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

The Mine, before it is Calcin'd being expoſed to the Air, will moulder in pieces, and yield a Liquor whereof *Copperas* may be made: but being Calcin'd, is fit for *Alum*. As long as it continues in the Earth, or in Water, it remains a hard Stone.

Sometimes a Liquor will iſſue out of the ſide of the Mine, which by the heat of the Sun is turned into Natural *Alum*.

The Mine is calcined with Cinders of *New-Caſtle* Coal, Wood and Furzes. The Fire made about two feet and a half thick, two yards broad, and ten yards long. Betwixt every Fire, are ſtops made with wet Rubbiſh; ſo that any one or more of them may be kindled, without prejudice to the reſt.

After there are 8. or 10. yards thickneſs of broken Mine laid on this Fewel, and five or ſix of them ſo covered: Then they begin to kindle the Fires: and as the Fires riſe towards the top, they ſtill lay on freſh Mine. So that, to what height you can raiſe the Heap, which is oftentimes about twenty yards, the Fires, without any further help of Fewell, will burn to the top, ſtronger than at the firſt kindling, ſo long as any Sulphur remains in the Stones.

In Calcining theſe Stones, the Wind many times doth hurt, by forcing the Fire in ſome places too quickly through the Mine, leaving it black and half burnt; and in others burning the Mine too much, leaving it Red. But where the Fire paſſeth ſoftly and of its own accord, it leaves the Mine white, which yields the beſt and greateſt quantity of Liquour.

The Mine thus Calcin'd is put into Pits of Water, ſupported with Frames of Wood, and rammed on all ſides with Clay; about ten yards long, five yards broad, and five feet deep; ſet with a Current that turneth the Liquor into a Receptory, from whence it is pumped into another Pit of Mine. So that every Pit of Liquor, before it comes to boyling, is pumped into four ſeveral Pits of Mine; and every Pit of Mine is ſteeped in four ſeveral Liquours, before it be thrown away; the laſt Pit being always freſh Mine.

This Mine thus ſteeped in each of the ſeveral Liquors twenty four hours or there about, is of courſe, four days in paſſing the four ſeveral Pits, from whence the Liquors paſs to the Boyling-Houſe.

The Water, or Virgin-Liquor oft times gains, in the firſt

Pit, two pound weight. In the ſecond encreaſeth to five pound weight. In the third, to eight pound weight. And in the laſt Pit, which is always freſh Mine, to twelve pound weight; and ſo in this proportion, according to the goodneſs of the Mine, and the well Calcining thereof. For ſometimes the Liquors paſſing the four ſeveral Pits, will not be above ſix or ſeven pound weight. At other times, above twelve pound weight, ſeldome holding a conſtant weight, one week together. Yet many times Liquor of ſeven or eight pound weight produceth more, *Alum*, than that of ten or twelve pound weight either through the illneſs of the Mine, or, as uſually, the bad Calcining thereof. And if by paſſing the weak Liquor through another Pit of freſh Mine, you bring it to ten or twelve pound weight, yet you ſhall make leſs *Alum* with it, than when it was but eight pound weight. For what it gains from the laſt Pit of Mine, will be moſt of it Nitre, and *Slam*, which poyſons the good Liquors, and diſorder the whole Houſe, until the *Slam* be wrought out.

That which they call *Slam*, is firſt perceived by the redneſs of the Liquor when it comes from the Pit, occaſioned either by the illneſs of the Mine, or as commonly the over or under Calcining of it, as aboveſaid; which in the Setler ſinks to the bottom, and there becomes of a muddy ſubſtance, and of a dark colour. That Liquor, which comes whiteſt from the Pits, is the beſt.

When a Work is firſt begun, they make *Alum* of the Liquor only that comes from the Pits of Mine, without any other Ingredients. And ſo might continue, but that it would ſpend ſo much Liquor, as not to quit coſt.

Kelp is made of a Sea-weed, called Tangle, ſuch as comes to *London* on Oyſters. It grows on Rocks by the Sea ſide, between High-water and Low-water mark. Being dryed, it will burn and run like Pitch; when cold and hard, 'tis beaten to aſhes, ſteeped in Water, and the Lees drawn off to two pound weight, or thereabout.

Becauſe the Country people, who furniſh the Work with Urine, do ſometimes mingle it with Sea-Water, which cannot be diſcovered by weight: they try it, by putting it to ſome of the boyling Liquor. For ſo, if the Urine be good, it will work, like Yeſt put to Beer or Ale, but if mingled it will ſtir no more than ſo much Water.

It

It is obſerved, that the beſt Urine is that which comes from poor labouring People, who drink little ſtrong Drink.

The Boyling Pans are made of Lead, nine feet long, five feet broad, and two and a half deep: ſet upon Iron Plates about two inches thick, which Pans are commonly new caſt, and the Plates repaired five times in two years.

When the Work is begun, and *Alum* once made, then they ſave the Liquour which comes from the *Alum*, or wherein the *Alum* ſhoots, which they call Mothers. With this they fill two third parts of the Boylers, and put in one third part of freſh Liquor vvhich comes from the Pits. Being thus filled up vvith cold Liquor, the Fires having never been dravvn our, vvill boil again in leſs than tvvo hours time. And in every two hours time, the Liquor will waſte four Inches, and the Boylers are filled up again with green Liquor.

The Liquor if good, will in Boyling, be greaſy, as it were, at the top: if Nitrous, it will be thick, muddy, and red. In boyling twenty four hours, it will be thirty ſix pound weight. Then is put into the Boyler about a Hogs-head of the Lees of Kelp, of about two peny weight, which will reduce the whole Boyler to about twenty ſeven pound weight.

If the Liquor is good, as ſoon as the Lees of Kelp are put into the Boyler, they will work like Yeſt put to Beer. But if the Liquor in the Boyler be Nitrous, the Kelp-Lees will ſtir it but very little; and in that caſe, the Workmen muſt put in the more and ſtronger Lees.

Preſently after the Kelp Lees are put into the Boyler all the Liquor together is drawn into a Setler, as big as the Boyler, made of Lead, in which it ſtands about two hours; in which time, moſt of the Nitre and Slam ſink to the bottom.

This ſeparation is made by means of the Kelp-Lees. For when the whole Boyler conſiſts of Green-Liquor drawn from the Pits it is of power ſtrong enough to caſt off the Slam and Nitre: but when Mothers are uſed, the Kelp-Lees are needfull to make the ſaid ſeparation.

Then the ſaid Liquor is ſcooped out of the Setler, into a Cooler, made of Deal-boards, and rammed with Clay. Into this is put 20. Gallons or more of Urine, more or leſs, according to the goodneſs or badneſs of the Liquor. For if the Liquor be red, and conſequently Nitrous, the more Urine is required.

In

In the Cooler, the Liquor in temperate weather, ſtands four days. The ſecond day the *Alum* begins to ſtrike, gather and harden about the ſides, and at the bottom of the Cooler.

If the Liquor ſhould ſtand in the Cooler above four days, it would as they ſay turn to *Copperas*.

The uſe of Urine, is as well to caſt off the Slam, as to keep the Kelp-Lees from hardning the *Alum* too much.

In hot weather, the Liquors will be one day longer in cooling, and the *Alum* in gathering, than when the weather is temperate. In froſty weather the cold ſtrikes the *Alum* too ſoon, not giving time for the Nitre and Slam to ſink to the bottom, whereby they are mingled with the *Alum*. This produceth double the quantity: But being foul, is conſumed in the waſhing.

When the Liquor hath ſtood four days in the Cooler: Then that called Mothers is ſcooped into a Ciſtern, the *Alum* remaining on the ſides and at the bottom; and from thence the Mothers are pumped back into the Boyler again. So that every five days, the Liquor is boyled again, untill it evaporate or turn into Alum or Slam.

The *Alum* taken from the ſides and bottom of the Cooler, is put into a Ciſtern, and waſhed with Water that hath been uſed for the ſame purpoſe, being about twelve pound weight. After which it is Roached, as followeth.

Being waſhed, it is put into another Pan with a quantity of Water, where it melts and boils a little. Then is it ſcooped into a great Cask, where it commonly ſtands ten days, and is then fit to take down for the Market.

The Liquors are weighed by the Troy-weight. So that half a pint of Liquor muſt weigh more than ſo much Water, by ſo many penny weight.

An Account of the way of making Engliſh *Green*-Copperas, *Communicated by the ſame.*

Copperas-ſtones, which ſome call Gold-ſtones, are found on the Sea-ſhore in *Eſſex*, *Hampſhire*, and ſo Weſtward. There are great quantities on the Cliffs; but not ſo good, as thoſe on the Shore, where the Tides Ebb and Flow over them.

The