

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 DBC equal to the observed Angle ASC , and BCD equal to the Complement to 180 degrees of both the observed Angles in DSB ; thereby the point D is determined, through which, and the points C , B , the Circle is to be described, and joyning DA , (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 Cornwall 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, somewhat according to their declivity, and somewhat according to the impetuoufness 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 situation, 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 ponderousness, which easily informs us whether it be metal or no. The second is, its porosity; for most Tin-stones 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 *Vauning*, 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 *Vauning* 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 *Vauner* 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 guess. 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-Country*, 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 versa*.

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 east to east, (*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. No. 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 $\frac{1}{2}$ 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 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 knocking (*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 (wavy-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, sharpened at both ends, well steeled and holed in the middle. It may last in a hard Countrey $\frac{1}{2}$ 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 *Beelemen*, 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 underly 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 *Cornwall* (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, seldom 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 $\frac{1}{2}$ 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 Shelly) 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 employ 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 a 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 remind 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 ways, 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 dampes 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 Coffe: 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 Coffe, (*i. e.* a long square box of the firmeft timber, 3 foot long and $1\frac{1}{2}$ 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 Coffe: These Lifters about 8 foot long and $\frac{1}{2}$ 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 overshoot-water-wheel on 2 boulders,) 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 brass grate, holed very thick, placed within 2 iron bars at one end of the Coffe 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 tyed a short rope with a transverse stick at the end of it, curiously, but trap-ways, 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 Coffers 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 Coffers are 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 Inconvenience of a Bell then used, which (as some Jacks) would only give notice, that the Coffers were empty; yet before they might come to let out the water, the Mill might break itself 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 $1\frac{1}{2}$ 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 Trampling-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 Trampling-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 ways 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 transversely 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 trampled over again: But the Fore-head of this with the Fore-head of the Launder are trampled 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 Trampling shovel, and so it new-names the Ore, *Black Tin*, *i. e.* such as is completely ready for the Blowing house.

5. We have another more curious way termed *sizing*, that is, instead of a Drawing Buddle, we have an hairn Sieve, through which we sift, casting back the remainder in the Sieve into the Tails, and then new-trample that Ore. After the second trampling we take that Fore-head in the second Buddle, and dilve it (*i. e.* by putting it into a Canvas 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 Hogheads covered, and lockt till the next blowing.

6. The Tails of both Buddles after two or three tramlings 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 trampling. There are commonly three or four of them successively, which contain two
forts

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

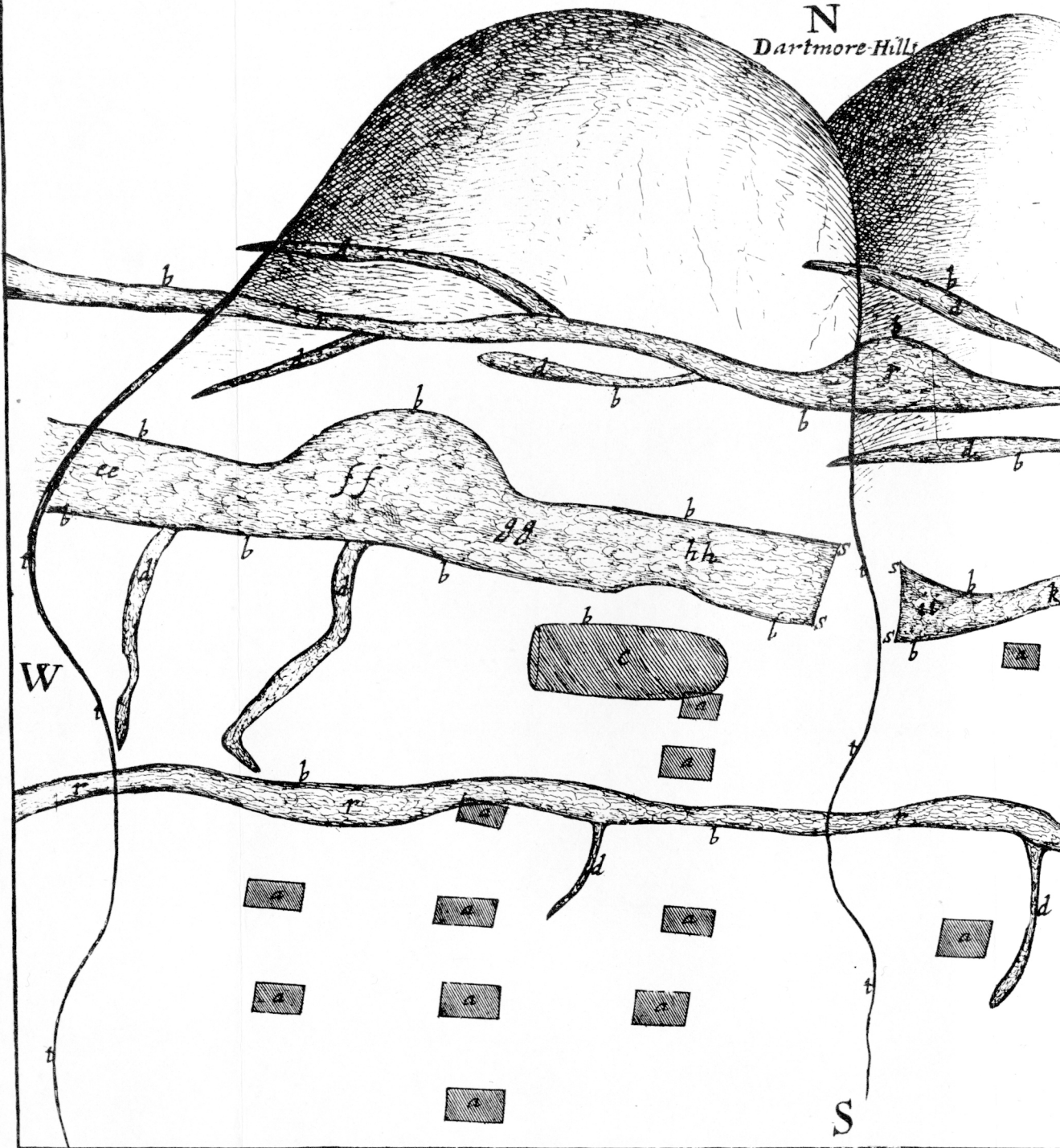
The Manner and Way of Blowing Tinn.

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,

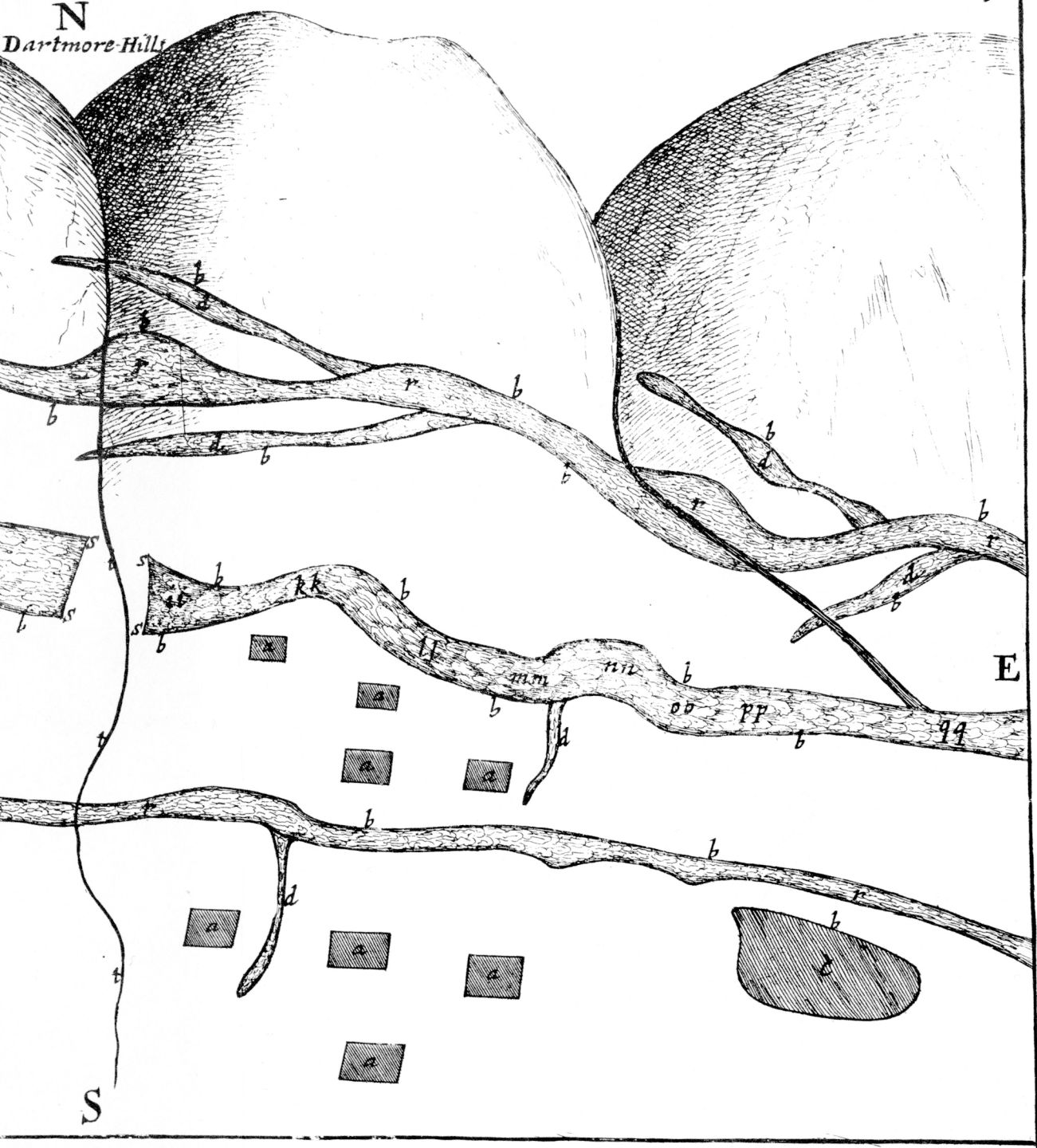
Now when we perceive much Mundick in our Tin, (which spoils it by making it britly hard, and not malleable) which we easily discern before knocking (some Loads being much pestered with it, other some not at all,) we are necessitated to burn away this Weed in this Kiln after this manner. All the Black Tin (brought to the Blowing-house in little Canvas-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 whilst 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 mortar. Albeit we let it cool of it self, or with water, we must new trample 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 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.

Tab. 2.
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Dartmore Hills



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N
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