BRITISH MINING No.39

MEMOIRS
1989

Chapman, N.A. 1989
"Langley Barony Lead Mine near Haydon Bridge, Northumberland"
British Mining No.39, NMRS, pp.14-19

Published by the

THE NORTHERN MINE RESEARCH SOCIETY
SHEFFIELD U.K.

ISSN 0309-2199

LANGLEY BARONY LEAD MINE
NEAR HAYDON BRIDGE NORTHUMBERLAND

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SYNOPSIS

We are all familiar with descriptions of metalliferous mining plants of the last century, several of these appearing in the editions of British Mining in recent years. However, these descriptions usually relate to hand or waterwheel operated plants which appear to have had very little further mechanization.

During the late 19th Century a lead mine was developed a few miles south of Hadrian's Wall in the wilds of Northumberland near a small coal field which made the use of steam power economic.

In 1868 Mr. Thomas Bewick obtained a lease of the minerals in Langley Barony near Haydon Bridge, Northumberland, part of which was known as the Greenwhich Hospital estate and extended over several square miles.

For a number of years he prospected and developed the mines until a group of local businessmen joined him to form Messrs. Bewick and Partners Ltd. This company worked these mines with considerable success and profit. The mines were operated in a rigorous way with just 30 tons output in 1873 raising to 4,760 tons by 1882, then declined to 230 tons by 1893 when the mine closed. (tons of lead ore.)

Geology

The mine consisted of four main veins, all bearing north east to south west and known as the Bewick, the Dixon-Brown, the St. Andrew and the New Veins. Of these veins the Bewick was the most productive and was therefore the most extensively worked. The vein was stoped for more than 6,000 feet and to a maximum depth of about 408 feet. It also had an average thickness of 2 to 4 feet.

A cross-cut from the Bewick Vein east of the Joicey Shaft, found the Dixon Brown Vein and this was stoped for about 300 feet but was unproductive. A further cross-cut from the adit found only broken ground.

The St. Andrew's and the New Vein were found by cross-cuts from the Bewick Vein near to the Leadbitter Shaft. These were worked to the west and a little ore was won but the veins were otherwise barren.

The gangue mineral of these veins was Barytes. Ribs of solid galena were found in the Bewick Vein and worked but these were few and far between. The average yield of this vein was about 2 tons per cubic fathom. The vein forms a fault of 16 feet dip to the north, which increases to 23 feet at the Joicey Shaft with a 'hade' or underlay slightly to the north.

Description of the plant

In the valley bottom beside the Honeycrook stream was placed the Honeycrook Works, consisting of a two storey sandstone-built crushing house. The machinery comprised a steam hoist to lift the veinstuff to the top of the crushing house, in which was a Blake stonebreaker and a crushing mill with a set of rolls. Adjoining the mill was a boiler and a horizontal steam engine to operate the machinery. On the opposite side of the mill was a complete set of jigging machinery.

In a house close by, stood a smaller crushing mill for reducing the lead ore, a stonebreaker, jigging machines, elevators, four round buddles and other machinery all driven by a steam engine with its vertical boiler. Nearby were a series of collecting pits and two round buddles.

About 50 yards downstream was a further group of collecting pits and a round buddle operated by a small waterwheel. Nearby was placed a steam pump with its vertical boiler for lifting the water used in the Honeycrook Works to large settling ponds 95 feet higher up the hillside. In these ponds the water, containing a small percentage of lead ore, was allowed to settle. The water was then removed by a mobile steam pump and the mixture of slimes and lead ore removed by shovel and barrow to be further refined in two of Zennor's buddles. These buddles were operated by a small waterwheel.

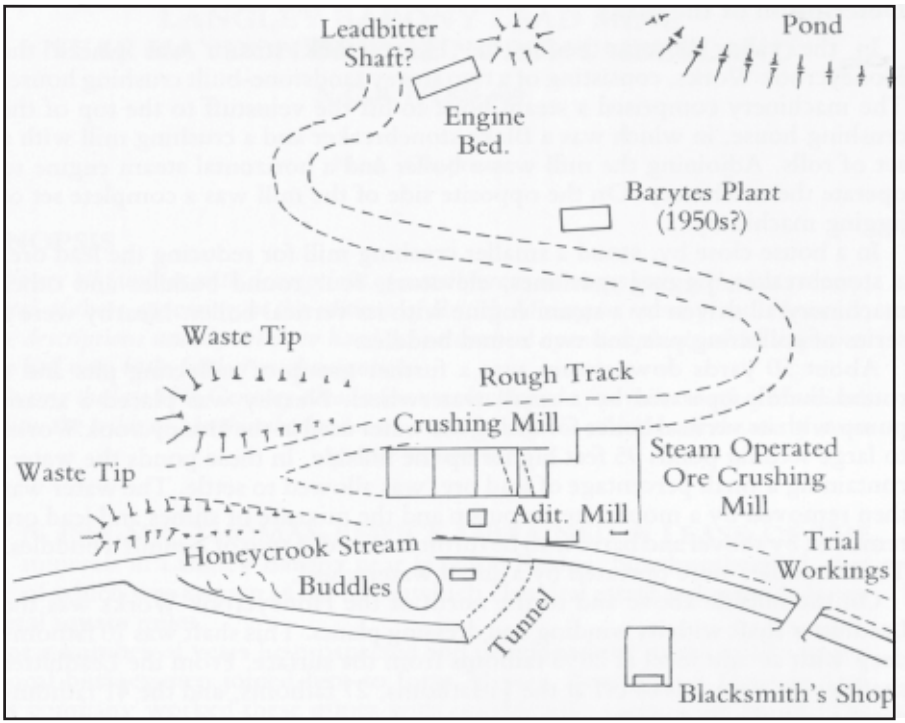
On the hillside above and to the north of the Honeycrook Works was the Leadbitter shaft with its winding and dressing plants. This shaft was 70 fathoms deep with an adit level at $26^{1}/_{3}$ fathoms from the surface. From the Leadbitter shaft levels were driven off at the 11 fathoms, 27 fathoms, and the 41 fathoms depths into the lead veins.

On the surface were constructed a crushing mill, a set of jiggers, and other machinery operated by a horizontal steam engine which was supplied with steam from three boilers at the shaft top. Steam from these boilers was also supplied to a Hathorn Davey single cylinder non-condensing engine of32 inches by 7 feet stroke, capable of lifting 120 gallons per minute from a depth of 100 fathoms at a steam pressure of 50lbs p.s.i. The wrought iron pumping quadrant had a cast iron balance weight held by adjustable screws so that the weight could be moved to suit pumping requirements from 458 to 600 feet. Steam was also supplied to a small oscillating cylinder engine driving a lathe and to a Tangye engine for driving the saw-mill for the mine.

On the hillside between the Honeycrook Works and the Leadbitter shaft was a small crushing plant with jigging machinery and two round buddles, operated by a horizontal steam engine made by Messrs. Robey and Co. of Lincoln, supplied with steam from a vertical boiler.

Near to the Leadbitter shaft were two reservoirs, into which the water from the dressing floors was collected. The large one was supplied by a leat over three quarters of a mile long. The small reservoir was supplied with water pumped from the mine.

About 700 yards to the north east of the Leadbitter shaft was the Joicey shaft which, by 1880, was nearly 41 fathoms deep. It eventually reached a depth of 91 fathoms. At the shaft top were two boilers that supplied steam to a pair of



Rough sketch of the remains of the Langley Barony lead mine.

winding engines. By the early 1880s the amounts of water to be handled had increased as the shaft was sunk deeper. So during 1882 an order was placed with Messrs. Hathorn Davey of Leeds for one of their differential type pumping engines. This horizontal compound engine with cylinders of 24 inches, 44 inches by 6 feet stroke, being capable of lifting 300 gallons per minute from a maximum depth of 130 fathoms. With the engine were two wrought iron quadrants to stand on the shaft edge and convert the horizontal motion of the engine into vertical motion in the Joicey shaft. The shaft pumps consisted of two bucket lifts of 15 inches placed in the shaft bottom, delivering water to a large cistern fitted into the side of the shaft. From this cistern two 14 inch plunger lift pumps delivered the water to a large reservoir on the hill top. From here water was taken down the hill to provide supplies on the dressing floors as required.

North of the Joicey shaft and about half a mile away is a large reservoir to which, by a series of leats, water from the surrounding moors was collected. As required, water was drawn to a small pond near the mine. Near to the Joicey shaft was a further reservoir used to hold water pumped from the mine. Further south of the Joicey plant was a storage reservoir into which all the water used at the mine flowed; from here it was delivered by a leat to the Honeycrook dressing floors.

The veinstuff was first delivered into hoppers of a stonebreaker or to a pair of crushing rolls, frequently to both! Having been reduced to a size of about ½ inch cube it was passed to a series of inclined revolving cylinders or 'trommels', each consisting of rows of holes of different sizes. Through these holes the crushed ore fell into the jiggers' or sieves, that had a similar series of holes. These jiggers were fixed boxes but the water was moved up and down by large square pistons activated by eccentrics powered by a steam engine. Jiggers of two, three and four compartments were placed in succession, each slightly lower than the previous one, so that the crushed material was stirred and carried from one compartment to another. The lead ore and other heavy minerals settled on the sieve or, if small enough, fell through the holes into the tub beneath, from which it could be collected as required. The lighter 'rock' or waste was carried over the end of the lowest sieve and was removed by barrow to the 'dead' heap.

Much of the material collected on the sieves, and in the tub below, was a mixture of ore and waste gangue, mostly a sulphate of barytes. At this point, it was further reduced in a crushing mill prior to being delivered with water into tanks or 'classifiers', from which the pulp was taken to a further group of jiggers with smaller holes and fitted with pistons of shorter stroke and higher speed.

Some of the pulp taken from the tubs had a mixture of sand in it. This was passed under a propeller or knife buddle. This had a cylindrical framework of iron, that was revolved by a vertical shaft and carried a series of scrapers or knife blades, fixed in spiral lines round the outside. These revolved close to a channel hollowed to the same radius. The pulp was fed at one end of the bed, whilst the revolving blades not only caused it to travel forward, but also swept it upwards on the curved bed against a stream of clean water flowing across it. The water separated and carried off the sand, leaving the ore almost pure by the time it reached the far end of the bed, from which it fell into a receptacle. By these means most of the lead concentrates were separated from the gangue. What was left, known as 'slimes', was fed on to a convex buddle of 16 to 20 feet in diameter and after mixing with clean water was allowed to flow down the slope of the cone. The specks of ore and the heaviest waste settled near the apex, while the lighter mixture settled next with the lightest mineral deposited along the periphery of the buddle. When the deposit had built up to about a foot depth it was removed by careful shovelwork. The outer portion went to the 'dead heap' while the middle and top portions were rebuddled until the concentrate was nearly fit for market.

The final operation with the slimes was to run it into a 'dolly' tub which was a large cylindrical wooden tub. The slimes were treated with water and stirred with a large wooden paddle until well mixed. Then boys employed on the mine rapidly struck the sides of the tub with hammers causing the ore to settle at the base of the tub with the lighter waste material at the top. The concentrated lead was then ready for sending to the company's lead smelting works at Hebburn, near Newcastle upon Tyne.

All the water used in the dressing operations was run into a series of pits, 20 to 30 feet long by about 3 feet wide by 2 feet deep, and permitted to settle.

When the pits had become full, these slimes were shovelled into barrows, taken to the buddles and concentrated. Eventually the slimes were further concentrated in the dolly tubs.

Site remains

In the bottom of a steep-sided wooded valley stands the three storey sandstone-built crushing mill. Now roofless, and crumbling, the walls display a series of openings for line shafting, floor levels and doorways etc. To the east of the mill, and at a higher level adjoining, are the sandstone-built foundations of a single boiler plant. With this is the massively built sandstone engine bed for a horizontal steam engine. To the south of the boiler plant stands a tall square sandstone chimney, complete with plain cornice and square cap.

The mill stands beside the Honeycrook stream, which provides a plentiful supply of water, yet the mill was operated by steam power. It would appear that with a coal field nearby it was economic to bring coal to the site than to use the more available water supply. Probably the water was more useful in dressing the ore than for driving the machinery. To the west of the mill, are a series of foundations of ore chutes and a secondary crushing mill. Beneath these is the sandstone arched adit level. This was commenced in July 1871 and found the Bewick vein in September 1872, the ore being processed in the mill. On the levelled area between the adit and the stream is the air vessel of a pump sunk into a sandstone-lined hole in the ground (Hydraulically operated?). Further west are a series of waste tips.

Across the Honeycrook stream and to the south of the mill stands the remains of a single storey sandstone building. The southern wall of the building had a large fireplace built into it, so this was probably the blacksmith's shop for the mine.

As the Honeycrook stream flows through the middle of the site, it has been put into a sandstone-lined channel with, slightly to the west of the mill, a division into two streams. The northern stream continues straight past the plant for about 200 metres before joining the southern stream. The southern stream doubles back on itself, still within the sandstone lining, then disappears into a short stone tunnel. On reappearing, the stream continues in the stone lining for a further 100 metres before the banks return to the normal grass and tree lined style. The streams then unite, having formed an island with the remains of four complete and three broken sandstone lined buddles on it. Each of the buddles are 4.8 metres diameter. Nearby is a small engine bed probably for a steam engine to operate the buddles.

To the east, and along the Honeycrook stream, are a number of collapsed trial workings into the hillside. A rough track from the mill area leads over a stone bridge and along the northern side of the valley to serve these workings. From the mill itself, a rough track zig-zags up the steep valley side to the north and across the field to the council road.

Halfway up the valley side stands the remains of a small corrugated iron shed with a concrete base. This probably dates from a reworking of the tips in the 1950s when barytes was extracted.

On the level ground above the mine is a depression, probably of the Leadbitter shaft, with a large sandstone engine bed nearby. On this bed was the most likely site of the Hathorn Davey pumping engine.

The make up of Messrs. Bewick and Partners Ltd., formed during 1874, with a capital of £32,000 divided into shares of £10 each, was as follows:-

The Directors were in 1874 the following:
T.J. Bewick of Westminster with 10 shares.
T. Leadbitter of Newcastle with 10 shares.
A. Leslie of Wallsend with 10 shares.
F. Bolton of Westminster with 10 shares.
J. Joicey of Stockfield-on-Tyne with 10 shares.
D. Brown of ? with 10 shares.
A. Brogden of Hyde Park with 10 shares.

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