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THE PHILOSOPHICAL MAGAZINE.

JUNE 1800.

I. *Researches respecting the Composition of Enamel.* By
C. CLOUET, Associate of the French National Institute*.

WHITE ENAMEL.

WHITE enamel, either for earthen-ware, or the purpose of being applied on metals, is composed in the following manner: You first calcine a mixture of lead and tin, which may be varied in the following proportions; viz. for 100 parts of lead, 15, 20, 30, and even 40 of tin. A mixture of lead and tin calcines very easily in contact with the air. As soon as this mixture is brought to a red heat, nearly a cherry colour, it burns like charcoal, and is calcined very speedily. The composition which calcines best, is that which in 100 pounds of lead contains from 20 to 25 of tin. The tin here meant is pure tin. In proportion as the calcination is effected, you must take out the calcined part, and continue to oxydate the rest until the whole has become pulverulent. As some small particles always escape calcination, you must expose to the fire a second time the oxyd obtained in order to calcine it completely; which may be easily known by its ceasing to sparkle; that is to say, when you no longer see any parts burn like coal, and when the whole appears of a uniform colour. When the proportion of tin exceeds 25 or 30, a stronger fire is necessary to produce the calcination. In a word, by varying the degrees of heat you will be able

* From the *Annales de Chimie*.

to discover that best suited to the mixture on which you operate.

A hundred parts of the calx above mentioned, which in the French potteries is called *calcine*, is generally taken with 100 parts of sand. From 25 to 30 pounds of sea-salt, or muriat of soda, are added: the whole is well mixed together, and it is fused in the bottom of a furnace in which potter's ware is baked. This matter is generally placed on sand, on lime quenched in the open air, or on ashes. The bottom of the mass is in general badly fused. This, however, does not prevent the matter, after it has been pounded, and applied on the articles, from becoming exceedingly white and hard in the furnace. When taken from the furnace it is not white; it is even often very black: in general it is marbled with black, gray, and white.

This process is that generally used in potteries. In the compositions destined for earthen-ware, the proportion of 25 parts of tin to 100 of lead is never exceeded: for common earthen-ware, the manufacturers are even satisfied with 15 of tin to 100 of lead. It may be easily seen, that if you wish to obtain an enamel whiter and more fusible, you must diminish the quantity of sand; but there is no necessity for augmenting that of the sea-salt, or muriat of soda: as the whiteness and opacity depend on the quantity of tin, you may use *calcine*, which contains 25 or 30 *per cent.* For example, 100 of such calcine, 60 of sand, and 25 of marine salt, give a composition exceedingly fusible.

But it is to be observed, that it is necessary to employ some further manipulations when you wish to have enamel proper for being applied on metal, and are desirous to give it all the perfection of which it is susceptible. In that case, you do not employ crude sand, but calcine it, in a strong heat, with a quarter of its weight of marine salt, either in a small quantity in a crucible, or on a large scale in a potter's furnace. If you wish to have a very fusible enamel, you may even add minium, or lead calcined by the former operation, and nearly as much sea-salt, that is to say, a fourth. You then obtain a white mass half fused and porous, which you pulverise, and employ in the composition of enamel instead of sand, and in

the same proportions as sand: you may even diminish the quantity of this matter to 50 *per cent.* if you are desirous to obtain an enamel very fusible. This will depend also on the *calcine* employed; for that which is most charged with tin is the least fusible.

When you wish to have fluxes for the colours, you employ the same compositions before mentioned, except that you put little or no tin into the lead. In the latter case you must generally employ minium. This flux is good for certain colours, but not for all. There are some which become tarnished by fluxes, that contain the oxyds of lead. In that case, you must make fluxes without oxyd of lead. Nitre and borax are generally used for making this glass, but you add no calx of tin. The following are those which I have tried:

Three parts of filiceous sand, one of chalk, and three of calcined borax, give a matter proper to be used as a flux for purples, blues, and other delicate colours.

Three parts of white or flint glass, one of calcined borax, a quarter of a part of nitre, one of the white oxyd of antimony made with nitre well washed, give an exceedingly white enamel, which may serve also as a flux for purple, and particularly for blue.

Sixty parts of enamel sand or less, thirty of alum, thirty-five of sea-salt, and a hundred of minium, or any other oxyd of lead, give a white enamel when the fluxes do not predominate too much, and a gelatinous glass when a great deal of fluxes has been added. This glass is good for red, and the enamel may be applied to all kinds of clay capable of sustaining a strong heat.

It is of great importance to remark, and to know, that the sand employed for enamel must not be sand which contains only flint: sand of that kind alone is of no use. The sand proper for this purpose is that which contains talc with flint. To make a sand proper for enamel and the fluxes of colours, &c. there must be nearly one part of talc and three of filiceous sand.

What appears to me most essential in regard to the success of enamel, is the choice of sand. It is very possible to com-
pose

pose this sand by art; and though I have not decomposed it, I have found by synthesis, that three parts of siliceous sand and one of talc form an excellent sand for enamel. From this it may be readily seen, that, to compose with facility sand for enamel, nothing is necessary but to determine, by a good analysis, the quantity of talc. This sand may be procured in places where earthen-ware is made. It may be easily known; for, besides the siliceous sand, which forms the greatest part of it, you may observe in it talcky particles in great abundance; and, to be good, it must contain nearly a quarter. When it does not contain a sufficient quantity, the enamel it produces fuses with more difficulty, and does not become smooth; it remains granulated and pitted. There are certainly some combinations of earth which may produce very good fluxes, either for enamel or for transparent colours. It might be attended with advantage to try some of these combinations. Ponderous earth (barytes) and lime fuse very well together: by adding a little flint, or a little magnesia, it is probable that an excellent matter might be produced. If this glass, composed of lime and barytes only, had sufficient solidity to resist the air and weak acids, there would be no necessity perhaps to add flint; but if the marine salt, as I am inclined to think, ought also to enter into the composition of this kind of glass, flint ought likewise to form a part of it. The experiments on this head, for the sake of trial, may be varied different ways. When the glass destined to serve as flux for colours is employed, it is customary, in order that they may be rendered more fusible, to add a little nitre and borax. The common borax of the shops contains an excess of soda, which, in my opinion, it would be of benefit to saturate with the nitric acid. I think also that the flux might be rebaked with the dose of nitre and borax, or of nitric borax, which might be added before being employed. It is only to colours such as purple and the oxyd of cobalt that nitre and borax are added.

I have tried to find a substitute for marine salt in the composition of white enamel. Potash produced only an ugly and ill fused gray mass, which acquired no lustre in the furnace; nitre produced a green mass, but exceedingly friable; sulphat

fulphat of potash produced very nearly the same effect, only the mass was a little whiter: but neither of these enamels was worth any thing. I did not try pure soda: I have, however, heard common soda extolled; but as it contains a great deal of marine salt, it must undoubtedly be on account of this salt that it produces a good effect. Pure soda may nevertheless be tried, either alone or with marine salt; it perhaps might produce no bad effect with potash.

I have tried also a mixture of equal parts of lime and argil, to which I added one part of flint, and likewise without flint; but this mixture did not supply the place of talcky sand. This sand is not in general found in grains; it exhibits itself most commonly under the form of a stone, such as free-stone; but some of it is found also in grains.

We should be much deceived in making white enamel were we to employ the oxyds of tin and lead separately, as I have read in all the authors I could find who treat on the art of pottery. None of them say what they ought respecting enamel, nor even respecting the composition or nature of the earth proper for bearing an enamel.

It is essential that the lead and tin for making the oxyd destined to produce white enamel, should be fused and mixed together before they are calcined; and if you wish that the enamel should immediately acquire its full whiteness, it will be requisite that the calcination should be complete.

Bismuth might perhaps be employed as a substitute for the lead, and it is not improbable that it would give a good product. Bismuth also might be mixed with the lead in the following manner; *viz.* one part of lead, one of bismuth, and one of tin: or other proportions might be employed; but I have not tried any others. As the oxyd of bismuth, however, is exceedingly fusible, I think it might be admitted, with great advantage, into certain fluxes. I have not tried what might be produced by the white calx of zinc, nor by that of tin, made by dissolving it in the nitric acid or by detonation with nitre. A mixture of lead and tin, detonated with nitre, would be useful. Though the white calx of regulus of antimony made by nitre, and well washed, (diaphoretic antimony,) produces a very beautiful white enamel when fused

fused with three parts of white glass, (which contains neither lead nor other metallic oxyds,) and one of glass of borax, with a half or fourth part of nitre; yet this calx, so white when mixed with the composition of enamel, made with enamel sand and the combined oxyd of lead and tin, instead of increasing, tarnishes the whiteness, and only gives a blueish enamel of a livid colour*. Perhaps enamels, completely made and mixed together in the first instance, would not produce the same effect; but this I never tried. I have, however, employed this composition as a flux for colours, which, applied afterwards on the enamel of earthen-ware, preserved its beauty. I put some of this pure enamel also over that of earthen-ware, and I think it preserved its whiteness.

The principal quality of good enamel, and that which renders it fit for being applied on baked earthen-ware, or on metals, is the facility with which it acquires lustre by a moderate heat, (a cherry-red heat, more or less, according to the nature of the enamel,) without entering into complete fusion†. Enamels applied to earthen-ware and metals possess this quality. They do not enter into complete fusion; they assume only the state of paste, but of a paste exceedingly firm; and yet when baked one might say that they had been completely fused.

There are two methods of painting on enamel: on raw or on baked enamel. Both these methods are employed, or may be employed, for the same object. Solid colours, capable of sustaining the fire necessary for baking the enamel ground, may be applied in the form of fused enamel on that which is raw, and the artist may afterwards finish with the tender colours. The colours applied on the raw material do not require any flux; there is one, even, to which flux must be added, that is, the calx of copper, which gives a very

* Antimony, employed in any manner as a glazing for earthen-ware, would be more dangerous than lead; even the latter should, if possible, be discarded.—*EDIT.*

† The ingenious author has omitted another principal quality. It ought never to contain such a portion of deliquescent salts, as to endanger its being afterwards injured by water. This takes place oftener than is generally suspected.—*EDIT.*

beautiful green: but when you wish to employ it on the raw material, you must mix with it about two parts of its weight of flux, and bring the mixture into combination by means of heat. You afterwards pulverise the mass you have thus obtained, in order to employ it.

To obtain good white enamel, it is of great importance that the lead and tin should be very pure. If these metals contain copper or antimony, as is often the case, the enamel will not be beautiful: iron is the least hurtful.

OF COLOURED ENAMELS.

All the colours may be produced by the metallic oxyds. These colours are more or less fused in the fire, according as they adhere with more or less strength to their oxygen. All metals which readily lose their oxygen cannot endure a great degree of heat, and are unfit for being employed on the raw material.

Purple.

This colour is the oxyd of gold, which may be prepared different ways; as by precipitating, by means of a muriatic solution of tin, a nitro-muriatic solution of gold much diluted in water. The least quantity possible of the solution of tin will be sufficient to form this precipitate. The solution of tin must be added gradually until you observe the purple colour begin to appear: you then stop; and having suffered the colour to be deposited, you put it into an earthen vessel to dry slowly*. The different solutions of gold, in whatever manner precipitated, provided the gold is precipitated in the state of an oxyd, give always a purple colour, which will be more beautiful in proportion to the purity of the oxyd; but neither the copper nor silver, with which gold is generally found alloyed, injure this colour in a sensible manner: it is changed, however, by iron. The gold precipitate which gives the most beautiful purple is certainly fulminating gold, which loses that property when mixed with fluxes. Purple is an abundant colour; it is capable of bearing a great deal of flux, and in a small quantity communicates its colour to a great deal of matter. It appears that saline fluxes are better suited

* The colour is always more beautiful, if the precipitate is ground with the flux before it has become dry.—EDIT.

to it than those in which there are metallic calces. Those, therefore, which have been made with flint, chalk, and borax, or white glass, borax, and a little white oxyd of antimony, with a little nitre, as I have already mentioned, ought to be employed with it. Purple will bear from four to twenty parts of flux, and even more, according to the shade required. Painters in enamel employ generally for purple a flux which they call brilliant white. This flux appears to be a semi-opaque enamel, which has been drawn into tubes, and afterwards blown into a ball at an enameller's lamp. These bulbs are afterwards broken in such a manner that the flux is found in small scales, which appear like the fragments of small hollow spheres. Enamel painters mix this flux with a little nitre and borax. This matter, which produces a very good effect, I employed, without attempting to decompose it. It may be a very fusible common white enamel which has been blown into that form. It is to be remarked, that purple will not bear a strong heat.

Red.

We have no metallic oxyd capable of giving directly a fused red; that is to say, we have no metallic calces which, entering into fusion, and combining under the form of transparent glass with fluxes or glass, give directly a red colour. To obtain this colour it must be compounded different ways, as follows:—Take two parts, or two parts and a half (you may, however, take only one part,) of sulphat of iron and of sulphat of alumine; fuse them together in their water of crystallisation, and take care to mix them well together. Continue to heat them to complete dryness; then increase the fire so as to bring the mixture to a red heat. The last operation must be performed in a reverberating furnace. Keep the mixture red until it has every where assumed a beautiful red colour, which you may ascertain by taking out a little of it from time to time, and suffering it to cool in the air. You may then see whether the matter is sufficiently red: to judge of this it must be left to cool, because while hot it appears black. The red oxyds of iron give a red colour; but this colour is exceedingly fugitive; for, as soon as the oxyd of iron enters into fusion, the portion of oxygen which gives it its red colour leaves it, and it becomes black,
yellow,

yellow, or greenish. To preserve, therefore, the red colour of this oxyd in the fire, it must be prevented from vitrifying, and abandoning its oxygen; which may be accomplished by the method I have indicated. I have tried a variety of different substances to give it this fixity, but none of them succeeded except alum. The doses of alum and fulphat of iron may be varied. The more alum you add, the paler will be the colour. Three parts of alum to one of fulphat of iron give a colour which approaches flesh colour. It is alum also which gives this colour the property of becoming fixed at a very strong heat. This colour may be employed on raw enamel: it has much more fixity than the purple, but not so much as the blue of cobalt. It may be washed to carry off the superfluous saline matter, but it may be employed also withoutedulcoration; in that state it is even more fixed and more beautiful. It does not require much flux; the flux which appeared to me to be best suited to it, is composed of alum, minium, marine salt, and enamel sand. This flux must be compounded in such a manner as to render it sufficiently fusible for its object: from two to three parts of it are mixed with the colour. In general, three parts of flux are used for one of colour: but this dose may, and ought to be varied according to the nature of the colour and the shade of it required. Red calx of iron alone, when it enters into fusion with glass, gives a colour which seems to be black; but if the colour be diluted with a sufficient quantity of glass, it at last becomes of a transparent yellow. Thus, the colour really produced by calx of iron combined with glass is a yellow colour, but which being accumulated becomes so dark that it appears black. In the process above given for making the red colour, the oxyd of iron does not fuse: and this is the essential point; for, if this colour is carried in the fire to vitrification, it becomes black, or yellowish, and disappears if the coat be thin, and the oxyd of iron present be only in a small quantity.

Yellow.

Though yellow may be obtained in a direct manner, compound yellows are preferred; because they are more certain in their effect, and more easily applied than the yellow,

which may be directly obtained from silver. The compound yellows are obtained in consequence of the same principles as the red colour of iron. For this purpose we employ metallic oxyds, the vitrification of which must be prevented by mixing with them other substances, such as refractory earths, or metallic oxyds difficult to be fused.

The metallic calces which form the bases of the yellow colours are generally those of lead; as minium, the white calx of lead, or litharge, the white calx of antimony, called diaphoretic antimony: that called crocus metallorum is also employed. This regulus, pulverised and mixed with white oxyd, gives likewise a yellow. The following are the different compositions used: one part of the white oxyd of antimony, one of the white oxyd of lead (or two or three); these doses are exceedingly variable; one part of alum, and one of sal-ammoniac. When these matters have been all pulverised, and mixed well together, they are put in a vessel over a fire sufficient to sublimate and decompose the sal-ammoniac; and when the matter has assumed a yellow colour, the operation is finished *. The calces of lead mixed in a small quantity either with filix or alumine, also with the pure calx of tin, exceedingly white, give likewise yellows. One part of the oxyd of lead is added to two, three, or four of the other substances above mentioned. In these different compositions for yellow, you may use also oxyd of iron, either pure, or that kind which has been prepared with alum and vitriol of iron: you will then obtain different shades of yellow. From what has been said, you may vary these compositions of yellow as much as you please. Yellows require so little flux, that one or two parts, in general, to one of the colour are sufficient; saline fluxes are improper for them, and especially those which contain nitre. They must be used with fluxes composed of enamel sand, oxyd of lead, and borax, without marine salt.

A yellow may be obtained also directly from silver. All these mixtures may be varied, and you may try others. For this purpose you may use sulphat of silver, or any oxyd of that metal mixed with alumine or filix, or even with both.

* This in colour-shops is called Naples yellow.

in equal quantities. The whole must be gently heated until the yellow colour appear, and the matter is to be employed with the fluxes pointed out for yellows. Yellow of silver, like purple, cannot endure a strong heat: a nitric solution of silver may be precipitated by the ammoniacal phosphat of soda, and you will obtain a yellow precipitate, which may be used to paint in that colour with fluxes, which ought then to be a little harder.

Besides the methods above mentioned, the best manner of employing the oxyd of silver is, in my opinion, to employ it pure: in that case, you do not paint, but stain. It will be sufficient, then, to lay a light coating on the place which you wish to stain yellow, and to heat the article gently to give it the colour. You must not employ too strong a heat: the degree will easily be found by practice. When the article has been sufficiently heated, you take it from the fire and separate the coating of oxyd, which will be found reduced to a regulus: you will then observe the place which it occupied tinged of a beautiful yellow colour, without thickness. It is chiefly on transparent glass that this process succeeds best. Very fine silver filings produce the same effect: but what seemed to me to succeed best in this case, was sulphat of silver, well ground up with a little water, that it may be extended very smooth. From what has been said, it may readily be seen that this yellow must not be employed like other colours; that it must not be applied till the rest have been fused; for, as it is exceedingly fusible, and ready to change, it would be injured by the other colours; and as the coating of silver which is reduced must be removed, the fluxes would fix it, and prevent the possibility of its being afterwards separated. Working on glass is not attended with this inconvenience, because the silver-yellow is applied on the opposite side to that on which the other colours are laid.

Green.

Green is obtained directly from the oxyd of copper. All the oxyds of copper are good: they require little flux, which even must not be too fusible: one part or two of flux will be sufficient for one oxyd. This colour agrees with all the fluxes, the saline as well as the metallic; which tends to vary
a little

a little the shades. I have already pointed out the method of employing these oxyds on raw enamel: were not that method only followed in this case, the oxyd of copper would extend, and spread itself, like a cloud, beyond the limits prescribed for it.

A mixture of yellow and blue is also used to produce green. Those who paint figures or portraits employ glass composed in this manner; but those who paint glazed vessels, either earthen-ware or porcelain, employ in general copper green.

Independently of the beautiful green colour produced by oxydated copper, it produces also a very beautiful red colour; but I do not know that it is employed on enamel. This beautiful red colour, produced by copper, is exceedingly fugitive. The oxyd of copper gives red only when it contains very little oxygen, and approaches near to the state of a regulus. Notwithstanding the difficulty of employing this oxyd for a red colour, a method has been found to stain transparent glass with different shades of a very beautiful red colour by means of calx of copper. The process is as follows: You do not employ the calx of copper pure, but add to it calx of iron, which for that purpose must not be too much calcined; you add also a very small quantity of calx of copper to the mass of glass which you are desirous of tingeing. This glass at first must have only a very slight tinge of green, inclining to yellow. When the glass has that colour you make it pass to red, and even a very dark red, by mixing with it red tartar in powder, and even tallow. You must mix this matter well in the glass, and it will assume a very dark red colour. The glass swells up very much by this addition. Before it is worked it must be suffered to settle, and become compact; but as soon as it has fully assumed the colour it must be immediately worked, for the colour does not remain long, and even often disappears while working; but it may be restored by heating the glass at the flame of a lamp. It is exceedingly difficult to make this colour well; but when it succeeds it is very beautiful, and has a great deal of splendour. By employing the calx of copper alone for the processes above mentioned you will obtain, when you succeed well, a red similar to the most beautiful carmine. The calx of iron changes
the

the red into vermilion, according to the quantity added. If we had certain processes for making this colour, we should obtain all the shades of red from pure red to orange, by using, in different proportions, the oxyd of copper and that of iron. The calx of copper fuses argil more easily than flint: the case is the same with calx of iron. If you fuse two or three parts of argil with one of the oxyd of copper, and if the heat be sufficient, you will obtain a very opaque enamel, and of a vermilion red colour: the oxyd of copper passes from red to green through yellow; so that the enamel of copper, which becomes red at a strong heat, may be yellow with a weaker heat. The same effect may be produced by deoxydating copper in different degrees: this will be effected according as the heat is more or less violent. The above composition might, I think, be employed to give a vermilion red colour to porcelain. The heat of the porcelain furnace ought to be of sufficient strength to produce the proper effect.

The calx of iron fused also with argil in the same proportions as the calx of copper, gives a very beautiful black. These proportions may, however, be varied.

Blue.

Blue is obtained from the oxyd of cobalt. It is the most fixed of all colours, and becomes equally beautiful with a weak as with a strong heat. The blue produced by cobalt is more beautiful the purer it is, and the more it is oxydated. Arsenic does not hurt it. The saline fluxes which contain nitre are those best suited to it: you add a little also when you employ that flux which contains a little calcined borax or glafs of borax, though you may employ it also with that flux alone.

But the flux which, according to my experiments, gives to cobalt blue the greatest splendour and beauty, is that composed of white glafs (which contains no metallic calx), of borax, nitre, and diaphoretic antimony well washed. When this glafs is made for the purpose of being employed as a flux for blue, you may add less of the white oxyd of antimony: a sixth of the whole will be sufficient.

Violet.

Violet.

Black calx of manganese, employed with saline fluxes, gives a very beautiful violet. By varying the fluxes, the shade of the colour may also be varied: it is very fixed as long as it retains its oxygen. The oxyd of manganese may produce different colours; but for that purpose it will be necessary that we should be able to fix its oxygen in it in different proportions. How to effect this, as far as I know, has never yet been discovered.

These are all the colours obtained from metals. From this it is evident that something still remains to be discovered. We do not know what might be produced by the oxyds of platina, tungsten, molybdena, and nickel: all these oxyds are still to be tried; each of them must produce a colour, and perhaps red, which is obtained neither directly nor with facility from any of the metallic substances formerly known and hitherto employed.

GENERAL REMARKS.

Those who paint on enamel, on earthen-ware, porcelain, &c. must regulate the fusibility of the colours by the most tender of those employed, as for example, the purple. When the degree which is best suited to purple has been found, the other less fusible colours may be so regulated, (by additions of flux,) when it is necessary to fuse all the colours at the same time, and at the same degree of heat.

You may paint also in enamel without flux; but all the colours do not equally stand the heat which must be employed. If the enamel, however, on which you paint be very fusible, they may all penetrate it. This manner of painting gives no thickness of colour; on the contrary, the colours sink into the enamel at the places where the tints are strongest. To make them penetrate, and give them lustre, a pretty strong fire will be necessary to soften the enamel and bring it to a state of fusion. This method cannot be practised but on enamel composed with sand, which I call enamel sand, as already mentioned. It may be readily seen, also, that the colours and enamel capable of enduring

the greatest heat, will be the most solid, and the least liable to be changed by the air. An account of the method of employing and baking enamel may be found in various works, and may be learned also by seeing the operations of enamellers.

II. *On a new fulminating Mercury.* By EDWARD HOWARD, Esq. F.R.S.*

SECTION I.

THE mercurial preparations which fulminate, when mixed with sulphur, and gradually exposed to a gentle heat, are well known to chemists: they were discovered, and have been fully described, by Mr. Bayen †.

MM. Brugnatelli and Van Mons have likewise produced fulminations by concussion, as well with nitrat of mercury and phosphorus, as with phosphorus and most other nitrats ‡. Cinnabar, likewise, is amongst the substances which, according to MM. Fourcroy and Vauquelin, detonate by concussion with oxymuriat of potash §.

Mr. Ameilon had, according to Mr. Berthollet, observed, that the precipitate obtained from nitrat of mercury by oxalic acid fuses with a hissing noise ||.

SECTION

* From *Transactions of the Royal Society of London* for 1800.

† *Opuscules Chimiques de Bayen*, Tom. I. p. 346, and note in p. 344.

‡ *Annales de Chimie*, Tom. XXVII. p. 74 and 79.

§ *Ibid.* Tom. XXI. p. 238.

|| This fact has been misrepresented in the introduction to a work entitled *The Chemical Principles of the Metallic Arts*, by W. Richardson, Surgeon, F.A.S. Sc. (page lvii.) The author, speaking of the acid of forrel, says, "Klaproth of Berlin precipitated a nitrous solution of mercury with acid of wood-forrel neutralised with vegetable alkali. The white precipitate, well washed and dried, produced a fulminating noise not inferior to that of fulminating gold. Acid of sugar, perfectly neutralised by vegetable alkali, produced the same precipitate, which, on exposure to heat, exhibited the same fulminating power." I must confess, I have not been able to produce any such fulmination. Mr. Richardson has moreover given this supposed discovery to Mr. Klaproth; whereas Mr. Berthollet, when quoting the fact to which I suppose Mr. Richardson intended to allude, observes, "Qu'on avoit déjà donné le nom d'argent