a diuretic power ; and from its mildness, it is well adapted for administration in scrofula to children in a small dose.

VINUM FERRI. Wine of Iron. Lond.

Take of Iron-Filings, two ounces ; Wine, two pints. Mix them together, and put aside for a month, shaking them frequently ; then strain through paper.

VINUM FERRI. Wine of Iron. Dub.

Take of Iron Wire cut, four ounces ; Rhenish White Wine, four pints. Sprinkle the iron-filings with a little wine, and expose them to the air, until they are covered with rust ; then add the remaining wine ; digest for seven days, shaking occasionally ; lastly, strain.

The tartaric acid of the wine contributes to the oxidation of the iron, and dissolves the oxide ; and in the mode directed by the Dublin College, being aided by the action of the air, the oxidation, and consequent impregnation of the wine with iron will probably take place to a greater extent. The acidity of the Rhenish wine will likewise contribute to this. Still the preparation must be liable to be variable in strength, and can scarcely be regarded as possessed of any advantage. It has been given as a chalybeate in a dose of one or two drachms.

ACETAS FERRI. Acetate of Iron. Dub.

Take of Carbonate of Iron, half an ounce; Acetic Acid, three ounces. Digest them for three days, and strain the liquor.

In this process, the acetic acid dissolves the iron, and may afford a mild and active chalybeate, probably, however, not differing much in its operation from the tartrate of iron.

TINCTURA ACETATIS FERRI. Tincture of Acetate of Iron. Dub.

Take of Acetate of Potash, two ounces; Sulphate of Iron, one ounce; Rectified Spirit, two pints. Rub together the acetate of potash and the sulphate of iron in an earthen mortar, until they unite into a soft mass. Dry this with a moderate heat; rub the dried matter with the spirit; put the mixture into a phial closely corked, and digest for seven days, agitating it frequently; lastly, pour off the clear liquor from the impurities.

TINCTURA ACETATIS FERRI CUM ALKOHOL. Tincture of Acetate of Iron with Alkohol. Dub.

Take of Sulphate of Iron, Acetate of Potash, each one ounce; Alkohol, two pints. Rub the acetate of potash and sulphate of iron in an earthen mortar until they unite into a soft mass; then dry with a moderate heat, and when cold rub it with the alkohol. Put the mixture into a phial well stopt, and digest for twenty-four hours, shaking occasionally; lastly, pour off the clear tincture from the impurities.

These tinctures are the same, with the difference, probably unimportant, in the proportion of acetate of potash, and the trivial substitution of alkohol for rectified spirit. In the action of the two salts, the acetic acid will be combined with the oxide of iron, forming acetate of iron, while the sulphuric acid is united with the potash, so as to form sulphate of potash, at least these binary combinations will be rendered more complete by the action of the alkohol added, sulphate of potash being nearly insoluble in that liquid, while acetate of iron can be dissolved. During the trituration too, it is probable that the oxide of iron absorbs oxygen from the air, and the salt formed, therefore, will be the one containing the metal at the higher degree of oxidation, and which alkohol more easily dissolves. The tincture may have the advantage over the watery solution of acetate of iron formed by the first process, of being less liable to spontaneous decomposition; but it must be regarded as altogether superfluous to have two tinctures differing probably in little more than in strength, or indeed to have more than one form of acetate of iron, if there was any necessity for its introduction as an officinal preparation, which is doubtful. The preparations of this metal in the Pharmacopœias are more numerous than what are required in practice.

LIQUOR FERRI ALKALINI. Alkaline Solution of Iron. Lond.

Take of Iron, two drachms and a half; Nitric Acid, two fluidounces; Distilled Water, six fluidounces; Solution of Subcarbonate of Potash, six ounces. Pour the acid and the water mingled together on the iron; and when the effervescence has ceased, pour off the liquor while still acid. Add this gradually, and at intervals, to the solution of sub-carbonate of potash, agitating frequently, until the colour, having become of a brownish red, effervescence is no longer excited. Put it aside for six hours, and then pour off the liquor.

This is a preparation, which has long been known under the name of Martial Alkaline Tincture, and the nature of it is not very well ascertained. The iron is oxidated and dissolved by the nitric acid; and the solution which answers best for its preparation, appears to be that in which the metal is in a low state of oxidation, and in which there is an excess of acid; this is obtained by the solution being effected slowly, and, when in this state, it is of a pale green colour. On adding the solution to the sub-carbonate of potash, the alkali saturates a portion of the acid, and the oxide or rather sub-nitrate of iron is precipitated, but by agitation it is kept suspended, and by the excess of alkali is redissolved, this being accompanied with effervescence from the disengagement of part of the carbonic acid. If the reverse mode of adding the alkaline carbonate to the solution of iron is followed, much of the oxide is precipitated, and is not redissolved even by the excess of alkali. According to this view, the liquid is a ternary compound of oxide of iron, nitric acid and potash. It has often been remarked, however, by chemists, that more of the precipitate is redissolved, when carbonate of potash is employed, than when pure potash is used; and this would lead to the conclusion, that a portion of the carbonic acid is likewise retained in the combination, and probably contributes, by its action on the alkali and the oxide, to maintain the state of solution. On standing, a portion of nitre, formed from the union of the potash and nitric acid is deposited, from which the clear liquor is to be poured off; and by this formation of nitre, it is not improbable that the whole, or the greater part of the nitric acid is withdrawn. It will then be a carbonate of potash and iron. Mr Phillips has remarked, that the proportion of alkaline carbonate ordered by the College is rather too small to retain the oxide dissolved: it requires about one-twelfth more.

This preparation is of a deep reddish brown colour, transparent, or frequently somewhat turbid, especially from the action of the air. It has a styptic alkaline taste. From the variable state in which it is obtained, from the operation of very trivial circumstances in conducting the process, it must be liable to uncertainty of strength; and it has farther been stated by the older chemists, that on being kept, it deposites much of its iron, — a change very likely to happen from the metal passing to a higher state of oxidation. Mr Phillips has also stated, that it is decomposed by water, five parts of water added to one of the solution precipitating oxide of iron in a few minutes. It is therefore so far defective. The advantages belonging to it as a chalybeate have been stated under the general history of iron.

HYDRARGYRUS.—QUICKSILVER.

Hydrargyrus purificatus. Purified Quicksilver. Ed.

Take of Quicksilver, four parts; Iron Filings, one part. Rub them together and distil from an iron vessel.

Hydrargyrus purificatus. Purified Quicksilver. Lond.

Take of Quicksilver, six pounds; Iron Filings, one pound. Rub them together; then applying heat, distil the quicksilver from an iron retort.

Hydrargyrum purificatum. Purified Quicksilver. Dub.

Take of Quicksilver, six pounds; Distil slowly four pounds.

The quicksilver of commerce has been supposed to be frequently adulterated with other metals. To obtain it perfectly pure is the design of this process. The addition of the iron-filings renders the distilled quicksilver more bright and mobile, an effect not perfectly explained, but ascribed to the iron retaining combined with it any foreign metal, or any portion of carbon that might have been contained in the quicksilver. But the process is in reality not very necessary; for although quicksilver is easily adulterated, this does not appear to be often practised, what is met with in commerce being in general nearly pure. The distillation, too, is rather difficult of execution, from the weight of the quicksilver and the high temperature that requires to be applied. Wherever there is reason, however, to suspect any impurity, the purification by this method ought to be performed. The Dublin formula is deficient both as omitting the iron, and directing only four pounds out of six to be distilled,—an unnecessary waste, to which it is not to be supposed the apothecary will submit.

Acetis hydrargyri. Acetite of Quicksilver. Ed.

Take of Purified Quicksilver, three ounces; Diluted Nitrous Acid, four ounces and a half, or a little more than may be requisite to dissolve the quicksilver; Acetite of Potash, three ounces; Boiling Water, eight pounds. Mix the quicksilver with the diluted nitrous acid; and towards the end of the effervescence, digest, if necessary, with a gentle heat, until the quicksilver be entirely dissolved. Then dissolve the acetite of potash in the boiling water, and immediately on this solution, while hot, pour the other, and mix them both by agitation. Then put aside, that crystals may be formed. These being placed in a funnel, wash them with cold distilled water; and, lastly, dry them with a very gentle heat. In preparing the acetate of quicksilver, it is necessary that all the vessels and the funnel which are employed should be of glass.

Acetas hydrargyri. Acetate of Quicksilver. Dub.

Take of Purified Quicksilver, three ounces; Diluted Nitrous Acid by measure, three ounces; Acetate of Potash, three ounces; Boiling Distilled Water, eight pints. Add the acid to the quicksilver, and the effervescence being over, digest on warm sand, that the metal may be dissolved; immediately mix the solution with the boiling water in which the acetate of potash has been previously dissolved: then pass the mixture quickly through double linen; let it cool that crystals may form; these, being washed with distilled cold water, dry on paper with a very gentle heat. In the whole operation glass vessels must be used.

Acetic acid, like the other acids, combines with mercury in different states of oxidation, and forms salts which are different in their properties. When the metal is in a high state of oxidation, a salt is formed which is acrid and soluble; when in a lower state of oxidation, the salt obtained is more mild and sparingly soluble. The object of the present process is to obtain the latter of these salts: it may be doubted, therefore, if the application of heat directed by both colleges to promote the solution of the mercury is proper, as it causes it, in dissolving, to pass to a too highly oxidated state. It has another disadvantage; that the acid being saturated with oxide, the solution is capable of being decomposed by water, and a sub-nitrate is precipitated; and accordingly this happens, when a solution, prepared with the aid of heat, is added to a solution of acetate of potash. By employing an excess of acid, this is counteracted to a certain extent, and from this circumstance, the process, as given in the Edinburgh Pharmacopœia, may succeed, while that of the Dublin College is more liable to fail. It is better, however, to avoid these sources of error entirely, by allowing the solution of the mercury in the acid to proceed in the cold, pouring off the solution from any undissolved mercury, and adding it to the solution of acetate of potash warm. On mixing the two solutions, the nitric acid of the nitrate of mercury combines with the potash of the acetate of potash, while the acetic acid unites with the oxide of mercury, and the acetate of mercury at a low degree of oxidation is formed. It remains at first dissolved, but on the liquid cooling a little, it appears in the form of delicate crystals, of a white colour and silvery lustre. Instead of employing boiling water to dissolve the acetate of potash, it is preferable to use only tepid water, as at a high temperature the water is liable to produce a partial decomposition of the acetate, so that it becomes of a yellow colour from a slight excess of oxide. It is necessary, too, not to continue to wash the salt after it is formed with much water, for a similar partial decomposition takes place, and the crystals become yellow. If this should happen, the brilliant whiteness is instantly restored by washing them with a little diluted distilled vinegar, the acetic acid neutralizing the excess of oxide to which the yellow colour is owing. With these precautions, the process, which often fails when they are not attended to, is easily conducted, and the preparation is obtained perfectly uniform, and in a proper state.

Acetate of mercury crystallizes in small brilliant scales. It is soluble in hot, and insoluble in cold water. As an antisyphilitic remedy, it is very mild in its operation; but its effects are not considered as sufficiently permanent to allow of its being relied on in effecting a radical cure. Its dose is a grain, night and morning.

MURIAS HYDRARGYRI, *olim Mercurius Sublimatus Corrosivus.* Muriate of Quicksilver. Ed.

Take of Purified Quicksilver, two pounds; Sulphuric Acid, two pounds and a half; Muriate of Soda, dried, four pounds. Boil the quicksilver with the sulphuric acid in a glass vessel placed in a sand-bath, until the matter become dry. Mix this when cold in a glass vessel with the muriate of soda; then sublime it in a glass cucurbit with a heat gradually raised. Separate the sublimed matter from the scoriæ.

HYDRARGYRI OXYMURIAS. Oxymuriate of Quicksilver. Lond.

Take of Purified Quicksilver, two pounds; Sulphuric Acid, thirty ounces; Muriate of Soda, dried, four pounds. Boil the quicksilver with the sulphuric acid in a glass vessel, until the sulphate of mercury become dry. Rub this when it has cooled, with the muriate of soda in an earthen mortar; then sublime it from a glass cucurbit with a heat gradually raised.

MURIAS HYDRARGYRI CORROSIVUM. Corrosive Muriate of Quicksilver. Dub.

Take of Purified Quicksilver, two pounds; Sulphuric Acid, three pounds; Dried Muriate of Soda, two pounds and a half. Dissolve the quicksilver in the acid; and increase the heat gradually until the matter become perfectly dry. Rub this when cold, with the muriate of soda in an earthen mortar; then sublime it in a proper vessel with a fire gradually raised.

These processes are nearly the same, except that in the formula of the Dublin Pharmacopœia, rather a larger quantity of sulphuric acid is ordered, and a considerably smaller quantity of muriate of soda. The excess of acid, if it is not dissipated in the evaporation, will be useful, as decomposing the muriate of soda more completely; and if the proportion of muriate of soda be sufficiently large to afford the quantity of muriatic acid requisite to the saturation of the oxide of mercury in the sulphate, the reduction of it from the larger proportion ordered in the other Pharmacopœias will be an advantage, as it will render it more easy to apply a due degree of heat in the subliming vessel to the whole mixture. On this point comparative experiments would require to be made.

In the first stage of the general process, the sulphuric acid, aided by the high temperature, oxidates the mercury, and combines with the oxide; the salt formed being that which contains the metal in a high state of oxidation. This salt, in its dry state, is mixed with the muriate of soda, and, by the application of heat, a double decomposition is effected; the soda attracts the sulphuric acid, and the muriatic acid combines with the oxide of mercury. The muriate of mercury being easily volatilized, is separated from the sulphate of soda by sublimation. The process formerly employed in the preparation of this important mercurial salt, consisted in mixing together sub-nitrate of mercury, muriate of soda, and dried sulphate of iron, and subliming the muriate of mercury, formed by the re-action of these, by the application of a sufficient heat. The present process originally proposed by Kunckel has been substituted as more simple, and more economical, from the expence of the nitric acid in preparing the sub-nitrate of mercury being avoided. There is reason to doubt, however, whether from a given weight of mercury it affords the same quantity of product; a deficiency arising from the dry sulphate of mercury not containing a sufficient quantity of acid to decompose as much muriate of soda as is requisite to afford the muriatic acid necessary to convert the whole of the oxide of mercury into muriate. The enlarged proportion of sulphuric acid, and diminished proportion of muriate of soda, directed by the Dublin College, are perhaps in this respect useful.

This mercurial, corrosive sublimate as it was formerly named, having long been established in medical practice, has been frequently submitted to chemical analysis. The earlier analyses were necessarily incorrect. The investigation of the composition of this and the other muriate of mercury, the mild sublimate or calomel, was some years ago undertaken by Mr Chenevix, and the relative proportions of their principles determined. It had been supposed by some chemists, that the corrosive sublimate is a compound of oxide of mercury with oxymuriatic acid; this supposition, he found no reason to admit, the compound consisting of mercury in a high state of oxidation united with muriatic acid; the oxide, which is its basis, he concluded, consists of 85 of mercury, and 15 of oxygen; and 100 parts of the salt are composed of 82 of this oxide, and 18 of muriatic acid. Its ultimate principles, therefore, and their proportions, are 18 of acid, 12.3 of oxygen, and 69.7 of quicksilver. Zaboada, from a more recent analysis, has inferred, that the oxide does not contain more than 10 of oxygen in 100 parts, and that 80 of this oxide are combined with 20 of acid. According to this, the ultimate principles and their proportions will be 20 of acid, 8.5 of oxygen, and 71.5 of quicksilver. Some other chemists have given results nearly the same.

According to the hypothesis which considers oxymuriatic acid as a simple substance, the corrosive sublimate is a compound of it with metallic quicksilver. According to this hypothesis, when the muriatic acid acts on the oxide of mercury, instead of combination, they suffer mutual decomposition; the hydrogen of the muriatic acid combines with the oxygen of the oxide; while the oxymuriatic principle or chlorine, the other supposed element of the acid, unites with the metallic mercury, and forms the corrosive sublimate.

The impropriety of the term Oxymuriate of Mercury, given to this salt by the London College, has been pointed out in the observations on the nomenclature of the metallic salts. Neither is the name Muriate of Mercury, given to it by the Edinburgh College, sufficiently distinctive. In modern chemical writings, this name is even frequently given to the other Muriate of Mercury, in which the metal is at a lower state of oxidation,—a circumstance which must render this as a medical nomenclature extremely hazardous. The name Corrosive Muriate of Mercury is the one which deviates least from the principles on which the system of chemical language is established, and the one which ought to be adopted, considered in relation to its medicinal application, as affording the most marked distinction, and approaching nearest to the appellation by which it has been long known.

Corrosive muriate of mercury is obtained by sublimation in the form of a dense crystalline mass: when sublimed slowly, it condenses in slender prismatic crystals; and it is obtained in a similar form by crystallization from its watery solution. It is easily soluble in water, requiring 20 parts at 60° for its solution, and 2 parts at 212°. It is still more soluble in alkohol, requiring scarcely 4 parts at 60°. Its taste is acrid and metallic. It changes to a green several vegetable colours; is decomposed by the alkalis and earths, and by a number of compound salts, and likewise by vegetable infusions.

It is the most powerful of the mercurial preparations. Its dose cannot safely exceed the fourth of a grain, nor can more than one grain be given in twenty-four hours. As an antisyphilitic remedy it has long been established in practice, and, as has been already stated under its history, it possesses some advantages. It acts speedily, and its action is more general on the system, or less determined to particular organs: these advantages are more than counterbalanced, however, by the occasional violence of its operation, and by the uncertainty which attends it, so that it cannot be relied on in establishing a permanent cure. It is also employed in other diseases, particularly as an alterative in some obstinate cutaneous affections. It is given in the form of solution in water or alkohol, the dose being increased cautiously from the eighth to the fourth of a grain, night and morning, and mucilaginous diluents being freely taken, to lessen the irritation it is liable to occasion. A solution of this kind has been introduced as an officinal preparation by the London College. As the solution has a very disagreeable taste, it is sometimes made into pills with crumbs of bread, a little of it being mixed with an equal weight of muriate of ammonia, which renders it more soluble in water, this being dissolved by adding the necessary proportion of water, and the solution being formed into a mass with crumbs of bread, and divided into pills, so that each pill contains the eighth of a grain of the corrosive muriate. Externally under the form of solution it is employed as an escharotic in chancre and venereal ulcers of the mouth; and a very dilute solution of it has been used as an injection, to excite inflammation in obstinate gleet.

LIQUOR HYDRARGYRI OXYMURIATIS. Solution of Oxymuriate of Mercury. Lond.

Take of Oxymuriate of Mercury, eight grains; Distilled Water, fifteen fluidounces; Rectified Spirit, one fluidounce. Dissolve the oxymuriate in the water, and add the spirit.

This formula is designed to afford a form of preparation under which corrosive muriate of mercury may be administered, and its dose be easily regulated. An ounce contains half a grain; its dose therefore may be from one to two drachms.

SUB-MURIAS HYDRARGYRI, *olim Calomelas.* Sub-muriate of Quicksilver. Calomel. Ed. Murias Hydrargyri Mitis. Mild Muriate of Mercury.

Take of Muriate of Quicksilver, rubbed to powder in a glass mortar, four ounces; Purified Quicksilver, three ounces. Rub them together in a glass mortar, with a little water, that the operator may be guarded against the acrid powder which would otherwise arise, until the quicksilver is extinguished. Put the dried powder into an oblong phial, of which it shall fill only one-third, and let it be sublimed in a sand-bath. The sublimation being finished, and the phial broken, the red powder at the bottom and the white one about the neck of it are equally to be rejected; the remaining mass is to be again sublimed, and rubbed into a fine powder, which is lastly to be washed with boiling distilled water.

HYDRARGYRI SUB-MURIAS. Sub-muriate of Quicksilver. Lond.

Take of Oxymuriate of Quicksilver, a pound; of Purified Quicksilver, nine ounces. Rub them together, until globules no longer appear, then sublime; afterwards remove the sublimate; rub it to powder, and sublime it twice. Lastly, reduce it to a very fine powder, in the manner prescribed for preparing chalk.

SUB-MURIAS HYDRARGYRI SUBLIMATUM, sive CALOMELAS. Sublimed Sub-muriate of Quicksilver or Calomel. Dub.

Take of Corrosive Muriate of Mercury, a pound; Purified Quicksilver, nine ounces. Rub them together until the globules disappear, and sublime with a heat sufficiently strong. Having rubbed down the sublimed matter, sublime it again, and reduce it to powder, which wash with distilled water, until the liquor poured off no longer afford any precipitate on a few drops of water of carbonate of potash being added to it; lastly, dry it.

This is, perhaps, the most important preparation of mercury, both from the certainty of its operation, its mildness, combined at the same time with sufficient activity, and the numerous indications it is capable of fulfilling. The process, by which it is obtained, too, is one that fortunately is little liable to be varied by circumstances, but affords an uniform product.

The ultimate result of the process, is to bring a quantity of metallic mercury into combination with the principles of the corrosive muriate. In the corrosive muriate, the metal exists in a high state of oxidation, and this oxide is combined with a considerable proportion of muriatic acid. The additional proportion of quicksilver, triturated with it, appears to be quickly oxidated, for it soon loses its metallic form, and the whole is converted into a grey powder. By the application of the heat, which is necessary to produce sublimation, the combination is rendered complete; the quicksilver which is added, shares the oxygen of the oxide in the corrosive muriate, and the whole oxide, thus formed, combines with the muriatic acid which the corrosive muriate contained. It is a general law, with regard to the combinations of acids with metallic oxides, that when the metal is highly oxidated, more acid is required to produce saturation, than when it is in a lower state of oxidation. Hence, if the degree of oxidation in any saline metallic compound be reduced, less acid will be necessary to the constitution of the new compound in the neutral state, and this is well displayed in the present combination; for, although the quantity of base is increased, relatively to the acid, yet as this base is also brought into a lower state of oxidation, the portion of acid appears to be sufficient to produce saturation in the new compound; it gives no indication of being a sub-salt, has no tendency to combine with a larger quantity of acid, nor apparently any power of neutralizing any additional proportion; it is of determinate composition, and is obtained in a crystalline form.

The product then of this process is a muriate of mercury, in which the metal is in a low state of oxidation, and in which this oxide is combined with no large quantity of muriatic acid. Of course, it differs from the corrosive muriate in the lower degree of oxidation of its base, and in that base being combined with less acid.

This is not inferred merely from the nature of the process by which it is formed, though it is sufficiently established by this; but it is likewise confirmed by its analysis. Mr Chenevix determined the proportions of its constituent principles, by the same series of experiments by which he investigated the composition of the corrosive muriate. The oxide which is its base, he concluded, is composed of 89.3 of quicksilver, and 10.7 of oxygen; and in 100 parts of it, 88.5 of this oxide are combined with 11.5 of muriatic acid. Its ultimate principles, therefore, are 11.5 of acid, 9.5 of oxygen, and 79 of quicksilver;—proportions of oxygen and acid considerably less than what, according to the experiments of the same chemist, enter into the composition of corrosive muriate of mercury. It has already been stated, that the subsequent experiments of another chemist, Zaboada, afford the result, that less oxygen exists in the composition of the oxide, which is the base of the corrosive muriate, than what is assigned by Chenevix; and the same experiments afford a similar result with regard to the oxide which is the base of the mild muriate; but still they establish the same general difference between these two salts,—that in the mild muriate, or sub-muriate as it is named, the metal is less highly oxidated, and the oxide is combined with an inferior proportion of muriatic acid. According to Zaboada, the oxide in the mild muriate contains little more than 5 of oxygen in 100 parts, and the salt itself is composed of 89.4 of this oxide, with 10.6 of muriatic acid. Its ultimate principles are 10.6 of acid, 4.4 of oxygen, and 85 of quicksilver. If the analysis of the two preparations are correct, more metallic quicksilver is employed than is necessary to convert the corrosive into the mild muriate.

According to the hypothesis, in which oxymuriatic acid is regarded as a simple substance, calomel is a compound of it with metallic quicksilver, containing less of the former, or chlorine, than corrosive sublimate does; the proportion of it in calomel being to that in corrosive sublimate as 1 to 2, the quantity of mercury being the same in both.

I have already pointed out the impropriety of the name given by the Colleges to this preparation, that of Sub-muriate. The compound is not, as the name, according to the principles of chemical nomenclature implies, a Sub-Salt; nor is its relation to the other salt, named Muriate of Mercury, such, that it can by any addition of acid be converted into it. As a medical nomenclature, it is still more objectionable, and the introduction of it is to be regretted,—the merely prefixing the syllable *sub* not being sufficient to guard effectually against the dangerous mistake of confounding it with the other, from which it differs so widely. The name, Mild Muriate of Mercury, is under both points of view preferable, as has been already explained; though it will always be safer to prescribe it by the arbitrary name of Calomel, by which it has been long known.

The combination, whence the mild muriate of mercury is formed, is scarcely complete at the first sublimation; a portion of the quicksilver rises on the first application of the heat, and adheres to the portion of muriate condensed on the sides of the vessel in minute globules; and a small quantity of unchanged corrosive muriate appears also to be diffused through the mass. The white powder mentioned in the formula of the Edinburgh Pharmacopœia, as collected in the neck of the matrass, is principally corrosive muriate, and is to be rejected; the red powder is oxide of iron, which, when the corrosive muriate is prepared by the medium of sulphate of iron, is diffused through it in minute quantity, but which will not be present when the corrosive muriate is prepared, as is now directed, from sulphate of mercury. To render the combination complete, the sublimed mass is reduced to powder, and is sublimed a second time. The London College order even a third sublimation, and the practice formerly was to sublime it six or seven times. This is, however, altogether unnecessary; and it has even been ascertained, that at each sublimation a little corrosive muriate is reproduced. After the second sublimation, any globules of quicksilver that may adhere to the mass are removed; it is reduced to a fine powder by trituration and levigation with water, and is well washed with water, until the water pass off tasteless, and according to the test given by the Dublin College, until it give no indications of precipitation, from adding a few drops of a solution of carbonate of potash. A method has been introduced by Mr Howard, of conducting the sublimation in an apparatus, so constructed, that the vapours are not condensed in the upper part of the vessel, forming a solid mass, but are condensed on the surface of water. The aggregation, whence a certain degree of ductility and hardness arises that renders difficult the levigation of the sublimate, is thus obviated; it is obtained at once, in the state of a fine powder, and any corrosive muriate that may rise with it is abstracted.

Mild muriate of mercury in its common form is in a dense cake, which is evidently an aggregate of short prisms; and when formed, in particular, by slow sublimation, these are very conspicuous. It is semi-transparent, has a slight yellowish colour, which is liable to be darkened by light, is somewhat ductile and very heavy, its specific gravity being 7.2. It is less volatile than the corrosive muriate; it appears to be altogether insoluble in water; at least Rouelle has stated, that above 1000 parts of water are required for its solution. When pure, it is perfectly insipid.

As a mercurial, this preparation is extensively employed, its operation being sufficiently mild, and, at the same time, certain and active, and its use is only limited by the tendency which it has to occasion purging. As a remedy in syphilis, it is given in the dose of a grain night and morning, its determination to the intestines being prevented, if necessary, by the addition of a little opium. It is the preparation which is most usually given in the other diseases in which mercury is employed. It is thus administered in affections of the liver or neighbouring organs, in which advantage appears to be derived, both from its local determination and its purgative operation; in some forms of inflammatory diseases, particularly chronic rheumatism and croup, in which its beneficial effects appear to arise both from its purgative effect and from its general action on the system; in dysentery, in which its successful application appears to depend partly on its operation as a cathartic, and partly as a mercurial; in various forms of febrile affection, particularly the fevers of warm climates, in which this combined operation of it is not less advantageous; in cutaneous diseases, in which it appears to operate simply as a mercurial alterative; in various diseases belonging to the class Neuroses, particularly tetanus and hydrophobia, in which it affords the most speedy mode of establishing the general action of mercury on the system; and in hydrocephalus, where it is probably farther advantageous by increasing absorption. It is in common use as a cathartic, either by itself in a dose from five to ten grains, or in a smaller quantity to promote the operation of other purgatives. Its anthelmintic power is justly celebrated. And it is superior to the other mercurials in assisting the operation of diuretics in dropsy. From its great specific gravity, it ought always to be given in the form of bolus or pill.

SUB-MURIAS HYDRARGYRI PRÆCIPITATUS. Precipitated Submuriate of Mercury.

Take of Diluted Nitrous Acid, Purified Quicksilver, of each eight ounces; Muriate of Soda, four ounces and a half; Boiling Water, eight pounds. Mix the quicksilver with the diluted nitrous acid; and, towards the end of the effervescence, digest with a gentle heat, shaking the vessel frequently. It is necessary, however, that more quicksilver should be mixed with the acid than this can dissolve, that the solution may be obtained fully saturated. Dissolve at the same time the muriate of soda in the boiling water: pour the other solution on this while warm, and mix them quickly together. After the precipitate subsides, pour off the saline liquor, and wash the sub-muriate of mercury, by frequently adding warm water, pouring it off after each time the precipitate subsides, until it come off tasteless.

SUB-MURIAS HYDRARGYRI PRÆCIPITATUM. Precipitated Submuriate of Quicksilver. Dub.

Take of Purified Quicksilver, seven ounces; Diluted Nitrous Acid, five ounces. Pour the acid on the quicksilver in a glass vessel, and when the mixture first ceases to effervesce, digest with a moderate heat for six hours, agitating occasionally; then increase the heat, so that the liquor boil a little; pour it off from the remaining mercury, and mix it quickly with ten pounds of boiling water, in which four ounces of muriate of soda have been previously dissolved; wash the powder which is precipitated with warm distilled water, as long as the liquor poured off affords any precipitate on the addition of a few drops of water of sub-carbonate of potash; lastly, dry it.

The design of this process is to obtain mild muriate of mercury, the muriatic acid of the muriate of soda combining with the oxide of mercury, and forming this compound, while the nitric acid of the mercurial solution is saturated by the soda; and the advantages supposed to belong to it are, that it is more easily executed, less expensive, and affords the product in a much finer powder than that obtained by sublimation can be reduced to. It was introduced on the authority of Scheele, and the directions which are given are those which he pointed out. The theory of metallic solutions was, however, in his time imperfectly understood, and the process to afford the proper product ought to be conducted in a very different manner from that ordered in the Pharmacopœias.

Scheele was evidently misled by the analogy of the increase of solubility of a salt in water by increase of heat; hence, by aiding the action of the acid on the quicksilver by heat, it appeared to follow, that a larger product would be obtained, and that the acid being thoroughly saturated, the product would be more mild. Two circumstances, however, operate in this case, and give rise to other results, which defeat the intention of the process, and have always rendered its success very imperfect.

1st, By digesting or boiling the acid on the metal, the decomposition of the acid is facilitated, and the mercury passes to a more highly oxidated state; hence, when the solution is added to the solution of muriate of soda, the degree of oxidation being too great to admit of the whole being converted into mild muriate, a portion of corrosive muriate is always formed. It has been observed, indeed, that although in the first stage of the solution much nitric oxide gas is disengaged, indicating a decomposition of the acid to a considerable extent, yet, that after this, an additional portion of quicksilver is dissolved without much effervescence, whence it has been concluded by some chemists, that this portion must receive oxygen from the portion already dissolved, and that the whole therefore still exists in a low state of oxidation. The degree of oxidation may perhaps be so far reduced in this manner, but the fact is, that the mercury, in the solution thus prepared, is still too highly oxidated to be converted entirely into a mild muriate when combined with muriatic acid; a portion of it is always converted into corrosive muriate, and with a solution so prepared, less muriate of mercury is obtained from a given weight of quicksilver, than from a solution prepared entirely in the cold. I have ascertained this by experiment, the quantity of mild muriate obtained from a solution of one ounce of quicksilver in diluted nitric acid in the cold being a little more than an ounce, while, from the same quantity dissolved with the application of heat, the precipitate did not much exceed half an ounce, while the liquor held dissolved much more corrosive muriate than the other.

2dly, When the solution of the quicksilver in the acid is promoted by heat, the acid is so completely saturated with oxide, that the solution is partially decomposed by mere dilution with water, a quantity of sub-nitrate of mercury being precipitated. Hence, when such a solution is mingled with the solution of muriate of soda, this decomposition will take place to a certain extent, from the operation of the water of the solution, and a quantity of this sub-nitrate must be mixed with the mild muriate, and must so far modify its powers.

These sources of error are obviated by using a solution of mercury prepared in the cold, and with a diluted acid; and from such a solution carefully prepared, the product, I have found, is almost entirely mild muriate, with very little corrosive muriate. The method of conducting the process is the following: Add the quicksilver in small portions at a time to the nitric acid previously diluted with one part and a half of water, (observing the proportions given in the Edinburgh Pharmacopœia), and avoid altogether the application of heat; when the solution is completed, or no more mercury appears to be capable of being dissolved, add a little water to dissolve any part of the nitrate of mercury that may have crystallized; then pour off the clear solution from the undissolved quicksilver, and add it to the solution of muriate of soda. The precipitate having subsided, is to be carefully washed with water, repeatedly poured on it, to carry off the small quantity of corrosive muriate that is formed. Mild muriate of mercury will thus be obtained. Berthollet has affirmed, however, that even as prepared from a solution of this kind, the precipitate retains in combination a portion of nitric acid, probably owing to the circumstance that such a solution must always have an excess of acid, part of which the precipitate, as it is formed, may attract. The process ought, on every account, perhaps to be expunged from the Pharmacopœias. It has no advantage; for it is not, as has been supposed, more economical. The fineness of the powder is of little importance, for by levigation the sublimed muriate is obtained sufficiently fine for medicinal use; and the process by sublimation gives a product perfectly uniform, while that by precipitation must always be liable to some uncertainty, from being so much influenced by the manner in which it is conducted. If it is ever followed, much attention should be paid to washing the precipitate thoroughly, so that not the most minute portion of the corrosive muriate may remain mixed with it.

The precipitated mild muriate of mercury is in the state of a smooth powder, whiter, and of much less specific gravity than the muriate prepared by sublimation, differences probably depending on its state of aggregation. When pure, its medicinal operation must be the same. It has been said, from trials that have been made of it, to be more liable to occasion purging. If this difference exists, it is probably owing to the presence either of sub-nitrate of mercury, or of a minute quantity of corrosive muriate.

OXIDUM HYDRARGYRI CINEREUM. Ash-coloured Oxide of Quicksilver. Ed.

Take of Purified Quicksilver, four parts; Diluted Nitrous Acid, five parts; Distilled Water, fifteen parts; Water of Carbonate of Ammonia, as much as may be sufficient. Dissolve the quicksilver in the acid. Add gradually the distilled water. Then pour on as much of the water of carbonate of ammonia as may be sufficient to precipitate the oxide of quicksilver, which is to be afterwards washed with pure water and dried.

PULVIS HYDRARGYRI CINEREUS. Ash-coloured Powder of Quicksilver. Dub.

Take of Quicksilver, two ounces; Diluted Nitrous Acid, two ounces by measure. Dissolve the quicksilver in the acid with a low heat, and dilute the solution with eight ounces of cold distilled water; drop into it of water of carbonate of ammonia an ounce and a half, or as much as may be sufficient to throw down the precipitate, which wash with warm distilled water, until the liquor poured off yields no precipitate on dropping in a few drops of water of sulphuret of ammonia; lastly, dry it.

These two processes are essentially the same. A preparation is inserted in the London Pharmacopœia under the same name, but the process for preparing it is quite different, and probably gives a different product. It is therefore to be considered by itself.

The action of ammonia on metallic salts is not perfectly similar to that of the other alkalis. It has a greater tendency to unite with the oxide and a portion of the acid, so as to form ternary combinations, and from its hydrogen attracting oxygen, it sometimes changes the constitution of the metallic oxide. These actions appear to be modified by the state of oxidation of the metallic salt, and this is well displayed in the effects it produces in the present process on the nitrate of mercury.

If the nitrous mercurial solution is in that state in which the metal is highly oxidated, on adding the ammonia, a precipitate is thrown down perfectly white. This was found by Fourcroy to consist of the oxide of mercury, in combination with a portion of acid and of ammonia, its composition, as he determined it, being 68.2 of oxide, 16 of ammonia, and 15.8 of nitric acid. But if the solution contain the metal in a low state of oxidation, the precipitate which is formed is of a dark blue colour approaching to black. This has been supposed to be merely the oxide of mercury that had been combined with the nitric acid, the ammonia combining with the acid, and precipitating the oxide. But an obvious objection to this opinion is, that the precipitate is not the same as that thrown down by potash or soda, but is of a more uniform colour, and darker, a proof that ammonia exerts some peculiar action in its production. According to Fourcroy, who investigated with considerable care these and other saline mercurial combinations, the ammonia, in precipitating the oxide from its combination with the acid, partially de-oxidates it, the hydrogen of a portion of the ammonia attracting part of the oxygen of the oxide, and reducing it to a still lower state of oxidation, approaching nearly indeed to the metallic state: hence, as he affirmed, there is at the same time a disengagement of a portion of nitrogen gas in consequence of this decomposition of a part of the ammonia.

In frequently performing this process, it has appeared to me that this peculiarity of action by ammonia is exerted only when the mercurial solution contains the metal in a state of oxidation intermediate between the *minimum* and *maximum*. If care has been taken in preparing the solution, so as to have it with the metal dissolved at a very low degree of oxidation, the precipitate thrown down by potash is as dark in its colour as that by ammonia. But if it be somewhat more highly oxidated, that from ammonia is of a much darker colour, and there appears even a film on the surface, with a lustre approaching to metallic. The theory given by Fourcroy, of the operation of the ammonia, is therefore probably just, though I must add, that any effervescence indicating the disengagement of nitrogen gas is extremely slight, and on a small scale is scarcely apparent.

Some chemists have supposed, that the dark grey precipitate contains ammonia. When the precipitate, however, is properly prepared, and thoroughly washed, I have not been able to discover any trace of ammonia in it: when mixed with lime, or with a fixed alkali, no ammonia is exhaled even when heat is applied. If the solution, however, from which the precipitate has been thrown down, has been that in which the metal has been highly oxidated, part of the white triple compound described by Fourcroy will have been formed, and will mix with the dark coloured precipitate, and in this case a portion of ammonia is detected. In decomposing mercurial solutions accordingly in this state, the precipitate at different stages of the precipitation is various in its colour, being at first grey, and afterwards lighter, and being more or less light as the solution contains the metal more highly oxidated, evidently from the predominance of the white precipitate. But any ammonia derived from this source is foreign to what properly constitutes the grey precipitate.

From the circumstances which influence this preparation not having been fully understood, it has been supposed difficult to obtain it uniform; nor are the directions in the Pharmacopœias sufficiently precise; and the direction in the Dublin Pharmacopœia of applying heat, even though gentle to favour the solution, is improper. If the process be properly performed, it may be obtained with certainty always the same, and it forms one of the best of the mercurial preparations for internal use. The nitrous acid ought to be diluted with rather more than an equal weight of water, so as to act on the quicksilver slowly, and with scarcely any sensible effervescence; the quicksilver should be added in small quantities at a time, and in as large a quantity ultimately as the acid can dissolve without the application of heat. When the solution appears to have ceased, the liquor is to be poured off from the undissolved quicksilver, and strained; it is to be diluted cautiously with water, as far as the dilution can be carried without impairing its transparency; and water of ammonia is to be added as long as any precipitation is produced. The precipitate prepared in this way is of a very deep grey colour, approaching to black; it is to be washed well with water, and dried. In drying, from exposure to the air and light, its colour becomes lighter; still it is a blue grey. In the shops it is usually of a light grey colour, and sometimes almost perfectly white, from the solution of mercury from which it has been precipitated containing the metal in too highly an oxidated state. Both Colleges order carbonate of ammonia to be employed in the precipitation; and it might be supposed from this, that the oxide thrown down will receive carbonic acid, and that the precipitate will be a carbonate or sub-carbonate. This, however, is not the case; the carbonic acid is disengaged, and the same precipitate is thrown down by pure ammonia. It has been supposed, that the precipitate is produced with more certainty of a dark colour, when the ammonia is added in the state of carbonate; but this is a mistake, the darkness of the colour depending entirely on the degree of oxidation of the metal.

The Grey Oxide of Mercury has been introduced as a substitute for those preparations in which the metal is oxidated by trituration under exposure to the air, and has been supposed to have the advantage of more uniformity of strength, as the others are liable to be variable from imperfect preparation. When properly prepared, it appears to be the same in chemical composition, and the medicinal operation of it is also extremely similar. It is given in the dose of a grain night and morning, usually under the form of pill, and this answers very well as a substitute for the Mercurial Pill. An ointment formed from it, Unguentum Oxidi Hydrargyri Cinerei, has been introduced into the Edinburgh Pharmacopœia; one part of the grey oxide being mixed with three parts of lard. This is designed as a substitute for the Mercurial Ointment, but it has been said not to be so easily forced through the cuticle by friction. It has also been used in the state of vapour from the application of heat, for fumigating venereal ulcers.

HYDRARGYRI OXYDUM CINEREUM. Ash-Coloured Oxyd of Quicksilver. Lond.

Take of Sub-muriate of Quicksilver, an ounce; of Liquor of Lime, a gallon. Boil the sub-muriate of mercury in the liquor of lime, stirring it constantly, until the ash-coloured oxyd of mercury fall down. Wash this with distilled water, and dry it.

This process has been had recourse to, from the supposed difficulty of obtaining the grey oxide, by precipitation from nitrate of mercury by ammonia, uniform. It will afford a preparation sufficiently uniform, and so far similar to the other, that the oxide is in a low state of oxidation, the oxide existing in that state in the mild muriate. The lime by its affinity to the muriatic acid may abstract the greater part of it, but can scarcely be supposed to abstract the whole, and the product is probably, therefore, what is in strictness of nomenclature, a submuriate of mercury.

OXIDUM HYDRARGYRI RUBRUM PER ACIDUM NITRICUM, *olim Mercurius Præcipitatus Ruber*. Red Oxide of Quicksilver by Nitric Acid. Ed.

Take of Purified Quicksilver, one pound; Diluted Nitrous Acid, sixteen ounces. Dissolve the quicksilver, and evaporate the solution with a gentle fire to a white dry mass, which being reduced to powder, is to be put into a glass cucurbit, a thick glass plate being put over its surface. Then a capital being adapted, and the vessel placed in sand, apply to it a fire gradually raised, until it pass into very red small scales.

HYDRARGYRI NITRICO-OXIDUM. Nitric Oxide of Quicksilver. Lond.

Take of Purified Quicksilver, three pounds; Nitric Acid, a pound and a half; Distilled Water, two pints. Mix them in a glass vessel, and boil until the quicksilver is dissolved, and the water being evaporated, a white matter remains. Rub this into powder, and put it into another vessel as shallow as possible; then apply a gentle heat, and gradually increase it, until any red vapour cease to be produced.

OXYDUM HYDRARGYRI NITRICUM. Nitric Oxide of Quicksilver. Dub.

Take of Purified Quicksilver, ten ounces; Diluted Nitrous Acid, ten ounces by measure. Mix them in a glass vessel, and with a heat gradually raised, dissolve the quicksilver; then raise the fire, until the residual matter in the bottom of the vessel pass into red scales.

The quicksilver is in this preparation first oxidated by the nitrous acid, and the oxide then combines with the remaining acid. By the increase of heat, this nitrate is decomposed, and the greater part of the acid expelled, leaving a mass of a deep red colour. From the name of oxide given to this preparation, it appears to be supposed, that the whole acid of the nitrate is expelled or decomposed, and that the residual matter is quicksilver combined with oxygen alone. This has not been established, however, by any accurate analysis of the preparation, and there are very obvious objections to it. Though a red oxide of mercury can be formed by the action of atmospheric air on the metal at a high temperature, it is quite different in its appearance from the product of the present process: and the latter is possessed of a considerable degree of escharotic power not belonging to the former, communicated probably by a portion of nitric acid combined with it. In cases where a volatile ingredient is expelled from one more fixed by the application of heat, the decomposition is scarcely ever complete, the influence of quantity operating, and causing a portion of the volatile ingredient to be retained, the quantity being greater as there is less difference in the volatility of the two substances. It follows from this, as the most probable conclusion, that although the greater part of the nitric acid may be expelled from the oxide of mercury, a portion of it will be retained, and it is probably impossible to expel the whole of it, without raising the heat to that point at which the oxygen itself will be expelled, and the quicksilver be reduced to the metallic form. I have accordingly found, that it does contain nitric acid. If the preparation be boiled for a short time with five or six times its weight of water, the liquor, when filtered, has the styptic metallic taste, and gives a white precipitate with water of ammonia, or with carbonate of potash,—a plain proof that it holds dissolved nitrate of mercury; and to avoid any fallacy, the preparation submitted to experiment was that found in the shops, the product of the process on the large scale, of a bright red colour, and more perfectly prepared than that formed on the small scale. This must therefore be regarded as a sub-nitrate, and the proper appellation to be given to it is, Sub-nitras Hydrargyri Ruber, by which also it will be better distinguished from the proper red oxide. According to Payssé, 100 parts decomposed by heat afford 82 of mercury, and 18 of oxygen; this oxygen probably having an intermixture of nitrogen from the decomposition of the acid. The proper red oxide affords only 007 of oxygen.

It has always been found very difficult to conduct this process, so as to obtain the product of that bright red colour and scaly appearance which are regarded as tests of its proper preparation; and some of the steps in the operation, as directed by the Edinburgh College, are designed to attain this more perfectly. Much of the success depends apparently on the scale on which it is formed, the heat acting more steadily, and with more uniformity, on a large, than on a small quantity. When properly prepared, it is in scales of a bright red colour. It is so acrid as to be altogether unfit for internal administration. Externally it is employed as an escharotic, being applied either in a finely levigated powder, or mixed with lard in the form of ointment. This ointment, composed of one part with eight of lard, is officinal in the Edinburgh Pharmacopœia.

SUB-SULPHAS HYDRARGYRI FLAVUS, *olim Turpethum Minerale.* Yellow Sub-sulphate of Quicksilver. Ed.

Take of Purified Quicksilver, four ounces; Sulphuric Acid, six ounces. Put them into a glass cucurbit, and boil in a sand-bath to dryness. The white matter remaining at the bottom of the vessel being reduced to powder, is to be thrown into boiling water. It will thus be converted into a yellow powder, which must be frequently washed with warm water.

OXYDUM HYDRARGYRI SULPHURICUM. Sulphuric Oxide of Quicksilver. Dub.

Take of Purified Quicksilver, one pound; Sulphuric Acid, a pound and a half. Dissolve with a heat sufficiently strong in a glass vessel, and increase the heat until the matter become quite dry. On pouring upon it a large quantity of warm water, it becomes yellow and falls into powder, which is to be rubbed with this water carefully in an earthen mortar. After pouring off the fluid above, wash the powder repeatedly with warm distilled water, as long as the decanted fluid gives any precipitate on the addition of a few drops of water of sub-carbonate of potash; lastly, dry it.

By boiling sulphuric acid on quicksilver, the acid suffers a partial decomposition, a portion of its oxygen is communicated to the metal, and sulphurous acid gas is disengaged. The oxide of quicksilver combines with the remaining acid, forming super-sulphate of mercury. By the continuance of the heat, this is partially decomposed, much of the acid is expelled, and a sub-sulphate of mercury remains. On this, boiling water is poured; and it acts as water does on many of the metallic salts. Having a stronger affinity to their acid than to their base, it decomposes the salt, abstracting the acid, and precipitating the oxide; but the influence of quantity on chemical affinity still so far operates in this decomposition, that the acid in combining with the water retains a portion of the oxide combined with it, and the oxide precipitated retains a portion of the acid. The entire compound, therefore, is resolved into a super-salt, which is dissolved, and a sub-salt which is thrown down. This happens in the present process; the water poured on the sulphate of mercury abstracts the acid, retaining in combination with it a portion of oxide, and forming therefore a super-sulphate of mercury, which remains dissolved, while a sub-sulphate is precipitated, and forms the yellow powder. The colour of this is more lively when hot water is used in its preparation, probably from the temperature favouring the chemical action of the water. The success of the process, with regard to the quantity of product, depends much on the sulphate of mercury having been deprived of all free acid previous to the affusion of the water; for if it contain much acid, the greater part of the salt is dissolved without being decomposed. The proportion of acid ordered in the Pharmacopœia is unnecessarily large, and rather defeats the object of the process; an equal weight is sufficient, and the heat ought to be applied to the saline mass until it is perfectly dry. The super-sulphate which is dissolved in the water may be decomposed by potash, and a sub-sulphate precipitated.

Yellow sub-sulphate of mercury must, from the nature of the process by which it is obtained, be liable to variation in the proportions of its constituent principles. According to Fourcroy, it consists of 76 of mercury, 11 of oxygen, and 10 of acid, with 3 of water, while another analysis gives the proportion of acid at 15. As a medicine, it is too harsh in its operation to be administered internally, being liable to produce violent vomiting. It has sometimes, however, been given as a powerful emetic, in a dose of five grains. It is an errhine, and has been employed as such, mixed with any mild vegetable powder, in some affections of the eyes.

SULPHURETUM HYDRARGYRI NIGRUM, *olim Æthiops Mineralis.* Black Sulphuret of Quicksilver. Ed.

Take of Purified Quicksilver, Sublimed Sulphur, of each equal weights. Rub them together in a glass mortar with a glass pestle, until the globules of quicksilver entirely disappear. It may be made likewise with a double proportion of quicksilver.

SULPHURETUM HYDRARGYRI NIGRUM. Black Sulphuret of Quicksilver.

Take of Purified Quicksilver, Sublimed Sulphur, equal weights. Rub them together in an earthen mortar, until the globules disappear.

By the trituration a chemical combination appears to be effected between the quicksilver and sulphur, as the former loses completely its metallic form, and no globules can be perceived in the powder by the microscope. It has even been supposed, that the metal is at the same time imperfectly oxidated, and combined with sulphuretted hydrogen; but from the researches of Seguin, this does not appear to be the case. The combination is much facilitated by the application of heat, and it can at once be effected, by adding the quicksilver to the melted sulphur.

This is the least active of the mercurial preparations. As an anthelmintic it is sometimes given in a dose of five or ten grains, and it has been used as an alterative.

SOME additional preparations of mercury have a place in the London and Dublin Pharmacopœias, and are used in practice.

HYDRARGYRUS CUM CRETA. Quicksilver with Chalk. Lond.

Take of Purified Quicksilver, three ounces; Prepared Chalk, five ounces. Rub them together until the globules no longer appear.

HYDRARGYRUM CUM CRETA. Quicksilver with Chalk. Dub.

Prepare this in the same manner as Quicksilver with Magnesia, *(described in the next formula)*, substituting only Chalk for Magnesia.

Quicksilver, when triturated with any substance which aids the division of its globules, and extends their surface, appears to be susceptible of oxidation from the action of the atmospheric air, and the grey oxide formed by this operation is the basis of the common mercurial pill, as well as of some other preparations. More than one preparation of this kind, however, for internal administration, is superfluous; and the mercurial pill, prepared by trituration of the quicksilver with honey, manna, or mucilage, being that which has been long established in practice, is to be preferred. The present preparation has nothing peculiar to recommend it.

HYDRARGYRUM CUM MAGNESIA. Quicksilver with Magnesia. Dub.

Take of Quicksilver, Manna, each one ounce; Magnesia, half an ounce. Triturate the quicksilver with the manna in an earthen mortar, adding a few drops of water to give to the mixture the consistence of syrup, and continuing the trituration until the mercurial globules entirely disappear. Then add to the mixture a drachm of the magnesia, triturating it constantly. The whole being well mixed together, add a pint of hot water, and shake the mixture; allow the liquor to rest, and as soon as the sediment subsides, pour it off. Repeat this washing a second and third time, that the manna may be entirely removed; and while the sediment is still humid, add to it the remaining magnesia. Lastly, dry the powder on bibulous paper.

The object of this process is to obtain the oxidation of the mercury by trituration, and the interposition of the soft viscous matter of the manna with the addition of the water may facilitate this; the subsequent steps of the operation are designed to remove the manna, and obtain the grey oxide mixed with the magnesia. The same observation applies, however, to this as the preceding preparation,—that it is superfluous, and that for any useful purpose the mercurial pill will answer equally well. The only advantage, at least, of either process, is, that it may afford a mild preparation that can be given under the form of bolus, where a pill cannot be easily swallowed.

HYDRARGYRI OXYDUM RUBRUM. Red Oxide of Quicksilver. Lond.

Take of Purified Quicksilver, one pound. Put the quicksilver into a glass vessel, with a narrow mouth, and broad at the bottom. Apply heat to this open vessel, raised to the six-hundredth degree, until the quicksilver pass into red scales; then rub these into a fine powder.

OXYDUM HYDRARGYRI. Oxide of Quicksilver. Dub.

Take of Purified Quicksilver, any quantity. Let it be put into an open glass vessel, with a narrow mouth, and broad bottom, and expose it to a heat of about 600°, until it is converted into red scales.

At the temperature at which quicksilver boils it combines with oxygen; and when heated to this temperature, under exposure to the air, red scales gradually form on its surface from this combination. There is a difficulty, however, in conducting the process; for if the quicksilver be freely exposed to the air, a considerable quantity of it is lost, from its vapour being dissipated, especially if the heat be raised a little too high; while, on the other hand, if the air is not freely admitted, the oxidation cannot proceed. The method directed in the formula of the Colleges is the most effectual,—employing a glass vessel broad at the bottom, (so as to present the quicksilver under an extensive surface), and with a long neck, drawn out to a small aperture, so that while the atmospheric air is admitted, the mercurial vapour will not so easily escape, the heat being applied by the medium of sand. Still the oxidation goes on very slowly, requiring the application of the heat for several weeks; and from the necessity of keeping up a steady heat without allowing it to become too strong, the conducting of the process requires considerable attention, and the preparation is comparatively high priced.

Red oxide of quicksilver is in scales of a dark brick red colour. When exposed to the heat of ignition it is decomposed, gives out oxygen, and the quicksilver returns to its metallic form. From the quantity of oxygen obtained by this reduction, Lavoisier inferred that the oxide contains seven parts of oxygen in 100 parts; the proportion is probably rather larger. It is a dangerous mistake which some have made, the supposing the red scaly substance obtained from the decomposition of nitrate of mercury by heat to be essentially the same. The latter is much more acrid, and cannot be given internally with safety; and it is to be regretted, that the name of Oxide has been given to it, as it may sometimes lead to its substitution for the present preparation.

The red oxide prepared by heat, Calcined Mercury as it was formerly named, is a very active mercurial. It has also been regarded as certain and permanent in its operation, and has therefore sometimes been employed in the treatment of the secondary symptoms of syphilis, where the milder mercurials had failed. Its dose is one grain. It is liable, however, to produce irritation in the stomach or intestines, and from this, as well as from its high price, is not very frequently used.

HYDRARGYRUS PRÆCIPITATUS ALBUS. White Precipitate of Quicksilver. Lond.

Take of Oxymuriate of Quicksilver, Muriate of Ammonia, each half a pound; Liquor of Sub-Carbonate of Potash, half a pint; Distilled Water, four pints. First dissolve the muriate of ammonia, then the oxymuriate of mercury in the distilled water, and add to these the liquor of sub-carbonate of potash; wash the powder which is precipitated, until it is free from taste; then dry it.

SUB-MURIAS HYDRARGYRI AMMONIATUM. Ammoniated Sub-Muriate of Quicksilver. Dub.

To the liquor which has been poured off from the precipitated sub-muriate of mercury, add as much water of ammonia as is sufficient to precipitate the metallic salt. Wash the precipitate with cold distilled water, and dry it on bibulous paper.

Though these two processes are apparently very different, they afford the same product. When corrosive muriate of mercury is decomposed by ammonia, a white precipitate is thrown down, consisting of the oxide of the muriate, with portions both of acid and of ammonia combined with it; the proportions, according to Fourcroy's analysis of it, being 81 of oxide, 16 of muriatic acid, and 3 of ammonia. It is this precipitate which is formed in both processes. In the first, it may be conceived, that the potash of the sub-carbonate of potash decomposes the muriate of ammonia, by combining with the muriatic acid, and that the ammonia evolved from this decomposes the muriate of mercury, throwing down the white precipitate the same as when ammonia is added directly to a solution of corrosive muriate; or, what affords a more simple, and perhaps a more just view, the potash attracts the greater part of the acid, both of the muriate of mercury and muriate of ammonia, and the oxide of mercury is precipitated, retaining a portion of the acid combined with it, and having attracted the quantity of ammonia necessary to the constitution of the ternary compound. Half the quantity, however, of muriate of ammonia, that is ordered by the London College, is sufficient for this purpose. The other process, that in the Dublin Pharmacopœia, is simply the decomposition of corrosive muriate of mercury by ammonia. In the preparation of the mild muriate of mercury by precipitation, it has already been stated, that if a solution of mercury in nitric acid be used, which has been prepared with the application of heat, and which therefore contains the metal more highly oxidated than the *minimum*, a portion of corrosive muriate of mercury is formed, when the solution is decomposed by muriate of soda. It is such a mercurial solution that is ordered in the Dublin Pharmacopœia for the preparation of the precipitated submuriate, and hence the liquor from which the precipitate subsides holds corrosive muriate dissolved. When decomposed, therefore, by ammonia, as directed by the present formula, it affords the ternary white precipitate. The name given to this preparation by the Dublin College is preferable to that in the London Pharmacopœia, which is altogether vague. Sub-Murias Hydrargyri et Ammoniæ is the correct appellation. The necessity of the presence of ammonia to its constitution is very well shewn from the fact, that, if the corrosive muriate be decomposed by potash, it is a yellow precipitate that is thrown down; when the white precipitate is decomposed by heat, ammonia and nitrogen are evolved.

This precipitate, when dried, forms a light white powder, which is tasteless and insoluble in water. It is used only externally, generally under the form of ointment, in some cutaneous affections.

HYDRARGYRI SULPHURETUM RUBRUM. Red Sulphuret of Quicksilver. Lond.

Take of Purified Quicksilver, forty ounces; Sublimed Sulphur, eight ounces. To the sulphur melted over the fire, add the quicksilver, and as soon as the mass swells, remove the vessel from the fire, and cover it closely, that inflammation may not take place; then rub it into powder, and sublime.

SULPHURETUM HYDRARGYRI RUBRUM. Red Sulphuret of Quicksilver. Dub.

Take of Purified Quicksilver, forty ounces; Sublimed Sulphur, eight ounces. Mix the quicksilver with the sulphur melted, and if the mixture inflame, extinguish the flame by covering the vessel; then let the matter rubbed to powder be sublimed.

The inflammation which is taken notice of, as liable to happen when the melted sulphur and quicksilver are mingled together, is not a real combustion, but the evolution of heat and light from their mutual action; this taking place in other cases of the combination of sulphur with metals, and being wholly unconnected with any agency of the air. The covering of the vessel will therefore not check it, though the removal of it from the fire may do so, by reducing the temperature, and thus suspending the mutual action of the mercury and sulphur. If this should happen, the combination will probably therefore remain imperfect, and the process may succeed less perfectly, or at least succeed only from the action being renewed in the subsequent sublimation. The exclusion of the air must, however, be proper, as preventing a real combustion taking place, when the mass is so much heated. Different opinions have been maintained with regard to the nature of the ultimate product of this process. Some chemists supposed, that the mercury exists in the state of oxide, in combination with the sulphur, and Vauquelin considered the bright red colour as arising even from a high degree of oxidation; this oxygen being supposed to be combined with the metal in the first stage of the process, when the apparent combustion takes place. This oxygenation, however, has never been clearly established. And according to Proust and Seguin, the compound is a pure sulphuret, consisting of 85 or 86 of quicksilver, with 15 or 14 of sulphur.

This substance, long known by the name of Cinnabar, is of a vivid red colour, which becomes still more bright when it is reduced to powder. Its principal medicinal application is for mercurial fumigation. It is easily volatilized by heat, and its vapour, directed on the surface of venereal ulcers, checks the progress of the ulceration; and where it is of importance to do so speedily, as from the situation of an ulcer it sometimes is, the practice is employed, a little of the powder being laid on a hot iron, and the vapour directed on the part. When applied, however, in this manner to an ulcer in the throat, which is the most common application of mercurial fumigation, its sulphureous vapour proves irritating, and hence the grey oxide is sometimes preferred.

PLUMBUM.—LEAD.

ACETIS PLUMBI, *olim Saccharum Saturni.* Acetite of Lead. Ed.

Take of White Oxide of Lead, any quantity. Put it into a cucurbit, and pour upon it ten times its weight of Distilled Acetous Acid. Let the mixture stand on warm sand until the acid become sweet; pour it off, and add a fresh quantity successively, until it cease to acquire sweetness. Then evaporate the whole liquor, freed from impurities, in a glass vessel, to the consistence of thin honey, and put it aside in a cool place, that crystals may form, which are to be dried in the shade. Evaporate the remaining liquor, that there may be a new formation of crystals, and repeat this until no more are formed.

PLUMBI SUPERACETAS. Superacetate of Lead. Lond.

Take of Carbonate of Lead, a pound; Distilled Vinegar, a gallon and a half. Boil the carbonate of lead with the acetic acid, until it is saturated, then strain through paper, and, having evaporated the water, until a pellicle appear at the surface, put it aside, that crystals may be formed. Having poured off the water, dry them on bibulous paper.

ACETAS PLUMBI. Acetate of Lead. Dub.

Take of Sub-acetate of Lead, Cerusse as it is named, any quantity; Distilled Vinegar, ten times its weight. Digest in a glass vessel until the vinegar become sweet, which being poured off, add more until it cease to acquire sweetness. Strain the liquor, and by alternate slow evaporation and cooling, form crystals, which dry in the shade.

This process is never attempted in the shops, but is conducted on a large scale, to furnish the salt for the purposes to which it is applied in the arts; distilled vinegar being either boiled on cerusse until the acid is saturated, or plates of lead being moistened with vinegar, or partially immersed in it, until they are incrusted with oxide, this oxide being dissolved by immersing the plates in the liquor, and a new quantity being formed by raising them to the surface. This is continued until the acid is saturated, and in either case the liquor is brought by evaporation to crystallize.

It is obvious, that the acetic acid of the distilled vinegar combines with the oxide of lead. The salt which crystallizes was supposed to be the neutral acetate; but it appears to be a super-acetate, and this name is accordingly given to it by the London College. The neutral acetate does not crystallize easily; and it was found by Thenard, whose attention was called to it, from this circumstance, that a slight excess of acid favours the crystallization, and that this excess of acid enters into the composition of the salt. It consists, according to the analysis of it by this chemist, of 58 oxide of lead, 26 acetic acid, and 16 of water, while the neutral salt is composed of 78 of oxide of lead, 17 acetic acid, and 5 of water.

This salt crystallizes in acicular prisms, and, as prepared on a large scale, is usually in the form of masses composed of these crystals aggregated; it is white, or of a light yellowish colour, with a silky lustre, is rather efflorescent; it has a sweet taste, whence the name of Sugar of Lead, by which it has been known, this sweetness being accompanied with a degree of astringency. It is soluble in water, requiring not more than three parts at 60° for its solution; with spring water, the solution is milky, from a partial decomposition of the salt, by the minute quantity of sulphates or muriates contained in the water; and even with distilled water the solution is not perfectly transparent, if a large quantity of the water be employed; the water, when its affinity to the acid is aided by its quantity, producing a slight partial decomposition.

Acetate, or rather super-acetate of lead, is employed principally as an external application. Its solution in water is used as a collyrium in ophthalmia, as an astringent injection in gonorrhœa, as a wash in superficial inflammation; and dissolved in vinegar, it is employed as a discutient. These applications of it have already been pointed out under its medical history.

LIQUOR PLUMBI ACETATIS. Liquor of Acetate of Lead. Lond.

Take of the Semi-vitrified Oxide of Lead (Litharge), two pounds four ounces; Acetic Acid (Distilled Vinegar), one gallon. Mix them, and boil down to six pounds, stirring constantly; then put the liquor aside, that the impurities may subside, and strain it.

LIQUOR SUB-ACETATIS LITHARGYRI. Liquor of Sub-Acetate of Litharge. Dub.

Take of Litharge, a pound; Distilled Vinegar, eight pints. Put into a glass vessel, and boil down to six pounds, stirring constantly; then pour off the liquor, after the impurities have subsided, and strain it.

This preparation was introduced by Goulard, a French surgeon, under the name of Extract of Lead, as possessed of peculiar powers, and from the confidence with which it was recommended was established in practice. It was considered by the chemists as a solution merely of oxide of lead in acetic acid, analogous to the crystallized salt. But from the examination of it by Dr Bostock, it is proved to have no excess of acid, but to consist of the neutral acetate dissolved in water, and hence the solution is largely impregnated with oxide of lead. One hundred parts of the saturated solution contain, according to his analysis, 23.1 of oxide, 5 of acetic acid, and 71.9 of water, while 100 parts of the saturated solution of the superacetate contain 16.8 of oxide, 7.5 of acid, and 75.7 of water. The distilled vinegar cannot dissolve much more than one-third of the quantity of litharge ordered in the London Pharmacopœia, and as the residue retains part of the solution mixed with it, the process by this excess of litharge is rendered unnecessarily expensive. The solution, or Goulard's extract as it is named, is of a brown colour. When kept, it becomes lighter, and deposites a quantity of oxide. It is used as a discutient, being mixed with vinegar and water, and frequently applied under the form of cataplasm. It forms also an application to inflamed surfaces, generally under the form of the following preparation, which has been admitted as officinal by the London and Dublin Colleges.

LIQUOR PLUMBI ACETATIS DILUTUS. Dilute Liquor of Acetate of Lead. Lond.

Take of Liquor of Acetate of Lead, a drachm; Distilled Water, a pint; Proof-spirit, a fluidrachm. Mix them.

LIQUOR SUBACETATIS LITHARGYRI COMPOSITUS. Compound Liquor of Sub-Acetate of Litharge. Dub.

Take of Liquor of Sub-acetate of Litharge, two drachms by weight; Distilled Water, two pints; Proof-spirit, two drachms. Mix the spirit and the sub-acetate of litharge; then add the distilled water.

This is what Goulard named absurdly Vegeto-Mineral Water, and which has been highly celebrated as an application in superficial inflammation. It is occasionally employed by surgeons, and some have thought it superior to a simple solution of acetate or super-acetate of lead.

ZINCUM.—ZINC.

CARBONAS ZINCI IMPURUS PRÆPARATUS, *olim Lapis Calaminaris Præparatus.* Prepared Impure Carbonate of Zinc, formerly Prepared Calamine Stone. Ed.

Procure the Impure Carbonate of Zinc roasted, from those who prepare brass, and let it be prepared in the same manner as Carbonate of Lime.

CALAMINA PRÆPARATA. Prepared Calamine. Lond.

Calcine Calamine; then rub it to powder. Lastly, reduce it to a very fine powder in the manner directed for preparing chalk.

LAPIS CALAMINARIS PRÆPARATUS. Prepared Calamine. Dub.

Reduce Calcined Calamine Stone into powder, and separate the finer particles in the manner ordered in the preparation of chalk.

Calamine is an ore of zinc, the composition of which is variable. Some varieties of it appear to consist of oxide of zinc, combined with siliceous earth; but the more common varieties are composed of the carbonate more or less pure. When calcined by a moderate heat, it becomes friable so as to be more easily reduced to powder; and as this calcination is performed in preparing it for converting copper into brass by cementation, it is ordered in the Edinburgh Pharmacopœia, to be obtained in this state, and then to be reduced to a fine powder by levigation, and washing in the same manner as carbonate of lime. Considerable care requires to be taken in this levigation, as the powder is applied to purposes, where, if it were coarse, it would prove irritating. It is used as an application to superficial inflammation and excoriation, dusted on the part, and it forms the basis of the common healing cerate, to which it communicates a degree of consistence and tenacity.

Oxidum zinci impurum præparatum, *olim Tutia Præparata.* Prepared Impure Oxide of Zinc, formerly Prepared Tutty. Ed.

Let Tutia be prepared in the same manner as Carbonate of Lime.

Tutia is a substance, the origin of which is somewhat doubtful; it consists of oxide of zinc with argillaceous earth; and the most probable account with regard to it is, that it is the sublimate collected in the chimneys in which zinc is calcined, mixed with clay and water, and baked. It is used externally for the same purposes as calamine, and hence requires to be well levigated.

Oxidum zinci. Oxide of Zinc. Ed.

Let a large crucible be placed in a furnace filled with burning fuel, in such a manner that it shall be somewhat inclined to its mouth; and when the bottom of the crucible is at a moderate red heat, throw in a piece of zinc, about the weight of one drachm. The zinc soon inflames, and is converted into white flocculi, which are to be removed, from time to time, from the surface of the metal, with an iron spatula, that the combustion may proceed more perfectly; and, when the inflammation ceases, remove the oxide of zinc from the crucible. Another piece of zinc being thrown in, the operation is to be renewed and repeated as often as may be necessary. Lastly, let the oxide of zinc be prepared in the same manner as carbonate of lime.

Zinci oxydum. Oxyd of Zinc. Lond.

Throw successively pieces of Zinc into a red-hot crucible, large, deep, and inclined; another crucible being placed over it, in such a manner that the zinc may be exposed to the air, and may admit of being stirred frequently with an iron spatula. Remove immediately the oxide which is produced, and pass the white and lighter part of it through a sieve. Lastly, pour water on this, so as to form a fine powder in the manner directed for preparing chalk.

Oxydum zinci. Oxyd of Zinc. Dub.

Take of Zinc broken into small pieces, any quantity. Throw these at intervals into a crucible at a red heat, sufficiently deep, the mouth of which inclines a little towards the mouth of the furnace, placing over it at each time another crucible inverted, but covering it loosely so that the air may not be excluded. Let the light and very white sublimed powder be preserved for use.

Zinc is the most inflammable of the metals. At the temperature of ignition, it attracts the oxygen of the atmospheric air, and burns vividly with a white and green light, producing an oxide in very light flocculi, which are in part carried off by the rapid current of air arising from the burning zinc, and hence the reason of the direction to cover the crucible, with another inverted, so that this may be obviated,—a direction however not easily complied with, without impeding the burning. The oxide accumulates so rapidly, that it must also be withdrawn to allow the combustion to proceed. Particles of metallic zinc are intermingled with it, and hence the necessity of submitting it to levigation. It is light, white, tasteless, and insoluble in water, and contains about 20 of oxygen in 100 parts. In medicine it is employed principally as an antispasmodic in epilepsy and chorea. Its dose is from two to five grains twice a-day, and this is gradually increased. It also forms the basis of a healing cerate.

SULPHAS ZINCI, *olim Vitriolum Album.* Sulphate of Zinc. Ed.

Take of Zinc cut into small pieces, three ounces; Sulphuric Acid, five ounces; Water, twenty ounces. Mix them, and the effervescence being finished, digest for some time on warm sand. Then strain the liquor through paper; and, after due exhalation, put it aside, that crystals may be formed.

ZINCI SULPHAS. Sulphate of Zinc. Lond.

Take of Zinc in small pieces, three ounces; Sulphuric Acid, five ounces; Water, four pints. Mix them in a glass vessel, and the effervescence being over, strain the liquor through paper; then boil it until a pellicle form on the surface, and put it aside, that crystals may form.

SULPHAS ZINCI. Sulphate of Zinc. Dub.

Take of Zinc reduced to powder, in the same manner that tin is, three ounces; Sulphuric Acid, five ounces; Water, a pint. To the zinc put into a glass vessel, add gradually the acid previously diluted with the water; when the effervescence ceases, digest for a short time; then evaporate the strained liquor, and after due evaporation, put it aside, that crystals may form.

The sulphuric acid in this process, by a resulting affinity, enables the zinc to decompose the water, attracting its oxygen, the hydrogen being disengaged with effervescence: the oxide of zinc combines with the acid, forming the sulphate, and by evaporation this is obtained in acicular crystals. The process, however, is scarcely ever performed in the shops, the sulphate of zinc being prepared on a large scale, from certain varieties of the native sulphuret of the metal. These are roasted, and exposed to air and humidity; oxygen is absorbed, the zinc is oxidated, and the sulphur is converted into sulphuric acid; the sulphate of zinc is extracted by lixiviation; and its solution is usually evaporated so far, that on cooling, the salt concretes in a granular mass, forming the white vitriol of commerce. It usually contains a little sulphate of iron, and sometimes, it has been supposed, a portion of sulphate of copper and of lead. From the insolubility of the latter salt, it can scarcely be present; the sulphate of copper is scarcely ever to be discovered, and the sulphate of iron is in small quantity, and cannot communicate any injurious quality. And as sulphate of zinc is principally employed externally, the neglect of this process, and the substitution of the common white vitriol are of less importance.

Sulphate of zinc is used principally as an astringent, in the form of solution; as an injection in gonorrhœa, and a collyrium in ophthalmia: sometimes also internally as an emetic, and in smaller doses as an astringent and tonic. These applications of it have been already considered.

SOLUTIO SULPHATIS ZINCI. Solution of Sulphate of Zinc. Ed.

Take of Sulphate of Zinc, sixteen grains; Water, eight ounces; Diluted Sulphuric Acid, sixteen drops. Dissolve the sulphate of zinc in water; then the acid being added, strain through paper.

This solution is designed to be used as a collyrium in ophthalmia, the sulphuric acid dissolving any excess of oxide that may be present in the common sulphate of zinc, if it be employed, and coinciding with it in astringency. As an injection in gonorrhœa, the solution, without the acid, is preferable, as sufficiently astringent and less irritating, and perhaps is equally preferable as a collyrium.

SOLUTIO ACETITIS ZINCI. Solution of Acetite of Zinc. Ed.

Take of Sulphate of Zinc, one drachm; Distilled Water, ten ounces. Dissolve it. Take also of Acetite of Lead, four Scruples; Distilled Water, ten ounces. Dissolve it. Mix the solutions. Let the liquor remain at rest a little; then strain it.

Sulphate of zinc and acetate of lead being the two astringent salts which usually form the basis of the astringent injection employed in gonorrhœa, they had frequently been conjoined in one formula, without the prescriber perhaps being always aware of the decomposition they suffer. The solution, however, was found to answer sufficiently well, being astringent without proving irritating. The use of it led to the introduction of the present process, in which the proportions are properly adjusted. The two salts exchange their principles, the sulphuric acid of the sulphate of zinc combining with the oxide of lead of the acetate of lead, while the acetic acid unites with the oxide of zinc: the sulphate of lead being insoluble, is precipitated, and is removed by filtration; the acetate of zinc remains dissolved. It is used both as an injection in gonorrhœa, and a collyrium in ophthalmia.

TINCTURA ACETATIS ZINCI. Tincture of Acetate of Zinc. Dub.

Take of Sulphate of Zinc, one ounce; Acetate of Potash, the same quantity. Triturate them together, and add of Rectified Spirit, one pint. Macerate for a week, agitating the liquor frequently, and strain it through paper.

In this process a similar decomposition takes place, the sulphuric acid of the sulphate of zinc combining with the potash of the acetate of potash, while the acetic acid enters into union with the oxide of zinc. The spirit dissolves the acetate of zinc, while the sulphate of potash remains in a great measure undissolved. The solution is strongly impregnated with the metallic salt, and a collyrium or injection of the usual strength may be prepared extemporaneously, by adding a certain proportion of it to water, though it requires much larger dilution than is proportional to the quantity of acetate of zinc it contains, to reduce the stimulant operation of the spirit. The formula appears to have no advantage over the more direct and simple method given by the Edinburgh College.

STANNUM.—TIN.

PULVIS STANNI. Powder of Tin. Dub.

Take of Tin, any quantity. Having melted it in an iron mortar, agitate it as it cools, until it is reduced to powder, which, when cold, is to be passed through a sieve.

Tin, when heated near to its melting point, becomes brittle, so as to be easily reduced to fragments. When melted, therefore, if stirred or agitated as it becomes solid, this effect is obtained, and a granular powder is formed more easily than by any other method. Its powers as an anthelmintic have been already considered.

ARSENICUM.—ARSENIC.

ARSENICI OXYDUM PRÆPARATUM. Prepared Oxide of Arsenic. Lond.

Triturate Oxide of Arsenic into powder; then put it into a crucible, and applying heat, sublime it into another crucible placed over the former.

Oxide of Arsenic is usually obtained by sublimation from the ores of cobalt in which it is contained, and which are roasted with the view of obtaining the oxide of cobalt for the purposes to which it is applied in the arts. The arsenical oxide is collected in the chimney and flues of the furnace; it is impure, but is usually purified by sublimation before it is brought to the shops, and is in the state either of a solid cake or a powder. Oxide of arsenic is a substance so very active, that any foreign matter it can contain in this state can be of no importance, and the present process is altogether superfluous. Its properties and medicinal applications have been already considered.

LIQUOR ARSENICALIS. Arsenical Solution. Lond.

Take of Prepared Oxide of Arsenic, rubbed to a very fine powder, Sub-carbonate of Potash from Tartar, of each sixty-four grains; Distilled Water, a pint. Boil them together in a glass vessel until the arsenic is entirely dissolved. To the solution when cold, add Compound Spirit of Lavender, four fluidrachms: Then add as much Distilled Water as may be necessary to make up the measure of a pint.

The substance named Oxide of Arsenic has by some chemists been considered as an acid, and named Arsenious Acid. It is not, like the greater number of oxides, insipid and insoluble in water, but has a sharp taste, and is soluble in not more than 80 parts of cold, and 15 of boiling water. It reddens the more delicate vegetable colours, particularly the infusion of litmus, and it combines with the alkalis. The alkaline properties, however, do not appear to be neutralized in these combinations; and it even neutralizes, as Berthollet affirms, the acids in combining with them. And hence, on the whole, it is to be regarded as an oxide in a high degree of oxidation. By combination with potash it becomes more soluble in water; and to render the solution of it perfect, and obtain it in a form in which its dose can be easily regulated, is the object of the present process. The formula was introduced by Fowler, as giving a substitute for the arsenical preparation known under the name of Tasteless Ague Drop. Each ounce of the solution contains four grains of the oxide. The dose is four drops three times a-day, as a remedy in intermittent fever, given with the precautions which have been pointed out under its medical history. The spirit of lavender is designed to communicate colour and flavour; but it would have been better to have added some other tincture, the flavour of which is less commonly known, and the taste less grateful, so as to have guarded against the possibility of the solution being incautiously swallowed.

ARSENIAS KALI. Arseniate of Potash. Dub.

Take of White Oxide of Arsenic, Nitrate of Potash, each one ounce. Reduce them separately to powder; then put them mixed together into a glass retort, placed in a sand-bath, and apply heat, raising it gradually until the bottom of the retort is obscurely red. The vapours which arise should, by an apparatus adapted to that purpose, be transmitted through distilled water, that the nitrous acid disengaged by the heat may be condensed. Dissolve the residual matter in four pounds of boiling distilled water, and after due evaporation put it aside, that crystals may form.

Arsenic, by a high degree of oxygenation, acquires unequivocally the properties of an acid. This acid, the Arsénic as it is named, is formed by distilling nitrous acid from the oxide of arsenic, the nitrous acid yielding to the oxide the requisite proportion of oxygen. The same change is produced by the present process; the nitric acid of the nitre being decomposed, the oxide of arsenic acquiring from it as much oxygen as converts it into arsénic acid, and this acid remaining combined with the potash of the nitre. The residual mass, therefore, when a sufficient degree of heat has been applied to expel or decompose the whole of the nitrous acid, is arseniate of potash. This salt is very soluble in water, and crystallizable. By evaporation of its solution it is obtained in large regular crystals, their figure being a tetraedral prism : in this form, and as obtained by this process, the salt has generally a slight excess of acid : when perfectly neutral, it does not crystallize so easily.

Under this form, as well as under that of the preceding preparation, arsenic has been employed as a remedy in intermittent fever, and in some cutaneous diseases. The dose is from one-sixteenth to one-eighth of a grain of the crystallized salt. It does not appear to have any advantage, however, over the more simple preparation.