extruendo nova Vasa quam hæc, si Vasa, in ordinem regularem & generationi idoneam restituendo. Observationes demum quas Transactionibus proximè editis & edendis (Num. 139. & 140) inserui, altera de Fœtu non matris in utero sed Abdomine invento, altera de Testiculo s. potius Ovario cujusdam mulieris Hydropico, rem omni dubio forsan extricabunt.

The Art of Refining, communicated by Dr. Christopher Merrit.

THe end hereof, is the separation of all other Bodies from *Gold* and *Silver*; which is performed four ways, *viz.* By *Parting*, by the *Test*, by the *Almond Furnace* or the *Sweep*, and by *Mercury*.

PARTING is done with *Aqua fortis*, which the Refiners make thus, ℞ *Salt Peter* ℔iii. *Dantzick Vitriol* ℔ii.

Let them be well bruised and mixed in a Morter and then put into a *Long-neck*, which is an Earthen Vessel so named from its Figure. Then six or eight of these *Long necks* thus filled, are placed in each side of their Furnace, on a *Range* built with Iron Barrs, of the form of a *parabola*, at above nine Inches distance one from another, and closed at the sides with Bricks. The upper Arches are left open to put in and take out the Pots. Over the said Arches they lay large Bars of Iron, and then cover all the top of the Furnace with Lome, the Body of each *Long-neck* lying naked to the Fire, the Neck outward; to which the Receivers, whether of Glass or German Pots, are well Luted.

Note that if the Vitriol be not *Dantzick*, which is made with Copper; but *English*, which is made with old Iron; the Water will be weaker, and make a dirty coloured Verditer, and wholly spoile it; besides, the Silver will not gather so well to the Copper after dissolution, and thereby becomes black.

Their Lute is made of good Lome, some Horse Dung, and a little *Colcothar*; although the two former do well. The luting being well labour'd and applyed, they make a gentle Charcoal-fire under the Pots, for three hours, and then increase it for three hours more: about the seventh hour, they make a vehement hot Fire for four hours, and cast in at last well dried Billets of the length of the Furnace, whose flame sur-

ſurroundeth all the Pots, and finiſheth their Work. The next morning they carefully ſeparate the Receivers from the Long-necks. Uſually performing this Work but once in 24. hours, ſometimes twice.

Some Refiners diſtill 100lb. of the materials put into a Caſt-Iron-Pot; which is the beſt way, eſpecially being perfomed after this lateſt Invention, *viz.*

Build a Furnace two yards high or more; and at the top place in your Iron-Pot. To which fit a Head of Earth, like the Head of a large Diſtillatory for Chymical Oyls, which muſt have a large belly, branching it ſelf, about eight inches from the Iron Pot, into three Branches: one whereof in the midſt, comes directly ſtreight forwards, two other lateral ones obliquely: all which Branches are four or five Inches hollow in diameter, and five or ſix long. To theſe Branches are fited Glaſs Bodies, narrow and hollow at both ends, large and globous in the midſt. Theſe muſt be exceedingly well luted on with *Colcothar*, Rags, Flower and Whites of Eggs. To this firſt Glaſs-Body is luted on another Glaſs, of the ſame figure and ſize, and in order eight alike in all, till they come to the Receiver, which is an ordinary Gallon Glaſs. All theſe Rowes of Glaſſes lye on boards ſhelving from the Head to the Receiver. The two upper Receivers or Glaſs-Bodies need exceeding good Luting, for the reſt ordinary Lute will ſerve.

The conveniency of this way is, that a little Fire, and that of *New Caſtle* Coals, will do the work, you ſave a Long-neck for each five pounds of materials, and you need never break or unlute any of the Receivers, but the lowermoſt.

The *Aqua fortis* being diſtilled off, is put into a large Earthen Pot, and there is added of fine Silver, one or two peny weight (which is called *Fixes*) to every pound of *Aqua fortis*, which within four hours will purge it from all dirt and impurity, and make it fit for Parting, which is thus done.

If their Silver guilt be fine enough for Wire, they only melt it in a Wind-furnace, and caſt it melted into a large Tub of water, that they may have it in ſmall pieces. But if it be but *ſtandard*, they firſt fine it on the *Teſt*. Theſe ſmall pieces taken from the water, being well dryed, are put into a Glaſs taper-

faſhion,

fashion, a foot high, and seven inches at the bottom; and then the Glasses are charged with *Aqua fortis* about two thirds of it, and set in a Range of Iron covered two inches deep with Sand, and a gentle Charcoal fire made under it.

Small bubles will soon arise, and the water also run over. If so, they take off the Glasses, and hold them, till it doth *deferveſcere*, or else pour some of it into a Vessel which is at hand.

If Lead be mixed with it, they cannot keep it from running over.

When the Water hath once been quieted, from this Ebullition, it will rise no more.

The greenness of the Water, manifesteth the quantity of Copper contained in it.

If the water boil over, 'twill penetrate the Bricks and Wood.

They commonly let it stand a night on the Iron Range, with a gentle heat under it, and in the morning softly pour off the water impregnated with all the Silver; all the Gold lying, like black dirt, at the bottom, which being washed out is put into small Parting-Glasses, and set over the Sand with fair Conduit-water for an hour, and then the water poured off. This is repeated five or six times, to seperate the Salt from the Gold, which is now fit to be melted, and Cast into an Ingot.

To regain the Silver they have large round Washing-Bowls, lined within with melted Rosin and Pitch (for otherwise the Water would eat the Wood and penetrate the sides of the Bowl) covered with Copper Plates ten inches long, six wide, and half or more thick. Into which Bowles they pour good store of water (the more, the better the Verditer) and then the Silver-water: which working on the softer Metal of Copper, leaves all the Silver in most fine *S*and at the bottom, and sides of the Bowl and Plates of Copper; which being taken out, is washed, dryed and melted for any use.

Concerning the Plates 'tis observable, That if any Brass or shroffe Metal be in them; they gather very little of the Silver, the latter mixing with the Silver, as 'twas proved at the *Tower* by a Finer questioned for his Silver.

With the Copper-Water poured off from the Silver, and Whiting, Verditer is made thus. They put into a Tub a hundred

hundred pound weight of Whiting, and thereon poure the Copper-Water, and ſtir them together every day, for ſome hours together. And when the Water grows pale, they take it out, and ſet it by for further uſe, and pour on more of the Green-Water, and ſo continue till the Verditer be made. Which being taken out, is laid on large pieces of Chalk in the Sun, till it be dry for the Market.

The Water mention to be taken from the Verditer, is put into a Copper, and boil'd till it comes to the thickneſs of Water gruel, now principally conſiſting of Salt Petre reduced (moſt of the Spirit of Vitriol being gone with the Copper into the Verditer.) A diſh full whereof being put into the other Materials, for *Aqua fortis*, is rediſtil'd, and makes a double-water, almoſt twice as good, as that without it, and ſold for neer a double value.

I COME next to the ſecond way of Refining, *ſc.* by the *TEST*. This ſeperates all Metals from Silver, except Gold, becauſe they ſwim over it, when they are all melted together.

The *Teſt* is thus made. They have an Iron Mould, oval, and two inches deep. At the bottom hereof, are three Arches of Iron ſet at equal diſtances, two fingers wide, if the great diameter of it be fourteen inches long; and ſo proportionably in greater or leſſer *Teſts*.

This cavity they fill with fine powder of Bone-aſhes, moiſtned with *Lixivium* made with Soap-aſhes. Some uſe Cakes of Pot-aſhes or other Aſhes well cleanſed, and ſo preſſed well together with a Muller, that it becomes very cloſe and ſmooth at the top.

There is left above a Cavity in the midſt of it, to contain the melted Silver. This Cavity is made greateſt in the middle; for the Bone-Aſhes come up parallel to the circumference of the Mould; only a ſmall Channel in that end, which is moſt remote from the blaſt, for the running off of the baſer Metals, and ſo is made declive to the centre of the *Teſt*, where 'tis not above half an inch deep.

The *Teſt* thus made, is ſet annealing 24. hours, and then it is fit for uſe, in this manner. 'Tis ſet in a Chimney a yard high, parallel almoſt to the Noſe of a great pair of Bellows, and then therein is put the Silver. Which being covered all over with Billets of barqued Oak, the blaſt begins and continues all the while

while ſtrongly. The Lead purified from all Silver, (which they call the Soap of Metals) firſt put in, melts down with the Silver, and then the Lead and Copper ſwim at the top, and run over the *Teſt*. Whoſe motion the Finer helps with a long Rod of Iron drawn along the ſurface of the Silver towards the forementioned ſlit, and often ſtirring all the Metal, that the impurer may the better riſe: and by continuing this courſe, ſeperation is made in two or three hours.

The greateſt part of the Lead flies away in ſmoak.

If the Lead be gone before all the Copper, 'twill riſe in ſmall red firy bubbles; and then they ſay, the Metal *Drives*, and muſt add more Lead. The force of the blaſt drives the higher Metals to the lower ſide of the *Teſt*, and helps its running over.

When the Silver is fully fined, it looks like moſt pure Quick-ſilver; and then they take off their ſogs and let it coole. In the cooling, the Silver will frequently from the middle ſpring up in ſmall Rayes and fall down again. If moiſt Silver be put into that which is melted, 'twill ſpring into the fire.

A good *Teſt* will ſerve two or three firings.

So ſoon as the Silver will hold together, they take it out of the *Teſt*, and beat it on an Anvile into a round figure, for the Melting Pot: which being ſet in a Wind-Furnace, ſurrounded with Coal, and covered with an Iron Cap, that no Charcoal fall into it, is then melted.

If any Droſs or filth be in the Melting-Pot, they throw in ſome Tincal, which gathers the droſs together that it may be ſeparated from it.

Theſe Melting-Pots are never burned, but only dryed, and will laſt a whole day, if they be not ſuffered to cool: but if they once cool, they infallibly crack.

NEXT IS the *ALMOND-FURNACE* or Sweep. Here are ſeparated all ſorts of Metals from Cinders, parts of Melting-Pots, Teſts, Brick, and all other harder bodies; which muſt be firſt beaten into ſmall pieces with a hammer, and an Iron Plate; and 'tis one mans work.

Thoſe which ſtick but ſuperficially to their Silver, they waſh off thus; they have a Wooden round Inſtrument two foot wide, ſomewhat hollow in the middle, with a handle on each ſide. On this they put the Materials, and hold them in a Tub

of

of Water below the ſurface, and ſo waving it to and fro, all the lighter and looſer matter is ſeparated from the Metal.

The Furnace is ſix feet high, four feet wide, and two feet thick. Made of Brick; having a hole in the midſt of the top eight inches over, growing narrower towards the bottom of it, where, on the fore part, it ends in a ſmall hole, environed with a ſemicircle of Iron to keep the molten Metal. About the middle of the Back, there is another hole to receive the Noſe of a great pair of Bellows, requiring continually the ſtrength of two luſty men.

The night before they begin, Charcoal is kindled in the Furnace to Anneal it: and when it is hot, they throw two or three ſhovels of Coal, to one of the forementioned Stuff, and ſo proceed during the whole Work, making *ſtratum ſuper ſtratum* of one and the other. After eight or ten hours the Metal begins to run; and when the Receiver below is pretty full, they lade it out with an Iron Ladle, and caſt it into Sows in Cavities or Forms made with Aſhes.

They frequently ſtop the paſſage-hole with Cinders to keep in the heat; and when they think a quantity of Metal is melted, they unſtop the hole to paſs it off.

If the Stuff be hard to *flux*, they throw in ſome *ſlag* (which is the Recrement of Iron) to give it fuſion. Their Irons melt away apace, wherewith they proak out the Cinders from the hole.

A ſtinking blue ſmoak proceeds from the Furnace, and all by-ſtanders put on the colour of dead men. The workmen muſt be well lined with Oyl, Sack, Strong Beer, and good Victuals: for the Work continues three days and nights without intermiſſion, uſing no other variety, than above ſaid.

A large Cavity will be made in the Furnace: for the Metals or the Fire, or both together corrode and wear the greateſt part of the bricks away.

To get the Silver from theſe Metals, they now uſe no other Art, than that of the *Teſt*.

To Refine their Copper from the Litharge, they formerly laid their Ingots of Lead and Copper on Loggs of Wood fired, which would eaſily melt down the Lead or Tinn, and ſo leave the Copper full of holes wherein the Lead had been lodged. But now they commit this work alſo to the *Teſt*.

THE LAST way of *Separation* is by *Quick-silver*. And this is for filings of small Workers and Goldsmiths, wherein Gold and Silver are mixed with dust, *&c.* This dust is put into a Hand-mill with Quick-silver, and being continually turned upon that, and the Metals, an Amalgama is made of them, and fair water poured in, carrys off the dust as it runs out again by a small Quill.

This Amalgama is put into an Iron with a Bolt Head, set into the fire, having a long Iron-neck three feet long, to which is fitted a Receiver. The fire distils off the *Mercury* into the Receiver, and the Gold and Silver remain in the Bolt Head.

An Account of the English *Alum-Works, communicated by* Daniel Colwall *Esquire.*

Alum is made of a Stone digged out of a Mine, of a Sea-weed, and Urine.

The Mine of Stone is found in most of the Hills between *Scarborough* and the River of *Tees* in the County of *York.* As also near Preston in *Lancashire.* It is of a blewish colour, and will clear like Cornish-slate.

That Mine which lies deep in the Earth, and is indifferently well moistned with Springs, is the best. The dry Mine is not good. And too much moisture, cankers and corrupts the Stone; making it Nitrous.

In this Mine are found several Veines of Stone called Doggers; of the same colour, but not so good.

Here are also found those which are commonly called Snake-stones. The people have a Tradition, that the Country thereabouts being very much annoyed with Snakes, by the Prayers of St. *Hilda* there inhabiting, they were all turned into Stones, and that no Snake hath ever since been seen in those parts.

For the more convenient working of the Mine, which some times lies twenty yards under a surface or Cap of Earth, (which must be taken off and barrowed away) they begin their work on the declining of a Hill, where they may also be well furnished with Water. They digg down the Mine by stages, to save Carriage; and so throw it down near the places where they Calcine it.

The