

BRITISH MINING No.48

MEMOIRS 1993



Harris, W.S. 1993
"Visit to a Lead Ore Mine"
British Mining No.48, NMRS, pp.128-131

Published by the
THE NORTHERN MINE RESEARCH SOCIETY
SHEFFIELD U.K.

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ISSN 0309-2199

VISIT TO A LEAD ORE MINE.

by William S. Harris

In the Autumn of 1877 I visited the lead mines of the Stonecroft and Greyside Mining Company which are situated near Newbrough in Northumberland (NGR NY853689). The mines were opened out by this company in 1851 and have been worked ever since.

The veins in the Newbrough district have a general North East and South West direction. They traverse part of the upper portion of the Carboniferous Limestone series of Northumberland, penetrating the great Whin Sill which is here interbedded with sedimentary sandstone and limestone, the hard sheet of Basalt or Trap being faulted by the veins in the same manner as are the softer rocks which lie above and below it.

The veins are here and there interrupted by throw-faults of great magnitude, the faults being sometimes reverted ones, and at these dislocations quantities of Carbonate and Sulphate of Barytes are frequently met with, also Carbonate of Lime and sometimes Fluorspar (Blue John or Derbyshire Spar).

The general dip of the strata is South to South East, the beds lying at a much greater angle than the surface slope of the surrounding country.

At the Stonecroft Mine there are three pits or rather two pits and a steeply inclined day drift used by the men as a travelling road to and from their work.

One of the pits sunk near the crest of a hill is used as a pumping shaft, the other, which is the working pit, is situated about a hundred yards further down the slope. The pumping is performed by a Cornish condensing engine with one vertical cylinder 70 inches diameter, the stroke of the piston being 10 feet. This engine raises to bank nearly 600 gallons per minute from a depth of 70 fathoms. The water is raised part of the way by an 18 inch lifting set and is then carried to the surface by a force pump whose plunger is connected with the spears of the lifting set.

The drawing shaft is ten feet in diameter and is also sunk to a depth of 70 fathoms. The cages are single decked and carry only one tub. The tubs are of iron and hold 20 pecks (about 6 cwts). All the work is brought to bank at this pit. At the depths of 15, 30, 40 and 50 fathoms respectively, stone drifts, or levels, are driven in a northerly direction until they cut the main vein of lead ore which here runs nearly due East and West. From these points the levels are driven in along the course of the vein, being made about six feet high by about six feet wide when they are driven the full width of the vein. The levels all have a slight rise away from the shaft and are kept as straight as possible.

As a level proceeds it will sometimes strike into barren ground, owing to some irregularity or fault in the vein. In such cases the level is still continued in the same course and small drifts, termed 'Speculations', are driven out of it in different directions. These are persevered with as long as there are any indications of the vein

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being at hand. Where the vein is again found the level is driven along it as before. The different levels communicate with each other by small rectangular air staples sunk about 50 yards apart; the vein is thus cut up into blocks, say 60 feet in vertical height, 150 feet in length and of variable bearth.

As soon as a few of these blocks have been holed round, those nearest the shaft are taken out by driving headings or lifts, 6 feet in height. The first lift is always set away at the top, outbye end of the block. When it has gone a few yards inbye, a second lift is started behind it and then a third and so on. Thus in a short time the block is formed into a flight of steps rising inbye. Since the blocks nearest the shaft are worked out first, the tramways along the levels have to be supported on timber put transversely as the ore is worked out below, then planks are laid from balk to balk to form a travelling way. Where the ore has also been taken out above a level, a strong timber roof is formed along the level so as to catch and carry away safely all the stone falling off the sides of the chasm overhead. If any stone drifting is going on, these chasms serve for stowage, the stone put in helping to relieve the side-pressure which becomes very great as the ore is removed. A large amount of timber is required in order to keep open the levels and headings. Norwegian Pine is the wood chiefly used. As the ore is worked off in the different lifts, it is conveyed to the level below by means of a long wooden box, or spout, having a trap at the low end. The putters fill their tubs at the trap and then run them to the shaft by hand, for there are neither horses or ponies underground. The spouts are fixed at various distances apart in order to suit the workings. The ore is usually found intermixed with carbonate of iron, pyrites, sulphide of zinc (Blende or Black Jack), sulphate of baryta and sometimes carbonate of baryta (Witherite) but in one part of this vein a mass of pure galena was worked which was seven feet six inches in width and some yards both in length and height. This is a very exceptional case, however, for the average width of the vein is only four feet.

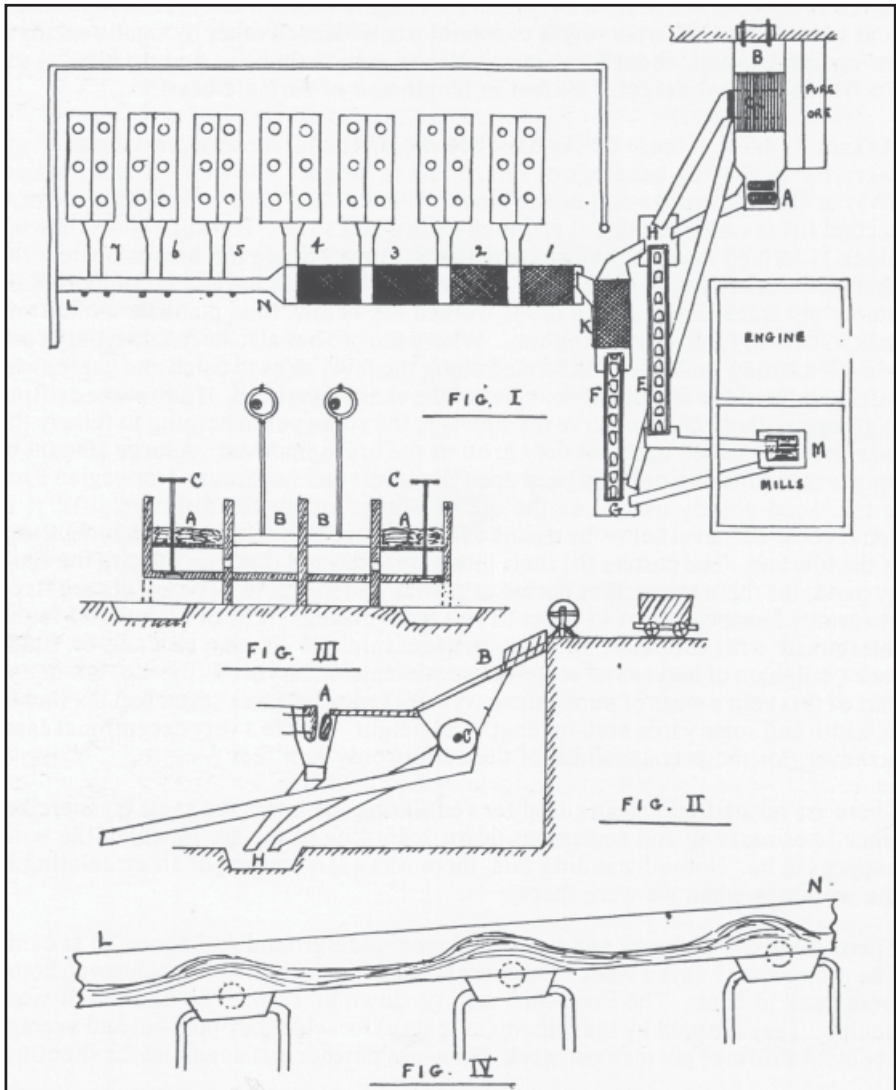
There are no artificial means used for ventilating the mine, the same pit therefore sometimes casts up and sometimes down according to the arc in which the wind happens to be. Notwithstanding this, there was a fair amount of air circulating in the workings when we were there.

There are about 100 men and boys employed underground and about 70 at bank. The pit works six days a week. There are two shifts of ore hewers, each seven hours from bank to bank. The Fore-shift men go down at 7 am. The hewers all work double. They are paid by the fathom (in length) for what they take out and average about 24 shillings per man per week. They use powder and dynamite for shooting.

At bank the ore is crushed and washed by machinery and carefully separated from all mechanical impurities. The motive power for several of the washing and separating machines is the water raised from the mine, which is distributed by mean of wooden boxes to waterwheels attached to the machines.

The loss in working the ore is small, being only 20 per cent of the whole. It is considered good work to prepare 10 tons of lead ore for market in the day.

A year ago (1876) galena would fetch £20 per ton and the total cost of working at Stonecroft was £11 per ton, giving profit of about £9 per ton.



Sketches to illustrate W.S. Harris's paper on Lead Ore Mining.

METHOD OF DRESSING THE LEAD ORE

The ore is first tipped over a screen (Fig.1B) with the bars one inch apart (section of which is shown in fig.II), and four feet six inches long. At the sides two men stand and pick out the pure ore or absolute rubbish. The rest proceeds over or through the bars, washed down by a heavy stream of water. The screenings pass into the revolving screen C, the rest is carried to a Blake's Crusher (A). What passes through C goes straight to pit G. What does not, goes to pit H and is there met by the ore which has

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passed through the Blake's Crusher, being in pieces less than one inch cube. The whole of this is helped greatly through the shoots by water. It is then raised by buckets E to the crushing mills M and, after being crushed, is carried to a pit whence it is raised by buckets F to the revolving screen K. What does not pass through this revolving screen of 5/8 inch mesh goes back to pit H to be taken through the crushing mills again.

From the revolving screen K, the ore is carried by water to the revolving screens 1,2,3,4 of 1/2 inch, 3/8 inch, 1/4 inch and 3/16 inch mesh respectively. They are about five feet long and three feet in diameter, and what does not pass through each respectively is taken to the four sets of continuous jiggers opposite. That which passes through screen 4 is carried along the trough LN, and at three points is raised by pressure of water, so that the lighter particles pass on and only the heavier go through their respective spouts to numbers 5, 6 and 7 sets of jiggers. The lighter gravel and rubbish is carried to waste after passing No.7 set of jiggers.

Fig.IV shows an enlarged sketch of the trough LN, illustrating the action of the water which comes in by two side pipes.

Fig.III shows a transverse section through a pair of continuous jiggers. The action is as follows:- the ore, gravel etc is washed through spout A which has a false bottom of wire grating (corresponding in mesh with that of the revolving screens). The piston B is moved up and down by an eccentric with a play of about one inch and thus the gravel etc is shaken so much that the lead ore falls to the bottom and through the grating on account of its superior weight, while the lighter gravel is carried on and out of the end. The plug C is to let the ore drop into the pit D below.

In the jigging the results of the first set were considered good enough. Those of the second set and the rest are done over again. The waste of No.4 and the rest are carried off as waste and sold as gravel at 4 shillings per ton. The ore is thus worked up to 82 per cent.

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British Association of Mining Students Journal, Volume 3, 1878, page112.

Submitted by N.A. Chapman.