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ORE HEARTH OF KELD MINING CO. SMELTER, WENSLEYDALE

N.C. & M.R.S. Records

Introduction
The Keld Heads Mine is situated half a mile east of the village of Preston-under-Scar in Wensleydale, Yorkshire. At one time it was a very rich mine employing some 250 men and boys either in the mine or on the dressing floors.

It is known to have been worked in the twelfth century. The mine worked several rich veins, the main one being Chaytor Rake which crosses the River Ure near Wensley Bridge.

A smelt mill was in operation here in 1610 when the first of the Yorkshire Ore Hearths" was errected.

Reverberatory Hearths were introduced round about 1750 but it is known that they never superseded the quality of lead smelted in the Ore Hearths.

The mine reached its peak in the 1850s after some long adit levels had been driven, Lord Bolton (Lord of the field) installed much new equipment and the whole installation was considered to be the most advanced in the country.

The fume from the five Hearths in the mill was conveyed in a flagged flue via a large Stokoe condenser for two miles up the moor until released up a stone stack.

As with all other Yorkshire mines towards the end of the nineteenth century, the increased charges entailed by deeper working could not compete with the low price of lead prevailing and the works were closed.

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Description of Ore-Hearth by Wm. Weston, a student of Percy.

a. The hearth-bottom or hearth-box, of cast-iron.

b. The work-stone, a flat plate of cast-iron, connected with the front edge of the hearth-bottom, from which it slopes downwards; on the sides and lower edge it has a raised border; and from the middle of the upper edge to the middle of the lower edge is a groove, as shown between b. and b. fig.5. Various component parts of the ore-hearth, though made of cast-iron, are termed "stones". The hearth-bottom and work-stone are cast in one piece; but in ore-hearths in other localities, they are separate castings. The groove is intended to conduct the lead into an iron pot, h., in front as it overflows from the hearth-bottom during reduction

of the ore.

c.c. Two similar rectangular prisms of cast-iron, termed bearers, resting on and somewhat overlapping the hearth-bottom, one on each side.

d.d. Rectangular blocks of cast-iron, termed keystones, two on each bearer. The two in front are shaped at the back as shown in fig.5, so as to form ledges for receiving the ends of the fore-stone.

e. The back-stone or pipe-stone.

f. The upper back-stone. These stones, e and f, form the back of the hearth. Through the lower part of the back-stone, e, passes the tuyer.

g. The fore-stone of cast-iron, which lies across the hearth, with its ends resting respectively between the key-stones. It can be moved towards the front or back by changing accordingly the position of the key-stones, or it can be raised by placing fire-bricks underneath it at each end.

k. The feed-door, through which the workman places a peat before the nozzle and detaches any adherent slag.

m. The flue of the fireplace under the pot. In recently erected hearths it has been found better to take this flue direct under the hearth bottom and curve it to one corner. The space between it and the work-stone should be filled in solid with brick-work.

The dotted space behind the back of the hearth is filled in solid with half-bricks and clay.

The dimensions of the ore-hearth are as follows:-

Hearth-bottom - 1' 11" from back to front 1' 9" wide, 1' deep, inside measure. The sides and front are 1½” thick, and the back 2½”.

Work-stone - 3' 12" wide and 2' from front to back. The raised border is 1" high and the slope forwards and downwards is 5" in its whole length.

Bearers - 2' long and 7" square.

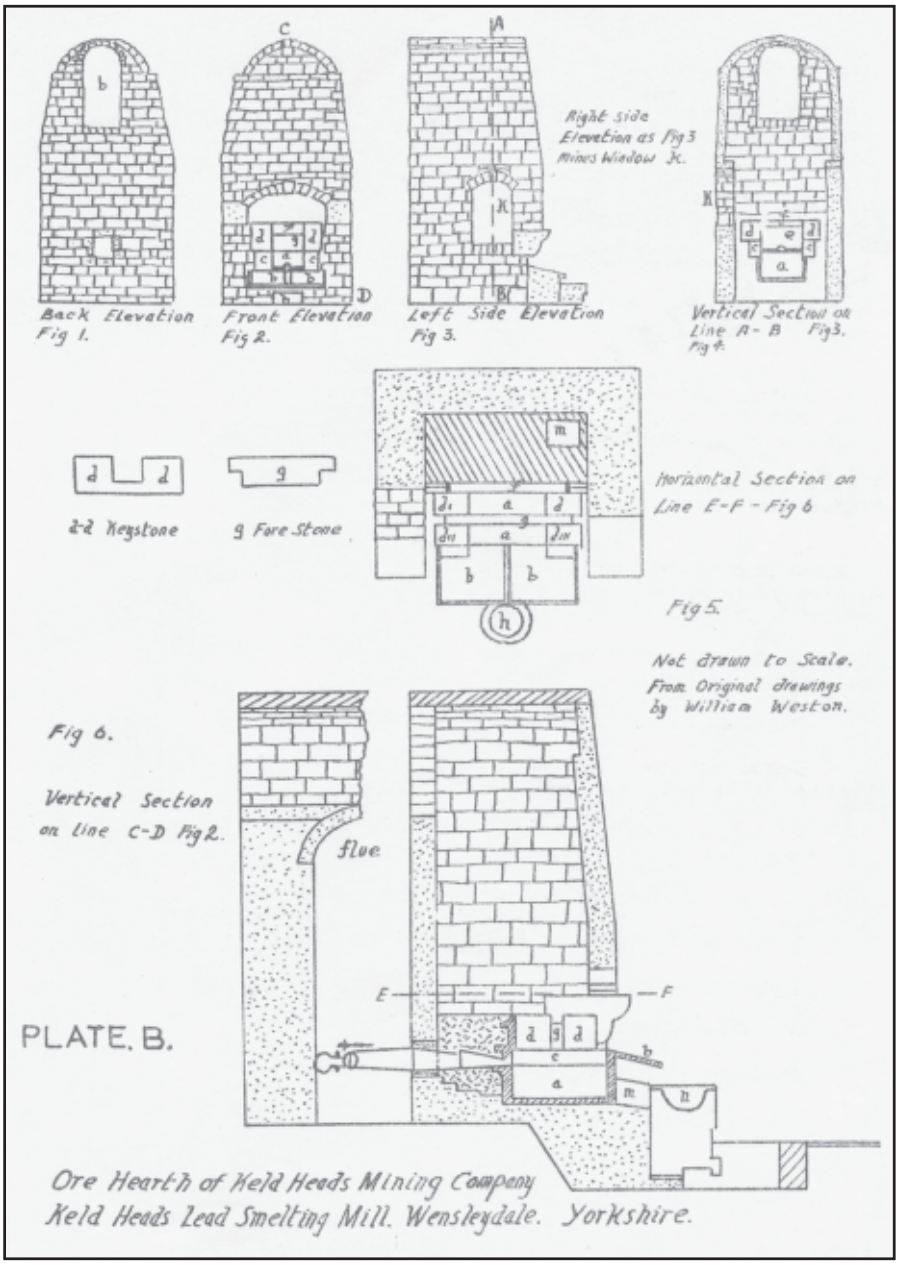
Back-stone or pipe-stone - 2' 6" broad and 1' 2" high.

Upper back-stone - 2' 8" long, 5" wide and 2" deep.

Keystones - The two at the back are cubes of 10".

Forestone - Its dimensions may be found in fig.5.

ORE HEARTH OF KELD MINING CO. SMELTER, WENSLEYDALE



Results obtained from one week's smelting of the same Ore at Keld Head Mining Company's Works

No. of Shift	Wt. of Ore used	Produced		Wt. of Brouse at beginning of 1st shift	Wt. of Brouse at close of last shift	% of lead direct from the ore	Fuel Consumed			Cost of Peat
		Lead	Grey Slag				Coal	Average cost of coal for each shift	Peats	
	Cwts	Cwts qrs lbs	Cwts qrs lbs	Cwts	Cwts qrs lbs		Cwts qrs lbs	s. d.	Bushels	s. d.
1	32	24 0 0	1 2 18	3			1 0 5		4	
2	32	24 0 0	2 0 18				1 0 5		4	
3	32	24 0 0	2 0 6				1 1 0		4	
4	32	24 0 0	2 2 0				1 1 8		4	1 5
5	32	24 0 0	2 1 0				1 0 5		4	per ton
6	32	22 3 18	2 0 0		3 0 3		1 0 5	0 8¼	4	of lead
	192	142 3 18	12 2 14			74.44	6 3 0	4 1⅛	24	10 2

The diminution of the produce of lead at the last shift is due to the abstraction of the quantity necessary to be put back into the hearth bottom to fill it up to its overflowing point, at which it was arranged it should be at the beginning and end of the trials. Accurate information concerning the quantity of fume produced could not be procured.

TABLE 2

Mode of conducting the process of smelting:-

Two men are required, and a shift lasts 8 hours. The fuel is coal and peat cut in prismatic pieces from 9" to 12" long by 2½" square. Such a piece of peat is called a peat, and the plural, peats, is used. Lead ore is termed bouse in the North of England, and the agglomerated masses of ore formed in the process of smelting are termed brouse or browse. The ore at the Keld Heads Company's Works is not previously calcined. The blast is varied considerably according to the nature of the ore operated upon.

The hearth is supposed to be in working order, and the bottom left nearly full of lead, after the last shift. A small quantity of coal is laid on the hearth-bottom, and the remaining cavity of the hearth is filled with peats, which are well walled up in front, while smaller pieces are thrown in without order behind. A few ignited peats are next placed before the nozzle, and the blast is let on. As soon as the peats are well ignited, a little more coal is added, and shortly afterwards a little of the brouse from the last shift is thrown on behind the fore-stone. When about half of the brouse is worked in, lead begins to flow; and then one of the workmen stirs up the contents of the hearth with a poker, throwing them forward away from the blast, a portion falling on the work-stone. At this moment the other workman introduces his scraper through the feed-door and removes any slag from before the blast and heaps it upon the fire. Both men then step to the front with their brouse shovels, and put back into the hearth what had fallen on the work-stone, setting up the contents so that the blast shall be well distributed throughout. Lead now flows freely. Ore in small quantities is added where the fire seems hottest. The stirring up of the contents of the hearth is repeated at intervals of about 5 minutes where the fire is seen to burn badly on account of imperfect diffusion of the blast. At each stirring, a fresh peat is placed in front of the nozzle; and from. the portions, which during this manipulation fall upon the work-stone, lumps of grey slag are picked out and laid aside for subsequent treatment in the slag-hearth. The pieces of brouse are broken up and returned to the hearth, after which fresh ore is added. When the receiving pot is full of lead, the latter is skimmed and laded into pig-moulds. During a shift these operations of stirring, lading etc., are performed alternately by the two workmen. Thus, the man who has been using the poker, lades out the metal, while the other skims it; and the latter attends at the feed door while the former uses the poker.

Towards the end of the shift no more ore is charged; but the contents of the hearth are afterwards worked up two or three times after which the blast is stopped. All the brouse is taken out, thrown on one side, and separated from the intermingled grey-slag. Lead is laded from the receiving pot back into the hearth-bottom, 80 as to fill it for the next shift.

Bibliography

Backhouse M.S.S. Central Library Leeds.
Clough R.T. "Lead Smelting Mills of the Yorkshire Dales"
N.C.M.R.S. Central Records, 8, Cedar Grove Rd. Sutton-in-Craven.

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