

BLASTING.

This is a very principle Piece in Mining, and any young Fellow will pretend to it, that can bore a Hole and put Gunpowder into it, and when he has done set it on Fire, so the Noise be but heard all is well; but if more Care and Pains were taken about it, it would be much bet-

ter; for the Gunpowder is able if good, to raise much more Stone, if rightly applyed, then these youngsters think of, and therefore I design to be more diligent in explaining it.

The hardest Rock that is may be broken with Gunpowder, by observing in the first Place a Conveniency for the picking of your Hole; if it be not as we would wish, we use our endeavour to make it so, or at least as near as we can, by cutting some of the Stone, which may be done with proper Tools, (for here I am for speaking only of making way through a Rock in which is no Sticking,) formerly the old Miners used to Cut it all with Picks, but now in many Places 'tis all done with Gunpowder; and the way is, to consider wisely to set one Shot to free another, always contriving to have it as side-loose as possible, that none may be in vain; large Gates are often taken where this is practised, whereby to have the Advantage to point the Noger at Pleasure; this is one way to Cut the Rocks by Blasting; the next is where there is a Sticking, and if it be a soft one, Blasting will turn out the Stone apace, but if your Sticking be hard, more Pains must be taken to slit it, and make it fit; for this is a general Rule, that it is never convenient and fit, until one side be freed and made open, so far as the length of your Hole at least, (what is further, is so much the better) where you design to Cut the Stone out by your Shot; and this must be observed, let your Blasts be for lifting or weighing down, Roofing or Sinking, forwards or towards you; and that it may do the better Execution, we ought warily to consider

and search whether any Joynt or Joynts be there, of what Sort soever, shall appear in the Rock, and whether they may be likely to help, or hinder the Powder in the Hole in its Working, then we may the better pitch the Blast, or point the Noger to the best Advantage; for 'tis a certain Rule that a Blast bored in or sometimes near a Joynt, is only lost Labour; and as I said before, any Body may bore a Blast, but to understand the matter well, requires some Discretion and Judgment, and this may suffice to shew how we contrive for the Hole; but then it may be demanded, how we manage the Gunpowder, which is as follows:


We have three several ways, by which we can compel the Gunpowder, rather to force thro' the hardest Rocks, than to come forth the same way that we put it in. First by an Iron Plugg and one Feather, or a Plugg with two Feathers, (I shall describe them in their proper Places,) we make a Cartridge of brown Paper, (something longer then the Hole we have bored) and put into the bottom of it, 3, 4 or 5 Inches of Gunpowder, according as we think the Strength of the Rock will require, and put the Plugg into the Cartridge close on the Top of the Powder, it being first Primed, and tye all fast together with a Thread, and then put it into the Hole, where about half an Inch of the Plugg stands forth of the Hole, that you may the better apply a Match to it, then we drive in the Feather or Feathers, and set the Matches thereto and Fire it; and although this way be very Danger-

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ous, being apt to Fire the Powder in driving the Leaves, yet it was most Practiced, and Men very often killed, or at least bruised and maimed, all their Days after, or if they escaped with their Limbs whole, they are often times burnt Blind by the Force of the Gunpowder, and there are Men now living, that have been thus hurt Twenty Years ago, whose Faces have been discolour'd by the Powder by such Mischances, that it is not yet worn out, nor perhaps never will while they Live; but some will think that the Workmen may stand out of its way, (and so he does when he can,) but Sides are so near one another oftentimes that he cannot; for who would run the risk to be shot thro' the Head or Body by those Iron Instruments, which is done at one Stroke, and many Miners have died so.

But the second way of Blasting is lately come into Use, and now called the New way, and it is very safe with small care, and is thus: After the Hole is bored, and made very dry, the Powder is put in (if it will run down) naked, the Quantity being proportioned to the Stones Strength, (but still this is not so safe as to make Use of a Cartridge, for sometimes it has miscarried) pressing it a little down with the weight of the Rammer; then we put in the large Pricker into the Powder and fall to Raming it, and this we do with any thing that is dry; such as dry Clay, Sparr, soft Tufft, Cawks, Brick, dry Raggs, or any such like things will do; and then you must observe, that at every time you

put in your fresh Raming, that is the Stuff you Ram with, to turn your Pricker * round, and so keep it loose, so that you may draw it forth at last, or all will be in vain; when the Hole is Ram'd full, put some good Clay on the Top of the Hole, close round the Pricker as a Cover; this is done to prevent any of the loose Raming from falling into the Hole, as you draw forth the Pricker; next draw out the Pricker, and then we have a small Wyer which we put down, and then put in Powder, which by the help of the small Wyer you may Ram it very securely to the Charge below, until the Hole be full, but this is in such Holes where the Powder may have Descent enough to run down; otherwise if it have not, we make use of a Wheat Straw, that is of a sufficient length to reach the Powder in the bottom of the Hole, and open it on one Side all along, and fill the Cavety with Powder, † this done we put it down to the Powder below, and have always some of the Straw standing out of the Top of the Hole, to which we apply a Candle Match, and set it on Fire, but we make sure to give it time enough to get away, and if this be done I see no other Danger that is to be feared in this way of Blasting.

But here may be a Question asked, how I will do to Ram my Hole if it be bored Slanting as this Line ; to this

* If you get a Bryar Dry it and burn out the Pith, fill it full of Powder and put it to the Charge, you may Ram up all together, without using a Pricker at all, and the better way.

† Or if the Powder be small enough, fill it full.

I answer, some Miners in this case use a Plug and Feather to their up Holes, thinking it may not be Ramm'd upwards; but this is because they have never tried otherwise, but it may be done easy enough, by putting the Powder in a Cartridge, and putting it up with the Rammer a little fast; and after it a piece of Paper, or a Ragg to hold it, and then such small pieces of Raming as the Hole will receive, and forcing them up with the Rammer, and putting in a Straw as aforesaid.

And now I think this Difficulty is answered, but here arises another more hard to be managed, and it is this: When we light of a Spring of Water in boring the Hole, what must we do then? Why formerly, we were wont to besmear the whole Cartridge very well over with Candle Grease, and put into the Hole, and making all possible haft to Fire it; but since we have this new way of Blasting, we do thus: If the Water come near the bottom of the Hole, we Ram it up to the Place very fast, and it will hold out the Water; but then we must content ourselves with the shorter Hole, but if the Water come higher in the Hole, we Ram it up higher, and having so done, we bore it forth again, * with a Bit of a lesser Size, than what we bored the Hole with at first, holding the Noger pritty Steddy and carefully in the middle of the Hole, so then part of the Raming sticks fast to the sides

of the Hole, and keeps the Water forth for a while; but then this Raming must be bored forth dry, or else it will otherwise not do at all; however in Danger of Wet, let your Charge be Greased as aforesaid.

I have heard some talkative Miners boast of their Blasting under Water, but as it is not a thing common, so I believe, there is not many has done it, nor did I ever see it done in my time; but yet where some special Piece of Service may be done by a few Shots, otherwise 'tis never Practiced; and a very good and Experienced Miner assures me he has done it, and his Method was as follows: To have a Plug made of a sufficient Length, that it may stand out of the Hole so far that the Water will not rise to the Top of it, while it is in putting of, and fitted for one Feather, and this Plug must have a Hole drill'd through the middle of it to Prime it; then within half an Inch of the end next to the Powder, must be made a Nick clear round it, and the Cartridge must be made of a Cows Pudding, that is dried and fit for the Hole, and the Powder being put in, the end of the Plug is put upon it, and the Cartridge is tyed fast thereto, with a strong Thread in the said Nick, and this secures the Charge from Water, this done the Plug is Primed, and then put into the Hole, altho' it be full of Water, when the Leaf is driven, but care must be taken that the Leaf be not so long as to reach the Cartridge, for fear of breaking it. And thus far my Friend shews the way, which seems very reasonable, and likely to be done; and he

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says

* Hard Clay driven down with the Rammer, and the Rammer pulled forth again, and the Sides of the Hole scraped, will hold out while you let it.

says further, he never saw it used but for letting down a Pump Foot, or taking of some Part of the Rock to set them straight, &c.

But here is another way of Blasting, which is the last I have to mention, and that is with the Gablock, formerly very much used in some Places, but most commonly in Sinking; the Powder being in the Hole Naked, upon it put a Plug of Wood, about two or three Inches long, or more as need is; this Plug has a Riggot made in it down the Side, or rather a Hole bored through the middle of it with a little Gimlet, by which it is Primed, and then dropt upon the Powder in the Hole, then a little more Powder put in upon the Top of it; after this the Gablock end is put into the Hole, and must reach down to the Top of the wooden Plug, which is about 4 Inches within the Hole, and having a Riggot ready on the Side thereof, by which it may be Primed; the other end of the Gablock is set fast against the contrary Side, in some sure Stope, that may not give way, and it will either get the Stone or break the Gablock.

Note, The end of the Gablock that goes into the Hole is always bent a little, which makes it more fit for the purpose, this way destroys the most Gunpowder.

BORING

Is common as boring Blaft-Holes, Clieving-Holes, and sometimes Holes between two Places, to let Water go, or have Passage for Air; and also in

hard and wet Shafts, which is of all boring the most Difficult; and because some may think it strange to bore the hardest Rock, yet it is no more than what any Boy that is used to the Mines can do, when he is shewed how to Point his Noger aright; and we do it thus: First make a Place or Stope in the Stone with a Pick, to set the Noger Point in; then one holds it with both his Hands, and another Strikes on the Head, or top of the Noger, with a Hammer about five or six Pounds Weight; and he that holds the Noger, moves it a little off from the Place every other Blow that is Stricken, and by putting Water into the Hole it will presently be done.

Miners often bore themselves, and turn with one Hand, and Strick with the other. About forty Years ago, some Gentlemen came to a Place call'd *Elton* in *Staffordshire*, there for to venture at an old Work, which was drowned with Water, in hopes to get Copper, (it being reported to be a Copper Mine) but no old People in the Neighbourhood could give any account when it was last wrought; they got Churn-Pumps, Sweap-Pumps, and Forces, and got at length to bare the Soles, and the Water proving very easy, (though they struck it a very great height) they got great Profit; but in the Work it was admired by all Miners that saw it, what Blaft-Holes had been bored, most a Yard or four Foot long, and two Inches or more Diameter, so that in those Days they used not such small Holes as we do in these; nor did I ever hear that any of their Blasting Tools were found in the Work,

so

so that it may be a Question whether they used any Plug, or Leaves to their Shots, or understood the way by Raming; the Report was that they were *Dutchmen*, others say *Germans* that was their Workmen; but be they who they will, we are sure some *German* Miners from * *Saxony* brought us of late Days, this new way we now have of Raming.

But to return to boring of hard and wet Shafts through; and here we suppose the Forfield to be driven so far as may be (which is always done at the Top of the Vein, or where the Vein lies far off, some other Gate is cut, as in Shale, &c.) for want of Wind, or other inconveniences, but want of Air is commonly the chief Impediment, then having exactly dialed it, to the Place where you would have your Shaft to come through, and laid it out at the Day upon the Surface, with the same Care, and having Discovered the Place you pitched upon for your Shaft to fall, you fall to Sinking; now if this Shaft prove hard, and very wet withall, that little can be done for Water, in such a Case, it is the best way to bore it through, that the Water may be clear let off.

This Boring we manage after this Manner: First having got the Water out of the Shaft, we pitch upon the Place where we will begin to bore, and place a Trunk thereon, and have the end next to the Hole made full of small Holes in the Sides thereof; the Sludg that comes out by boring, may the better work out from the Top of the Hole,

* *Mr. Brown* in his *Travels* says, they Ramm'd up their Holes in the Mines in *Hungary*.

Hole; and this Trunk is set fast and secure, with Stemples and Stays, that it may not stir from its Place, and this is to guide the Noger Bit into the Hole, and then up higher in the Shaft; we place a good Plank or two, or three if it so require, one above another, at a fit Distance, with Holes in each of them, and as perpendicular upon the Hole as may be; and lastly, at the Top of the Water where we are sure it will rise no higher, there we make a good Bunding to stand on, with a Hole to put in the Rods; then they must be managed with a great deal of Care, for the Bit in the first Place must be proportioned to the Depth that the Hole must be bored; and suppose it be bored 20 or 30 Yards, we consider what Measures we are to go through such as Shale, or Binds, or Stone, or some Chirt-Beds, in such case the Bit will often need Sharpening, so that we draw them the oftener for fear of making the Bits to Blunt, if they be worn a little Bald on the Corners, they must be Sharpened, that the Hole may loose as little of its Compa's as may be; and at every time the Bits are Sharpened, an exact Gage must be taken of the blunt one, that the new Sharpened Bit be made no bigger, and this is the care of the Smith as well as the Miner, or else we shall soon make the Rods fast in the Hole. A Man will scarcely ever loose a Hole, if he take but due Care, and have his Rods of good Iron, and good Steel for the Bits, and good Screws, (for I do not at all like Sockets and Cotters) and a Skilful Smith to keep them Streight and in good Order.

When the Rods grow too heavy that one Man cannot manage them, then a Rope is fastened to the Top of them that is about the Turntree, and here is fastened a turn of Iron, that the Man at the Bunding may turn them round, by a small Handle of Wood fixt in the top Rod, two Men raise them up by the Turntree, and let them fall down again, and their own Weight is a violent Stroak on the bottom of the Hole; and for drawing up the Rods, we have to hold them an Iron Instrument called a Bitch, and for unscrewing them, two more we call Dogs; and besides when Gravel works not aright out of the Hole Top, we have a cleansing Bit to take it out.