

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 Fetu 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, *R salt Peter lbiii. Dantzick Vitriol lbii.*

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 Glafs 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 100 lb. of the materials put into a Cast-Iron-Pot; which is the best way, especially being performed 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 fitted 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 Rows 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 un'lute 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 penny 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 dried, are put into a Glass taper-fashion,

fashion, a foot high, and seven inches at the bottom ; and then the Glaffes 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 bubbles will soon arise, and the water also run over. If so, they take off the Glaffes, and hold them, till it doth *deservescere*, 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-Glaffes, 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 separate 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 moist fine Sand at the bottom, and sides of the Bowl and Plates of Copper; which being taken out, is washed, dried 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 thicknes 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 redistill'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 fore-mentioned slit, and often stirring all the Metal, that the impurer may the better rise: and by continuing this course, separation 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 fiery 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 fogs 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 dried, 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 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, carries 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.

A *Lum* 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 *Dog-gers*; 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.