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LUMB CLOUGH LEAD SMELTING MILL

J.M. Dickinson, M.C. Gill and H.M. Martell

INTRODUCTION

A meet held by the then newly formed Northern Cavern and Mine Research Society in January of 1961, was a visit to a small level in Lumb Clough, Sutton-in-Craven, near Keighley, Yorkshire. The level situated near to Lumb Clough Head is driven on a bearing of S. 25º W. for 320 feet, the passage being fairly uniform in shape and size, viz. 3 feet high by 2 feet 6 inches in width, being cut through a hard dark grey shale with iron staining in the floor mud. Two small faults cross the level towards its end and at both these points a riser of 8 feet has been put up. Throughout the level there is no sign of drilling or blasting having been carried out nor is there any mineral worth working. From these it was concluded that this was an early ironstone trial, it is now thought possible that it is more likely to be a coal trial. About a quarter of a mile downstream from the level at a fork in the Clough a ruined dam was observed with a curious circular stone structure, built into the banking near the stream, this at the time was related to ironstone working or early textiles.

About 1933 the Sutton Co-operative Society issued a small magazine which contained in it odd item of local history, one of these items in one of the editions described two or three circular furnaces the Clough which had at an unknown date been used for smelting lead. (A copy of this magazine has not yet been traced). A Mr C. Geldard of Sutton visited the described site sometime in 1933 found small pieces of a black glassy slag containing metallic lead which was strewn about the tops of the two circular furnaces, which at that time were in a fair state of preservation the walls standing some 18 inches to 24 inches higher than the present time. It is also reported that in or around 1939 a member of the Crosshills Naturalists had pieces of the slag identified as being iron in origin. One evening in the early part of 1973 the author and Mr Geldard were talking in the local inn and the subject of the Clough site was discussed. The following day the author found slags containing lead and a dig was started with the kind permission of Mr F. Lister of Bank Top Farm, in the circular structure remaining. The other having been destroyed during timber felling and extraction in 1950. [1]

NCMRS DIG: MAY - OCTOBER 1973

KEYHOLE HEARTH

The circular structure when cleaned out was 6 feet in height by 4 feet 6 inches in diameter at the top with slightly tapering walls down to the hearth area, the floor of which consists of burnt clay and ash with traces of charcoal. Many pieces of black glassy slag were found in the rubbish filling the hearth together with much burnt gritstone some with lead ore and soot adhering to one side. At the front of the hearth a slab of gritstone is set across the entrance with 1½ inch grooves down either side leading to a dished stone set just

below the latter, the dish being three feet deep at its centre forming a crude kind of collecting vessel. The area in front of the hearth entrance is paved by a large gritstone flag with wing walls giving the plan of the hearth a keyhole shape.

Whilst excavating at the hearth entrance a piece of wrought iron was found. This is a bracket designed to be held between the joints of a stone built wall and carries a semi-circular piece riveted to it which would have carried a three inch diameter pipe, it is thought to be part of the blast pipe arrangement and is probably from the ore hearth in the mill proper. At the back of the hearth there is no sign of a blast pipe entry but just off centre to the right there is a break in the regular store work forming a chimney piece.

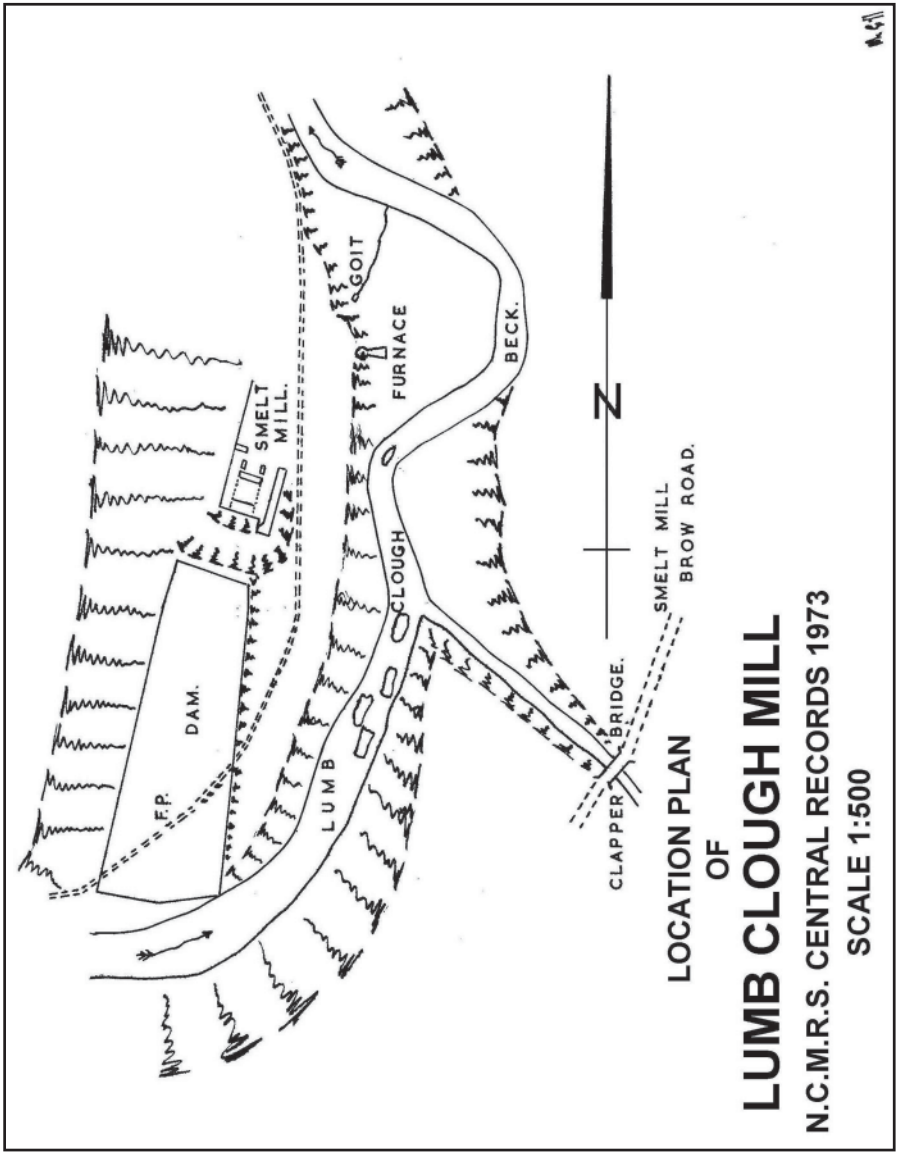
At first it was thought that the black glassy slag had come from this hearth, but later evidence tends to rule this out.

No definite decision on the purpose of this furnace has been made. It may well have been a small 'Elling Hearth' used to dry 'chop wood' also known as white coal for the open ore hearth in the mill. Chop wood was used mixed with peat in all Yorkshire lead smelting mills using the ore hearth up to the 19th century. The wood, barked and chopped into small pieces about 6 inches x 2 inches (measurements from samples found at Sutton) was then stacked on thick branches laid across the top of the elling hearth, a slow fire underneath drying out the wood sap.

On the other hand regarding the details of the bottom of the hearth we may well have a early type of furnace mid-way between the Bole Hill and the ore hearth similar in many respects to furnaces built in Saxony during the 16th century.

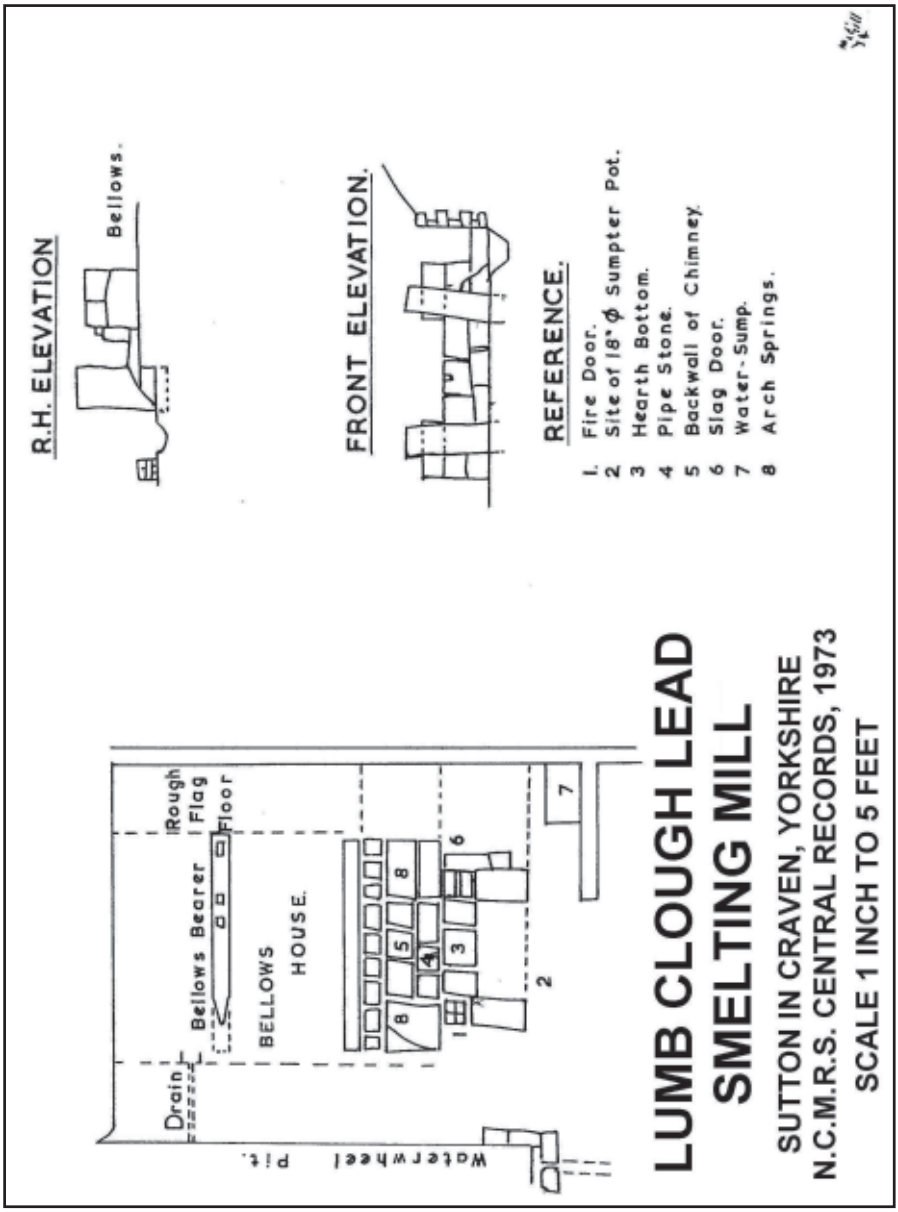
LUMB CLOUGH LEAD SMELTING MILL

After the initial dig in the Keyhole Furnace it was apparent that the dam had been built to serve a water wheel and several trenches were dug across the line of the dam wall from the Keyhole Hearth back towards the dam. The last of these cut across a wheel pit. The pit is 22 feet by [2] 18 inches in width and was fully excavated to its flagged bottom at a depth of 7 feet. The first find was a chamber at the outlet end of the pit over the tail race, the latter although partly collapsed was still in working order. Whilst clearing the debris from the floor of the pit a mould for the pig lead was discovered. The mould, carved out of a solid piece of gritstone had by its fall into the pit roken in half. It is estimated that a pig weighing up to 2 cwts and measuring 31 inches x 6 inches x 4 inches was cast. No parts of the wheel have survived save a small section of the wooden launder which fed the wheel, a part of this has been preserved. As the pit and its adjacent area were excavated an ore hearth and the walls of a small building came into view. The mill is quite small, 18 feet by 15 feet, the longer dimension being in the line of the wheel. The furnace occupies the front of the building with a wide doorway opening directly on to it. At the rear of the furnace the bellows occupied the



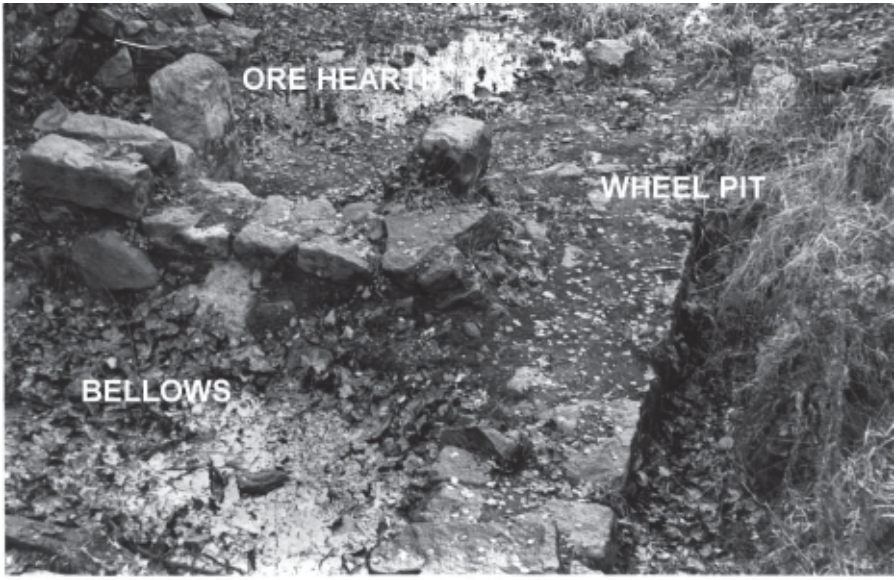
rest of the building. It is thought that, two sets of bellows were mounted on the timber baulks set into the floor, being driven by a 16 foot x 1 foot overshot waterwheel, the blast pipe entering the furnace slightly off centre through the rear wall of the chimney/furnace arch structure. The wheel may have been of a larger diameter as the total length of the pit is 22 feet, but in the absence of any sign of the wheel mountings the lesser diameter has been adopted.

The ore hearth is built to the more or less standard dimensions expected for this type of furnace, 36 inches x 18 inches inside measurements approximately. It has almost been totally destroyed, only the foundations of native gritstone bedded on river sand remaining. It is not known if the hearth was lined with cast iron or simply lined with gritstone, a great amount of



burnt gritstone has been found scattered all over the site, but the slags adhering to most pieces suggest that they are from the chimney, which vented from the furnace arch directly through the roof of the mill. The hearth's floor inclines from right to left along its longest measurement. At the right hand side a working hole allowed slags to be pulled on to a small workstone. The slags then being sorted and thrown into a water filled sump in the right hand corner of the mill building in order to break then ready for re-smelting. The sumpter pot (approx. 18 inches diam.), part of which has been found, is carved out of a solid piece of gritstone and would have been situated on the left hand side of the hearth. The most unusual features of the hearth are the two large 'Keeper Stones' between which the hearth was built, these massive gritstone boulders roughly dressed standing to a height of 2 feet 10 inches being 2 feet in length and over a foot thick. In the immediate furnace area and in the bed of the hearth a considerable amount of burnt and unburnt coal has been found together with the site of the coal store outside mill. Suggesting that a great use of coal was made, possibly in place of peat. A large amount of grey slags containing much load ore have been found in and around the hearth and bellows house, one piece retaining the shape of a corner of the hearth. This grey slag in obviously only half worked and must have been scattered about when the furnace was demolished. [3]

In the furnace area., the foundations of the hearth, and over a wide area outside the mill, up to and beyond the Keyhole Hearth black glassy slags have been found, leading us to believe that the latter was the final slag product of the are hearth. This being the case the primary slags must have been re-



General View of the mill area

smelted in the ore hearth, this my well explain the large amount of coal that has been found in and near the mill, for to reduce the slags a much hotter fire would be required than that for reducing lead ore.

HISTORY

Two miles to the north of Lumb Clough are the lead mines of Glusburn and Cononley Moors. The actual date as to when mining began on the moors is not known, the first recorded instance is in 1530, when King Henry VIII made a grant for the working of lead ore on Glusburn Moor. Two shallow shafts being sunk at this time. By 1538 Bolton Priory in Wharfedale held the mining rights to Appletreewick and Cononley Moors, on its dissolution in 1540 the land and rights were retained by the Crown. In 1542 the lands of Bolton Priory were sold to Henry Earl of Cumberland for the sum of £2490, including the Lordship of four Manors and title to various lands in fourteen other parishes. It is not known if he had any interest in mines, although a later Earl in 1603 was responsible for the opening up of the lead mines at Grassington with miners brought from Derbyshire. The Garforths of Steeton Hall 1589-1811 were Lords of the Manor of Glusburn holding the mineral rights of Glusburn Moor, and it is probable that the Lumb Clough mill smelted lead from their mines. In early times the workings were centred on the outcrop of the Main Vein reaching depths down to 24 fathoms, trials were also made at the eastern end of the veins, several shafts and two levels being driven. Unfortunately for the Garforths the oreshoots tended to be richer at their western ends where they passed into the Cononley Moor royalty, here they were fully developed by the Duke of Devonshire, (1820-1869) who also built a new smelter in Cononley.

The ownership of Sutton Clough or Lumb Clough has not been so far discovered during the period that the mill could have been working. In the late 13th century, Sir William, de Vavasour held chief of the Lord of Skipton Castle land in Sutton, which in turn was held by John de Boyvill Lord of the Manor of Sutton, although the Lord Prior of Bolton had a small amount of land within the Manor. In 1340 the Manor was transferred to Adam de Copley, the Copley family remaining in the village for the next 300 years, apparently surviving the Black Death which passed through the area in 1587. At the end of the 17th century the manorial system declined and Vestry Government came in, Sutton belonging to the Parish of Kildwick.

It is apparent from entries in the Kildwick Parish Register that lead mining was being carried out on Glusburn Moor in the late 1600's, a time contemporary with mining at Grassington and Greenhow. According to the register a lead miner called Joseph Harrison of High Gate, Glusburn, was buried in 1728, another Mathew Carr, also of Glusburn was buried in 1733. [4]

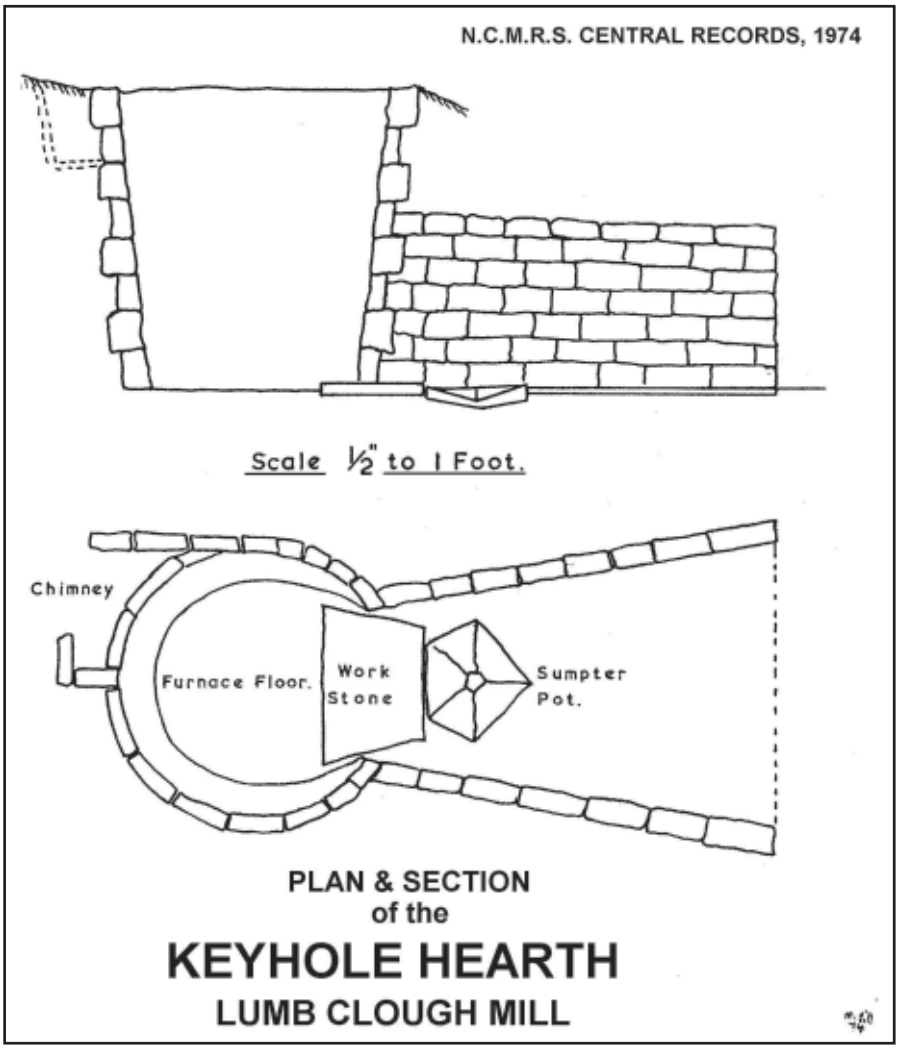
Between 1728 to 1746 the names of 16 lead miners are listed, living mainly in Glusburn with a few from Sutton and Cowling, plus two miners from Linton marrying local girls. Residing in Sutton was a Benjamin Carrington who

was married in 1737 and when baptising his third son in 1744 was still described as a lead miner. The most notable being Richard Braithwaite, Steward of the Lead Mines who married Ann Smith in1742. The Steward being the Lord's agent, was above a Barmaster in rank. Edward Perkin lead miner who baptised his daughter Rosamund in 1745. After 1746 there are no further records of lead miners, although Coal Miners are recorded up to 1782. It must be assumed that a decline in lead mining had set in possibly due to the troubles north of the Border. Richard Braithwaite the Steward was the Landlord of the White Bear Inn at Crosshills in 1756.

At the present time there is no knowledge of the smelt mill in the village of Sutton other than that shown by excavations. In the Clough itself a small foot bridge over the beck on a path leading to the mill has been known for generations as 'Bellows Bridge', originally built of timber it was replaced by the present iron structure in 1880. The old road out of Sutton to Keighley and Halifax once of importance to the textile industry of the village is called the 'Ellers' as it leaves the village, where it climbs steeply up the eastern side of the Clough. At a point nearly above the mill a branch road descends from 'Smelt Mill Brow' into the Clough crossing the stream by an old slab bridge near to the mill site. The area around the mill has been and still is known as 'Smelt'. The ruins of an old house or farm, which was also called 'Smelt' can be seen on the side of the branch road to the Clough. [5]

List of Items Found in Lumb Clough Lead Smelting Mill

Item	**Description**	**Location**
1.	Wrought iron bracket. Blast pipe.	Keyhole Hearth
2.3.4.	Wrought iron timber dogs.	Bellows House
5.	Three iron nails.	Bellows House
6.	½ inch wide lead strip with nail holes.	Bellows House
7.	Oak slate nails (2).	Bellows House
8.	Part of wooden shovel.	Mill
9.	Piece of hand woven cloth. woollen.	Bellows House
10.	Button, iron (copper plated).	Bellows House
11.	Lump of Beeswax wrapped in fibre.	Bellows House
12.	Iron pin, 2 feet long 1½ inches diam,	Bellows House
13.	Assorted leather strips.	Bellows House
14.	Gritstone lead mould.	Wheel Pit
15.	Part of feed launder.	Wheel Pit
16.	Part of Gritstone Sumpter Pot.	Mill Yard
17.	Grey slates, single hole fastening.	Wheel Pit & Mill
18.	Gritstone roof ridge piece.	Wheel Pit
19.	Pottery. 1 large pot 9 inches diam. part only. 1 pot with handles, part only. other fragments, all in blue/ black glaze on red pot.	Mill



20,	Coal.	Mill & Yard
21.	Lead metal. small fragment.	Ore hearth
22.	Thin angled iron plate 6 inches long.	Bellows House
23.	Timber baulk 6 x 4 inches x 6 feet 9 inches - Bellows base.	Bellows House (in situ)
24.	Assorted modern pottery & bottles.	
25.	Lead slag, Brouze, in shape of hearth.	Bellows House
26.	Pieces of chop wood.	Mill
27.	Lime mortar.	Mill & hearth
28.	Black glassy slags.	[6]

Slag Detail's By Leeds University Mining Dept.

Sample OH/11 **Ore Hearth grey slag (Brouze).**

D.C. Arc Spectrography of galena.

Ag	52 ppm.
Cu	44 ppm.
Sb	Trace (Stibnite Sb_2S_3)

Chemical Analysis.

Pb	21.40%
Zn	0.57%

Sample CH/101 **Black glassy slag.**

Does not contain enough galena for spectrography.

Chemical Analysis.

Pb	0.99%
Zn	0.26%

[7]

IDENTIFICATION OF COAL FOUND AT LUMB CLOUGH MILL

Pieces of coal found near the furnace of a mid 18th century lead smelting mill near Keighley, in the West Riding of Yorkshire, were submitted to the Yorkshire Regional Laboratory of the National Coal Board by M.C. Gill of the N.C.M.R.S., for evidence which might indicate the source of the coals.

It was thought that the coal might have come from a number of small local pits which worked seam In the Millstone Grit and/or an outlier of Coal Measures in nearby Lancashire. Samples of coal (each approx. lb.) from old tips associated with these mines were supplied for comparison.

Reflectivity measurements and spore analyses were made on all samples to determine the rank and approximate age of the coals.

SAMPLES

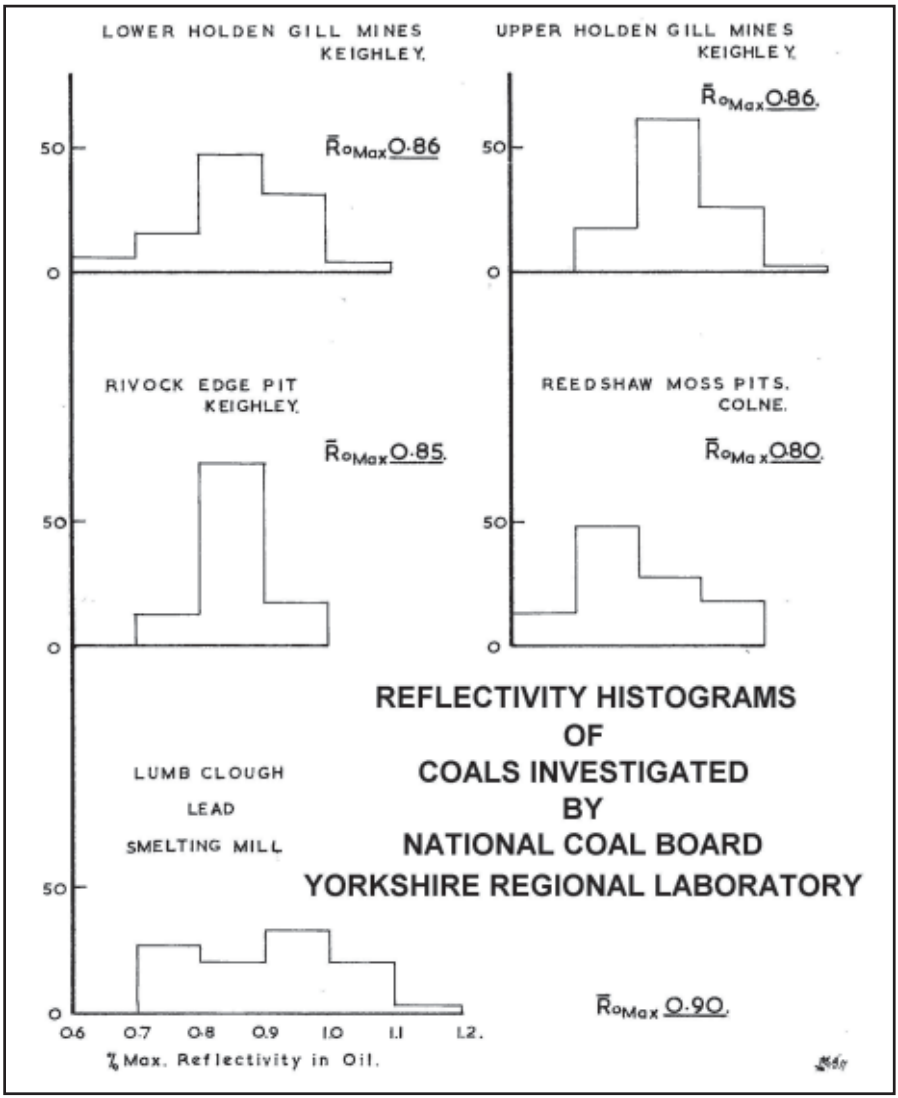
Lumb Clough Lead Smelting Mill.
Lower Holden Gill Mine, Keighley.
Upper Holden Gill Mine, Keighley.
Rivock Edge Colliery, Keighley.
Reedshaw Moss Colliery, Colne, Lancashire.

The two samples of coal from Holden Gill were taken from two levels in a very steep valley in Millstone Grit and shales and it was considered possible that the same seam might be repeated by faulting.

The Reedshaw Moss sample was considered to be from high in the Grits or possibly from an outlier of the Lower Coal Measures in the Burnley Coal Field. This sample contained a proportion of charred material.

RESULTS OF INVESTIGATION

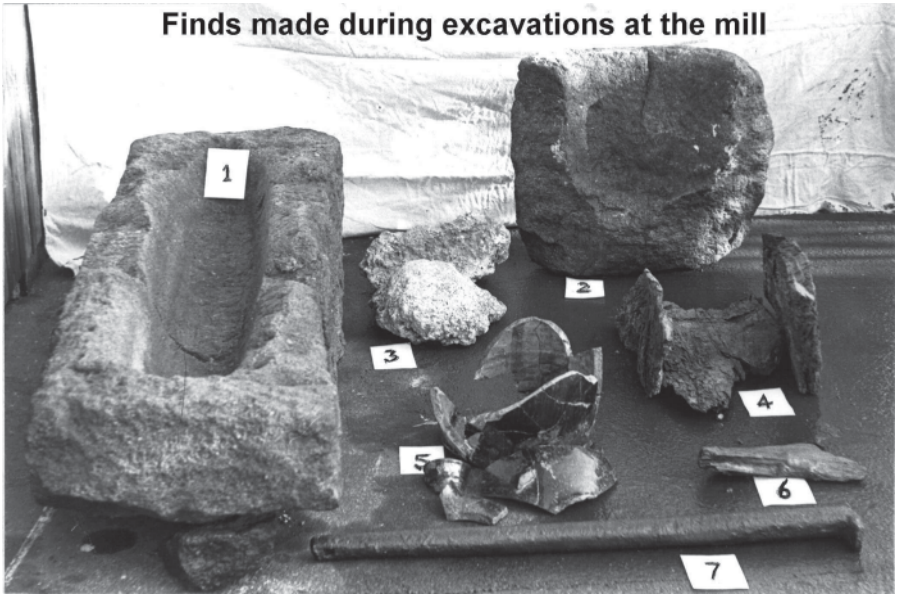
Histograms of reflectivity measurements of the vitrinite in the five coal samples are shown in Fig.4. The average reflectivity of the four mine samples ranges from 0.60 - 0.86% the coal of lowest rank being from Reedshaw Moss. These histograms are typical of coals from a single seam. The histogram of



the coal from the mill shows a greater spread of reflectivity values which suggests that two or more coals are present in this sample.

Good assemblages of well-preserved spores were isolated from all [8] samples although that from Reedshaw Moss was very poor in species. The two assemblages from Holden Gill were fairly similar and could in fact be from the same seam if the observed differences are attributed to the fact that the samples were not fully representative of the seam being worked. The assemblage from Lower Holden Gill contained more species, some of which are clearly indicative of Namurian C (Millstone Grit) age. The spores in the coal from Rivock Edge Colliery suggest that it is from the base of the Lower Coal Measures or possibly the top of the Millstone Grit although no diagnostic Namurian spores were observed. The coal from Reedshaw Moss is assigned to the base of the Lower Coal Measures on the basis of the limited evidence available.

The assemblage from the smelting mill contained species from more than one stratigraphical horizon. The occurrence and frequency of certain species suggests the presence in this sample of coals from the base of the Lower Coal Measures but other species are present which suggest the presence of coals from horizons higher in the stratigraphical succession. In particular, one species, represented by several specimens, is only found in coals occurring above the mid Modiolaris Marine Band (Clay Cross Marine Band of Yorkshire) thus indicating the presence of coal of Middle Coal Measures Age.



If it is assumed that the lower reflecting coal from the smelt mill contains the species found in the coals from the colliery tips having similar reflectivity then the species from the younger coal are contained in the coal of higher reflectivity. If, in the mid 18th century, the coals were only being worked at or near outcrop then the nearest source of coal of the appropriate age and rank would be the Yorkshire Coal Field in the vicinity of Barnsley. The seams in the Burnley Coalfield are confined to the Lower Coal Measures and, although of appropriate rank., are not of the required age.

CONCLUSION

The coal from the Lumb Clough Lead Smelting Mill, is derived from at least two sources. Part could have come from local mines but a higher rank component was probably imported from other parts of the Yorkshire Coalfield or from more distant sources.

From Report N.C.B. Yorkshire Regional Laboratory
YRL. 3040 by A.H.V. Smith.

IN CONCLUSION

As stated before no documentary evidence on the mill has been discovered. From the list of miners names in the Kildwick Parish Registers and the design of the mill and furnaces we can presume that the mill was built around 1700 and continued in use up to at least 1746. It my well be on the evidence of the coals found at the site that the mill was working when the Leeds and Liverpool Canal reached Kildwick in 1773. The building itself must have stood intact for a long time, it is marked as a ruin on the first Ordnance Survey of the district (1843). It is thought that the structure was completely vandalised in the early 1920's when Lumb Clough or as it is better known today Sutton Clough reverted back to a public right of way after the demise of (Hartley's) Sutton Hall which had incorporated the lower part of the Clough in its gardens.

J.M. Dickinson., Sutton in Craven, October 1974.
M.C. Gill,
H.M. Martell.

The authors would like to express thanks to members of the Leeds University Mining Department and the National Coal Board, Yorkshire Regional Laboratory for analytical work undertaken and any member who assisted at the dig. [10]