to pass through the place of Station at *S*, and any two of the Objects (as in the sixth *Scheme*) through *B* and *C*, wherein making the Angle *D B C* equal to the observed Angle *A S C*, and *B C D* equal to the Complement to 180 degrees of both the observed Angles in *D S B*; thereby the point *D* is determined, through which, and the points *C*, *B*, the Circle is to be described, and joyning *D A*, (produced, when need requireth,) where it intersects the Circle, as at *S*, is the place of Station sought.

This *Probleme* may be of good Use for the due Scituation of Sands or Rocks, that are within sight of three Places upon Land, whose distances are well known; or for *Chorographical* Uses, *&c.* Especially now there is a Method of observing Angles nicely accurate by ayde of the *Telescope*; and was therefore thought fit to be now publisht, though it be a competent time since it was delivered in in writing.

An Accompt

Of some Mineral Observations touching the Mines *of* Cornwal *and* Devon; *wherein is described the Art of* Trayning *a Load*; *the Art and Manner of* Digging *the Ore*; *and the Way of* Dressing *and of* Blowing Tin: *Communicated by an Inquisitive person, that was much conversant in those Mines.*

FOr the more easie apprehending of this Art, it is supposed; *First*, That there hath been a great Concussion of waters in that Separation of the waters from the waters mentioned in the Creation, *Gen.* 1. *v.* 9. 10. when the Dry Land first appeared; or in *Noahs* Flood; or at both times, whereby the waters moved and removed the (then) Surface of the earth.

Secondly, That before this Concussion, the uppermost surface of Mineral Veins or Loads did (*in most places*) lie even with the (then real, but now imaginary) surface of the Earth, which is termed by the Miners, the *Shelf*, *Fast Countrey* or Ground that was never moved in the Flood (say they;) whom and whose terms, for avoiding of superfluous words and needless circumlocutions, I shall in these following

lowing lines repreſent and uſe. I ſaid, *in moſt places*, becauſe they dip in ſome; as may be collected from the annexed *Scheme* & what ſhall be ſaid anon in the manner of Digging.

Thirdly, That in this Concuſſion of waters the ſurface of the Earth, together with the uppermoſt of thoſe Mineral veins, were then looſed, and torn off, and by the deſcending of the waters into the valleys, both the earth, or *Grewt*, and thoſe mineral ſtones, or fragments, ſo torn off from their Loads (which are conſtantly termed *Shoad*) were together with and by the force of the waters carried beneath their proper places, and from ſome hills even to the bottoms of the neighbouring valleys; And from thence by Land-floods, many miles down the Rivers; in others more or leſs diſtant in the ſides thereof, ſomwhat according to their declivity, and ſomewhat according to the impetuouſneſs of the waters; which, as I conceive, was not in all places alike.

Now theſe three Generals, on which ſeem to depend the grand reaſons of this Art, being ſuppoſed and premiſed, we thus proceed to *Train:*

1. Where we ſuſpect any Mine to be, we diligently ſearch that Hill and Countrey, its ſcituation, the earth, or grewt, its colour, and nature, and what ſort of ſtones it yields; the reaſon hereof being only this, that we may the better know the grewt, and ſtones, when we meet with them at a diſtance in the neighbouring valley; for mineral ſtones may be found 2, 3, 4, 5 miles diſtant from the Hills or Loads, they belong unto.

2. After any great Land-flood (in which it is ſuppoſed there are ſome new frets made in the ſides of the banks,) we go and diligently obſerve ſuch frets (which uſually after ſuch floods are very clean) to ſee, if happily we can diſcover any metalline ſtones in the ſides or bottoms thereof, together with the Caſt of the Countrey (*i. e.* any earth of a different colour from the reſt of the bank) which is a great help to direct us, which ſide or hill to ſearch into. Neither will it be much amiſs in this place to ſubjoyn the few, but ſure, characters of Mineral ſtones, by which we know the kind of metal, and how much it yields. The firſt way

is, by its ponderousnes, which easily informs us whether it be metal or no. The second is, its porosity; for most Tinstones are porous, not unlike great bones almost throughly calcined; yet Tin sometimes lies in the firmest stones. The third is, by water, which we term *Vanning*, and that is performed by pulverising the stone, or clay, or what else may be suspected to contain any mineral body, and placing it on a Vanning shovel; the gravel remains in the hinder part, and the metal at the point of the shovel, whereby the kind, nature and quantity of the Ore is guessed at; and indeed most commonly without any great deception, especially if the *Vanner* have any judgement at all.

3. But if no *Shoad* may be found or discovered in such frets, then we leave that place, neither trust we to any Metalline stones found in the common River, for the reason afore-mentioned, and because they rather breed distraction, than guide us to the finding out the Load, especially if they are smooth, without protuberances, and asperities, such as are usual to stones newly broken; for then they plainly shew they have been brought a great way, and in their tumblings thither are worn so smooth, as most water-stones are. Then we go to the sides of those Hills most suspected to have any Loads in them, where there may be a conveniency of bringing a little stream of water (the more the better,) and cut a Leat, Gurt, or Trench, about 2 foot over, and as deep as the Shelf, in which we turn the water to run 2 or 3 dayes; by which time the water, by washing away the filth from the stones, and the looser parts of the earth, will easily discover, what Shoad is there. If we find any, we have a certainty of a Load, or at least a *Squatt* in the upper parts of the Hill. *Squatts* are certain distinct places in the earth, not running in veins, differing from *Bonnys* (which word will occur by and by,) in this only that *Squatts* are flat, *Bonnys* are roundish.

4. Sometimes *Shoad* may be found upon the open surface of the ground, as being thrust up by Moles in their hillock, or turned up by the plow, or by some other accident;

dent ; for it is seldome found on the open surface of the ground, unless brought thither by an accident since the Flood, especially in cultivated places ; seeing that the corruption of vegetables and other creatures have in the long tract of time begotten a new surface, heighten'd in some places above a foot, in others more or less. And this I have often observed, and is easily demonstrable to the eye in every Tin-work.

5. When all these wayes have been attempted for finding *Shoad*, if we find any, it makes us proceed with the greater confidence, having an assurance of a *Load*; but in case we find not any, then we must go by gues. And here is all the difference as yet between finding and not finding *Shoad*. For in the next place we sink down about the foot or bottom of the Hill an *Essay-hatch* (an orifice made for the search of a vein, about 6 foot long and four foot broad) as deep as the *Shelf*. And it is observable, they are always to be as deep as the Shelf for this reason, that otherways you may come short of the *Shoad*: But if we meet with none before, or when we come to the *Shelf* or *Fast-Countrey*, there is none to be expected ; yet sometimes the *Shoad* is wash'd away clean, when you come within 2 or 3 foot from the *Load*, and then the *Load* is a foot or two farther up in the Hill. If we find any *Shoad* in this first *Essay-hatch*, our certainty is *either* encreased if any Shoad were found before ; *or* begun. Neither doth it add a little to make a right conjecture, how high up the Hill, or far off, the *Load*, *String*, or *Bonny* is, carefully to mark how deep from the surface of the Earth our *Shoad* lies: for this is held an infallible Rule, that the nigher the *Shoad* lies to the *Shelf*, the nigher the Load is at hand, *& vice versâ*.

6. Albeit we finde no *Shoad* in this first *Hatch*, having found some before by the ways afore-mentioned, or having found none, we are not (as yet) altogether discouraged ; but ascend commonly about 12 fathom, and sink a 2d *Hatch*, as the former: And in case none appear in this, we go then as many fathom on each hand at the same height, and sink there as before, and so ascend proportionably with 3 or more

more Hatches (if the ſpace of ground requires) as it were in breſt, till we come to the top of the Hill, and if we find none in any of theſe *Hatches*, then farewell to that Hill.

7. But if we find any *Shoad* in any of theſe Hatches, we keep our aſcending Hatches in a direct line; and as we draw nearer the *Load*, the deeper the *Shoad* is (as afore) from the ſurface, but the nigher the Shelf; as ſuppoſe it be 7 foot deep, and but half from the Shelf, then we preſently conclude, the *Load* to be within a fathom or 2 of us, and ſo we leſſen our firſt proportion accordingly, as of that of 12 fathom to 6, 4, 2, 1; as our conjecture guides us.

8. Sometimes it falls out, that we may over-ſhoot a *Load*, that is, get the upper ſide of it, and ſo we looſe it; for which we have another (counted alſo infallible) Rule, *viz.* that finding *Shoad* lying near the *Shelf* in this *Hatch*, and finding none in the next aſcending, we have over-ſhot our Load. The remedy is eaſie, which is to ſink nigher the Hatch, wherein we laſt found *Shoad*.

9. At other times it may happen, that we find a new *Shoad*, that is, two different Shoads in one Hatch, as ſuppoſe in this Hatch we find our Shoad 8 foot deep, in the next we hope to find it at 10 foot; but at 2 or 4 we meet with a new Shoad, and Grewt, (which we diligently obſerve,) and at 10 we meet with our firſt Shoad: Then, I ſay, we have a certainty of another *Load* above the former, and it may be in Training up to the ſecond, we meet with the Shoad of a third. Neither is this diſſonant to the opinion and practiſe of the ancient Tinners, who affirm, that 7 Loads may lie parallel to each other in the ſame Hill, but yet one only *Maſter-Load*; the other 6, (3 on each ſide) being the leſſer concomitants. So may 5 lye in like manner: 3 are common, as in the *Scheme*.

10. Every Load has (as it were) a peculiar coloured earth, or grewt about it, which is found likewiſe with the Shoad in a greater quantity, the nearer the Shoad lies to the Load, and ſo leſſened by degrees about a $\frac{1}{4}$ of a miles diſtance; farther then which, that peculiar grewt is never found with the *Shoad*.

11. A Valley may so lye, as at the feet of 3 several hills; and then we may find 3 several *Deads*, *i. e.* Common earth, or that loose earth which was moved with the *Shoad* in the Concussion, but not contiguous to the Load in its first position, (which is also termed by us the *run of the Countrey*,) with as many different Shoads in the midst of each. And here the knowledge of the *Cast of the Countrey*, or each hill, in respect of its *Grewt*, will be very necessary, for the surer training of them one after the other, as they lie in order according to the fore-going rules of *Essay-Hatches*: for the uppermost will direct you, with which hill to begin first.

12. It may be, that after we have trained up the Hill, instead of a Load we find nought but a *Bonny*, or *Squat*; which likewise have their Shoad, whose form is about 2 or 3 fathom long and half as broad; few larger, most less: which communicates with no other Load, or Vein, neither doth it send forth any of its own; but is entire of it self, whose extremities terminate without running out into little innumerable strings, not lying within walls, as Loads; although they are in the Shelf, (not moved by the Flood) whose surface is equal every where with that of the imaginary Shelfy one, and may go down five or six fathoms deep, some more, some less, and there terminate; which *Squatts* are constantly wrought out with good advantage to the Workers when found; neither is the Tin of the baser sort.

13. Although the *Virgula divinatoria* of some few (whose success I am ignorant of) hath been employed for finding the orifice of a proposed Mine, and some more curious ways, as that of Waters, which may be thought to issue from such Loads (which I will not deny, but may be a very considerable way in finding Cole-pits,) Mineral steams, Barrenness of soyl, and the pitching of Nocturnal Lights on the supposed orifices of Mines; yet because they are rather nice, than needful, and not sufficient for what they are urged by some, unless it be to cause the over-curious but unskilful Trainer to desist from a farther search after what

what by ſuch fallible curioſities may ſeem not to be, but yet by the before-mentioned, and daily experimented rules may eaſily be diſcovered; I ſhall willingly omit to inſiſt on any of them. Now having by this way once found our Load, we preſently conſult,

The Art and manner of Digging *up the Ore.*

1. The difficulty of this is not conſiderable to that of *Training*. When we have found our *Load*, the laſt Eſſay-hatch looſes or rather exchanges its name for that of a *Tin-ſhaft*, or *Tin-Hatch*, which we ſink down about a fathom, and then leave a little long ſquare place, termed a *Shamble*, and ſo continue ſinking from caſt to caſt, (*i. e.* as high as a man can conveniently throw up the Ore with a ſhovel,) till we find either the Load to grow ſmall, or degenerate into ſome ſort of weed, which are diverſe; as *Mundick*, or *Maxy* (corrupted from *Marchaſite*) of 3 ſorts; white, yellow, and green: *Daze*, white, black, and yellow: *Iremould*, black, and ruſty: *Caul*, red: *Gliſter*, bloud-red, and black. [*See theſe hard names explained below.* N°. 3.]

2. Then we begin to drive either *Weſt* or *Eaſt*, as the goodneſs of the Load, or conveniency of the Hill invite; which we term a *Drift*, 3 foot over, and 7 foot high; ſo as a man may ſtand upright, and work; but in caſe the Load be not broad enough of it ſelf, as ſome are ſcarce ½ foot, then we uſually break down the *Deads*, firſt on the North-ſide of the Load (for the greater conveniency of the right Arm in working,) and then we begin to rip the Load it-ſelf. [By *Deads* here are meant, that part of the Shelf which contains no metal, but encloſeth the Load as a wall between 2 rocks, and not as that, which was mentioned in the Concuſſion, as in *Training*.]

3. That this myſterious underground-way of working, may the eaſier and ſooner be apprehended, be pleaſed to to caſt an eye on the annexed *Scheme*, in *Tab. II.* as here, by the *Alphabet*, explicated; which may give ſome information

to

to those that have not been conversant in Mines.

a a. The Essay-Hatches.

b b. The wall which the Shelf makes on both sides the Load, and the Load so walled.

c c. The Bonny's or Squatts.

d d. The strings or little Veins of the greater and lesser Loads.

e e. All Mundick.

f f. Most Tin with its Spar, which places prove all good Tin, if the string *d*, *b*, happen to be Tin.

g g. All Clay.

h h. Caul; differing both from *Marcasite* and *Sparr*: it endureth the fire, which *Marcasite* or *Mundick* doth not. *Sparr* is a flinty stone of different colours.

i i. Clay which may hold a quantity of Tin.

k k. Tin; such flexures are commonly well tinned.

l l. Ire-mould and Daze. *Daze* is a kind of glittering stone, enduring the fire, some softer, some harder, of different colours.

m m. Tin again.

n n. All Tin.

o o. Clay carrying Mundick.

p p. A Sell-bed of Tin, which is all Tin, and needs no stamping as the other, but dry knacking (*i.e.* without a grate or Cock-water, as anon.) 'Tis observed, that a Sell-bed hath never any strings issuing from it.

q q. The innumerable strings, like little Capillary veins, in which a Load sometimes in respect of its uppermost surface may be said to terminate and strike out.

r r. The concomitant Loads on each side.

s s. That upper part of the Load, which seems as though it were cut off in the side of one Hill, and to begin again on the opposite side of the other Hill; which is when the Load dips almost perpendicularly for many fathoms together, and may rise again in the next Hill (wavie-ways) so that the load lies not parallel to the surface of the earth every where as hinted before. And hence it comes, that we sometimes

loſe our Loads; for otherwiſe it were almoſt impoſſible to loſe them, did they run in a parallel line to the ſurface of the Earth.

t t. The Rivers.

4. Albeit I have divided this *Maſter-load* into ſo many parts, and the ſame is to be imagined concerning the concomitants; yet I would not you ſhould ſuppoſe, that ſuch real diviſions happen all at once in one Load, but may happen in diſtant ones.

5. The Inſtruments commonly uſed in Mines, that ſerve for ripping the *Loads*, and breaking the *Deads*, and landing both the Ore and Deads, are; (1.) A *Beele* or *Corniſh Tubber* (*i. e.* double points) of 8 *l.* or 10 *l.* weight, ſharped at both ends, well ſteeled and holed in the middle. It may laſt in a hard Countrey ½ year, but new pointed every fortnight at leaſt. (2.) A *Sledge*, flat-headed from 10 *l.* to 20 *l.* weight; will laſt about 7 years, new-ordered once a quarter. (3.) *Gadds*, or Wedges of 2 *l.* weight, 4 ſquare, well ſteeled at the point; will laſt a week; 2 or 3 dayes, then ſharpened. (4.) *Ladders.* (5.) *Wheel-barrows*, to carry the Deads and Ore out of the Drifts or *Adits* to the Shambles.

6. The proportion of Men is, 2 Shovelmen, 3 Beele-men, which are as many, as one Drift can contain, without being an hinderance to each other. The Beele-men rip the Deads and Ore; the Shovel-men carry it off, and land it by caſting it up with ſhovels from one ſhamble to another, unleſs it be where we have a *Winder* with two *Keebles* (great buckets made like a barrel with iron hoops, placed juſt over the then termed *Wind Hatch*,) which as one comes up, the other goes down.

7. A great of this skill conſiſteth in the exact knowledge and obſervation of the Loads dipping; for which we have this general rule: That moſt of our Tin-loads, which run from Weſt to Eaſt, conſtantly dip towards the North, ſometimes they under-lye (that is, ſlope down towards the North) 3 foot in 8 perpendicular; which muſt be obſerved for this reaſon, that we may exactly know, where

where to sink an Air-shaft, when occasion requires; yet in the higher Mountains of *Dartmoor* there are some considerable Loads, which run *North* and *South*: these under-ly towards the East.

8. Four or five Loads may run parallel to each other in the same Hill, and yet (which is rare) meet all together in one Hatch, as it were in a knot, (which well tins the place;) and so separate again, and keep their former distances. Such a knot hath been observed, and wrought on *Hingston*, a known Mineral-*Down* or *Common* in *Cornwal* (within two miles of which particular place I have formerly lived some years.)

9. The breadth of *Master-loads* may generally be from 3 to 7 foot broad, seldome larger; unless at certain places, as in the *Scheme* at *ff*; or where several Loads may chance to make a knot, or send forth strings or veins; neither retain they their usual breadth in all parts: for, they may be 6 foot at *gg*, scarce 2 at *kk*; nay sometimes scarce ½ inch over; but that is to be understood of strings and the narrowest places of the concomitant ones.

10. The Load is usually in an hard (*i. e.* in a Rocky or Shelfy) Countrey, made up of metal, spars and other weeds, and as it were all a long a continued Rock; but hath many veins and joints, as we speak; but in some softer Countries, the Tin may lie in a softer consistence, as that of clay in a manner petrified, whereby it may rationally be expected, that they make more speed and shew in their Drifts, and the before-cited number of Beele men imploy more Shovel-men.

11. Concerning Water, we have these observables; that in most places we meet with it at some feet deep from the Loady surface, in other some not at many fathom deep. It runs commonly through the heart of the Load, not in a direct continued Channel, but windingly in and out, insensibly through the veins and joints of the Load.

12. When we are come at any depth, and find the waters begin to annoy us, as it quickly will if any be in the

work, we descend to the bottom of the Hill, where we have that conveniency, and at the lowest place begin as little a Drift, as the conveniency of working or driving will permit (scarce half so big as that of the Load) on a level, till we come up to our work. And here becomes the use of the *Dial* needful, which we term *Plumming* and *Dialling*, (either to know the exact place of the Tinwork, where to bring our *Adit*; or where to sink to bring down our *Air-shaft* even with the desired place, perpendicularly; or to know, which way our Load inclines, when any flexures happen;) which is to be perform'd in this manner, *viz.*

13. A skilful person with an Assistant, pen, ink, paper, Sun-dial, and long line, after his guess of the place above ground, descends into the Adit, or work, and there fasteneth the one end of the line to a fixed thing; and then lets the incited Needle rest, exactly observing, at what point it stands, with his pen; then he goes farther in the line still fastened, and at the next flexure in the Adit makes a mark on his line, by knot, or otherwise, and sets his Dial down again, and there likewise notes down that point, on which the Needle stands, at the second position; and so proceeds from turning to turning, still marking down the points, and his line, till he comes to the intended place; which performed, and exactly set down, he ascends, and begins at the orifice of the Adit or work, and repeats what he did in the work; brings his first knot, or mark in his line to such a place, as the Needle will stand at the same point it did under-ground at the knot, and so proceeds till he come exactly over the intended place in the Mine.

14. But to reminde what I was saying of Water, if this conveniency of an Adit may be had, then our water injures us but a little, as long as we keep on that level with the Adit; for we drive not always on one and the same level: As for instance; At five fathom we make a drift both wayes, and sinking five fathom more, we make another

ther drift at ten fathom, and ſo deep as we pleaſe. Now when we once paſs that level, on which our Adit runs, and the water begins to trouble us, we have this remedy; either with a Winder and keebles, or leathern bags, pumps, or buckets to get it up to the Adit-level, and ſo we are enforced to do to the very top, where we have not the convenience of an Adit, as in plains. Some, but very few, works may be dry.

15. We obſerve, that if we have *Water*, we never want *Air* ſufficient for Reſpiration, and our candles to burn in; but yet this caution muſt be annexed, that in a ſoft looſe quagmire, clayie Countrey, by the falling of the Deads after us, yet not in ſuch meaſure, as totally to ſtop us up, albeit we have water (and it may be too much) yet our Air is rather too copious, or ſo much condenſed, as that it becomes in a manner a damp, and requires an Air-ſhaft for vent; which damps are ſometimes enlarged by working of the *Mundick* with the Ore.

16. In caſe the Countrey be not ſtrong enough (as being over ſoaked with water from above) to ſupport its own weight, we under-prop our Drifts with Stemples, and Wall-plates, placed much like a Carpenters ſquare, on the one ſide, and over head.

This being the moſt uſual way of Digging, and Landing our Ore, we will haſten to give you an Account of

The Manner and Way of Dreſsing *Tinn.*

Although this be the eaſieſt in reſpect of skill and labor, inſomuch that it is commonly the task of the Lads, that are but new beginners; yet I ſhall not ſcruple to ſet it down, together with the deſcription of our Mills, and other neceſſaries, as ſuccinctly and diſtinctly, as I may.

1. After the Ore is landed, and the greater ſtones broken at the top of the Mine by the Shovel-men, 'tis brought on horſes to the ſtamping or knocking mills, and unloaded at the head of the Paſs (*i. e.* 2 or 3 bottom-boards with 2 ſide-boards ſloping-wiſe,) in which the Ore ſlides down into the Coffer: But that it may not tumble down all at once, there is placed an Hatch nigh the lower end of the Paſs (*i. e.* a thwart board to keep up the Ore;) beneath that comes in the Cock-water in a trough cut in a long pole, which with the Ores falls down into the Coffer, (*i. e.* a long ſquare box of the firmeſt timber, 3 foot long and 1½ foot over,) wherein the 3 uſual Lifters, placed between 2 ſtrong broad Lones, having 2 braces or thwart-peices on each ſide to keep them ſteady as a frame, with ſtamper-heads, weigh about 30 *lb.* or 40 *lb.* a piece, of iron; which ſerve to break the Ore in the ſaid Coffer: Theſe Lifters about 8 foot long and ½ a foot ſquare of heart-Oak, having as many In-timbers or Guiders between them, are lifted up in order by double the number of Tappets, (faſtened to as many Arms paſſing diametrically through a great beam, turned by an over-ſhoot-water-wheel on 2 boulſters,) which exactly, but eaſily, meet with the tongues ſo placed in the Lifters, as that they quickly ſlide from each other, ſuffering the Lifters to fall with great force on the Ore, thereby breaking it into ſmall ſand, which is waſhed out by the Cock-water through a braſſe grate, holed very thick, placed within 2 iron bars at one end of the Coffer into the *Launder*, (*i. e.* a trench cut in the floor, 8 foot long, and 10 foot over,) ſtopt at the other end with a turf, ſo that the waters runs away, and the Ore ſinks to the bottom: which when full is taken up (*i. e.* emptied) with a Shovel.

And here I muſt beg leave to digreſſe a little, that I may inform you, how we make our Mill go ſome 2 hours or more after we give over our attendance on it. We have a *Tiler* (*i. e.* a long pole,) faſtned without at the one end to the ſlew or ponder (*i. e.* that looſe and laſt part of the trough, that conveys the ſtream to the mill-wheel) and at the other end

is

is tyed a ſhort rope with a tranſverſe ſtick at the end of it, curiouſly, but trap-wayes, hitcht at both ends under two little pins faſtened in the Lones for that purpoſe; there's another pin ſet in one of the Lifters, at ſuch an exact height, as that, if there be no Ore in the Coffer to keep that Lifter high enough, the purpoſed pin in deſcending knocks out the water, carrying it quite over the Mill-wheel; ſo that when the Coffer is emptied, the Mill reſts of its own accord. And this is the invention (about 30 years ſince but now become common in thoſe parts) of one *John Tomes*, then a Lad, but now as skilful and experienced a Tinner, as our parts afford; who even then ſaw the Inconveniency of a Bell then uſed, which (as ſome Jacks) would only give notice, that the Coffer was empty; yet before they might come to let out the water, the Mill might break it ſelf in pieces, notwithſtanding their attendance; which by this ingenious knack is now ſaved, and the Mill kept from danger. One Wheel may ſupply three or four Coffers, if we will, but then the Grate-holes of the firſt muſt be much larger than the others, and the reſt proportionable; for Tin may be as well too ſmall (for profitable fuſion) as too great.

2. But to return to our full Launder, it is divided into three parts, *i. e.* the Fore-head, the Middle, and the Tails. That Ore which lies in the Fore-head, *i. e.* within 1½ foot of the grate, is the beſt Tin, and is taken up in an heap apart. The Middle and Tails in another, accounted the worſt.

3. The latter heap is thrown out by the Trambling-buddle *i. e.* a long ſquare Tye of Boards, or Slate, about four foot deep, ſix long, and three over; wherein ſtands a man bare-footed with a Trambling-ſhovel in his hand to caſt up the Ore, about an inch thick, on a long ſquare board juſt before him as high as his middle, which is termed the Buddle-head, who dexterouſly with the one edge of his Shovel cuts and divides it long wayes in reſpect of himſelf,

ſelf, about half an inch a ſunder; in which little cuts the water coming gently from the edge of an upper plain board carries away the filth and lighter part of the prepared Ore firſt, and then the Tin immediately after: all falling down into the Buddle, where with his bare foot he ſtrokes and ſmooths it tranſverſly to make the ſurface the plainer, that the water and other heterogeneous matter may without let paſs away the quicker.

4. When this Buddle grows full, we take it up; here diſtinguiſhing again the Fore-head from the Middle and Tails; which are trambled over again: But the Fore-head of this with the Fore-head of the Launder are trambled in a ſecond Buddle (but not different from the firſt) in like manner: The Fore-head of this, being likewiſe ſeparated from the other two parts, is carried to a third, but Drawing, Buddle, whoſe difference from the reſt is only this, that it hath no tye but only a plain ſloping board, whereon 'tis once more waſhed with the Trambling ſhovel, and ſo it new-names the Ore, *Black Tin*, *i. e.* ſuch as is compleatly ready for the Blowing houſe.

5. We have another more curious way termed *Sizing*, that is, inſtead of a Drawing Buddle, we have an hairen Sieve, through which we ſift, caſting back the remainder in the Sieve into the Tails, and then new-tramble that Ore. After the ſecond trambling we take that Fore-head in the ſecond Buddle, and dilve it (*i. e.* by putting it into a Canvaſs Sieve, which holds water, and in a large Tub of water luſtily ſhake it) ſo that the filth gets over the rim of the Sieve, leaving the Black Tin behind, which is put up into Hogſheads covered, and lockt till the next blowing.

6. The Tails of both Buddles after two or three tramblings are caſt out into the firſt Strake, or Tye, which is a pit purpoſely made to receive them; and what over-ſmall tin elſe may waſh away in trambling. There are commonly three or four of them ſucceſſively, which contain two

ſorts

ſorts of Tin; the one, which is too ſmall, the other, too great. The latter is new-ground in a Crazemill (in all reſpects like a Greiſt-mill with two ſtones, the upper and the neather,) and after that trambled in order. The former by reaſon of its exceeding ſmalneſs is dreſſed on a *Reck* (provided for that purpoſe, that is, a frame made of boards about three foot and an half broad, and ſix long, which turns upon two iron pegs faſtened in both ends, and the whole placed upon two poſts, ſo that it hangs in an æquilibrium, and may, like a Cradle, be eaſily removed either way) with the ſhovel and water, and made ready fit to be uſed according to

The Manner and Way of Blowing Tinn.

Conceiving it ſufficient to ſay, that our Furnace is no other than an Alman Furnace, I ſhall proceed (only taking notice, that our Lime, though the ſtrongeſt, I ever yet heard of, as being made of the hardeſt Marble, will not endure the fire in our Hearth, but we muſt uſe a particular kind of Clay) to deſcribe a *Tin-kiln*, whoſe ſtructure is four ſquare. At the top is a large Moor-ſtone about 6 foot long, 4 broad; in the middle thereof is an hole made about half a foot diameter. This ſtone ſerves as an head or cover to another like ſtone, placed about a foot beneath it, but is not ſo long by half a foot as the upper, becauſe it muſt not reach the innermoſt or back part of the Wall, which is the open place through which the flame aſcends from a leſſer place below that, where a very ſtrong fire of *furze* is conſtantly made, and another little ſquare hole on the out-ſide, for a purpoſe anon to be mentioned: The fore-part is like a common Oven, and hath ſuch a chimney in the fore-part.

Now when we perceive much Mundick in our Tin, (which ſpoils it by making it britly hard, and not malleable) which we eaſily diſcern before knacking (ſome Loads being much peſtered with it, otherſome not at all,) we are neceſſitated to burn away this Weed in this Kiln after this manner. All the Black Tin (brought to the Blowing-houſe in little Canvaſs-bags on Horſes) that is to be burnt, is laid on the top-ſtone (the Kiln being throughly heated before) and, at the hole above-mentioned, caſt down on the ſecond or bottom-ſtone; at the mouth of which ſtands a man with an iron Cole-rake, to give notice, when enough is let down to cover the ſtone all over about three or four inches thick, which he performs with his rake: The hole at the top is immediatly covered with green turffs, that the flame may reverberate the ſtronger. The Rake-man, after this, conſtantly moves the Tin with his Rake, that all parts of the Mundick may get uppermoſt of the Tin, and ſo be burned away; which we certainly know by this, that then the flame will become yellow (as uſual) and the ſtench leſſened; for whil'ſt the Mundick burns, the flame is exceeding blew. Then with his Rake he thruſts it down at the open place behind, into the open fire, and then receives a new ſupply of Tin from above, as before. Now when the place beneath, where the fire is made, grows full of Tin, Coals, and Aſhes, with his Rake he draws it forth with the Coals on the mentioned little ſquare hole on the one ſide, near the back, where the Ore (fiery hot and red) lies in the open Air to cool; which will ſcarce be in three dayes, becauſe of the Coals that lye hid in it: But in caſe we cannot ſtay ſo long, then we quench it with water, and is like morter. Albeit we let it cool of it ſelf, or with water, we muſt new tramble it or waſh it (as before) before we put it into the Alman furnace. And becauſe I have ſet down the proportions of Ore and Fire already in the Anſwers

to

to the Mineral Queries, I will not repeat them here, but only add an obſervation or two, and then diſmiſs this ſubject. Moor-Tin (*i. e.* ſuch as is digged up in the Moors) we find runs or melts beſt with Moor-coal, chark't: But our Tin, which lyes in the Countrey, runs beſt with an equal proportion of all Char-coal, and Peate (*i. e.* Moor-coals) for the firſt running; but when we come to remelt our Slags, then we uſe Char-coal. When all is melted down and remelted, there ſometimes remains a different Slag in the bottome of the Float, which we term *Mount-Egge*; And that it is moſtly an iron body, though of a Tin-colour, I accidentally aſſured my ſelf by applying one of the Poles of a Loadſtone to it, which quickly attracted it, yet not ſuch a quantity by far, as that of Iron.

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Dartmore-Hills

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