The Ringing Rake and Masson Soughs and the mines on Masson Hill

Digitalised by Roy Fellows for the purpose of private study and research only. Extracted from the Bulletin of the Peak District Mines Historical Society, Vol 8 No2. Copywrite PDMHS and the various authors

Produced by scan and OCR to Microsoft Word from original document, and then converted to Portable Document Format December 2007. Please excuse any errors.
Rediscovery of a previously unknown sough and mine system has led to survey, geological archaeological investigations, combined with a review of documentary sources. Workings of 18th century and 19th century have been identified, together with a considerable range of artefacts. Until recent quarrying removed the central section, the sough led to almost 5 miles (9 km) of mine workings, including the previously surveyed Masson System.

INTRODUCTION

The Mines of Masson Hill have been previously described by Flindall and Hayes (1976) and Flindall and Swain (above2 whose survey reached as far as Gentlewomen's Engine Shaft, whilst Workman (1974) described an isolated shaft and working, probably on Shining Rock Vein. The almost simultaneous rediscovery of an extension eastwards, towards Matlock, of Gentlewomen's Pipe, and of a sough system now identified as Ringing Rake and Masson Sough in 1977, led after much digging through blockages to a connection of the systems. This article describes the discovery and subsequent exploration and survey which was carried out by David Warriner and Norman Birkett, together with an archaeological and geological investigation by Lynn Willies (with acknowledgement to J. H. Rieuwerts). Photographs were taken by P. Deakin, R. Bird, D. Warriner and M. Critchley and illustration of artefacts by John Pickin and Tony Dixon. Other PDMHS members have been actively involved, notably Les Riley, John Peel, and Terry Worthington.

We are especially grateful to Mr. Stuart Younds, formerly of Dale House, Matlock, and Mr. Frank Kirkham of Greenhill Farm for their co-operation and encouragement over access. Artefacts removed have been deposited at Peak District Mining Museum.

Note on names used

During the three years of exploration and survey, shafts and mine sections were given temporary names for convenience, and these have been adopted in the geological and archaeological sections so as to accord with historical development. Temporary and rediscovered names follow:

"Younds Level" - Ringing Rake and Masson Sough  
"Railway Shaft" - Haslam Pipe Founder  
"Day Shaft" - Deep Shaft  
"Toadstone Shaft" - Forefield shaft  
"Toadstone Bank", "Jigging Box", and "Clay Shaft" area -probably old Jant Mine (also known as Tant Mine on some documents)  
"Overseer Shaft" - Upper Close Shaft  
"Queen Shaft" (its modern name) - Gentlewomen's Pipe  
Engine Shaft (and mine)

EXPLORATION AND SURVEY

by David Warriner

The entrance used in the survey is at N.G.R. SK 29555945 in the back yard of a block of flats. It was found in 1977 by Stuart Younds, who was then the owner of the property. He was digging in the front garden for a drain and broke through into a level which ran under the house and on into the hillside. He had a look inside but did not go in, after which the hole was blocked up for the drain. Some time later, PDMHS was contacted with a view to making a new entrance in the back-yard. Two weekends and several trial digs later, an entrance sunk through a retaining wall was made into a roomy passage, about 6 ft (2 m) high going almost due north. The passage passed flooded stopes on the left, into which a stream flows. At this point a short trial is seen on the right going east. Up
the Day Shaft is met, 269 ft (82 m) deep with one small trial driven off at the 90 ft (27.5 m) level. The passage continues to the head of the Waterfall Shaft. Passing this one comes to a "Y" junction, and by taking the right hand passage after a short distance the Day Shaft is met, 269 ft (82 m) deep with one small trial driven off at the 90 ft (27.5 m) level. The passage then takes the form of a coffin level, and as will appear, is a sough to Gentlewomen's Pipe Mine, on Masson Hill. Further along the sough the next trial goes off on the left, but only for a short distance. Another trial, this time going for 300 ft (91.5 m) again on the left, is met about 750 ft (229 m) along the sough from the Waterfall Shaft. Passing this one comes to a "Y" junction, and by taking the right hand passage after a short distance the Day Shaft is met, 269 ft (82 m) deep with one small trial driven off at the 90 ft (27.5 m) level. The passage continues to the head of the Waterfall Shaft. Following the left hand branch one is back in the coffin level and still following the stream, after 300 ft (91.5 m) the coffin level ends and the passage changes to a more rough section at the site of an old washing floor. Some parts of the level are old cave passages widened here and there. After a short distance the Waterfall Shaft is reached, rising about 81 ft (25 m) with a stream flowing down it. Just before this point the left hand branch was met, with water up to within 2-3 ins (5-8 cm) of the roof for about 40 ft (12 m). On the left side of the entrance is a blockage of solid rock. This had a very small triangular shaped hole at floor level with the stream flowing out of it, and there was also a small drainage culvert. A dig at floor level managed to get under the rock and into a small chamber, from this a low, 3 ins (8 cm) high, silted-up passage with the stream running down led off into the distance. A way was dug and forced through to a small chamber where the passage out the other side was back-filled completely. About 21/2 tonnes of silt was removed from the low crawl to make entry into the chamber easier. The final stage was a dig in the back-filled passage leading from the chamber which broke through into the chamber at the bottom of the Overseer Shaft at 2 a.m. one Saturday morning. The party of two went through the system and out of Masson Cavern back entrance making the first uphil through-trip. The section from Overseer to Queen is straightforward apart from the stope section where the way through is found by trial and error. Overseer Shaft later was found to be open upwards for 177 ft (54 m) where it was blocked. It was located on the surface and dug out for 20 ft (6 m). The side of the shaft was then supported with 3 ft (9 m) diameter air ducting, to make an easier approach for the surveyors. A through-dig intoPrincetown Shaft, the highest open shaft on the hill and out of the bottom entrance of Youds' level, was done before the shaft was quarried away making a total fall of 700 ft (250 m) and a distance of about 13/4 miles (2 km) underground. This required only 100 ft (30 m) of abseil rope, and could be considered a British caving record.

**Subsidiary sections**

**Shafts - Day Shaft**

**Climbing Shaft Series**

**Back at Toadstone Bank the left level follows a stream round a corner and a passage on the right has an old wheelbarrow, now collapsed and rotting away, laid in the entrance. On entry to this passage the level from the Toadstone Bank is seen on the right. From a turn left and climb up, it then levels out and at this point the side passage from just before the 5 ft (1.5 m) deep sump joins on the right. From here one drops down sharply to the head of a 7 ft (2.1 m) deep drop to a jiggling box on the main stream level. The main passage now has a high level passage on the left: this is the left-hand branch and will be referred to later. Following the main line round a short right-hand turn a short distance further on the joggling box is seen again. Here a number of tools were found stacked against a wall as if ready for the next day's use. These included: wedges, hammers, small kibbles, a sieve and a straw fuse. The passage from the wheelbarrow can be seen above and at the back of the box. The level now turns left and starts to climb and the stream is lost, running out of a jumble of rocks, its origin not known. Leaving this behind a steeply rising passage is gained on the left, which climbs up and over the main line and runs parallel with this for about 100 ft (30 m) to the head of a shaft in clay, which drops down on to the main line below. It then continues to a small stoppage going up about 25 ft (7.5 m). The main line continues to rise to the foot of the "Clay Shaft" which is 16 ft (5 m) deep, it only goes about 200 ft (61 m) further with a flat-out crawl until just before the end, which seems to be more back-fill from above. It is possible that this exploration took place during the "Clay Shaft" as no exploration took place in it. The passage was found by a group from Derby, including Mr. John Miller and others who were kind enough to inform us of their discovery. This ran from the bottom of the Shafts (or Gentlewomen's Engine Shaft) down the hill as far as the "Overseer Shaft" with no further way on. The first half of this extension is a complex stope; at the far end of this is a drop-down into a passage running down the hill as far as a chamber just below "Overseer". This new extension was surveyed, and a temporary survey of the "Yoads Level" put us about 150 ft (45 m) away and likely to connect. In the bottom chamber below Overseer Shaft, a drawing, possibly of a mine overseer, gave its name to the shaft, (cover photo).

**Left hand branch**

This rises steadily up following the stream from Queens (Gentlewomen's) Mine, passing on the way a level on the right which goes again to the joggling box but about 10 ft (3 m) above it. Shortly after this a level is passed on the same side which goes to the foot of a 40 ft (12 m) climbing shaft to higher workings. At the top of the left-hand branch the passage height drops down to a flat-out crawl. Here the stream had silted up the passage and had to be dug out for 20 ft (6 m) but this is still very tight to get through. On the other side the height rises to 3 ft (1 m) and not much further on was a total blockage of solid rock. This had a very small triangular shaped hole at floor level with the stream flowing out of it, and there was also a small drainage culvert. A dig at floor level managed to get under the rock and into a small chamber, from this a low, 3 ins (8 cm) high, silted-up passage with the stream running down led off into the distance. A way was dug and forced through to a small chamber where the passage out the other side was back-filled completely. About 21/2 tonnes of silt was removed from the low crawl to make entry into the chamber easier. The final stage was a dig in the back-filled passage leading from the chamber which broke through into the chamber at the bottom of the Overseer Shaft at 2 a.m. one Saturday morning. The party of two went through the system and out of Masson Cavern back entrance making the first uphill through-trip. The section from Overseer to Queen is straightforward apart from the stope section where the way through is found by trial and error. Overseer Shaft later was found to be open upwards for 177 ft (54 m) where it was blocked. It was located on the surface and dug out for 20 ft (6 m). The side of the shaft was then supported with 3 ft (9 m) diameter air ducting, to make an easier approach for the surveyors. A through-dig intoPrincetown Shaft, the highest open shaft on the hill and out of the bottom entrance of Youds' level, was done before the shaft was quarried away making a total fall of 700 ft (250 m) and a distance of about 13/4 miles (2 km) underground. This required only 100 ft (30 m) of abseil rope, and could be considered a British caving record.
A climb of 40 ft (12 m) up a shaft off the left hand branch lands one in a high, wide passage. The top of the shaft is unsafe, and should be treated with West care. The level runs upwards and passes several small trials; one of these runs to the foot of a stope, at the end of the level there is an 18 ft (5.5 m) climb.

Climbing up this the level continues in the same direction for a further 300 ft (91.5 m). At the top of the climb the passage also goes to the opposite direction over the top of the passage below it, it then turns left then sharp right, over the top of the stope mentioned previously, it then continues for a further 200 ft (61 m) to the end of the trial.

**Waterfall Shaft Workings**

The only way to get into the above workings, which are about 500 ft (150 m) in length, is a free climb up the 80 ft (24.5 m) shaft near the entrance. This is against a stream which varies in volume depending on the time of year but is usually very severe. At the top of the shaft the passage follows the strike and goes off in a north-easterly direction driven in a bed of toadstone about 5 ft (1.5 m) thick dipping at 20°. After 30 ft (9 m) it turns left at right angles. This part is very low and one is forced to crawl in the stream. A little further on the passage gets higher until there was a fall where no further progress could be made at this level. The stream could be seen flowing out and over the fall from the passage beyond, and the dig was started to lower the water level. When this was done it was found that the passage beyond had silted up to within 3 ins (8 cm) of the roof. This was forced for a further 20 ft (6 m), but had to be left due to the deep liquid clay that resisted efforts. So the origin of the stream remained a mystery and an attempt to further get left was until some it was washed out. Directly above the fall a climb up 14 ft (4.25 m) leads to a 3M passage which has packs on one side, but is mainly natural. This is straightforward and takes two turns, first right then left, and through a jumble of boulders. Following a low passage for some distance leads to a shaft in the which was descended to a level at the bottom which is timbered and is unstable. A short dig from here led to the bottom of a further shaft, Rocks Shaft, which though covered over, had at some time been open to allow plastic debris to be thrown in.

**Waterfall Extension**

The dig that was started in November 1979 was left for a year to allow the silt to wash out. In December 1980 the fall was tackled again, a trench was put through to allow lowering the silt on the other side still further with the resistance of slow wet-winter water flow. The passage beyond was silted up for 50 ft (15 m) and then came out into another fall 40 ft (12 m) long whilst the passage beyond was also silted up. A further dig was started through the fall and silt, and it became evident the level was a sough as it was carried off by a strong wet-stream bringing the water level of Ringing Rake at about 340 degrees. Through this dig was a low passage that looked for the first part like a partially silted coffin level. This soon changed to a rough passage about 3 ft (1m) high and 4 ft (1.2 m) wide which was followed for 50 ft (15 m) with a dig through two more short lengths of blockage. This came out into a back-filled reaching down to the clay bed with another fall with the water flowing over. After 10 ft (3m) of digging was a passage 2 ft (0.6 m) high with 8 ins (20 cm) of water for most of its length. This was cleared of falls and after 100 ft (30 m) a shaft that had run in was seen on the right hand side. The bottom of this was calcited up, with the stream flowing out. The level went another 80 ft (24 m) and rose to between 4 ft (1.2 m) and 6 ft (1.8 m) high, ending in another fall with water flowing out through the fill. The total length of the extension is 400 ft (122 m) (110 ft (33.5 m) of which was dug out), and the source of the water is still not known.

The Survey was carried out using a tripod-mounted dial (except Waterfall Series) and fibron tape, and both bearings and elevations were taken. Shaft positions at surface indicated a high degree of accuracy using this simple equipment. The help of H. M. Parker is acknowledged for photographic reduction of the survey, and of Mr. J. Grayson and Mr. J. Stapleton, the Unit and Deputy Unit Surveyors at Mansfield Colliery for assistance with production.

**Shaft Capping** As part of the exploration, all shafts in the area, whether directly involved in the survey or not, had the ginges made safe where necessary, and were fitted with concrete sleepers supplied by Derbyshire County Council. A new lockable access with manhole cover has been made near the sough tail by courtesy of the Severn-Trent Water Authority and West Derbyshire District Council and with the assistance of Midland Road Construction Ltd.

**Decoration by Quarrying** Unfortunately fluor spar quarrying activity has destroyed the Crichman Workings on Masson Hill, making through-trips impossible. However, the system described, together with the Gentlewoman or Queen Mine section should survive mining activity, and has nearly two miles, or over three kilometres of mine and cave of high sporting and archaeological value.

**GEOLOGICAL FEATURES**

by Lynn Willies

**Geology of the area** (See Smith, Rhys, and Eden (1967) for a general background).

The lowest rock exposed in the area is the Matlock Lower Lava, with its maximum thickness exposed at outcrop on top of Masson Hill estimated at 380 feet (116 m). It is a dark green, amygdaloidal olivine-basalt for the most part, with the top portion, sometimes for several feet, weathered to a greyish-clay with red or brown streaks and mottingling. Only the top is visible in the mine workings, and it forms the base of mineralization as exploited. The Matlock Group which lies above the Lower Lava has up to 250 ft (76 m) of usually grey massive limestone’s, divided into Upper and Lower Limestone by the Matlock Upper Lava. It also has within it several prominent wayboards, or tuffaceous horizons which usually weather to a yellowish clay. These are useful locally for correlation, but are not always persistent.

The Lower Matlock Limestone, known as the second limestone to 19th century miners, is about 100 ft (30 m) thick, and forms the lower cliff on High Tor. At Masson Hill it is extensively dolomitised, the apparent result of introduction of magnesium when covered by the Zechstein sea in Permian times, but at the depth found in the mine workings explored, it is usually unchanged. A wayboard seen most easily in the recently quarried workings on top of Masson is some 60 ft (18 m) above the base, about a foot (0.3 m) thick of yellowish-grey clay with thin rubbly limestone included in it, and a vestigial layer of coal laminar. At about the same horizon a similar coloured clay was seen in some of, but not all, the workings and shafts, and, like the exposure on the top of Masson, it seemed to have exerted a degree of control on the vertical extent of mineralization, which is primarily found below it. Down dip, near the Haslam Pipe Founder Shaft, this wayboard seems to have split into three, separated from each other by a foot of limestone.

The Upper Lava seems to vary from about 120 ft (36 m) down to 50 ft (15 m) thick, thinning south-eastwardly. (See Fig.6). The base and the top are both heavily weathered, and greenish amygdales are visible in both relatively unaltered lava, and the clay. The clay, which is possibly partially tuffaceous in origin, varies from greyish-green to yellow brown, presumably dependent on the degree of oxidation. The lavas, whether upper or lower are usually referred to locally as toadstone (clay) though occasionally thick wayboards are thus termed also.

The Upper Matlock Limestones are seen best in the main cliff of High Tor, and in the limestone quarries where they are the principal economic beds. They are generally massive, greyish, medium or fine-grained, sometimes dolomitised, with occasional bands of chert, and with several wayboards, totalling about 80 ft (24 m) in all. At the top is an unconformity, and above it a foot (0.3 m) thick grey
The Veins. (See map of area 3 Fig. 5).

Here we are concerned with the veins between the Chirchman workings on the top of Masson Hill, and the town of Matlock, which by a combination of natural and pumped drainage, can be considered a single unit. Some effect may also have been felt from pumping in the mines under High Tor, but probably to a much lesser degree.

Mineralisation has taken place at two main horizons. In what to the 'old man' was known as the first limestone, under the shale of the Millstone Grit series and the Black Beds of the Cawdor series, and above the Upper Lava, and in the second limestone, that is between the Upper and Lower Lavas. Various wayboards also seen to exert significant control. In addition mineralization was also reported to be found in the faulted Upper Lava in Seven Rakes (Stokes 1822, p.163) and was observed by us in the Ringing Rake. All four major types of vein: rakes, pipes, flats and scrins, are present.

The major rake type veins run roughly NNW-SSE: Seven Rakes, which can be considered a faulted zone though with only slight displacement, was freed as seven separate parallel veins - obviously very close together (Barmaster Books of Entry 17/10/1816). As Slit Rake it cuts across the back of High Tor, and the River Derwent, through Shining Cliff and what is now Cawdor Quarry, then turns northwardly across the Derwent again, under the Shales. In Cawdor two main veins, a yard (1 m) or more wide, are seen, with about 15 ft (4.5 m) between of rock. Five other small mineralised joints in the face up to 50 yards (50 m) north of these may make up the Seven Rakes. In terms of drainage it seems to have been considered the key to the area. Ringing Rake, which cuts the front of High Tor, runs almost parallel to Seven Rakes. It appears most powerful at High Tor, where it is known as Raddle Rake, and dies out during hillocking operations, but since they do not seem to appear in the Gentlewomen's Pipe, they are presumably confined to the area.

Several even lesser veins, perhaps better described as scrins, trending northwest, such as Shining Rock, Old Meer Hole, and Hedgerow cut the middle ground between Crichman and the River. These have not been entered due to destruction of the shafts.

In those small areas of workings explored above the Upper Lava the lava again forms the base, but probably, to judge from the Haslam Pipe Founder Shaft, a somewhat lesser wayboard, some 20 ft (6 m) below the well marked Cawdor basal wayboard, limits the vertical extent in the Upper Matlock Limestone.
Only a limited thickness of the Cawdor Group was penetrated, but this does not anywhere seem to be well mineralised, perhaps because its clay content seems to inhibit cavernisation and replacement which appear to be important in both the Upper and Lower Matlock Limestones. There appears also to be a very marked difference in character in mineralization in the replacement flat of Crichman, with abundant yellow-brown fluorite, and the pipe and vertical development above seen in Gentlewomen's, with a golden-yellow calcite lining the pipe, and galena and white calcite vein stuff predominating above: presumably this is in part due to the lack of dolomitisation in the pipe, and partly also to a different paragenesis. Some calamine (smithsonite) was also observed in the pipe - but most lead ore therein seems to have been alluvial, contained in a gravelly or silty infill. No obvious reason was found as to why certain parts should have vertical development above the pipe.

The geologically most interesting area of the mine was undoubtedly the entrance section, in and next to Ringing Rake, for unfortunately although the vertical shafts allowed a reasonable correlation of lavas and limestones seen in the sections the presence of stalagmitic calcite prevented detailed examination.

The tail of the sough was formed by cut and cover through a soft and, when wet, ‘quaggy’ clay-silt, presumably deposited before successive lowering of the river bed when flooding was more prevalent. North of the road, the sough passes through a tufa arch under Dave House, and includes below sough level in the floor. These lower soughs presumably continue back almost to the river, since the stream which flows into the sough ‘reserves’ in the last part of the sough before pouring out into the river. The sough successfully utilises the weathered chloritised zone of the fault through the otherwise hard lava, before turning to follow the strike at its softer base. The major mineral in the lava is a pinkish calcite, in lenses in the chloritised material, with abundant zinc blende ( sphalerite), and a few more exotic minerals. This is in contrast with the lead-fluorite-calcite mineralization seen earlier in the Upper Limestone.

The base of the lava is on top of a wayboard or tuff material laminated with thin calcite horizons: these appear to have been disturbed by the encroaching lava, and have been deformed, the most distinctive feature being an en-echelon arrangement of the calcite lamination often characteristically sigmoidal. The lava appears to have cooled rapidly, with development of hyaloclastic, shard-like material, as well as the usual amygdaloidal textures.

The lava is shown to be about 80 ft (24 m) thick at Waterfall Shaft, with 5-10 ft (2-3 m) of a weathered amygdaloidal, rough-textured product, and clay a the top, with occasional pillow-like weathering structures. Beyond the shaft the sough, now presumably Masson Sough, turns against the dip, passing first through a rubbly material, probably another tuff-with-limestone in the limestone just below the lava, and becomes a typical coffin-type level in hard limestone. Occasional wayboards can be made out in the bedding planes - one such seems to have formed a marker horizon in the Haslam Pipe Founder Shaft, enabling them to locate, and drive (at a later date) to the sough. Some 200 ft (60 m) beyond the Haslam Pipe Founder are the ‘three clays’ as they were later referred to, an in or so thick, and each a foot (30 cm) or so away from the other, dipping at 100 towards the shaft. These were certainly considered a marker horizon, below which were the bearing beds. Could these be equivalent to the single thick wayboard further up hill? A further thin wayboard, visible only on the bedding plane, forms the roof, as the sough meanders to follow the strike for a short distance before the Deep Sough, it may have been used as marker for the trial level driven 300 ft (90 m) south-west out of the sough.

Beyond Deep Sough, where unfortunately it has not been possible to determine at what depth, if at all, the miners met the Gentlewomen's pipe, the sough turn through two right angles, each following a joint, but clearly not being dominated by them, since the first continues unexploited. Here it is within yards of the pipe and its horizon, and possibly water flows were encountered on the joints, and for that reason followed. The first joint lies possibly on the range of the upper part of Gentlewomen's Pipe, and may have released some water with later a re-alignment onto the lower already exposed pipe section. A little further on the sough intersects the pipe, presumably meandering across its range - certainly little notice was generally taken of the character of the limestone beyond local use of suitable joints or bedding planes.

Mineralization of the pipe has been partially considered above - primarily it is lined with a yellow-golden calcite, up to a foot (30 cm) or more thick, which commonly displays erosional features typical of cave systems: occasional a little galena is found behind it, but rarely enough to cause the miner to strip the walls systematically. The principal infill of calcite debris, beside being painful to those crawling over it, was the major source of galena, and occasional pieces - nuggets - were found by ourselves. It seems possible that galena was originally probably concentrated at, if at all, near the floor, as the result of vadose flow of mineralising fluids down-dip. A great deal of the material has been sorted through and washed underground. In the vicinity of Deep Sough near the junction in the extensive stopes above the line of the pipe in infill is a rather gritty clay - not obviously related to nearby solid material. This is strong enough to form footholds in the shaft to climb on, and extends vertically for 20 ft (6 m) or more. There is no sign of it in the stopes above. Possibly it marks the original (pre-mining) variation in water table. Above the Forefield Shaft two water flows combine, only one of which can be followed far towards its source. The left updip or south-westerly branch continues up Gentlewomen's Pipe until just below the stopes on the lower side of Gentlewoman’s Engine Shaft it emerges from a joint, and clearly runs parallel perhaps five yards south-east of the main pipe. However, some distance higher, route from the stopes below the engine shaft leads into the lower pipe via a connection. The stream is again located updip of the engine shaft in longer known section of Gentlewoman's Pipe. From this evidence it is possible to hypothesise that the Gentlewoman's Pipe is perhaps three en-echelon pipes developed as adjacent but separate pipes.

Above the Upper Lava, the workings entered are too small for generalisations about vein content, but presumably fluorite was a major ganguing material since the hillocking around Hedgerow and Meershore Veins in the 1950s was for this mineral, and would require well in excess of 30%. In Haslam Pipe there is some fluorite and calcite visible, and presumably the sands and gravel present have further reserves together with limestone and chert rubble: again this denotes a different mineralization regime from other areas examined.

**ARCHAEOLOGICAL FEATURES**

by Lynn Willis

No actual excavation, in archaeological terms, has been carried out, though it has been contemplated for the surface site of the 1802 Fire Engine Shaft on Seven Rakes, which is under threat from hillocking for fluorite. The digs, referred to in the account of exploration were made to remove debris washed in by the stream, subsequent to mining, or falls of rock from the roof or stopes. The conditions of preservation generally have made excavation unnecessary on the one hand, because tools, etc. and workplaces are still visible as left, whilst it is also frequently impracticable, for reasons of space and stability, and difficulty of access. Substantial scope exists for further detailed work on stopes, working chambers, and passage types.

Unfortunately, several artefacts were removed surreptitiously, and are still missing, though a photographic record is available.

**Surface features relating to the surveyed area**

The Ringing Rake forms a fairly easily defined range from near the top of Shining Cliff, to about 50 yards (50 m) from Greenhills Farm, with a series of hollows and shallow trenches, now grassed over. Above the underground ‘Waterfall Shaft’ is a
well-defined mound, with toadstone-clay debris, with centre 'run-in'. This has not been located underground. The shaft at north end of the upper level in Ringing Rake has a small collapse depression at surface whilst the shaft discovered underground at the end of Waterfall Series, 'Rocks Shaft*', has been located in the grounds of Rocks House, but has not been descended due to the unstable conditions below.

The range from here to the tail is defined by the Raddle Hole extension on the side of the river, but the sole indication of a level into the Rake is a foot diameter drain pipe discharging water, and some mineral fragments in river.

A short distance from the 'Waterfall Shaft' site, a large hillock has the am Pipe Founder Shaft originally protected by barbed wire and a section of railway line, thus the temporary name. A line of shaft mounds running uphill alongside the boundary to Shining Cliff wood marks the Haslam Pipe range, but are closed or run-in. Further along the range of the Sough is Deep Shaft, which rectangular top had been badly damaged by a large tree which spanned the top. A few yards away a shaft about 60 ft (18 m) deep, possibly originally Greenhill Mine, is blocked below by debris. It is roughly circular and about 4 feet wide.

The position of the Forefield Shaft has been obliterated by hillocking along the former tips of the Hedgerow Vein, but may be marked by boulders infilling a hole. The Upper Close Shaft had collapsed from old age, but appears once to have been surrounded by a square building, a coe or storehouse the shaft at the centre, and is so shown on older large scale maps.

Gentlewomen's Mine Engine Shaft has been filled with rubbish too revoltling to be moved.

The Shafts (See Fig. 7 for open shafts)

Two shafts are now open from surface into the system, a third is blocked and at least two others probably once had a link to the surface. Two r shafts in the Upper Gentlewomen's Pipe section are also blocked near surface, but are not considered here.

UPPER CLOSE SHAFT is some 197 ft (60 m) deep descending almost vertically, until just above the line of the pipe it falls into a narrow solution cavity, it hades slightly causing rope-marks (3/4 inch diameter) to be developed. The top of the shaft was originally ginned with limestone rubble (only a little of which now remains), but once in hard rock (basalt and limestone) it has an angular section of only 45 x 18 inches (1.15 x 0.45 m). Just below the basalt at 71 ft (21.6 m) the long axis of the lower section is at right angles at above, and a *standing hole* has been constructed in the limestone: the change may indicate the shaft was made by rising from below concurrently with sinking from the surface, but if so indicates considerable surveying skills. A short picked level is driven off northwardly and horizontally in the limestone 15 ft (4.5 m), at 160 ft (48.8 m) depth, for no obvious reason but probably to try and intersect an upward extension of the pipe. The bottom of the shaft initially had a wooden platform, supported on stemples, below which the pipe dips steeply. Material to be wound could be dragged horizontally from the up dip side onto the platform, and despite the standing hole, was apparently hand wound direct to surface. Its isolated position suggests it was also used man riding - absence of stemple holes precludes climbing. It is difficult to asses the mode of construction, but it appears entirely hand-picked or barred. Association of this with dates and the 'Overseer' drawings below suggests a late or early 18th century date.

FOREFIELD SHAFT is today only open from below. When found it was totally blocked with toadstone clay, and is still so blocked about 20 ft (6 m) up. Our attempts at clearing it had obviously been preceded by those of the miner, probably in the mid-19th-century, using a wheelbarrow to dump the material on 'Toadtone Bank', a short distance up-passage. It appears similar in size to the Overseer Shaft, and was used for winding, as shown by kibbles etc left it. Since this is the lowest shaft in the series before the sough was driven, the fairly steep slope down-dip below it was probably then flooded. It was possibly a collapse of toadstone clay from above the lava (?) which caused the abandonment of the mine.

DEEP SHAFT is 269 ft (82 m) deep to the level, and continued downwards, though part is now blocked with rubbish. It is roughly circular and about 6 feet wide. The shaft initially had a wooden platform, supported on stemples, below which the pipe dips steeply. Material to be wound could be dragged horizontally from the up dip side onto the platform, and despite the standing hole, was apparently hand wound direct to surface. Its isolated position suggests it was also used man riding - absence of stemple holes precludes climbing. It is difficult to asses the mode of construction, but it appears entirely hand-picked or barred. Association of this with dates and the 'Overseer' drawings below suggests a late or early 18th century date.

HASLAM SHAFT(HASLAM PIPE FOUNDER) The sough is connected to this shaft by a short drift, with shot holes of 1 inch (2.54 cm) diameter. The top of the shaft, which was originally picked, but larger section coffin-type level. On the wall the initials I.M. accompany a date, 1796. A similarly large coffin-level connects with a sump in the floor, originally with timbers on which a stoce stood - plumbed at 50 ft. (15.2 m). Above the sump, the sump-head has been blasted out using 1 ins (2.54 cm) diameter and 7/8 ins (2.22 cm) diameter shot holes. Unverified reports of a dive suggest is no connection at the bottom with either workings or the sub-level of Deep Shaft. It does not seem possible to determine whether Deep Shaft was sunk during the driving of the sough - all evidence including documentary points to its active in 1796, using a horse gin (space, but no direct evidence at the surface) to wind water from below sough, presumably to reach the pipe horizon. Today it is not possible to distinguish between water entering the shaft from above, and from the sub-level, and in summer the level in the nearby sump is (3.5 m) or so below sough, though water-lain clay on the floor indicates flooding at times.

HASLM SHAFT(HASLM PIPE FOUNDER) The sough is connected to this shaft by a short drift, with shot holes of 1 inch diameter, outwards from the shaft, indicating the shaft was connected to the sough at a later date than driving, possibly, in conjunction with other evidence, as late as the mid-19th century. Unfortunately, the shaft is now blocked in the toadstone-basalt, at a depth of (44.5 m), so that up to 100 ft (30 m) of debris may have accumulated. of the shaft, The Top of the shaft, which was originally distinguished by having a section rail of part of its cover, is comparatively large, approximately 6 feet diameter, now irregular due to a damaged ginge. Below it opens out into a wide mineralised and debris and sand-filled joint, separated from the overlying Cawdor Beds by a substantial clay wayboard: small wooden props, decayed but still in situ, have been used to prevent slumping of the overlying thin limestone beds over the wayboard. These are arranged round the shaft at 3 ft (0.9 m) intervals, each 18 ins (0.5 m) high, resting on the thick bed of limestone below. Much of the infill of the shaft has been derived from below this, extending down to about 98 ft (30 m) depth, where the shaft is about 15 ft x 12 ft (4.6 x 3.5 m). Several possible passages are apparent, but have not been entered because of stability problems, except for a substantial level or wagon gate 6 or 6 ft (1.5 or 1.8 m) high at 95 ft (29 m) depth. This follows a vein in a widened joint, for some 250 ft (76 m) on a general S.W. bearing, probably intersecting another shaft, still visible but blocked at surface. It has had a substantial railway laid in it, of probably about 18 ins (0.46 m) gauge, as shown by sleeper holes, suggesting mid-19th century or later work. Below this level the shaft enters the toadstone and is circular with a diameter of 6-2 feet (2 m). Large diameter shot holes, 11/8 inch or 11/4 inch (2.8 or 3.2 cm) a few up to two feet (0.6 m) long, suggest a mid-19th century sinking date. Except for the section at the top of the lava, it is in perfect condition in the hard basalt. Like Deep Shaft it also has a very narrow level driven northwards right at the top of the weathered lava, carrying a little water, but it is not feasible to enter it.

Today it is not possible to distinguish between water entering the shaft from above, and from the sub-level, and in summer the level in the nearby sump is (3.5 m) or so below sough, though water-lain clay on the floor indicates flooding at times.
WATERFALL SHAFT. This is a shaft or sump, sunk from workings above the lava to the level below, probably simultaneously, as the level bends to meet it. It has the usual size of above 31/2 x 1 1/2 feet (1.07 x 0.45 m) typical of late 17th or early 18th century shafts, and delivers considerable volumes of water at rainy times. This was originally directed into a wooden 'trunk', about 6 ins x 6 ins (15 x 15 cm) extending down the shaft, where the bottom is still visible at the sough level. The lava is here about 85 ft (26 m) thick, with a low level, partially blocked with silt and clay, heading in a northerly direction driven through the toadstone clay, on the approximate range of Ringing Rake. Beyond a silted up 'coffin' type section, the passage, still the toadstone clay, drains a stope overhead. Near the end of the accessible section, the passage size diminishes, until only just passable, and it may originally have been natural. Fallen calcite deads end progress in this northerly direction on Ringing Rake: a possible passage overhead was too unstable for entry.

An alternative section from near the Waterfall Shaft gives access to down dip natural cavities, and to spasmadic working in vein. This section probably once connected to 'Dogleg Shaft', and certainly has been open to surface at 'Rock Shaft' in recent times, as evidenced by plastic debris. The section near 'Rock Shaft' is unstable.

The Sough (See Fig. 2)

In Ringing Rake. Two stages of development, possibly three, are clearly displayed in this section. Advantage has been taken of the faulted area through the otherwise extremely hard toadstone. Traces of the original level, of coffin section, similar to that described later, are seen low down on the sides of the existing level: the later and larger level has evidently been re-driven in the roof of the earlier. The actual tail today is a clay-tile drain steeply angled from the floor of the level towards the river: originally the river stood at a much higher level, obstructions in the bed having been removed first in the 1790s, then again, more thoroughly in 1977, to alleviate flooding upstream. The roof of the present walled and slabbed section under the road and Artists Corner Park is about 5 ft (1.7 m) below surface: the original level would thus probably be some 9 or 10 ft (3 m) deep at this point. Beyond the road, it enters an arched section beneath the foundations of Mr. Yould's house and then enters into the limestone. It is now a commodious walking level with former stopes extending below water level on the left (S.W. side): some are now blocked off, though the sump-head remains but two other sections are still open, with water up to 34 ft (10.4 m) deep. 1 inch (2.54 cm) diameter drill holes suggest at least some of the widening was done in the 19th century, thou the possibly earlier 7/8 inch (2.2 cm) are visible too. A short cross-cut is driven out from the northernmost (on the right hand) of the two low levels in the sough: it has a coffin type section (modified by a wayboard and easily broken limestone bed in the roof - presumably it was part of the original sough. searching for a branch of the se Rakes). A line of 1 inch (2.54 cm) drill holes in the roof have been used to rip down the weak bed - either by blasting or by plug and feather. Partial widening has also been done using 1 inch (2.54 cm) drill holes on the right hand side, possibly or even probably at a later date. In the softer parts of the rock, a broader mattock-type (hack) blade has been used instead of the usual pointed pick. A similar passage to the 'Dogleg' shaft is developed under a wayboard on the left hand side a short way on. The Ringing Rake section is terminated by a short passage and water-filled sump in line, but off the sough route. The passage is rough hewn about 5 ft high by 3 ft wide (1.5 x 1.0 m) wide, the sump some 12 ins (12 cm) deep. A little water flows in it in wet weather, but is up to 4 ft deep (1.2 m) down in dry.

The few drill holes present are 7/8 inch (2.2 cm) diameter. Somewhat surprisingly, there does not seem to be a continuation along Ringing Rake, though this passage below the present floor is not entirely precluded, and a connection can be made from Waterfall Shaft.

The Sough to Deep Shaft. From Ringing Rake, the sough at first follows a strike direction at the base of the lava, taking advantage of the softer material. So far as Waterfall Shaft, it is again developed mainly in the roof of the earlier level, which has been ripped out and widened by a 'line' of sholes (7/8 inch (2.2 cm) diameter - one still with the stemming intact). At Waterfall Shaft the passage broadens and deepens (in water), and beyond, except for loose (tuff-like) material which has fallen from the roof, the way on is in the original sough, badly silted as far as Haslam Shaft, causing the explorer to lie flat-out in the water near Waterfall and to crawl until close to Haslam. The water level implies an original gradient of almost one in fifty in this section.

The connecting passage to Railway Shaft is clearly of later date, with 1 inch (2.54 cm) diameter drill holes 9 inches (0.23 m) long, as also in the shaft itself. It enters the sough via an 18 inch (0.46 m) high 'step', and is probably nearly 3 ft (0.9 m) above the original base of the sough. The drill holes show the miner first blasted out the top of the passage, above a styloite or wayboard heading, then drilled holes into the sides until the a hole to out to its full four feet height. The step and its position probably suggests Haslam Shaft was designed for lifting water from below, up to sough level. Beyond Haslam Shaft the sough is a full height coffin level, picked and wedged from solid limestone. Some difficulty appears to have been experienced during driving in maintaining the level, since some 20 yds (18 m) on, the floor has been chopped out below the sweep of the pick marks, and in several places the roof has a 'step' (or underside of a step), probably marking further recent regrading hidden at floor level by silt. The temptation of a convenient wayboard has occasionally caused the full 51-2 ft (1.7 m) height to be lost, and there are occasional almost inexplicable convexities in the roof line which make passage uncomfortable and inconvenient: it is very possible these may indicate arc-levelling, and consequent deepening of the sough.

Two side passages have been driven out of the sough in a southerly direction. The first is a rectangular 3 ft x 1 1/2 ft (1.07 x 0.45 m) pick worked level, backfilled a few yards, and developed under a greenish wayboard - this is probably more or less contemporaneous with the sough. The second is just over 100 yards (92 m) long, and clearly of later construction, probably late 18th or early 19th century, with a 9 inch (0.23 m) and 12 inch (0.3 m) long, slightly triangular section 1 inch (2.54 cm) diameter shot holes, rough hewn, 2h to 3 ft (0.76 m x 0.9 m) wide, and 51-2 to 6 feet (1.7 to 1.83 m) high - the whole of quite different 'character' to the Haslam Shaft connecting passage. Egg and eye holes placed horizontally at shoulder height probably supported ventilation pipes during driving. A sump now only 6 feet (1.9 m) deep containing rubble may once have gone deeper. The proximity of this trial to the main line of the sough is difficult to explain in any terms of mining terms. Just before Deep Shaft the sough turns sharply left, with the route to the shaft straight ahead. A small chamber is formed at the junction at which point the miners appear to have been quite undecided about which direction to continue with at least four 'false starts' before the decision was made to drive in the present direction (see Fig. 4). Past the junction the passage to Deep Shaft itself (i.e. not the sough) is still hand picked, but of larger and comfortable dimensions, five feet (1.5 m) and 21 inches (0.53 m) wide at centre. It appears to have been driven to meet the shaft, since a sharp change in direction suggests an initial error. The bottom of the shaft opens out to a roomy chamber, 12 feet (3.66 m) wide by 6 feet (1.8 m) high. A short length of ladder was found on one side, badly damaged, wooden sided with iron rungs. On the wall L.M. 1796 had been picked out. Drill holes in the chamber are 7/8 inch (2.2 cm) diameter, by 10 inches (0.25 m) long. Beyond the chamber an even larger picked passage 64 inches x 28 inches (1.63 m x 0.7 m), with possibly six or more inches (15 cm) of mud on the floor, leads to a sump head with a water filled sump some 50 feet (15m) deep. Timbers in a very much decayed state remain from a hand windlass. Drill holes were found of both 7/8 inch (2.2 cm) and 1 inch (2.54 cm) diameter. It can reasonably be presumed that the blocked downward continuation of the Deep Shaft and this sump represent effort to sink down to the presumed horizon of the main pipe: the date 1796 is reasonably consistent with other documentary evidence for this work (below).
SOUTH FROM DEEP SHAFT JUNCTION TO THE PIPE. From the junction, the sough follows a joint, which has been partially picked out, partially plug and feathered, and blasted. About 10 yards in the passage has been widened using 1 inch (2.54 cm) drills (as a passing place?), in contrast to the 5/4 inch or 7/8 inch (2.2 cm) drills elsewhere. The remains of a plug and feather remain in one of the 3/4 inch (1.9 cm) holes. but the 7/8 inch (2.2 cm) slightly triangular holes seem generally to represent a later widening, especially on corners, or to provide an alternative to picking where the joint presents a weakness. After a few yards more the sough turns through a right angle, with a few inches of blind heading (see plate 1, fig. 2), and the initials DB inscribed on the wall. The blind heading has a thin, mud filled joint, whilst the sough also follows a joint for a few yards, again exploited apparently by plug and feather. It is conceivable that here the miner followed the major water channel. A little further on the joint was abandoned, and the coffin-shape resumed. For some reason, the level here was lost, and the passage rises for a few yards, after which the pipe was intersected. Subsequently a coffin-type bypass-passage was made with a dam to divert water away from the pipe.

Gentlewoman’s Pipe

THE PIPE, TO THE FIRST WASHING CHAMBER. The pipe at the intersection forms a natural chamber, bisected by the stone and clay dam, with walls lined by calcite. The pipe below the dam is nearly silt-filled and it is not possible to see to what extent it has been mined below sough level. This first chamber has been used for washing ore, and for storing 'dead's': slots in the wall suggest a substantial beam was formerly placed across the chamber, just up from about three feet above the floor level. A second dam, three feet high, but now breached has been built 10 yards upstream, and may have held back a convenient supply for washing purposes. Up dip beyond this area, only sufficient mining has been done so as to remove restrictions, using a 1 inch (2.54 cm) drill to produce trianguloid holes. Some deads have been stacked at the sides and in avens in the roof, which were derived from working the alluvium. Just before the first washing chamber a small cross-joint has been opened out, using 7/8 inch shot holes - the debris has been dumped in the pipe, suggesting late stage exploration, but despite a thin lead ore string it was abandoned after a few feet.

FIRST WASHING CHAMBER. Water flowing in this chamber has been diverted down stone-lined culvert, over which washing waste, "fleet or fastings" has been piled, making it virtually certain access was from further up-dip. Heaps of well sorted material, from a coarse sand to pea size, and routher assorted waste disguise the true height of the chamber, which is mainly natural except for some small are areas where there have been tripped out lead ore (1 inch shotholes). Though these in total do not amount to much, they have some surprisingly large lumps (up to 4 inches wide) of lead ore in a calcite matrix left behind. This was probably again late-stage working, since no back-filling has taken place. Above the chamber the pipe narrows once more, and occasionally the passage is restricted by stacked deads, so that movement past is difficult. Some late stage working, similar to that in the chamber has taken place in several screns and cavities rising above the pipe.

THE FOREFIELD SHAFT AND OLD JANT MINE. (Fig. 3). Two areas of the mine had tools left in situ, in both cases carefully stacked (plates 2 & 3). The first, near the Forefield Shaft, had the rotted remains of a kibble, vat, and riddle, with sundry hand tools and, opposite, a small stone-lined hollow in which was a scraper or limp, and the rotted twigs of a small hand-brush - a temporary store for ore possibly. The second, in the 'jigging areas', had substantial remains of a hutch or brake-sieve and a range of tools including drilling equipment, riddle, and sheet iron batten dish, crowbar, and a straw (fuse?). The two areas are connected by a passage at the minimum broad enough to use a wheelbarrow, for which blasting of rock has been necessary, though the height is in places a little low for working. A "shadow" of rotten wood, once a wheelbarrow, was found in a cavity at the side of the passage. An iron tub-wheel, of substantial size, but since unfortunately removed without consideration of the need for archaeological recording, was found in the bed near a retaining deads opposite the hutch though there is no evidence of the use of rolled waggons. The tub and wheel alone are sufficient evidence of working in the middle years of the 19th century or later.

The wheelbarrow appears to have been used to transport clay from the blocked Forefield Shaft to the 'Roadstone Bank' area, where it has been dumped on top of all other material, and clearly represents the last work done in the area, perhaps in the mine.

The mine itself at this level presents no remarkable features. It follows the pipe on a gentle incline between the two artefact areas, with the Gentlewomen's pipe flow of water cascading down a boulder-strewn chamber to the main passage and other stream, and has a complex of solution passages, with only occasionally mining of rock. Most of what ore was found was probably alluvial. On the walls, however, and which have been tripped out lead ore, there are small triangular holes indicating the presence of a 3/4 inch (1.9 cm) hawser laid rope were observed at an 18 ft rise out of the chamber. The way forward is an awkward climb, to a forefield which has been worked overhand from three positions at least, simultaneously (see diagram), either from convenient ledges, or in one case from a platform made of stone stemples. The waste stone has been dropped into the cavity below, possibly the Clay Shaft series. In places the width is little more than a foot, and the impression is of an under-capitalised desperate scratching of small quantities of ore, more as a trial "paying for getting" than for real profit. "Talliesman Alley" is a downward passage probably into a parallel scree, with tally-marks scratched on the wall in groups of five, partially obscured by a later pack. Presumably these represent kibbles or other containers of ore got. The overhand stopping and general appearance may suggest late stage working.

In the main passage again of the pipe, upstream of the entrance to the Climbing Shaft, the stream emerges from a very low, clay-lined passage, just sufficient to crawl through, and no doubt intended only to be just sufficient for water to pass. Beyond the "Connection" is the washing debris of the Upper Close Shaft Washing Floor, through which a passage had to be forced by the exploration team.

UPPER CLOSE SHAFT WASHING FLOOR. Again the true extent of this passage has been obscured by heaps of washing debris. At the lower end the present way through was back-filled with a gravelly material, and the original way on down dip was
probably by a six feet (1.9 m) deep sump in the floor, down which part of the stream water still flows. This gives (dubiously safe) access to a very low by wide passage under the washing floor, now silted to within a few inches from the roof. Apart from the shaft in the floor, the main feature is a 10 by 8 ft (3 x 2.5 m) buddling dam, almost filled with sandy material at or just above which the actual washing of ore took place. Immediately above it in the roof is picked a drawing on a conveniently flat piece of rock of miners in frock coats and pointed hats and high heeled shoes (see photograph). The style may suggest a late 17th or early 18th century date. Graffitti nearby includes “SF 1726”, “JR 1793” and in rather cruder letters “GEORGE”. Finds were limited to rotten wooden planks, and an iron-pointed shovell, at the bottom end of the chamber.

Beyond, updip from the chamber, a steep slope leads to the bottom of the Upper Close Shaft: presumably ore was removed to the surface by this route, but again backfilling and silting has destroyed any route or mechanism.

Below the shaft, stemple holes show a horizontal platform was constructed, leading to the almost horizontal passage on the up-dip side. There is no evidence of any means of winding or lifting ore to the platform from the lower or down-dip side. Graffitti includes “THA 1846” and “AB 1846”, which would be consistent perhaps with the iron-pointed shovell in the chamber below. A few 3 inch (7.6 cm) and 2h inch (6.4 cm) square section nails were found nearby.

Beyond, and up-dip from the shaft, the passage is only very slightly inclined with the stream confined to one side by a small mud and gravel wall 8 inches (20 cm) high. A few yards up a small hole in the wall at ground level, enclosed by a semi-circle of stones may have been used to store ore (as that found near the Forefield Shaft), but now has several inches of red ochre in it. A nail in the wall may have been used to hang a lamp or candle holder, or possibly a tool.

The passage is generally a metre or so wide, of irregular but generally stoooping height, mainly natural, with occasional 1 1/8 inch (2.9 cm) drillholes. The floor is partly silted, partly lump mineral or gravel. Many cavities have deposits of an ochreous mud, which may suggest occasional flooding before the sough was built. Eventually the water is found to enter the passage from the south side, from a small joint which has been widened out by the miner, but who gave up work before its ultimate origin was reached. Beyond this point, the main passage is dry to where it is entered by the chute or climbing way from the stope of the Queen Extension, found by John Miller an others. A small iron wedge about 2 inches (5 cm) long was found here, perhaps once used to secure a tool to a wooden shaft

THE QUEEN EXTENSION STOPE. The stope appears to be another vertical joint rising from the horizon of the main pipes, and appears to be of similar character to the workings of the climbing shaft series; i.e. a connected series of tight passages and sumps, partly natural, partly excavated from the solid rock, in this case, with 11/8 inch (2.9 cm) or smaller shot holes where necessary. Substantial lumps of ore have been left behind - though considerable and inconvenient pick-work or blasting in solid limestone would have been required to extract them. The route through, presumably that used by the miners, involves a reasonably straight-forward, but strenuous climb of (Very Difficult standard in rock climbing terms) at either end of the stope, with no obvious use of stemples for assistance, for a vertical height of 50 feet (15 m) or so, connected by a fairly easy passage at the top. Stopping, of a very irregular type, and has been carried out below this, with possibly a passage below, and extending down dip beyond the connection of the adjacent pipe with the main passage (entry was too difficult and dangerous). The upper end of the stope descends by a series of ledges to a small chamber, linked by an inconveniently narrow and low crawl to the bottom of Gentlewomen's or Queen Shaft. Above this the Gentlewomen's Pipe, described by Flindall and Hayes, linked to the main workings of Crichman Mine on the top of Masson Hill.

THE MINES ON THE EAST SIDE OF MASSON HILL, by Lynn Willies and Roger Flindall

This section is mainly based on documentary sources, together with data observed at surface and underground. The major sources are the Barmasters, Books of Entry, and Ore Accounts, with further scattered sources from the early 17th century, and after 1850, from local newspapers and the Mining Journal. M of the veins and some of the workings can be identified from the various descriptions by comparison with the field name and occupancy data on the 1848/49 Tithe Award Map and Survey.

Development of drainage

Early mining not unnaturally preferred self-draining areas: the obvious outcrop of the rakes on High Tor and the Heights of Abraham has led to extravagant claims of “Roman Mining”, which, if not impossible, are quite unsubstantiated. The top of Masson Hill has the mineralization at very shallow depth. The actual working and steady production of Gentlewomen's Pipe from 1630 onwards (Flindall and Hayes 1976) suggests even earlier development of the major flats and pipes, which, after 1750 became the Crichman Consolidated Title.

Proximity of the river valley would encourage short soughs at an early date: Wildersley Sough under High Tor seems to have been in existence in 1709, Allenhill Sough at the bottom of the Dimple in Matlock driven in shale to Ladgacy Vein was begun in 1734 (Rieuwerts 1966) and Masson Sough succeeded in draining Gentlewomen's Pipe about 1749 after seven years driving (SCL. Deeds 1497). These were all cross-cutting soughs - the Ringing Rake section of Masson Sough may have been earlier, as also its equivalent sough in Raddle Sole, the other side of the river (seen in late 18th century sketches at river level - now well above due to successive lowering of the river level in the 1790s and 1970s). A sough observed into and along Ladgacy vein at Pic Tor during recent trenching for a sewer could equally be of early date, and another could be expected at Stoneyway to Bentley Brook from Jane Vein, where in fact water normally issues. Seven Rakes was drained by a level under Cawdor and possibly another from the River near the Boathouse Inn. Holt Level, now under the railway bridge, probably drained Robin Hood Vein, but may have extended to Seven Rakes.

At Deep Shaft on Gentlewomen's, a horse gin was probably used to raise water to sough level, and it is likely this practice was used on the other mines too, initially Haslam Pipe. Water power was used where the veins cross the Derwent - on the Dimple Mine presumably on the extension to Seven Rakes (Wolley 6679 .1-4) about 1766 and at about the same time at Artists' Corner a double under shot wheel may have pumped from Raddle Rake via a level under the river (willies, Rieuwerts & Flindall, 1977 p.305). In 1815 an agreement was made to convey along Slit Rake to Hard Rake (the eastward extension of Bacon Rake) for a wheel underground. Possibly this was not lasted, since ten years later an 80 HP wheel was installed under High Tor, linked by 300 yards (91.5 m) of flat rods passing under the Tor. The weir for this was recently removed, but the level, and the tail race etc survive. It seems to have had some effect, causing Seven Rakes to be drained on the other side of the river. Several steam engines were also erected, which would probably have had an effect over all the lower part of the area. The first was erected about 1802 on Seven Rakes Mine, almost directly on the intersection with Gentlewomen's Pipe. It ceased work about 1816. Another was erected at about the same time at Soneyway Mine, probably by Francis Thompson, who was a shareholder in the mine (Barmaster Book of Entry), with others including John Barker, lead merchant. Barker gave up his 3/4 after a loss of £1039 had been made 1804-5 (SCL. Bag. 393) and the machinery was sold 1807 (Derby Mercury 22/1/1807). Two years later another of 80 HP was erected at the Dimple Mine, on the range of Seven Rakes, in a venture which also included the use of a 18-20 HP winding engine, both for sale in 1812 and 1813 (Derby Mercury). This was possibly the same engine described by Farey as at work in 1810 on Ladgacy Vein, part of which belonged to Dimple but cinder etc. on Pic Tor at Matlock Town could indicate another on Ladgacy, if so, presumably discharging to the river by a
recently revealed short level under the path below on the range of the veins. Another was erected Moothall Mine prior to 1817, which probably also linked hydraulically to Dimple (see below).

The mid-19th century saw technology of the Cornish type applied at Matlock as elsewhere: the Cawdor Mine on the north end of Seven Rakes near the river put down an engine some time before 1853, which after a boiler explosion and new owners was replaced by another, the large multistage engine from Watergrove of some 200 HP: this had stopped work by about 1861. As was usual by this time, this was complemented by a small steam winder (Willies, Rieuwerts and Flindall) The Cawdor Engine was claimed to drain the whole hillside almost certainly including Moothall, which was briefly re-opened by the same proprietors and probably several other small parasitic ventures were due to presence. Unfortunately Stoneyway Mine had less to commend it: in early 1857 it set up a combined 16 HP winding and pumping engine: At its closure nearly three years later it was said to have been “first projected as a mere speculation to foster a spirit then prevailing to raise up shares to an undue value for the sole purpose of traffic”. (M.J. 26 Nov. 1859).

We can be fairly sure its effect on the wider area was negligible, and with the closure of Cawdor, lead mining in the area effectively ceased.

Development of Mines

The very large area of ‘Crichman’ on top of Masson Hill, now almost quartered away, was certainly mined in the 17th century as confirmed in documents, and to the extent that date marks can be relied upon by the inscription of 1680 marked on the wall at the north-east end (see Flindall and Hayes 1976. and Flindall Swain (above) for details). Presumably Gentlewomen's Pipe, discovered about 16309 was developed out of Crichman. since it is both deep, and ,for the major part, beneath the Upper Lava. The upper part has been described by Flindall and others, and bears no distinctive dating features, but before artificial drainage the practical limit was probably still lower, between the Forefield and Upper Close Shafts: significantly the date marks below Upper Close commence about 1726, those at the Forefield from 1749 onwards, i.e. by the time Masson Sough had drained off the water.

Mining of course could take place lower down the hill above the Upper Lava, which to a degree would be self-draining, but limited by the presence of way boards and vein infill. There is later inferential evidence that the 'Three Clays' seen in Masson Sough held back water below them, and the top wayboard in Haslam Pipe Founder Shaft would have a similar effect, especially in wetter weather for years. The Ringing Rake Sough, which archaeological evidence shows originally to have been picked coffin type level, could be a 17th or early 18th century attempt to drain the rake. Curiously the vein above the lava was also reached by a shaft (possibly driven upwards) through the solid lava, rather than in the vein itself, and rather than the more obvious drive up-dip in the decomposed top of the lava from the surface or the vein. The occasional 7/8 inch (2.2 cm) diameter shot-holes suggest these *Waterfall Series* workings may post date the sough, forming perhaps a second phase of working itself. Similar drives in the decomposed lava material found in both Haslam and Deep Shafts, presumably are also later examples of opportunities, perhaps clearing out ground beneath wayboards.

Masson Sough was driven between 1742 and 1749, when about £600 was expended on it. The discovery of some £35 of ore towards the end of this time suggests completion, or at least tapping off the water (SCL. Oakes Deeds 1497). This lowered the water almost to river level, and facilitated work in the Forefield Shaft area for the next few decades to about 1780, though as seen today it doe not bear the marks of great prosperity. This relatively low cost suggests Masson Sough was that driven out of Ringing Rake, rather than including it. Rather than reveal substantial quantities of ore probably discouraged further major work and investment. Which turned for a time towards the area at Matlock east of the River, and it was not until the latter end of the 18th century that attention was given again to Masson Hillside. Prior to 1771 several of the mines there appear to have belonged to a Mr. Clay (Joseph Clay, lead merchant) of Sheffield, who perhaps by this time sorely regretted his attempt to drain the rake, and his agents had attempted to keep the mines in legal possession.

This relatively low cost suggests Masson Sough was that driven out of Ringing Rake, rather than including it. Rather than reveal substantial quantities of ore probably discouraged further major work and investment. Which turned for a time towards the area at Matlock east of the River, and it was not until the latter end of the 18th century that attention was given again to Masson Hillside. Prior to 1771 several of the mines there appear to have belonged to a Mr. Clay (Joseph Clay, lead merchant) of Sheffield, who perhaps by this time sorely regretted his attempt to drain the rake, and his agents had attempted to keep the mines in legal possession. His agent for the last nine or ten years had been Samuel Bown (a carpenter by trade and knows little more of a mine than what his axe does) who, despite this disparagement of his abilities, had used every evasive trick possible to keep the titles in Barber's possession: eight had been lost but he had kept Deep Shaft, Gentlewomen, Dick Eye (Ringing Rake in the Dick Eye?), Raddle Hole (Ringing Rake under High Tor), Ladygate, Hedge Vein, and the unallocated Three Ashes, and of course for a time the Greenhill Mine.

Development of Mines

This relatively low cost suggests Masson Sough was that driven out of Ringing Rake, rather than including it. Rather than reveal substantial quantities of ore probably discouraged further major work and investment. Which turned for a time towards the area at Matlock east of the River, and it was not until the latter end of the 18th century that attention was given again to Masson Hillside. Prior to 1771 several of the mines there appear to have belonged to a Mr. Clay (Joseph Clay, lead merchant) of Sheffield, who perhaps by this time sorely regretted his attempt to drain the rake, and his agents had attempted to keep the mines in legal possession. His agent for the last nine or ten years had been Samuel Bown (a carpenter by trade and knows little more of a mine than what his axe does) who, despite this disparagement of his abilities, had used every evasive trick possible to keep the titles in Barber's possession: eight had been lost but he had kept Deep Shaft, Gentlewomen, Dick Eye (Ringing Rake in the Dick Eye?), Raddle Hole (Ringing Rake under High Tor), Ladygate, Hedge Vein, and the unallocated Three Ashes, and of course for a time the Greenhill Mine.

Development of Mines

This relatively low cost suggests Masson Sough was that driven out of Ringing Rake, rather than including it. Rather than reveal substantial quantities of ore probably discouraged further major work and investment. Which turned for a time towards the area at Matlock east of the River, and it was not until the latter end of the 18th century that attention was given again to Masson Hillside. Prior to 1771 several of the mines there appear to have belonged to a Mr. Clay (Joseph Clay, lead merchant) of Sheffield, who perhaps by this time sorely regretted his attempt to drain the rake, and his agents had attempted to keep the mines in legal possession. His agent for the last nine or ten years had been Samuel Bown (a carpenter by trade and knows little more of a mine than what his axe does) who, despite this disparagement of his abilities, had used every evasive trick possible to keep the titles in Barber's possession: eight had been lost but he had kept Deep Shaft, Gentlewomen, Dick Eye (Ringing Rake in the Dick Eye?), Raddle Hole (Ringing Rake under High Tor), Ladygate, Hedge Vein, and the unallocated Three Ashes, and of course for a time the Greenhill Mine.

Development of Mines

This relatively low cost suggests Masson Sough was that driven out of Ringing Rake, rather than including it. Rather than reveal substantial quantities of ore probably discouraged further major work and investment. Which turned for a time towards the area at Matlock east of the River, and it was not until the latter end of the 18th century that attention was given again to Masson Hillside. Prior to 1771 several of the mines there appear to have belonged to a Mr. Clay (Joseph Clay, lead merchant) of Sheffield, who perhaps by this time sorely regretted his attempt to drain the rake, and his agents had attempted to keep the mines in legal possession. His agent for the last nine or ten years had been Samuel Bown (a carpenter by trade and knows little more of a mine than what his axe does) who, despite this disparagement of his abilities, had used every evasive trick possible to keep the titles in Barber's possession: eight had been lost but he had kept Deep Shaft, Gentlewomen, Dick Eye (Ringing Rake in the Dick Eye?), Raddle Hole (Ringing Rake under High Tor), Ladygate, Hedge Vein, and the unallocated Three Ashes, and of course for a time the Greenhill Mine.

Development of Mines

This relatively low cost suggests Masson Sough was that driven out of Ringing Rake, rather than including it. Rather than reveal substantial quantities of ore probably discouraged further major work and investment. Which turned for a time towards the area at Matlock east of the River, and it was not until the latter end of the 18th century that attention was given again to Masson Hillside. Prior to 1771 several of the mines there appear to have belonged to a Mr. Clay (Joseph Clay, lead merchant) of Sheffield, who perhaps by this time sorely regretted his attempt to drain the rake, and his agents had attempted to keep the mines in legal possession. His agent for the last nine or ten years had been Samuel Bown (a carpenter by trade and knows little more of a mine than what his axe does) who, despite this disparagement of his abilities, had used every evasive trick possible to keep the titles in Barber's possession: eight had been lost but he had kept Deep Shaft, Gentlewomen, Dick Eye (Ringing Rake in the Dick Eye?), Raddle Hole (Ringing Rake under High Tor), Ladygate, Hedge Vein, and the unallocated Three Ashes, and of course for a time the Greenhill Mine.

Development of Mines

This relatively low cost suggests Masson Sough was that driven out of Ringing Rake, rather than including it. Rather than reveal substantial quantities of ore probably discouraged further major work and investment. Which turned for a time towards the area at Matlock east of the River, and it was not until the latter end of the 18th century that attention was given again to Masson Hillside. Prior to 1771 several of the mines there appear to have belonged to a Mr. Clay (Joseph Clay, lead merchant) of Sheffield, who perhaps by this time sorely regretted his attempt to drain the rake, and his agents had attempted to keep the mines in legal possession. His agent for the last nine or ten years had been Samuel Bown (a carpenter by trade and knows little more of a mine than what his axe does) who, despite this disparagement of his abilities, had used every evasive trick possible to keep the titles in Barber's possession: eight had been lost but he had kept Deep Shaft, Gentlewomen, Dick Eye (Ringing Rake in the Dick Eye?), Raddle Hole (Ringing Rake under High Tor), Ladygate, Hedge Vein, and the unallocated Three Ashes, and of course for a time the Greenhill Mine.
Most of Seven Rakes
(Barmarx Books of Entry, Chatsworth)

On this compact title the Seven Rakes partners erected their fire engine in 1802. Whereas previously the maximum depth reached was about 30 fathoms (55 m), in the first limestone at or just below river level, using the engine allowed them to sink through the toadstone (Upper Lava) and into the second limestone (Lower Matlock Limestone). Whether they were able to reach the horizon of Gentlewomen's Pipe, just above the lower lava is unknown, but probably the bulk of ore found in Matlock Liberty between 1802-06, between 1000-2000 loads annually (250-500 tonnes) came from Seven Rakes. Some of it was found in the toadstone itself, according to Farey (1811), though Stokes in 1820 stated it was not worked in the toadstone until 1819 “by five miners”, (Stokes 1822 p.163).

By 1809-10, according to Farey, only the Dimple and Ladygates engines respectively were at work, and in 1808 the Ladygates vein was given by the Barmarx to Dimple Mine, presumably to rationalise their operations: given the exhilarating rise in prices after 1800 then either Seven Rakes had insufficient ore, or the water problems were considered insuperable. Mothall had a brief success from around 1817 to 1823, raising almost 1000 tonnes, before decline. The case of Stoneyway is simpler: it was a total loss, whilst Dimple and Ladygates were certainly no better than Seven Rakes, probably worse, and mining in the area soon after returned to its former desultory state, like most of the Derbyshire ore field. With the exception of the brave and equally useless venture by Thomas Boothman under High Tor in 1824 onwards capital was not again tempted until the mid-century.

With the sale of the Seven Rakes machinery about 1813, the consolidation was only partially maintained. In 1812 the lower end of Gentlewomen's Pipe was given to George Knowles and Partners, who already owned the upper five meers next to his (Crichman) Knowles Mine, and in 1819 Anthony Knowles was given the Deep Shaft or Greenhills Mine, possibly to clear any doubts as to whether it was the same as Gentlewomen's, on the same range. Haslam Pipe Title was given to John Cardin and George Knowles (1814), and confirmed and extended in 1819: Michael Cardin also acquired Seven Rakes South, from the old Fire Engine to the river (1816 (Barmarx Books, Chatsworth).

Precise extant details of production (Barmarx Ore Accts, Chatsworth) for all the mines commence soon after the Napoleonic Wars ended. The most productive mine was Mothall, with an output of 678 loads in 1821, after which came Seven Rakes, divided into three separate parts, further peaked at just over 460 loads in 1820 (120 tonnes) presumably exploiting the toadstone above the Holt or Boathouse Levels. It was, however, generally much below this, and after 1831, like other mines, produced no more than was necessary to keep alive. Gentlewomen's, worked by the Knowles family, in its upper part peaked at 93 loads in 1820, and 87 loads in the newly acquired lower section Deep Shaft produced a few loads under Peter Tipping, probably above the Upper Lava, and a few more after it was acquired by Knowles, in 1824. Haslam Pipe had been acquired by James and Joseph Neal. - their output reached a peak in 1829 at 35 loads. In the desperate circumstances around 1830, the best that can be said is that they provided a little work for otherwise destitute miners, but with the possible brief exception of Seven Rakes and Mothall around 1820, certainly produced nothing of profit.

The final act began with the general recovery in mining which began in the late 1830s, and continued into the 1860s, though the Matlock area action was generally rather desultory. Again Seven Rakes was the principal vein, but this time operations centred on the Cawdor End, i.e. half-way between the earlier Seven Rakes Engine, and Dimple Engine, on a site midway between the new railway and the river. The title was re-united in 1839, when two of Seven Rakes from the south end at the river, was united with the Mothall and Dimple Mines on the East of the River: the arrangements appear to have been made by a Mr. Rivis, of Mothall Mine, which was then enjoying a faint revival, and members of the Knowles family, though a surviving interest from 1819 may have involved the use of a small steam engine in a way sufficient to keep the title, and then in 1853 the concern was taken under the charge of William and Charles Milnes, lead smelters and merchants as Cawdor Mining Co. Though Rivis seems also to have kept in work at Seven Rakes, possibly at Tipping Shaft. The mine agent, Charles Walker, is recorded for land to be set out for the shaft and hoilcock close to the river, and just off the vein, and by 1856-57 they were producing modest quantities of ore, with worthwhile amounts in 1858. A naively optimistic account of the local mines, possibly by William Adam (author of Gem of the Peak) described the mine as sunk through the first toadstone into the second limestone, their engine having completely mastered the water (Derby and Chesterfield Reporter 2 October 1857): this would suggest a shaft between 200-220 ft (61 to 91 m) deep, which should not have created problems with the 200 HP available. It presumably drained the veins on both sides of the river, and also a large area of Masson hillside, perhaps stimulating the acquisition by Seven Rakes of Gentlewomen's Pipe, from below Seven Rakes Engine Shaft to Matlock Bridge. The old Seven Rakes (Fire Engine Shaft) was also re-opened, by the Knowles family, and the surface tips were reworked for low grade ore - the water being fetched from the troughs on St John's Road (now under St John's Chapel). Work continued until 1861 when the Cawdor engine was shut down and later disposed of. In all the ventures from 1853 produced about 4600 loads (1160 tonnes), certainly insufficient for them to have been profitable.

The revival of interest at Seven Rakes was matched at the other mines, and from the mid-1830s almost every mine on the hillside changed hands, or had its ownership confirmed. What profits were made came not from mining however, but from share-dealing, and though Stoneyway Mine became the most notorious in this respect, it was probably no more or less successful than the Haslam Pipe, Ringing Rake and Shining Rock ventures, which managed to trade without the expensive necessity of a steam engine. James and Joseph Neal had acquired Haslam Pipe in 1818, and by the 1840s its ownership had passed to John, James, and probably Luke Neal, father and sons, or perhaps brothers. In June 1846 they were given five meers in Ringing Rake, 'with the use of a level which is drove in the said vein for mineral purposes not to injer (sic) but to keep open if need be so far as they go, that is to the north of their title. This presumably refers to the first section of Ringing Rake Sough and the 'Waterfall Series'. The Neal's then disposed of 17 of their 24 shares to Stephen Neal of Manchester for 20s (£1.00) i.e. a nominal sum for the purpose of entry in the Barmarx's Book of Entry. He then almost immediately sold

8 shares to Thomas Fletcher, Little Lever, Lancs. for £50
8 shares to John Whewell, Radcliff, Lancs. for £50
2 shares to James Sutton, Spindle Maker, Manchester for £40
2 shares to John Allwood and others of Sheffield for £40

the odd extra share presumably being already in his possession. Stephen Neal was then an inspector of nuisances. A year later, when presumably the new shareholders had tired of their investment, and no doubt also the calls on their pocket to maintain the mine and miners, Fletcher and Whewell sold back their shares to Neal for £40, a loss of £10 for both. What happened to Sutton and Allwood and others' shares is not known: it seems unlikely that they kept possession and paying for too long in view of what followed. The Neals, evidently not discouraged by this lack of confidence, divided the 24 shares into 96, presumably to allow less influential or wealthy people to participate. Stephen Neal, now, or about to become, Chief Constable of Salford, quickly managed to dispose of 32 of these at £1.00 each, to men like Thomas Wender and William Deakin, both wine merchants in Manchester, who took two of each, and the even more credulous Sanders Leigh who took sixteen. Thomas Haywood took a couple also, but immediately, and wisely,
gave them up. Two years later, and presumably several calls lighter, the others sold their shares back to Neal for a shilling apiece, the deal negotiated by a solicitor: presumably they all were totally ignorant of the provisions of the local customs, let alone the financial risks of mining. What work was done? The main clue is contained in the report of the later company, who commented their predecessors had sunk a shaft through the toadstone, to the “three clays” but who had abandoned it “on the point of trial” (M.J. 24 April 1858). The only shaft to reasonably fit the facts is the ‘Haslam Shaft’ which is linked by a short crosscut with drill marks of appropriate size to the sough just under the toadstone. The “three clays”, prominent wayboards about a foot apart from each other are seen about 200 ft (61 m) further up the level dipping towards the shaft - probably the shaft was sunk about 35 or 40 ft (10 or 12 m) below level, when it could have encountered heavy springs of water. The shaft is of an impressive size, quite large enough for a steam engine to have pumps fixed, and would hopefully have drained workings below Haslam Pipe. About a tonne of ore was actually mined.

This review, coinciding as it did with a general fall in confidence in the area, caused interest in the title to wane, but in the mid-1850s the success of Cawdor in draining their, and adjacent, mines, and the opportunities aroused by passing of the 1856 Limited Liability Act could not be resisted. Several ventures set out to attract speculative capital from shareholders whose interest only surpassed by their gullibility - stimulated by encouraging newspaper reports, by men like the “Grocer and Share broker” of Sheffield, and the setting up of a “stock-exchange” in the new Market Hall at Chesterfield. Included in these was the Stoneyway Mine (1857), the Robin Hood Mine, near the Matlock railway bridge (1857), and of course the Haslam Pipe and Shining Rock Mining Company (1858). In order to avoid possible embarrassment from any remaining shareholders, James and John Neal arranged to sink Haslam Pipe, Shining Rock, and Ringing Rake veins in 1857 and in March 1858 the new company was set up. The title was bought the Neals, who also took 40 of the 1200 one pound shares. The shareholders elected a Mr Baker of Chesterfield as chairman, and S. Nall as Captain at £40 a year. It was expected the works could be drained by the sough, no steam power would be required. The miners present at the meeting were optimistic that not half the capital would be required.

After his preliminary examinations, Nall recommended recommencing sinking the “Bounder Shaft” (‘Founder’), below the ‘three clays’ where it has been abandoned by the previous company (M.J. 24 April 1858). Soon after, a horse gin and other equipment were installed on what is almost certainly the ‘Haslam Shaft’ of our explorations, and a little work getting ore was done in the upper levels - the railed level perhaps. Work was also done on Shining Rock Vein, probably on a shaft now blocked, but explored in 1954 by Workman and others (1974 p.17-20).

Any “good work done” by Nall's men does not appear impressive from the survey produced by Workman, and by the end of the year shareholders were getting restive, particularly as Nall resided at Chesterfield attending the mine only once or twice a week (M.J 18th Dec 1858). By May 1859 only two men plus the manager were still employed, and in August a meeting was called to decide its future. The Mining Journal remarked it was “drawing its slow length along – the arrears of calls forming a millstone large enough to enclose its neck” (M.J 9th April 1859)

Nall by this time favoured two projects: the first a new shaft to be sunk at the pee of Shining Rock and the Haslam Pipe with the object of sinking to the toadstone, and under “the second bearing clay” where there was an old shaft, the second the continuance of the driving of a level at Shining Rock, where at an expense of about £100 an uncut strong vein could be worked. The shareholders, or some of them, had however, commissioned a Mr Boden, the Captain of Milltown Mine at Ashover, to examine the mine. He considered the driving of the Shining Rock level south-west, i.e. up-dip, was useless, and put forward a further project of sinking a shaft onto Gentlewomen's Pipe, since the Cawdor Engine had unwatered the whole area. This was in fact similar to a less favoured project of Nall's, of sinking on Ringing Rake near Seven Rakes, again to locate Haslam Pipe (M.J. 13 August 1859).

Since the lower section of Gentlewomen's Pipe had just been taken by Seven Rakes (Cawdor), any project to tackle it was at the very least an unusual one. It had already been explored by the previous company, had not seen any great venture. Further work on the much exploited Haslam Pipe within the limited title available, as Nall presumably recognised, was similarly likely to be futile. The following February just before Cawdor Mine closed, it was agreed to wind the Haslam Pipe affair up. Some £700 had been expended, just over two tonnes of ore raised, but at the sale the whole mine and plant was bought in for £45, and sold privately later.

Any “good work done” by Nall's men does not appear impressive from the survey produced by Workman, and by the end of the year shareholders were getting restive, particularly as Nall resided at Chesterfield attending the mine only once or twice a week (M.J 18th Dec 1858). By May 1859 only two men plus the manager were still employed, and in August a meeting was called to decide its future. The Mining Journal remarked it was “drawing its slow length along – the arrears of calls forming a millstone large enough to enclose its neck” (M.J 9th April 1859)

Haslam Pipe, the nearby Stoneyway and Robin Hood Mines were financially a new phenomenon in Derbyshire, incorporated as private limited companies under the 1856 Act; in practice this made little difference to shareholder rights except that forfeiture of shares did not automatically take place if calls were not paid up. The Act, however, required the appointment of directors - Chairman, Secretary, Treasurer, from the shareholders, which, though common in traditional mining organisation, was far from universal, and this encouraged an unusual amount of participation. It also created a certain acerbity with the Barmoot Court system, in the sense that because the Company owned the mines, changes of ownership of Company (not mine) shares need not be, or were not, notified to the Barmaster, removing the right of redress by miners or other claimants against shareholders out of the Barmoot Court.

The Haslam Pipe Mining Company was registered with the Barmaster as “Chas Doe and Wm. Wyatt and others”. Wyatt was to remain treasurer of the company throughout, whilst Doe was presumably the company secretary. Later this last post was taken temporarily by William Abbott, an innkeeper at Chesterfield, and by a Mr Broadhurst, a surveyor. Others involved included local miners, like Adam Bunting, and Matlock joiner, a Mr. Foggatt, and George Heath, a Chesterfield builder. A civil action at Derbyshire Assizes between Foggatt and Wyatt have details of the working of the company. Foggatt had presumably been responsible for the horse gin at the mine, and out of £50 was still owed some £15. Unwisely, in every respect, he had lent thirty shillings (£1.50) on Adam Bunting's five shares, and later may have formally taken them over - this was the crux of the dispute, and despite never having paid any calls (which would have led to forfeiture in the Barmoot Court) he was found legally to be a shareholder, not of the shares but as treasure. Further, fact that Wyatt had not paid his share of the calls was though he was left with the (useless) remedy of suing individual shareholders. Had he not been a shareholder he could have sued any shareholder for the amount owing. Wyatt was hardly less fortunate - he had paid all his calls, “unfortunately” he said, which produced sympathetic laughter in the Court, and also money out of his own pocket, which had not been repaid due to defaulting by men like Foggatt. As treasurer he viewed himself responsible for paying for materials, but the ordering was done by Nall, the mine agent. In one sense the miners had been right: only a little over half of the capital originally envisaged was used.

The actual work done by the Neals and the subsequent two companies was thus very limited: Haslam Shaft, and its connection to the sough was probably re-sunk through an older shaft on Haslam Pipe. The long, formerly railed level above the Upper Lava probably dates from this time too. In the sough, the blind level, driven some 100 yards (92 m) out of the sough southerly has the futile appearance, and appropriate size and method of working for this period. Unfortunately it has not yet proved feasible to enter the Shining Rock section to see workings there.

Higher up the sough in the Gentlewomen's Pipe section, reworking is evident also from the mid-19th century, in the stopes reached perhaps. Work was also done on Shining Rock Vein, probably on a shaft now blocked, but explored in 1954 by Workman and others (1974 p.17-20).
1849 more vigorously under Thomas and George Barton, brothers, who lived at Starkholmes. It is a reasonable surmise the remains of working and the tools and equipment belonged to the Bartons, and that the Jigging Box area, and the Forefield Shaft were Old Jant Mine.

A few other of the veins above Gentlewomen's also produced ore; Meerholme or Old Meerholme had a little production in 1837 then 1852-53, and in 1860. Beetneed spasmodically produced a little between 1835 and 1857. None of these mines are today open.

Peripheral ventures east of Seven Rakes included the Stoneyway Mine, and Robin Hood Mining Company, which were both private limited companies, Collingwood's Venture more famous for its owner's name than for the mine, and Negator (Negeker) Mine.

Stoneyway Mine was acquired by Charles Walker in 1841, and later was amalgamated with the adjacent Jane Vein. Under him it was worked in a small way, until in 1857, by which time Walker was also agent to the Cawdor Company, it was formed into a private limited company. For work already done on the mine Walker received a payment of £1092 and was to receive a further £100 when 20% of the shares were taken up, and £100 of paid up shares: the remaining 900 £1 shares were disposed of between the trustees and shareholders. Soon after an engine of 16 HP to be set behind the houses on Matlock Green was purchased to assist unwatering - but unfortunately the shaft fell in as the support of the water was removed (Mining Journal 1 Aug. 1857; 24 Oct. 1857).

Undaunted, a further 1000 £1 extension shares were issued, which though they could not match up to the original premium price of up to £5 5s, still sold at a thirty shilling (£1.50) premium on top of the original one shilling (£0.05) deposit. In early 1858 a favourable report by the agents to a further call on the extension shares (M.J. 6 Feb. 1858) and a few weeks later work was suspended until shaft sinking was complete (M.J. 27 March 1858). By November sinking the shaft and driving a level had yielded £50 of ore, (M.J. 20 Nov. 1858), but a week later the bubble was pricked, and the operation condemned as solely a means of raising up shares . . . "for the sole purpose of traffic". (M.J. 26 Nov. 1859).

Stoneyway Mine attracted its shareholders from the nearby towns - Clay Cross, Chesterfield and Sheffield. Robin Hood Mine, by contrast, was largely locally owned. It was situated at the Holt, near the Railway Bridge over the river at Matlock, on a vein which crossed the now worked out Harveydale quarry towards Ringing Rake and Haslam Pipe, and seems in the early 19th century, or late 18th, to have also worked the Ladygate Vein in the Shiploads - i.e. between the Holt and the river. After 1817 it was only occasionally worked, but in 1852 one half of it was transferred for £20 to Solomon Carding of Matlock, by Thomas Green of Matlock Green, who retained the other half. In 1858 it was officially transferred to the Robin Hood Mining Company Ltd. in exchange for £130 of paid up shares. As an article in the Derby and Chesterfield Reporter put it: "The mines have been hitherto in the hands of small proprietors, who have had neither the means nor inclination to try their property effectively", and when Ladygate ceased pumping (c.1817) the Robin Hood Mine “abandoned, most unwisely” their work also (2 October 1857). The article felt the new company had fine prospects, and deserved encouragement. The company however, already had problems, even in advance of actual mining, and a month later one of its promoters, George Shaw, was sued for a small sum for shares sold to the as yet still intended company (Derby Mercury 25 Nov. 1857).

However, the company was eventually formed, and issued a total of 1200 £1 shares, mainly in Matlock (M.J. 27 March 1858). Another Walker, George, was the captain, and in December 1858 was able to issue his first report of work done. An existing shaft had been repaired for 16 fathoms (29.3 m) and 19 fathoms (34.8 m) had been driven from the bottom along a pipe or vein, but sinking another shaft was recommended. To encourage shareholders it was reported several specimens of ore had been found, close to where a large (unspecified) amount of ore had been raised at an earlier date, and it was not far from other mines which also yielded considerable quantities of ore (M.J. 11 Dec. 1858). By the next April several shafts had been forfeited, and in June the only encouragement available was the expectation of driving into a vein “shortly” (M.J. 9 April; 25 June 1859). It “died” by 1860, like Haslam Pipe, too dependent on the success of Cawdor. It produced about a tonne of ore.

Collingwood's Venture, named after H.S.J. Collingwood of Dale Cottage (now the High Tor Hotel), son of the famous admiral, was a tiny mine, possibly linked to Holt Pipe (or Holt Lane Pipe) which he also owned - situated below Seven Rakes, above Matlock Bridge. It produced about half a tonne of ore.

Collingwood took the mine in 1837, and disposed of it to Thomas Cardin twelve years later. Negeker (Negacow or Negator) Mine, which vein ran almost parallel to the River Derwent, especially the upper workings, substantial proceeded Masson Sough must remain undecided, but it is perhaps likely. By 1780, and certainly for the next half century, the main attention turned to the less easily mined, and thus near-virgin ground near or to the east of the river - using waterpower, with a certain amount of technical success, but very little financial. This left the Masson hillside to very small ventures, some owned by families such as the Neals, others to larger but still small scale operations like John Barber, in effect gleaning any ore left behind, made economic or sub-economic by advances in washing or smelting. The unsuccessful sub-level deepening of Deep Shaft marks the greatest extent possible for this scale of operation.

The early and mid-19th century, with inflated wages from and since the Napoleonic wars, but substantially reduced prices for ore, saw widespread regrouping on mining interests over the whole of the Derbyshire Field, in general creating substantial companies with ownership of large amounts of ground, in the manner of Cornish 'setts'. This did take place on the eastern margin: for instance Mooat Hall and Dimple Mines combined with Seven Rakes under Milnes' Cawdor Company, but this example was not followed on the hillside. Instead exploitation of shareholders by company promoters parasitically dependent on the reputation and success of those more respectable to an (for Derbyshire) unusually naked degree replaced exploitation of the mines - seen particularly at the...
Stoneyway and Haslam Pipe ventures, though others, such as Old Jant (Old Gentlewomen's), Negator, or Collingswood's Venture continued on a very small scale in a traditional, blindly optimistic way. The gleanings of this more honest endeavour were very slight indeed.

In the system surveyed a possible chronology is as follows:

Late 17th century and early 18th century: Down-dip development of Gentlewomen's Pipe. Driving of Ringing Rake Sough along the vein, and exploitation of vein above and below the Matlock Upper Lava.

Mid-18th century: Driving of Masson Sough to Gentlewomen's Pipe. Working of alluvial material. Gleaning ("caving") old workings.

Late 18th century and early 19th century: Sinking of Deep Shaft below sough level, and continued gleaning.


Late 19th Century Final abandonment.

Early 20th century Blocking of Sough Tail except for drainpipe.

SCHEDULE OF ARTEFACTS

Sough
ladder at Deep Shaft. Wood sides 3 x 2– inch (7.6 x 6.3 cm), % inch (1.9 cm) iron rod rungs, secured by nuts at 1 foot (30 cm centres.) Broken and not recovered. Plug and feather, at DB corner in sough. Immoveably corroded in % inch (1.9cm) drill hole.

Forefield Shaft Iron bands for washing vat. Thin, corroded, 26; 24; 22; inches (o.66; 0.61; 0.56 m) diameter respectively, by 2 inches broad (5cm). Not recovered. Wooden kibble reinforced with iron bands, 18 inches (0.46m) wide at middle, approximately 24 Inches (0.61 m) high. Not recovered. Iron rammer. Nominal inch (2.5 cm) diameter, by 26 inches (0.66 m) long, with riggot for pricker. (PDMM. 182)

Limp or scraper, of sheet iron. About 6 inches wide by 4 inches deep (15 x 10 cm), with rounded handle. Found with twig brush in "storehole" apparently used for ore. Not recovered.

Widdle. Iron wire interwoven mesh ~ inch (0.3 cm) centres. Circular with 4 inch (10cm) high sides of wood, with iron lifting handles. Not recovered.

Toadstone Bank Wheelbarrow. Little more than a shadow. Apparent overall length 42 inches (1.1m) with wheel of 19 inches (0.48m) diameter with 2 inch (5 cm) iron tyre. Not recovered.

Jigging Box area
Match or Brake Sieve. Wooden box of ~ inch (1.9cm) plank, still partially water-filled, 47 x 34 x 30 inches (1.2 x 0.86 x 0.76 m) with stump of upright post behind 6 x 4 inches (15 x locm) and axle apparently formed from old windlass. Iron pins and collars from axle recovered. (PDMM.175) See reconstruction by John Pickin. (Fig.4)
batten Dish, for serving ore. Sheet iron, with iron handles. Riveted construction, with sloping sides. 24 x 15 x 4– inches (0.61 x 0.38 x 0.11 m) Possibly used in conjunction with batch, or conceivably for dragging spoil in low passages nearby. (PDMM. 172)

Double ended iron pick. 12 inch (30 cm) head with 20– inch (0.52 m) handle. (PDMM.173)

Shovel, of sheet iron. Oval ended, 10 x 10 inch blade (25 x 25 cm). Handle rotted. (PDMM.174) Bands for stoke barrels. Pair 5% inch (15 cm) diameter by 1 inch (2.5 cm) wide. (PDMM.176) Pair 6– inch (17 cm) diameter by 1– inches (3.8cm) wide. (PDMM.178) Pair 4 inches (10 cm) diameter by 1 inch (2.5 cm) wide. (PDMM.178)

Riddles, two with % inch (0.3 cm) interwoven iron wire mesh at 1 inch (2.5 cm) centres, diameter approximately 18 inches (0.47 m) with wooden circular sides. Not recovered. Kibble handle, iron, with attaching brackets. 11 inches diameter (0.28 m). (PDMM.180)

Pair of iron feathers, iron, damaged by use: 4% x 1– x 1% inches (11.4 x 3.8 x 4.5 cm). Bolts and nuts, wrought iron, two of 6– inches by ~ inch (16 x 1.75 Cm) with round head and square nut, one of 9 inches by ~ inch (22 x 1.75cm) with square head and nut

Iron Gads. 5 x 1– x 1 inches (19 x 3.8 x 2.5cm) (PDMM.184)

8 x 1– x 1 inches (20.3 x 3.8 x 2.5 cm), one with broken tip. (PDMM.185)

Nogers - Iron drills with plain bit. The longer drill is slightly narrower
12 inches by nominal one inch (30 x 2.5 cm)

20 inches by nominal one inch (52 x 2.5cm)(PDMM.186)

Rammer, iron, nominal one inch 21 inches long, with riggOt for pricker. (PDMM.187)
Pricker, iron, with two inches wide eye formed at the top, 16 inches (41 cm) long..(PDMM 188)
Rake, iron, 4 pronged, 8 inches (20cm) wide. (PDMM.179)
Powder Horn 8 inches (20cm) long iron badly corroded. (PDMM.254)

Upper Close Shaft Washing Chamber Shovel, iron, oval ended 10 inch (25 cm) blade. Not recovered. Nails, 2h inch (6 cm) square section. Not recovered.

REFERENCES


Other data on technical development can be found in:


MANUSCRIPT SOURCES

Barmasters Collection, Chatsworth House, made available by permission of the Chatsworth Settlement Trustees.

Sheffield City Libraries (SCL), Local Collection.

Wolley Mss: Microfilm copy in Derbyshire County Library, Local Collection.

Mining Journal: Microfilm in Derbyshire County Library.

Turner Collection: Private papers relating to the Nightingale Family, belonging to Mr. Turner of Derby.

Newspaper references have been obtained from R. Flindall's unpublished Index of Derbyshire Newspapers.

We are greatly indebted for the help and encouragement given by the librarians and archivists of the above institutions.

David Warriner,
19 Warwick Drive,
Mansfield, Notts.

Lynn Willies,
Dale Road,
Matlock Bath.

Roger Flindall,
18 Thoresby Avenue,
Long Eaton,
Notts.
Miners tools, as they were found. Photo Richard Bird

Fig. 1. RINGING RAKE, MASSON SOUGH AND THE MASSON MINES

with acknowledgement to surveys of Masson
by R.Flindall and A. Hayes.
Finding in Old Jaint Mine

Reconstruction of the Hutch (jig or breakers's)

SECTION

PLAN

Based on survey by DM & NE

Method of sampling

m
MINES AND VEINS ON THE NORTH-EAST SLOPE OF MASSON HILL

Fig. 5.

L.W. 1981. Based on the 1848/49 Matlock Tithe Award Map and Barmaster's entries. Data from R. Flindall.
SECTIONS THROUGH SHAFTS TO SHOW GEOLOGY AND ARCHAEOLOGY

Horizontal scale exaggerated

Fig. 7.
Deep Shaft

First Washing Chamber

Forefield Shaft Area

Toadstone Bank Area

Talliesman Alley

GEORGE Upper Close Washing Chamber

Upper Close Shaft

GRAFFITI IN GENTLEWOMEN’S PIPE. NOT TO SCALE

Fig. 8.

THA 1846
AB 1846

Upper Close Shaft

TB

LW 1981
A SURVEY OF THE MASSON CAVE-CUM - MINE COMPLEX, MATLOCK
(including Great Masson Cavern, Carding's Nestus, High Loft, Crichman and Gentlewomen's Mines) by Roger Flindall, John Swain and Andrew Hayes Abstract

A full description of nearly 7 km of scrins, pipe veins and associated caverns is presented in view of the recent destruction by opencast fluorspar working of a large part of the system.

The workings covered by the Mines Survey Group extend along the eastern crest of Masson Hill in a 100 m wide belt NW from Bacon Rake (alias Great Rake) for 600 m to collapses near the old (pre-1978) face of Knowles Quarry and also include that part of Gentlewomen's Mine downhill so far as the Engine Shaft where has been made with Dave Warriner's survey of the workings up from 'Youds Level' (Masson Sough and Gentlewomen's Pipe). The M.S.G. survey totals over 6,800 metres of passages and the complexity of some of the mazes is such that slight simplifications have had to be made to adapt it for publication. The survey is of Grade 3C standard but much detail was noted which cannot be shown on the plan or described in this account because of space limitations. The workings depicted on the survey and described below as they were when explored in 1972–1974; however, since that time Knowles and Langhorne Quarries have continued their resulting destruction of the Crichman workings southwards to Beck Shaft blockage of the connection with Gentlewomen's Mine. In consequence of this and the continuing use of Masson Cavern as a show cave, exploration should not be attempted for the time being. The details given below are intended merely to supplement the survey and to highlight the more interesting features of these mines.

An historical account of the mines was given by Flindall and Hayes (1976) and need not be repeated here. It is hoped that at some future date a thorough survey will be published of workings immediately south of Bacon Rake, viz. Bysweep, Rutland Cavern, and Nestus mines; a presumed connection between Masson Cavern and Rutland is blocked by large amounts of waste rubble and has never been recorded as being open.

MASSON SHOW CAVE and CARDING'S NESTUS MINE

The show cave is entered from a cutting on Bacon Rake; beyond a large chamber, where the pipe workings of Carding's Nestus Mine are met the passage along the rake degenerates into unstable stopes which are inaccessible. The show route turns NW and is quite spacious whereas the side passages are mostly blocked off with packs and are not conspicuous. The first important turning is into the spacious chamber containing Tomlinson's Founder Shaft and with numerous openings off. Here a floor hole leads to passages dipping eastwards and e point marked 'A' on the survey is a partly backfilled, picked level on right, linked to a roof pocket by a turn 2.4 m high and 1.2 m by 0.6 m in s-section; the smallness of the picked level (1 m high by 0.4 m wide) suggests considerable antiquity and apparently these old workings were later bypassed (see Flindall and Hayes, 1976, Plate 8). At point 'B', after leaving chamber containing large packs, the passage closes down to only 0.6 m high including 0.3 m depth of mud and water although the workings to the NW may also be reached by a passage in the roof. Probably it was here that in the 1670s Tinker's Mine and Eaton's Mine were cut together, resulting in a lengthy dispute; these titles were later merged and became known as Carding's Nestus.

From the impressive Great Cavern, at Tinker's Shaft, the old show cave route continued up a winding staircase to the rear entrance which is at present blocked after much vandalism; a passage in the roof here doubly backs into the top of Great Cavern.

A large side passage westwards off the show cave route brings one directly to shaft (still open on the surface) which was used recently when working this title (under the incorrect name of Black Ox Mine) for fluorspar. The fluorspar workings include a spacious passage ranging southwards for 60 m through two chambers after which a crawl in old lead workings continues to the base of a 21 m deep shaft (now capped) just inside the Heights of Abraham grounds. Immediately west of the shaft used by fluorspar miners them was, until recently, a small crushing machine (see Flindall and Hayes, 1976, Plate 13) used to break up the ore prior to it being washed. A trickle of water which flows from a bedding plane nearby was brought along a narrow channel and into a bubbling trough near the shaft foot. An incline level, started in the early 1970s from below Masson Cavern rear entrance to provide easier access for fluorspar mining, was abandoned when water was met. The workings on the west side of Carding's Nestus Mine contain numerous pockets out of which lead ore has been extracted, leaving the hard un-mineralized country rock covered with pick marks.

HIGH LOFT alias BLACK OX MINE

From the west side of Carding's Nestus Mine a passage ranges northwards into High Loft Title, becoming relatively constricted where the title boundary is crossed. Near High Loft Shaft a turning to the left enters a short 'coffin level' cross-cut into a flooded passage which seems to connect with an adjacent similar working. As Dale (or Dial) Shaft is approached, the main passage becomes very roomy with a plank wheelbarrow run set in the floor and extensive packs along the walls, these all dating from recent fluorspar mining operations at Dale Shaft (commonly, but incorrectly known in recent years as High Loft Mine).

At Dale Shaft there is a choice between three prominent routes. That to the right doubles back and drops steadily through a chamber 15 m high by 5 m wide, ending at a shallow lake beyond which is a flooded connecting passage to the Great Cavern in Masson show cave. The lake chamber was discovered by miners in 1779, being mainly natural although the flowstone deposits have been destroyed and the approach is heavily packed and altered by spar mining. The central passage at Dale Shaft leads to another area of fluorspar workings and instead the main route onwards is that up the path over the pack along the left.

Again the main workings have been extensively opened out by fluorspar mining and are only remarkable for the deposits of laminated red clay and silt which are most conspicuous in the chamber about 75 m beyond Dale Shaft. From the NE corner of this chamber old lead workings branch off, ending at a 3 m deep flooded shaft with a flooded stope on its east side. There is no sough to these mines and the level in Masson Farm yard (Grid Ref 2926.5908 ; altitude 190 m) mentioned by Rieuwerts (1966) ends naturally after only 29 metres. Before this chamber there is a coffin gate off to the left which is neatly picked, 1.5 m high by 0.5 m wide and rises some 3 m in the 27 m until it terminates at the intersection of a scrin; high level workings off to the SE here were not surveyed. In the opposite direction along the scrin a tight rising squeeze over waste rubble gives access to a lengthy crawl through small flats and pipes which links via another coffin gate to Crichman Chamber (see below) and eventually merges into Crichman Maze.

CRICHMAN MINE SOUTH END
The fluor spar workings from Dale Shaft end as one passes through a doorway of wooden sleepers and enters Crichman Chamber (12 m by 20 m and up to 10 m high) which has a very uneven rubble floor. 4 m up the far wall of the chamber is an opening into a low cavity with two exits: a long passage on a 5 cm wide scrin running SE and a floor hole into a passage which develops into a 12 m long coffin gate (1.2 m high by 0.4 m wide), ending at the bottom of a turn 5 m high through to workings-entered from the coffin level further south. The shaft was drilled downwards whereas the coffin gate was cut with picks towards the shaft foot. Water trapped above a clay wayboard trickles along the passage out of the coffin gate and emerges in Crichman Chamber.

From the north side of Crichman Chamber a large passage takes one to the foot of Crichman Old Founder Shaft which has long been blocked; when large scale fluor spar mining commenced here about 50 years ago a new shaft (Beck Shaft) had to be sunk 20 m further NW. Crichman Old Founder Shaft is only 1 m by 0.6 m in cross-section (as are all the other old lead shafts in this vicinity) whereas Beck Shaft is 1.8 m by 1 m. At the foot of Beck Shaft is a small chamber which is crossed by a steel-arched level (an unusual feature in local fluor spar mines) packed round with railway sleepers; despite this the level has been smashed by collapses at several points in its 20 m length ranging NE.

BECK MAZE

Most of what follows describes passages accessible at the time of the survey which have been destroyed by fluor spar open-cast operations 1979-80. The description is included to put on record what was once a most interesting series of mineral deposits and mine workings.

Beyond Beck Shaft is Beck Maze: a grid system of 1940s fluor spar workings where a crossroads is met every 3 or 4 m on average. It consists of 4 small *galleries* ranging NW-SE along the pipe veins which are connected by numerous heavily timbered cross passages. Beck Maze is less than 100 m by 40 m in extent, merging on its west and north sides into the Crichman Maze of lead workings. 65 m of Beck Shaft is an unstable stope (rising about 10 m in its 25 m length and being up to 5 m high by 6 m wide) which was thought too dangerous for accurate surveying. A few metres east of Beck Shaft is a chamber in a large pocket of laminated red clay; both this and the adjoining chamber to the north have bedding plane roofs dipping approximately 20° to the NE. The gallery ranging NW from the latter chamber forms the eastern boundary of the maze and some pockets on its NE side contain druses of brilliant quartz crystals up to 5 mm long - a rare occurrence in the Matlock region.

When exploring in the far end of Beck Maze (at point 'C' on the survey) a live frog was noticed under rubble on the floor of a large collapsed stope; presumably it had been washed down one of the visible fissures from the surface for there are no shafts nearby. A passage eastwards from Beck Maze probably once connected directly to the top end of the Gentlewomen's Pipe workings (see the survey) but it is now blocked by falls, much of this area being unstable. The fluor spar workings peter out about 260 m NW of Beck Shaft and the only surviving link from here to the Bedding Plane Chamber near Knowles Quarry is an awkward route through a shattered fissure 4 m high vertically but sloping over a width of 6 m and only 0.3 to 0.6 m wide at any one point.

CRICHMAN MAZE AND KING SHAFT

12 m west of Beck Shaft a 4 m high rise in the level of the floor marks the boundary between the fluor spar and the remaining lead workings. The passage onwards is quite spacious and has numerous openings on its SW side into flat workings often less than 0.5 m high which merge and double back to the coffin gates near Crichman Chamber and Dale Shaft. Continuing NW a tight crawl links through to the workings associated with Crichman New Founder Shaft (re-named 'King Shaft' when worked for fluor spar early this century). This is one of three such connecting crawls; by far the most frequently used was that at the 'waterfall' marked on the survey which is the easiest to locate in the maze because of the sound of water trickling from it. Crichman Title was worked for lead as two distinct areas (viz. the South and North Ends from the Old and New Founder Shafts respectively) connected only by these few crawls.

The main passages become walking height near King Shaft which is situated in a small stope. The shaft foot is marked by a 1.8 m high cone of fallen debris and the shaft itself is choked 6 m up by further debris on top of a precariously wedged beam; iron and wood climbing ladders dating from c1920 dangle uselessly. Fluor spar mining appears to have affected only the immediate vicinity of King Shaft - 40 m SE of King Shaft a relatively large side passage seems at first to follow the scrin on which the shaft lies but it soon becomes a cross-cut with up to 60 cm depth of standing water. A tight squeeze where this passage side-steps indicates that workings driven from the opposite direction are being entered after which progress is immediately blocked by a 3 m high slope of fallen rubble, possibly a collapse of the adjoining stone-stamped roof pack. There is no air flow here yet a series of shafts on the range of this vein marked on the Barmaster's 1:2500 scale map suggests there may be a major extension. Before the flooded section is a small pocket containing scalenohedral calcite crystals up to 10 cm long adjoining a bank of toadstone clay (the upper surface of the Lower Lava). 35 m south of King Shaft is an area of partly backfilled workings which rise SW under a 1 cm thick wayboard and end in a pocket containing purple fluor spar resting on top of the Lower Lava.

BEDDING PLANE CHAMBER

From the small chamber just before King Shaft a long crawl, averaging 1 m in height, leads off NW. For a short length the sloping limestone floor has been polished smooth by a combination of water and the passing of countless boots; at the start of this section a 10 cm diameter exploratory borehole from the surface enters the roof (see the survey). After about 100 m the Bedding Plane Chamber is met: mostly less than 1 m high its uneven floor makes it impossible to perceive its full extent in a single view. By the mid 1970s the roof of the chamber was so badly shattered that detailed surveying was deemed unwise. A few metres east of Beck Shaft is a chamber in a large pocket of laminated red clay; both this and the adjoining chamber to the north have bedding plane roofs dipping approximately 20° to the NE. The gallery ranging NW from the latter chamber forms the eastern boundary of the maze and some pockets on its NE side contain druses of brilliant quartz crystals up to 5 mm long - a rare occurrence in the Matlock region.

NORTHWEST FROM KING SHAFT

Beyond King Shaft the main route is an easy walking passage. The surveyed workings on the vein from King Shaft end at another shaft, the bottom 6 m of which are 2.4 m by 0.6 m in cross-section although its higher reaches are a usual 0.6 m square; a 1.5 m high pile of rubble at its base may conceivably extend north-westwards. The remaining passages are of a rather repetitive nature, averaging about a high except for the main route to the most westerly shaft which is often 5 m in height. The only unusual feature is reached by following a heavily packed, twisting crawl which has frequent changes in its floor level; there are a few bones, animal droppings, etc. here and at the end of the working. 1 metre up the west wall is a natural horizontal tube 30 cm high by 60 cm wide, closing to 20 cm by 50 cm after 2 m, with a slight draught out in winter. This is evidently used by animals although it is apparently some 10 m or more below the surface.
On all the main runs exploration north-westwards is finally terminated by collapses near the face of Knowles Quarry and no positive link was made with workings from Knowles Fluorspar Mine (which was almost completely destroyed in the 1940s and 1950s by the quarry). An approximate correlation of the surveyed workings with the Knowles Fluorspar mine passages is given by Flindall and Hayes (1976) but the relative positions of the workings are not known accurately enough to be marked on the large scale survey included with article.

From Crichman old Founder 13 meers were freed northwards which suggests that the forefield of the lead workings was no more than about 80 m beyond the limit of this survey. Between Carding's Nestus and Beck Shaft the workings are usually at some 30 metres depth, rising steadily NW in conjunction with the surface contours but towards the old quarry face the workings come to about 15 m depth and evidently the pipes outcrop at the north end of the quarry. In these pipe workings roof packs are extremely rare because of the wide and frequently low of the veins; however, the walls are often packed with deads which probably conceal many side passages.

**GENTLEWOMEN'S MINE**

The only link with Gentlewomen's Mine is an inconspicuous opening at floor on the east side of Beck Maze. This drops 1.5 m into a narrow lead working on a 15 cm wide scrin containing fluor spar, red clay and iron ores. After 35 metres one enters a collapse zone associated with nearby workings in Beck Mine but the through route turns off to the right before this along a natural passage 2 m high which soon closes to a crawl with a suddenly varying floor level and links through two small openings to the top of an easy climb down a vertical drop of 10 m through large pockets into the upper end of Gentlewomen's Pipe.

From the bottom a crawl doubles back towards Beck Mine, soon ending where the Lower Lava is met; the toadstone clay rises at 45 degrees to the SW and a trickle of water issues from it. This is doubtless the same water that flows through workings near King Shaft and it follows Gentlewomen's Pipe NE downhill for great distance although it is not always in evidence.

The main run along Gentlewoman's Pipe consists of a series of irregular small chambers usually about 4 m high and following the 20 degree dip of the beds. It has been reworked for fluor spar, calcite being more common here, and the mineralization and appearance of the workings are completely different from the Critchman system. Many of the cavities seem to be at least partly natural.

A long passage SE on a 10 cm wide scrin of red clay contains much backfilling. Opposite this a large side passage ends in an area of laminated red clay at a mud slope up to a choke which seems to be associated with Beck Mine.

Downhill on the main run, the next turning off to the west contains a raise 2.4 m by 0.4 m in cross-section, partly in a natural fissure and with a visible height of 6 m although animal bones at its base suggest a connection to the surface. The next passage off on that side ends in a tight crawl, which was explored for only 5 m, rising at 300 and with water trickling down.

80 m along Gentlewomen's Pipe from the point of entry is a natural chamber up to 3 m high by 5 m wide with large packs at its lower end where the stream re-emerges and in this vicinity there is much washed mineral waste. Beyond here the main run intersects several natural fissures up to 20 cm wide with extensively scalloped walls. Gentlewomen's Engine Shaft was sunk in one of these rifts and is about 2.4 m by 1 m in cross-section with some rope grooves on its sides.

This concludes the area surveyed by Roger Flindall with John Swain, Andrew Hayes and Jerry Corson.

### SITE GRID REF. ALTITUDE (m)

<table>
<thead>
<tr>
<th>Site</th>
<th>Grid Ref.</th>
<th>Altitude (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Masson Cavern show cave entrance</td>
<td>SK2916.5869</td>
<td>approx. 244</td>
</tr>
<tr>
<td>Masson Cavern rear entrance</td>
<td>SK2905.5883</td>
<td>278</td>
</tr>
<tr>
<td>Carding's Nestus Fluorspar Shaft</td>
<td>SK2903.5879</td>
<td>290</td>
</tr>
<tr>
<td>High Loft Shaft</td>
<td>SK2897.5882</td>
<td>298</td>
</tr>
<tr>
<td>Dale Shaft</td>
<td>SK2896.5889</td>
<td>293</td>
</tr>
<tr>
<td>Crichman Old Founder Shaft</td>
<td>SK2887.5894</td>
<td>305</td>
</tr>
<tr>
<td>Crichman New Founder Shaft</td>
<td>SK2870.5903</td>
<td>320</td>
</tr>
<tr>
<td>Gentlewomen's Engine Shaft</td>
<td>SK2889.5910</td>
<td>275</td>
</tr>
<tr>
<td>Date</td>
<td>Green River &amp; Crow's Mine</td>
<td>Healy's Pipe</td>
</tr>
<tr>
<td>------</td>
<td>--------------------------</td>
<td>-------------</td>
</tr>
<tr>
<td>1817</td>
<td>5-6</td>
<td>43-2</td>
</tr>
<tr>
<td>1818</td>
<td>107-4</td>
<td>91-8</td>
</tr>
<tr>
<td>1819</td>
<td>200-7</td>
<td>96-5</td>
</tr>
<tr>
<td>1822</td>
<td>153-9</td>
<td>13-3</td>
</tr>
<tr>
<td>1823</td>
<td>147-7</td>
<td>6-3</td>
</tr>
<tr>
<td>1824</td>
<td>142-3</td>
<td>4-4</td>
</tr>
<tr>
<td>1825</td>
<td>160-5</td>
<td>60-4</td>
</tr>
<tr>
<td>1826</td>
<td>173-6</td>
<td>41-5</td>
</tr>
<tr>
<td>1827</td>
<td>157-1</td>
<td>0-7</td>
</tr>
<tr>
<td>1828</td>
<td>169-0</td>
<td>44-2</td>
</tr>
<tr>
<td>1829</td>
<td>14-5</td>
<td>35-5</td>
</tr>
<tr>
<td>1830</td>
<td>67-2</td>
<td>22-5</td>
</tr>
<tr>
<td>1831</td>
<td>173-0</td>
<td>4-0</td>
</tr>
<tr>
<td>1832</td>
<td>300-4</td>
<td>1-5</td>
</tr>
<tr>
<td>1833</td>
<td>743-3</td>
<td>9-7</td>
</tr>
<tr>
<td>1834</td>
<td>492-0</td>
<td>1-6</td>
</tr>
<tr>
<td>1835</td>
<td>942-0</td>
<td>1-7</td>
</tr>
<tr>
<td>1836</td>
<td>18-6</td>
<td>13-2</td>
</tr>
<tr>
<td>1837</td>
<td>19-5</td>
<td>9-1</td>
</tr>
<tr>
<td>1838</td>
<td>10-6</td>
<td>10-2</td>
</tr>
<tr>
<td>1839</td>
<td>1-0</td>
<td>3-1</td>
</tr>
<tr>
<td>1840</td>
<td>1-5</td>
<td>1-5</td>
</tr>
</tbody>
</table>

Notes: Totals are for one or more mines on the same vein, and include ore measured for the mine, and lot ore paid (½/25 was normal). One load = mine dishes. About four loads to one tonne. Data extracted by H. Flindall, from Barmaster's Accounts, Chatsworth.