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CORNISH MINERS AT CHARTERHOUSE-ON-MENDIP

by

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ABSTRACT

Between 1844 and 1858 the 'adventurers' of the Mendip Hills Mining Company sank 6 deep shafts at Charterhouse in search of lead ore, without success. From 1847 to 1885 they reworked almost the whole deposit of lead-rich refuse that had been left by earlier miners in Blackmoor and Velvet Bottom valleys. The venture was beset by disasters and lost money until Nicholas Ennor was employed as a consultant. In 1861 control passed to a large Cornish smelting firm, Treffry's, and thereafter profits were made. Detailed accounts are given of the existing remains of mining and slagging.

INTRODUCTION

The last phase of the lead industry on Mendip, as described by Dr. J. W. Gough (1967, pp. 181-205), was the reworking of the masses of lead-bearing slags and slimes that had accumulated over many centuries in the valleys (the 'mineries') where the ore was dressed and smelted. Lead mining had long ceased when slagging reached its peak in the second half of the 19th century, but sporadic attempts were made by the slagging firms to re-open old mines, and even start new ones, in search of fresh ore.

The authors' interest in lead working at Charterhouse began with their excavations in Blackmoor Flood Swallet (Stanton 1976) and Waterwheel Swallet, in the Charterhouse Minery. Both were natural swallets that had been used by the slaggers. An adjacent site, the so-called Grebe Swallet, was shown by the authors' investigations to be an 18th century lead mine.

A prolific source of information on Charterhouse slagging that was not, apparently, known to Dr. Gough, was indicated to the authors by Mr. Chris Richards of Weston-super-Mare. He had seen references to Charterhouse in the *Mining Journal*, a weekly newspaper that was published in London from 1830 onwards. From 1844 to 1860 the development of the *Mendip Hills Mining Company* based at Charterhouse is documented in the *Mining Journal* (MJ) in some detail. The authors are much indebted to Mr. Richards.

The following account is based on the MJ reports, on information from other sources (see Table of References), and on extensive field work carried out by the authors between 1974 and 1984.

THE MENDIP HILLS MINING COMPANY

This company (MHMC) began operations at Charterhouse in 1844 and continued, with several ownership changes and under slightly varying names, until closure in 1885. Initially the intention was to reopen the old

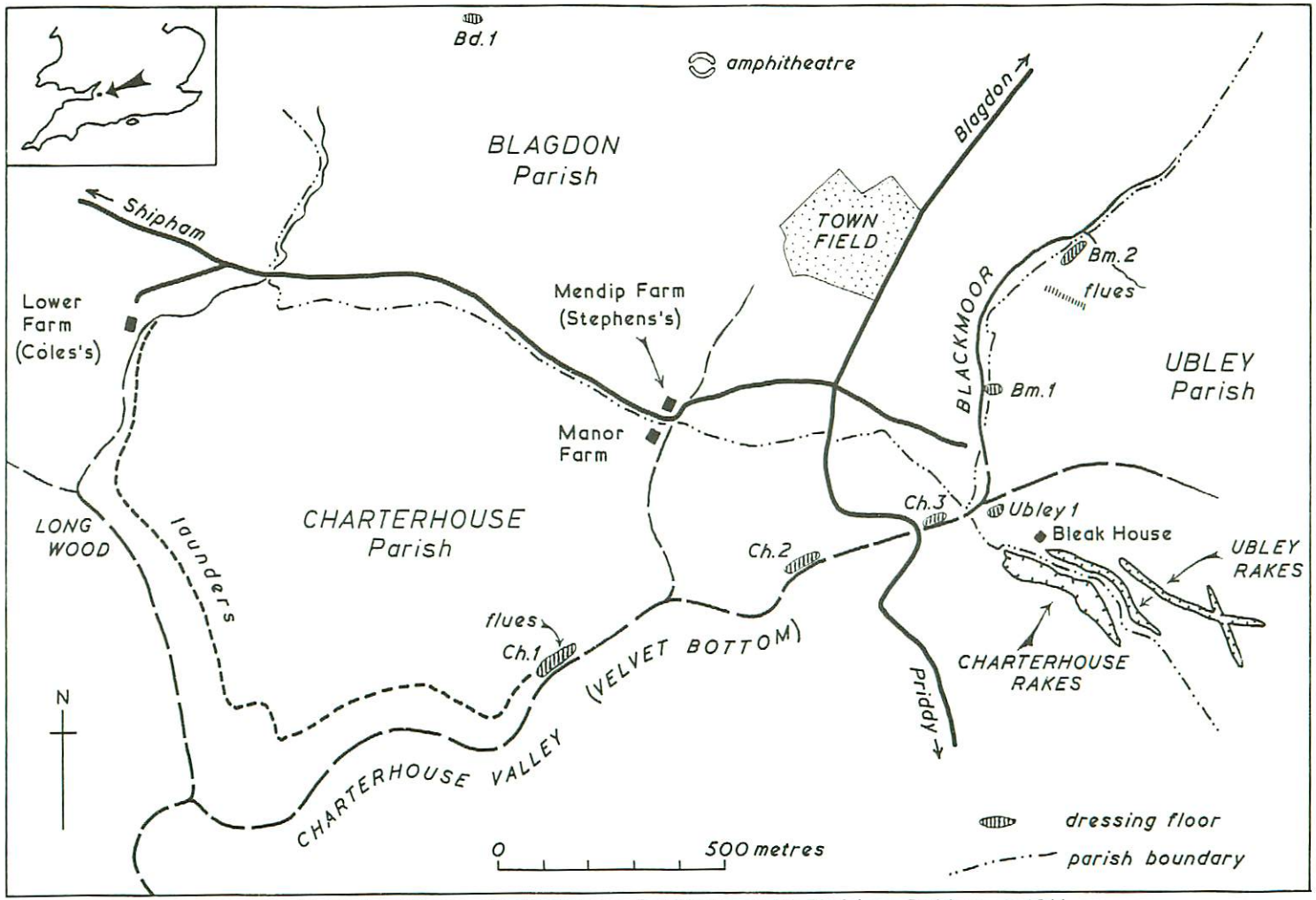

Fig. 10 Site location map. Ch: Charterhouse. Bm: Blackmoor. Bd: Blackdown. Parishes as in 1844.

mines and exploit the deep ore that the 'ancients', without the benefit of Cornish technology, had been unable to reach. Between 1844 and 1849 four deep shafts were sunk and 570m of galleries at various levels were driven. The Cornishmen found to their cost what the ancients had known all along, that "the ore on Mendip . . . does not lie deep" (Gough, 1967, p. 141). In 1847 they turned their attention to the 'slag grounds' of Charterhouse Valley (Fig. 10), setting up dressing floors and furnaces in Velvet Bottom. Later they obtained rights over the Ubley and Blackmoor slag grounds and built new floors and furnaces there.

From 1844 to 1856 the company's operations were a financial disaster to the shareholders, if not to some of the directors. Only one dividend was paid, but 12 'calls' (negative dividends) were made on shareholders. Small dividends were paid annually from 1857 to 1860, but in about 1861 the concern was sold to an all-Cornish firm: Treffry & Co. of St. Austell. This firm did not report to the MJ, but Gough (1967, pp. 193-5) gives a short account of its activities.

THE MINING OPERATIONS, 1844 to 1849

The MJ of 30.11.1844 contains the first account of the mining. A company, the *Mendip Hills Mines,* had agreed with Dr. Benjamin Somers of Langford to search for lead ore on his Ubley Warren estate. A sketch map (copied in Fig. 11) shows what appear to be the Ubley Rakes, in which the mine director, John Williams of Plymouth, had sunk a shaft "20 fathoms" (37m) deep on Somers's Lode. Somers's Shaft, as it was called in honour of the landowner, had located large "stones of lead" (lumps of galena) in the lode, but it was not yet beneath the old men's workings, so the plan was to deepen it to 55m. The company also planned to sink several shafts on Williams's Lode and run a railway into the mine.

When the mines are next described, on 15.11.1845, they are under new management. The headquarters of the MHMC are in Finsbury Square, London, at the house of the manager and treasurer, Peter Stainsby, who is a

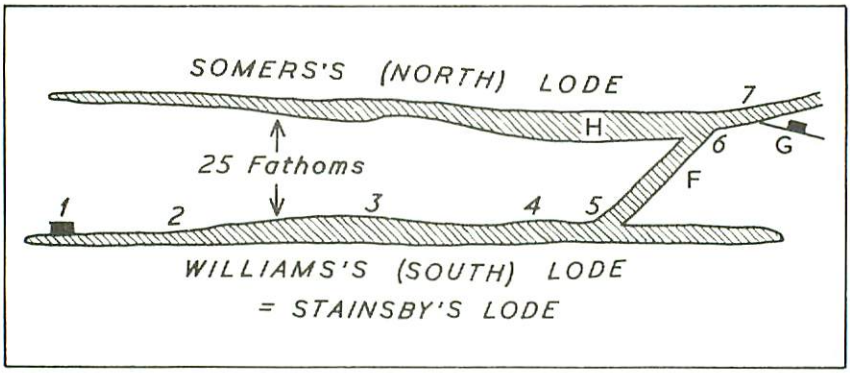

Fig. 11 Sketch plan of MENDIP HILLS MINES (copied from the Mining Journal of 30.11.1844). The two main lodes are joined by the caunter lode F. Somers's whim-shaft G is sunk on another caunter lode after a trial shaft at H "found that the old workings were too extensive to timber". New shafts are to be sunk at points 1 to 7. (Compare with *Fig. 13*).

promoter of mining companies especially in Cornwall and Devon. The Chairman is Edward Barwell, Mayor of Northampton. With extra capital generated by an increase in the number of shares from 1000 to 5000 the 'adventurers' are sinking 3 new shafts and deepening Somers's Shaft as planned. The agent's residence, office ('count house'), store and workshops are on the hilltop, at the Bleak House site.

One of the new shafts had no name other than New Shaft. It was sunk 37 m in hard limestone, not on a lode, at a point a few metres NE of Somers's Lode, to connect with the "20 fm level" (i.e. a level starting 37 m below the shaft top) that was being driven NW from Somers's Shaft, to improve ventilation. Another new shaft was Paynter's Shaft, named after the new mine captain, on Stainsby's Lode (originally Williams's Lode, Fig. 11). The third new shaft was Stainsby's Shaft, in the low ground beyond the north end of Stainsby's Lode. It had been begun by the previous owners.

Three anonymous reports in the MJ between November 1845 and March 1846 are of a circumstantial nature and were probably written to promote the mine and persuade shareholders that their investment would soon pay off. The first progress report, written by the mine captain, is in similar vein:

"MENDIP HILLS *April 21 1846.* This day we have got in our count-house the largest stone of lead that there is in any count-house in England; it took 14 strong men to get it up to the count-house ... I was underground assisting the men to get out of the end this large stone of lead, with many other good ones. This is at Stainsby's, at the 18 fm level, driving north of shaft; there has not been seen such a large stone of lead on the Mendips in our day – it weighs from 10 to 12 cwts, and we shall have more of them yet. G. PAYNTER."

Thereafter, progress reports followed at weekly to monthly intervals. In June 1846 Paynter, whose writings had seemed rather incoherent, was replaced as mine captain by another Cornishman, Francis Harpur, and Paynter's Shaft was rechristened Barwell's Shaft. Both captains used Cornish mining terms, thus the *lodes* commonly consist of *flookan* (soft or clayey material), with *iron, spar, quartz, carbonate of lime* and *lime-rock*; the *levels* (galleries on the lode) driven off the *whim shaft* (engine shaft) may lead to a *winze* (descending shaft) or a *raise* (rising shaft) or may intersect a *gunnis* (open working of the *old men*); the *horse-whim* (horse-driven engine) brings to *grass* (the surface) *kibbles* (large buckets) of *good work* (rich ore) or *attle* (rubbish), and so on (see Appendix). Distances were given in fathoms (1 fm = 1.83 m), yards and feet; weights in cwts (1 cwt = 51 kg) and tons.

At the first annual general meeting of MHMC on 10.9.1846, in London, Captain Harpur reported that Stainsby's Shaft was 69 m deep with an 18 fm level driven 18 m north and 80 m south; Barwell's Shaft was 46 m deep with short 14 fm and 25 fm levels; Somers's Shaft was 55 m deep with a 20 fm level driven 143 m NW, with a winze 16 m deep about 90 m from shaft. The crosscut to connect this level to New Shaft was in very hard limestone and was unfinished, though only 15 m driving was needed. In all, 223 m of shaft had been sunk and 293 m of levels had been driven. The old men's workings had been met in many places.

The mining consultant, Mr. P. Johnson, explained that his intention was "to get below any former workings, the prospects being evidently in

depth." A small quantity of lead ore had been found, but most had been "taken away by the old men". Nevertheless, "the indications are promising of lead at deeper levels."

The work force at this time consisted of 27 miners, a carpenter, a smith, a kibble-filler and a lander. Three horse-whims were operating. The directors considered that prospects were encouraging, but the shareholders must have winced on hearing that expenditure to date had been £2765, and earnings nil.

The following year, 1846-7, at first saw frantic underground activity as the company desperately searched for ore. Barwell's Shaft was divided from top to bottom (part for ladders, the rest for kibble hauling), only to be abandoned when the lode at the 25 fm level shrank to a barren hard spar vein. The New Shaft crosscut holed through into Somers's 20 fm level, and the lode in the floor of this level, which was producing good stones of lead, was stoped to several metres depth, but the ore soon failed. A *costean pit* (trial pit) 4 m deep was sunk in the eastern ground; Captain Harpur reported finding stones of lead in it, with flookan, *gossan* (weathered ore), manganese and calamine. His report, optimistic as ever, continued: "I think it probable that we shall meet with lead at no great depth, it being in maiden ground; and what is still more encouraging, the continuation of a lode, where the ancients secured such an immense profit." But the costean pit was not mentioned again.

In December 1846 the company restricted its operations to Stainsby's Shaft. This was to be deepened indefinitely, and a 38 fm level was to be driven south for 36 m "to get under a large cavern, we have gone down in the level above; below these caverns large deposits of lead are often found". Ominously, at the start of 1847, when the shaft was 86 m deep, the lode was hard, with a small stream of water issuing, and the only traces of ore were "spots of lead in places".

In January 1847 MHMC began investigating the slag grounds of Charterhouse Valley. The number of miners was reduced to 10, with a kibble-filler and a lander. They had no success. On 27.3.1847 Captain Harpur reported "in Stainsby's Shaft the lode is principally composed of quartz and iron, with spots of lead occasionally; it has been gradually diminishing in size for several fathoms past and is now become very small – consequently I have suspended operations". This was at the respectable depth of 108 m. The 38 fm level had reached the expected "cavern" 55 m SE of shaft on 1.5.1847; it was not, evidently, open void, but may have been filled with rocks and mud. The lode at this point consisted of soft light and dark flookan "with large stones of good quality lead at times". Capt. Harpur was much encouraged and began sinking a winze "to get under the cavern", but the hoped-for bonanza of residual ore was absent, the lode shrank from 2 m width to "nothing more than a small vein or division of the rock", and the winze was abandoned at a depth of 33 m (104 m below surface). Small streams of water had entered the winze and the level nearby, but there is no mention of pumping.

In December 1847 most of the remaining miners were brought to the surface to work on the slag grounds. Dr. Somers had stipulated in the lease that some mining must be carried on, so 4 men were kept driving the 38 fm

level south of Stainsby's Shaft, without, by now, any lively hopes of striking ore. In February 1848 there is the first allusion to the real direction followed by this (or any other) level: "the lode ... has taken a more easterly direction ... being about 35° east of south." This happened when a branch lode was reached about 75 m beyond the winze.

At a meeting of MHMC on 24.4.1848 Capt. Harpur reported that the 38 fm level south of Stainsby's Shaft was 165 m long, on a lode up to 4 m wide consisting mainly of flookan and spar with "sprigs of lead" at times. The 4 miners went on driving this level in 1848. Following the Cornish custom they 'bargained' at intervals to decide their remuneration: when the ground was "good for driving" the group received £2.25 per fathom; when it was hard they earned £3 per fathom.

The final length of the 38 fm level was not recorded, but was probably about 220 m. It was abandoned in November 1848. The miners returned to Somers's Shaft where they found a few stones of lead in a winze and a raise off the 20 fm level north. In March 1849 underground work ceased when the lease was renegotiated with Mr. Thomas Somers (son of the Doctor, who died in 1848). The MJ does not record any later mining by MHMC, but it probably took place, as discussed later.

THE LAYOUT OF THE SHAFTS AND LEVELS

Cornish miners in the 1840's constructed shafts that were unlike those of the Mendip lead miners a century or two earlier. A typical Cornish exploratory shaft was about 2.5 m square, timbered where necessary, fitted with wooden ladders and platforms down one side for 'footway', the remainder being used for hauling. Around the mouth would be a flat area of tip, probably with a horse-whim close by. Not all shafts were vertical, some would follow steeply sloping lodes (R. Williams, *pers. comm.*).

Four such shafts can be recognised in the Ubley Rakes (Figs. 10, 13). The one in the low ground was dug open to 10 m depth by cavers and called by them Blackmoor Swallet (Barrington and Stanton, 1977, p. 41); it is undoubtedly Stainsby's Shaft. The neatly squared-off shaft with large shotholes is still open. On the high ground, Stainsby's Lode and Somers's Lode are identified as the two biggest rakes in Ubley parish; they are in fact the Ubley Rakes. Somers's Shaft, near the SE end of Somers's Lode, is a deep hollow in a large flat-topped tip that fills up the rake. The New Shaft is distinguished by its tip of limestone rubble down the side of Somers's Lode. Barwell's Shaft on Stainsby's Lode is the central hollow in a large tip where several deep rakes meet, almost on the parish boundary. Over the wall, in what was then Charterhouse parish, is the circular base of a horse-whim that served this shaft.

Charterhouse parish was abolished in the early 1900's (perhaps in 1908 when the little church was built) and the Charterhouse Rakes, even deeper and more impressive than the Ubley Rakes, have become part of Blagdon parish. There are 2 Cornish shafts in the Charterhouse Rakes, each with a flat-topped tip containing large blocks of limestone with shotholes, but they are not mentioned in the MJ.

Fig. 12 is a projected section of the shafts and levels, constructed in the Cornish fashion from the MJ reports. It shows that the Ubley Rakes were extensively prospected at two levels, the deeper being some 75 m below ground level – unprecedented for Mendip. The 'old men's' workings had seldom reached half that depth. The rich ore deposits had been shallow, petering out in depth.

Capt. Harpur's reports always refer to the levels as driving north of shaft or south of shaft, or, in the New Shaft crosscut, west of shaft, but this must have been a convention, for simplicity, as the general direction of the Ubley Rakes is NW–SE. Assuming that the underground lodes underlay those at surface (which may not always be true) the main levels from Stainsby's Shaft would have driven almost south until Stainsby's Lode was reached, when they turned ESE. The Somers's and Barwell's levels would have trended WNW to NW.

THE SLAGGING OPERATIONS, 1847 TO 1850

In 1845 Dr. Somers owned the 'slag grounds' of the Blackmoor valley (Blagdon and Ubley parishes, Fig. 10), while the slag grounds of the Velvet or Charterhouse valley, in Charterhouse parish, belonged to Lord Clifden (or Clifton). The Blackmoor slags had been resmelted by Dr. Somers for at least 20 years (Gough, 1967, p. 183) but Lord Clifden's grounds were untouched.

By the middle of 1846 MHMC, whose grant from Dr. Somers did not include any slag ground, knew that the mining trials were proving an expensive failure. The Chairman was therefore delighted to announce, on 10.9.1846, the lease of Lord Clifden's grounds, where "the ancients, or oldmen" were believed to have left "a large and valuable tract of slag ground ... the slags contain about 25 per cent of lead". Mr. Barwell apprehended that Dr. Somers had realised at least £400,000 from slag-smelting on his adjacent estate (which was double the sum conjectured in a letter written to the MJ ten months earlier).

On 11.1.1847 Capt. Harpur "put some men to work on the slag ground, commencing with a large open trench at the lower part of the ground; as soon as we make any discovery, the particulars shall be made known to you". Next week the trench was 22 m long and 3 m deep and had exposed two beds of "very good slags". It had begun 300 m downvalley of the present road crossing, where the Charterhouse 2 dressing floors would later be built (Fig. 10), and it was driven up the centre of the valley. (As in the underground works, Capt. Harpur expressed distances and dimensions in fathoms and feet.) By 5.4.1847 the trench was 200 m long and up to 7 m deep, with continuous beds of slags as much as 4 m thick. Capt. Harpur often referred to the value of this trench for "carrying off the water", which suggests that the valley floor was liable to be flooded by the stream from Blackmoor.

By now, enough slags had been proved for MHMC to plan the building of dressing floors where the slags would be washed and prepared for smelting. The site chosen for the Charterhouse 1 floors and smelter, 900 m down Velvet Bottom from the road crossing, was entirely dependent on the availability of water.

Probably because it is the largest and most reliable stream in the area, the company elected to use the water that now enters Longwood Swallet. Damming it below the springs at Lower Farm (now the Bristol Waterworks source) they led it almost horizontally along 1800 m of 'launders' (rect-

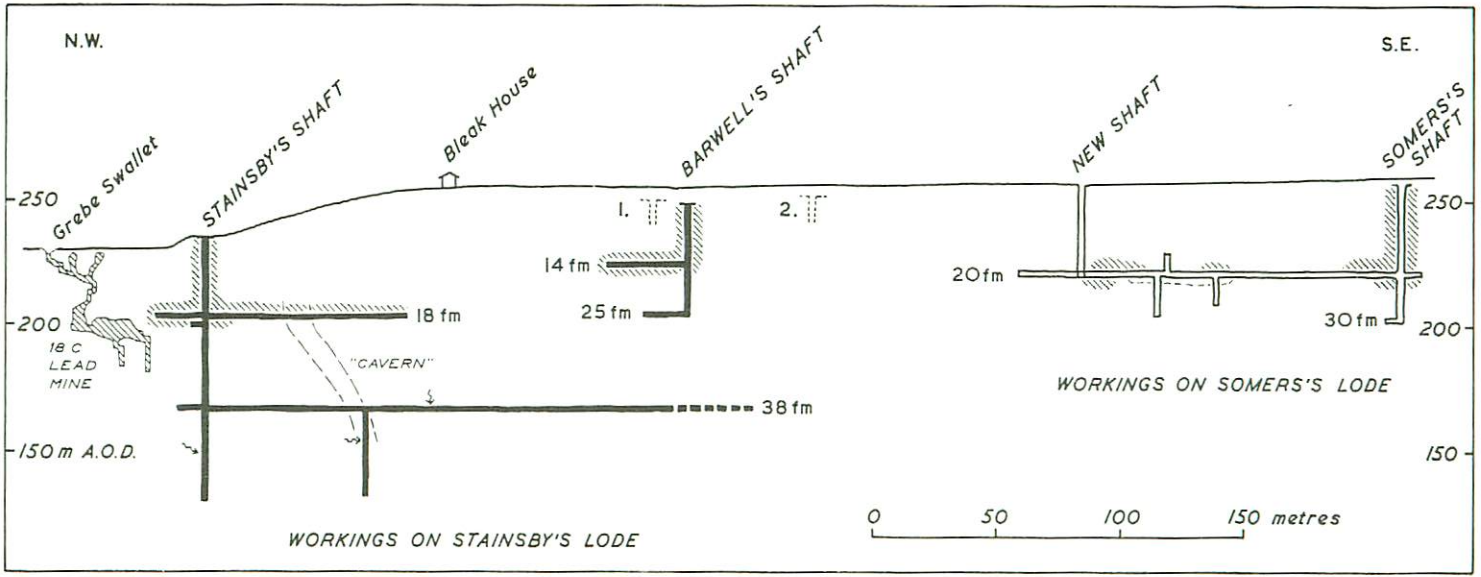

Fig. 12 Projected section of the shafts and levels. Wavy arrows indicate streams of water. Hatching indicates "old men's workings". 1 and 2 are shafts in Charterhouse Rakes.

angular wooden troughs) made by their own carpenters, 30 cm wide by 20 cm deep, through the wood on the steep east side of Longwood valley and into Velvet Bottom, where it turned east towards the slag grounds, following a contour until it met the valley floor at a level less than 5 m below that of the Lower Farm springs. In some places the launders rested on flattened ground, in others they were carried on posts. In July 1847 Capt. Harpur reported: "During the past week but little has been done in removing the top rubbish from off the slag, as the principal part of our force has been employed in laying open a cutting to receive the launders between Long Wood and Velvet Valley – there being in this part a point of hill about 5½ ft. higher than the water level". This cutting is still present on the north side of Velvet Bottom; why the launders had to cut through the point of hill, instead of going a few extra metres round it, is unclear. The launder route along the side of Velvet Bottom (Fig. 10) is visible, looking like a footpath, on air photos taken in 1946, but it has since been partly erased. No trace remains in Longwood, where, probably, the launders were mainly on posts.

By August 1847 the launders were in place and a "carriage road" had been made to the smelting site. It probably developed into the existing track (Fig. 14). A large area of slag beds had been cleared for excavation by removing the "top rubbish", a layer 1 to 2 metres thick of soil and stones of uncertain origin.

At the general meeting of September 1847, shareholders were informed of these promising developments. Twenty men were now working on the slag grounds. A tramroad 600 m long with iron rails and wooden sleepers was under construction, linking the slag beds to the dressing floors; it would continue up Capt. Harpur's trench. Work on the floors and furnaces had begun.

The next few months saw the building of the engine house and installation of the boiler and steam engine (brought from Bristol) that would power the fan. Brickwork flues were laid to convey the "wind from the fan" to the 3 blast furnaces which, with condensing flues and deposit chambers totalling 55 m in length, were virtually complete by the end of 1847. So was the tramroad with its wagons made by the company's smith and carpenters. Several strakes (narrow trough buddles used with a fast water flow) for washing the slags were in place on the dressing floors. Concurrently a cross-trench was driven across Charterhouse Valley just below the present road crossing, which proved that the slag beds extended almost the full valley width, being thickest (up to 3 m) in the middle.

In January 1848 the first slags were trammed to the floors, and Captain Harpur proudly reported "we have washed and cleaned a few tons ... and a small pile was smelted, which produced a fair quantity of metal". Two weeks later 3.5 tons of slags were smelted, producing 0.6 tons of lead. This proportion, about 17% by weight of lead (significantly less than the average 22.5% predicted by chemical assay), was to prove normal in the next few weeks.

It was soon realised that the layers and pockets of clay that occurred intermixed with slag beds were "the washings of the ancients", or slimes, containing 40% or more of lead. The dressing floors were therefore adapted

to treat the slimes, and the first batch was encouraging: "the quality of the clay is good, as we took from the furnace, last Thursday, 16 cwts of lead, being the most yet produced in one day". In the week to May 15 the furnaces yielded 5.2 tons of lead. From now on, smelting took place 3 or 4 days per week. A small new furnace had been set up to resmelt the lead into pigs, and the masons had built a store for coal and coke.

Captain Harpur's trench was widened to take the tramroad, and was slowly pushed eastward to the cross-trench and beyond. The lead content of slags and slimes, and the thickness of the beds, improved eastwards, and the company's fortunes seemed to be on the mend until, late in 1848, disaster struck.

The Riot

At a special meeting on 22.12.1848 Chairman Barwell made "a statement of the extra expences which had unavoidably been incurred, from extensive breakages of the leats and launders, and that during their repairs they were unable to continue operations". At the ensuing court case (Barwell and others v. the Hundred of Winterstoke) held at Taunton in April 1849, the prosecution told how "40 or 50 persons riotously and tumultuously assembled" to demolish the troughs. As individuals could not be identified, the Hundred was sued for damages. The main witness was Capt. Harpur, who had been a miner, he said, since he was 9 years of age. He described the mine, and the troughs carrying water to dress the ore. "The water is taken up ... at a place called Coles's Farm, brought through a wood called Long Wood, and continued to Velvet Valley, where it ends. ... In some places the troughs are supported at a considerable height above the ground by wooden legs. ... On the night of the 9th of June the troughs were injured, and the repair of them cost between £60 and £70. In consequence of something that occurred, I set Joseph Cole to watch the troughs on the night of the 23rd of June. About 1 o'clock I was awoke by Cole. I heard the report of firearms. I was afraid, and, therefore, did not go to the spot at that moment, but the next morning I went to the troughs, and found that they ... were broken to pieces in every direction for more than a mile, and the cost of reparation is £140." The defence contended that the aggrieved people of Cheddar were simply exercising their right to prevent the poisoning of their water.

The MHMC won the case, and an appeal in the following year. The Hundred of Winterstoke had to pay £140 damages. The MJ had not carried the full story, for many years later Nicholas Ennor recalled (MJ, 8.2.1873) that the company had "adopted a plan ... of washing out the slime and picking out the old slags by hand. The slime they washed out was sent into a hole, commonly called a swallet; from there it washed for miles underground, and came out into Cheddar fishponds and filled them, for which the company had to pay damages. I have taken samples from these ponds since, producing 8% lead." Cavers have still to discover the site of this swallet near the Charterhouse 1 dressing floors.

At the same meeting the Chairman announced that MHMC was to lease the adjoining slag grounds called Blackmoor, Ubley Warren and Stevens's, for 21 years from Mr. Thomas Somers. These were the grounds in Ubley and Blagdon parishes (Fig. 10) that had been

worked by Dr. Somers "by the old system of delving and forming a cone reversed". whereas MHMC won the slags "opencast or as a quarry" (MJ 1848, p. 146). Mr. Somers was to receive £700 for the use of water and existing buildings and machinery, and for anulling the clause in the earlier lease that required a number of men to work underground.

Capt. Harpur began work on Ubley slag ground in March 1849. Slimes from the first trial pits contained an astonishing 53% to 57% of lead, and the slags a normal 23% of lead. New dressing floors (Ubley 1) were at once prepared, and the men were set to laying open a cutting to take the water from the floors, and to "driving a lobby from the side of the valley into Stainsby's Shaft". A lobby was a short tunnel; presumably the dirty water from the "strakes, machines, buddlers, etc." was to be disposed of into the deep shaft.

In April the Ubley dressing floors began work. The deposits were found to be 7 m thick down to rock floor, the top half being mainly slimes and the bottom half rich slags, but they were saturated with water, and work was held up until the lobby was completed in May. Then a cutting was driven to drain both Ubley and Blackmoor slag grounds into Stainsby's Shaft.

During this period, and on into 1850, the main trench in Charterhouse Valley was being driven east towards the Ubley grounds. The quality of slags and slimes continued to improve. The deposit consisted of 2 m to 3 m of top rubbish above 4 m to 5 m of "good work for slags".

In May 1849 at a general meeting of MHMC, the directors announced that an 8 horse-power steam engine would be set up between Ubley and Blackmoor grounds "for the purpose of raising the material out of the valley to the washing floors and for returning the water to the washing strakes". Workshops and a sawpit would be established close by, and the old workshops on the hill (Bleak House site) would be made into 2 tenements. A reverberatory furnace would be built to smelt the slimes, for which the blast furnaces were unsuitable. MHMC had decided to expand the scale of operations. Mr. John Walker was employed as a consultant. His aim, recalled 24 years later in an exchange of abusive letters with Nicholas Ennor (MJ 1873, p. 125), was to dress enough slags and slimes to produce 20 tons of lead per month.

By August 1849 large dressing floors were approaching completion on Ubley and Blackmoor grounds, each with washing strakes, slime boxes, jigging machines and buddles. The reverberatory furnace was in operation at the Charterhouse 1 site. The steam engine was in place and inclined planes led from it down into the Blackmoor and Ubley workings. Wagonloads of 'stuff' would be drawn up tramways on the planes by chains and winding drums powered by the engine, on their way to the floors – which at this early stage were at a high level, on top of the deposit. Later, as space became available in the workings, new floors were built on the natural bottom of the valley, so that the deposit beneath the original floors could be quarried.

In September Capt. Harpur set some men to making a reservoir at the upper end of Blackmoor, and to "clearing the large drain around the north side of Blackmoor slag ground, in order to prevent, if possible, the surface water falling to the bottom of the valley" where it could flood the workings in wet weather. This drain, perhaps first dug by Dr. Somers' men, can still be traced from the reservoir to beyond Waterwheel Swallet (Fig. 14) where, no doubt, it once provided water to the 6 m diameter waterwheel excavated by a group including the authors in 1977. (An account of this work is in preparation.) Possibly the waterwheel powered the sawpit that was planned in 1849.

The Ubley and Blackmoor grounds had become so important to MHMC that in October Capt. Harpur called for the building of offices, stables, a store and a reverberatory furnace near the Ubley floors. There was insufficient water, in the dry weather, to operate both floors at full capacity, but at Charterhouse 1 there was a problem with disposal of the water coming from Longwood. Possibly the swallet had become blocked. November saw "a few showers of rain", which activated the launders from the new reservoir to the Blackmoor and Ubley floors.

MHMC's last report appeared in December 1849. Written by Captain Harpur, it runs, much as usual:

"MENDIP HILLS. I have no particular change to report to you this week in the appearance of any part of your works at Charterhouse; the men are still engaged in extending the cutting towards the eastern part of the valley, where the beds of slagstuff are about 14ft. thick, producing some very good slags. At Ubley we are progressing with the incline plane towards the bottom of the valley – a good pile of slags has been washed from this place during the past week, as also a little slimes, assay of which I have made, and find it contains 39¼ per cent of metal. At Blackmoor we are now getting pretty near the bottom of the valley, where I think, on the whole, we have an improvement in the stuff now removing to the washing floors."

At this point the company seemed to be doing well. The three floors were in full production and the furnaces were smelting almost every week, in spite of occasional problems with the blowing apparatus.

FURTHER DEVELOPMENT OF THE COMPANY, 1850 TO 1860

All was not well with MHMC. In March 1850 the MJ noted that "the workmen in the Mendip Mines have left their occupation – have struck, that is, for an increase of wages." (Three years later, referring to this or to a later demand, the Chairman commented guardedly "the directors had to a certain extent complied".) Shortly afterwards, in May 1850, a shareholder wrote to complain of "the recent depression in the value of our property".

Now for some years the only reference to MHMC is the report of its annual general meeting. In May 1850, Chairman Barwell expressed the directors' satisfaction with the productive state of the company, which now employed 150 persons. Lead worth £1202 had been sold, but expenditure had been heavy, and the balance against the company was £1443. A call (the tenth so far) of 25p per share was made, to wipe out £1250 of this debt.

At the 1851 meeting in July, Mr. Barwell reported that 293 tons of pig lead had been sold for £4564. The works employed 300 men and women, many of them coming as much as 5 miles to work. The year's balance against the company was £1909, but 100 tons of lead, worth £1600, were in stock, and the directors were anxious to pay the first dividend – so anxious, in fact, that they would cheerfully give up their salaries in the coming year. With coal and coke at 17p and 25p per ton the business promised to make good profits, and Mr. Barwell anticipated paying "two dividends a year – more if possible". The directors "still contemplated employing three or four men to search in the veins for lead."

This rosy picture was damaged, in the next issue of the MJ, by a sarcastic letter signed ARGUS. "What?" he asked. "The directors of Mendip Hills forgo all remuneration for their services! Mr. Stainsby *cheerfully* consent to the arrangement as regards the London management!! ... No one can deny that the directors of Mendip Hills have had a fair picking out of the concern; still the news in your last is too good to be true." ARGUS went on to assert that if the directors paid a 4 shilling dividend it would be followed by a 7 shilling call.

No dividend was paid, and there was no news of MHMC for 17 months. Then, in December 1852, the MJ carried a brief note that the company expects to sell 100 tons of lead per month at about £20 per ton. New smelting works are being set up by Mr. Horatio Nelson Hornblower.

An explanation of sorts was provided at the next meeting on 6.5.1853. Chairman Barwell spoke vaguely of "almost insurmountable difficulties" which would have justified 3 calls, but the directors gave up their salaries instead. £1600 had been spent on machinery and alterations to the furnaces and flues. But the sales of lead had realised £11077, all debts were paid, the mine was £2580 in profit, and directors declared a dividend of 50p per share. An "able and scientific manager" (Mr. Hornblower) had been secured, and the company expected to produce 60 to 70 tons of lead per month. The work force was now 300 to 400 persons.

Again the company seemed to be on the brink of prosperity, but 18 months went by with no news. Then, in November 1854, an anonymous

correspondent enquired whether MHMC was "among the killed or wounded, or to be kept a State prisoner in Bishopsgate Ward?" (Salvador House, Bishopsgate, London, was the office from which Mr. Stainsby now controlled his mining empire). Two weeks later another writer, probably fishing for a denial, alleged that the Mendip Company's deposit was superficial, a paradox, soon to be exhausted.

Perhaps by coincidence, MHMC called a meeting in December 1854 at Salvador House. Mr. Barwell described how increases in the costs of coal and labour, and the departures of furnacemen to Australia, had prejudiced operations; nevertheless lead worth £11330 had been sold and a profit of £2177 made. A dividend of 37½p per share was declared, payable in the following March. The shareholders asked searching questions, establishing that MHMC had no bank account, that debts of up to £2000 had been met by directors, especially Messrs. Stainsby and Barwell, out of their own pockets, and that directors had waived their salaries for the past 3 years. Mr. Stainsby was interrogated about his conduct as manager and treasurer, and he agreed, reluctantly, to open a bank account. On a lighter note, the Chairman thanked shareholders on behalf of himself and Mrs. Barwell for the gift of a handsome tea service, costing £100.

The Embezzler

The dividend was never paid. Only a month later, Mr. Stainsby was exposed as a felon and embezzler, having misappropriated the £2000 allocated for the dividend, as well as £1700 in bills. He had been manager and treasurer of 11 mines, and had used their funds for his own purposes. His liabilities were £48,000 and his assets ("problematical") £30,000. In a leading article the MJ (March 1855) remarked on "the plausibility, the *suaviter in modo*, of the late manager", which had deceived so many. The article went on to condemn the rules of the Stainsby companies, whereby the directors, once appointed, had absolute power and could not be removed by the shareholders. Mr. Stainsby was prosecuted by MHMC for embezzlement and went through the bankruptcy courts.

Worse was to come. In October 1855 a call of 35p per share was made to compensate a Mr. Stephens, who had sued MHMC for damage to his farm and been awarded £500. Then in May 1856 it was revealed that the company must buy the farm. As Nicholas Ennor recalled 17 years later: "they smelted their slags without a sufficient length of flues, and the lead was carried over the adjoining lands to such an extent that an action was brought, and the company had to purchase all the land". These would have been Mr. Barwell's "almost insurmountable difficulties". Stephens' land probably lay along the north side of Velvet Bottom from the Charterhouse 1 smelter to Blackmoor (where "Stephen's slag grounds" were situate). At present these lands are part of Mendip Farm, where stock grazing has to be carefully controlled to prevent lead poisoning. They would have been in the path of the prevailing winds carrying fumes from the smelter.

Stephens's Farm was bought for £8330. Shareholders paid a call of 50p per share, but the directors (themselves large shareholders) must have borne the brunt, not necessarily to their disadvantage as the property was conveyed to them on behalf of the company. At the same meeting a dividend

of 25p per share was announced in respect of a £1862 profit, sales of lead having been £7388. Chairman Barwell reported that a desilverising process was being profitably used.

Henceforward only the briefest references to the company appear in the MJ. Dividends of 25p per share in 1857, 30p in 1858, 25p in 1859 and 12½p in 1860 were paid. In 1860 an anonymous correspondent praised the mine and its manager Mr. Hornblower in fulsome terms, and announced the production of "a splendid plate of silver" weighing nearly 56kg "being the first plate" from the mines. This kind of letter was often written to promote a sale, and it is significant that MHMC was removed from the Mining Shares list in 1862, in which year Mr. Hornblower became manager of the newly formed St. Cuthbert's Lead Smelting Co. Probably, therefore, it was in 1861 that MHMC passed into the ownership of Treffry & Co. (Gough, 1967, p. 193), a Cornish firm that operated a great lead smelting works at Par in Cornwall. A remark by John Walker (MJ, 1.2.1873) suggests that the sale realised £24,000. Treffry's either constructed or improved the smelter and flues at Blackmoor, which were larger than, and probably superseded, those at the Charterhouse 1 site. They were operating in 1873 (Waldron, 1875, pp. 2-4) smelting material from the Town Field (Fig. 10), which was offered for sale in 1867 (MJ 1867, pp. 599) and was worked by MHMC.

Under the new manager, Mr. Rogers, the new MHMC prospered, but Gough (1967, p. 195) records that the steady fall in the price of lead led to a cessation of smelting in 1878 and abandonment of the works in 1885.

LATER MINING

As we have seen, MHMC in 1851 was still thinking of "employing three or four men to search in the veins for lead." The MJ carries no clear statement, but much circumstantial evidence, that there was mining after 1851, and indeed the 2 Cornish shafts in Charterhouse Rakes, and some works on Blackdown, must belong to the later period. In July 1854 Mr. Barwell wrote to Countess Waldegrave that he had "lighted upon a fine vein of lead" (Hewett 1956, pp. 104, 108). This must however have been on Waldegrave land, in which Barwell had an interest (p. 44), for there is no evidence of any link between the Waldegraves and MHMC.

In April 1855 an anonymous note in the MJ argued "there appears to be a splendid chance, if a shaft were sunk through the debris to the bottom of the old mine, that an immense deposit of lead will be found". Some people at Charterhouse must still have thought that rich ore was present at depths beyond the reach of the old men, in spite of Captain Harpur's demonstration to the contrary.

The note may have been intended to sway opinion in favour of mining, for in 1856 it had probably begun. At the MHMC meeting in May, Mr. Barwell was asked "whether the search for minerals had been successful? The Chairman replied that the prospects on their old property were very promising, but if Mr. Kitelee alluded to the minerals in the new estate, they had not commenced operations there yet." The "new estate" was Stephens's Farm, whose late owner had brought samples of green ore and carbonate of lead (pyromorphite and cerussite) to the mine captain.

In August 1858 Adolphus, son of Nicholas Ennor, wrote to the MJ criticising the directors of MHMC, who had reduced the price of shares "when private report says they have discovered a lode of lead in the bottom of one of the old mines, at the depth of 30fms, 10ft. wide".

In 1862 the celebrated geologist Charles Moore, of Bath, described his visit not long previously to the Charter House Lead Mine (Moore, 1862,

1867). This was a shaft "sunk as an experiment ... but had lately ceased working ... The shaft was then covered up ... learning that the ladders had been left in, I induced the manager of the local works to uncover the shaft that I might go down ... a work, from the state of the shaft, not unattended with some danger". The shaft was 53 m deep, according to Moore's 1862 account (in 1867 he said it was 82 m). Some upper galleries, one 27 m below ground, were driven in veins of calcite and "vertical limestone", with barite. At the bottom was a vein of green or blue marl or clay, 3 m thick, full of Liassic fossils and containing 7% of lead as disseminated galena. (This sounds like A. Ennor's lead vein "30 fms. deep and 10 ft. wide".)

Moore's shaft was in "Charter House Warren"; thus unless he made a careless mistake it was one of the two Cornish shafts in the Charterhouse Rakes. The eastern shaft has the biggest tip, so, although lacking geological evidence of the clay and "conglomerates" that Moore found, we refer to it as "Charles Moore's Shaft (?)" in Fig. 13. The shafts in Ubley Rakes would have been abandoned for at least 10 years by the time of Moore's visit, unless further works had been done in them. Stainsby's Shaft, which since 1849 had been receiving mud-charged water from the Ubley and Blackmoor floors, would not have been fit for a descent.

An early Ordnance Survey map at 1 : 10560 (surveyed 1884, published 1891) shows "Mendip Lead Mines" at Blackmoor, and "Lead Mine (disused)" at the Charterhouse 1 site and on the south flank of Blackdown 500 m west of the 'amphitheatre' earthwork. Kingsbury (1941, p. 74) collected many small pieces of green pyromorphite from the latter site, where, until it was levelled for agriculture in 1980, there was an area of mined ground with a narrow inclined shaft in weathered sandstone, two ponds and an arched stone wall. Some of the work here must have been done by MHMC, investigating the green ore of Stephens's Farm. They were unsuccessful. Woodward (1876, p. 16) records that "a shaft was sunk in the Old Red Sandstone near Charterhouse on Black Down, penetrating red and yellow micaceous sands, mottled shales and sandstones ... with incrustations of sulphate of iron. No mineral veins however were proved".

The pyromorphite ore appears to have been peculiar to the sandstone environment, occurring as a superficial secondary deposit. Kingsbury (1941, p. 74) commented "The mineral occurs, apparently as ribs and impregnations, in the Old Red Sandstone". The narrow shaft indicates pre-Cornish mining, and Kingsbury has no doubt that this is the site ("Greenhill, near Charter-house") from which John Woodward obtained the samples of pyromorphite for his Cambridge collection (Woodward, 1728).

To sum up, it is probable that the two Cornish shafts in Charterhouse Rakes, and the shaft on Blackdown, were sunk by MHMC between 1856 and 1858, before the company was sold to Treffry & Co. This was a smelting firm, and there is no evidence that it engaged in speculative mining.

THE COMPANY AND NICHOLAS ENNOR

The name of Nicholas Ennor is still remembered on Mendip for the lawsuit brought against him, 1860-63, by Hodgkinson, the Wookey Hole paper maker, involving Mendip's laborious first water-tracing experiments

(Ashworth 1956, pp. 112-5). Ennor's possession of the Priddy (or Prithy) Minery was a short phase in his eventful career. He came to Mendip about 1853, when he was already a celebrated and controversial mining consultant, promoter and correspondent. For decades, few issues of the MJ lacked a letter from Ennor, except when he was abroad inspecting mines in Spain, Portugal, Ireland and elsewhere.

From his letters we learn that he was born in 1798, the eldest of ten children, and was working in a tin mine at Perranporth before he was 7 years old. He was a mine agent in Devon at 15 years of age, and worked in "nearly every mine in East Cornwall and West Devon." After further travels in the South West, and missing emigration to South America by a whisker, he became manager of Delabole Slate Quarry, "from which I paid good dividends. I then took mines and quarries in Somerset on my own account ..."

Ennor was working in slate quarries and mines on the Brendon Hills for the Bishop of Bath and Wells (MJ 1860, p. 415) when in 1853 or 1854 he was consulted by Barwell. The Chairman of MHMC had since 1852 been dressing and smelting slags on the Chewton (or Cutchill) Minery, on behalf of the Waldegrave family (at whose local residence, Harptree Court, he was now living). Ennor advised Barwell on the works at Charterhouse and Chewton until they quarrelled over possession of the Priddy Minery. This led to the lawsuit Ennor v. Barwell (1860) over water rights, summarised by Gough (1967, pp. 187-9) and reported in detail in the MJ (1860, pp. 415-470).

For all his flamboyance and eccentricity in later years, Ennor was in the 1850's a shrewd and forthright man, with a reputation "as a fearless exposer of abuses wherever he finds them to exist" (MJ editorial 1858, p. 631). Alone he condemned the 1856 flotation of the "Little Down and Ebber Rocks Mineral Mining Co." as an attempt to fleece shareholders, affirming that although there was good iron and manganese ore on the property (now Higher Pitts Farm) its value was too low even to pay carriage costs. In 1860 he was proved right when the company went bankrupt and the director absconded.

In 1858 he exchanged angry letters with Barwell, who had refused to allow Ennor's son Adolphus to buy shares in MHMC. Barwell said that Ennor, who was "formerly employed by the Mendip Company ... advised me to place the entire management of the mines and dressing department under his care. The directors did not think proper to accept this advice" (MJ 1858, p. 594). Ennor replied: "I certainly was called in occasionally for four years to advise as to the best system of carrying out these works; but I soon found carrying out the mine was not all – I must meet his views, as well as keep secrets. ... I plainly told him that the mine, if properly managed, should pay £5000 per year, whereas they were only sharing £1500, ... and at the last meeting I refused to put pen to paper any more ... when he requested me to write on the wall; I then drew a rough plan on the office wall, at Waldegrave, and wrote how they should proceed ... I now ask him ... if he has paid me a single shilling for four years' service, and if they are not now obliged to return to my plans of working?" Referring to the shares, Ennor continued: "my son purchased five shares in the concern 12 months since ...

and paid for them, when certain parties say – 'He shall not come in, as he will be scrutinising our accounts'. This is a specimen of limited liability companies' proceedings." Ennor certainly disliked these companies because the financial secrecy their directors were permitted was often abused, but the fact that his and Barwell's workmen were currently unblocking and reblocking the flow of water to Ennor's buddles in Priddy Minery no doubt added acerbity to his letter.

Ennor was employed by MHMC at the time of later mining. He may well have advised on the shafts in Charterhouse Rakes, about which his son received a "private report". Much later, reminiscing on ore in limestone (MJ 1874, p. 209), he asserts: "It is the most treacherous of all known mineral-bearing rocks". The lodes do not go deep, but they "twist and turn in every way, and get lost, or worthless". He gives 2 sections of lodes in bedded limestone; they dog-leg, cut across the strata, stop and restart abruptly, and behave in fact like the lead lodes in Grebe Swallet at Charterhouse. He must have been unfamiliar with persistent lead lodes like those of the Pennines, and his sections probably illustrate his experiences in Charterhouse Rakes. He had earlier noted (MJ 1859, p. 318) that "all the great lead-bearing lodes on the Mendip Hills run from 10 to 30 degrees west of north or south of east, and the 'swallets' or open lodes commonly called cracks by geologists, run about 10 degrees east of south". This is a good summary of conditions at Charterhouse.

"The only safe guide"

Ennor's dispute with Barwell over water rights in the Priddy Minery seems to have sparked off his contempt for "theoreticals". In a letter (MJ 1860, p. 310) entitled "Practice v. Theory" he attacks a geologist and mining engineer, Handel Cossham of Bristol, who provided geological evidence supporting Barwell's case. Cossham claimed that an anticlinal axis lay between the Priddy and Chewton Mineries, "bringing a red sandstone bar to within 3 ft. of the surface ... which prevented the water flowing according to the law of nature". Ennor said he had tested the claim "by sinking in search of the said sandstone bar. After excavating the ground for 20 ft. deep and 300 ft. in length no sand bar could be found ... but instead the soil proved to be worth 25 per cent for lead and silver ore ... which totally upset his theory, and shows with what caution the statements of such men ought to be received". Cossham had also examined a 'crack' in the Chewton Minery into which Barwell's water vanished: "it must date back from the time of the eruption of the Mendip Hills ... prior to the deposit of new red sandstone". Ennor, being accustomed "like all practical miners, to descend into such places with alacrity, I did not scruple to go down to examine it, expecting to witness a freak of nature; but judge my surprise when I found it to be only an old mine shaft ... full of borer holes, and propped open by timbers. I consequently at once felt satisfied that Mr. Handel Cossham had been studying old books that ought to be obsolete instead of the book of Nature, the only safe guide".

The Hodgkinson v. Ennor case confirmed his scepticism: "one of the first chemists of the day ... undertook to throw something into the water, that 1-100th part of a grain should be detected 40 miles off. After a fortnight's

experiment, when he threw in the stuff by cartloads, they could not detect one of their chemicals, and were then compelled to have recourse to common mud" (MJ 1861, p. 227).

From 1861 Ennor felt obliged to instruct readers of the MJ in matters previously entrusted to "theoreticals, who I call loafers", or "useless fossil-hunting geologists". His sensible mining correspondence was interspersed with, and in the end largely superseded by, long speculative outpourings on subjects like "The Geological Formation of the Earth", which first attracted mild rebukes, then sharp rebuttals, finally severe personal abuse (which did not worry Ennor, who gave better than he got). Occasionally there is a mention of MHMC, for example (MJ 1872, p. 662) "I erected the round buddles on the Mendip Hills to work sand and slime 30 *(sic)* years ago, and worked the round grates and the jigger ... they all answered well for lead".

It is not clear whether he refers to MHMC or to Priddy Minery, and a similar ambiguity led to the exchange of letters with John Walker. Ennor was describing (MJ 1873, p. 75) the dressing of lead ores: "most men know of the expensive lawsuit I had on the Mendip Hills for dirting the water going to a paper mill (we were over 30 days in Court). To prevent this I had over 20 catchpits; the water from the last, to the eye, was clear enough to drink, but if you stood on one side in a bright sunny day you could see like small bright stars passing". Walker thought Ennor was referring to the lawsuit MHMC v. Hundred of Winterstoke, and was "fairly astonished on reading Mr. Ennor's letter about the treatment of lead slimes at the Mendip Hills, for during all the ten years I had the management of the works I never heard his name mentioned ... I was appointed just after the lawsuit, and went down with Mr. Barwell". Walker went on to imply that the failure he "found at Mendip" was Ennor's fault!

Next week (MJ 1873, p. 154) Ennor dealt brusquely with his querulous adversary: "He says he never heard of me. Strange as this appears, it may be true. In return, I say I never heard of a Mr. Walker ever being on Mendip Hills, but when I was officially called in I was informed that the mine he alluded to had been worked by a Mr. Johnson and others, under the management of some would-be practical, who ... ran the company so many thousands of pounds in debt ... as they neither knew how to catch the slime or smelt the lead". After describing the pollution of Cheddar fish ponds, and the mindering of Stephens's Farm, Ennor goes on "After this it came into the hands of the late company, when Capt. Harper and the engineers ... were discharged. After this I was called in to advise, and Captain Hornblower to manage and smelt the ore; and ... we soon brought the mine into a dividend-paying state. ... What can Mr. Walker say to this? Will it awake him out of a trance?"

Walker's reply was muddled, and of the two old men, Ennor seems to have had the clearer memory. He died suddenly in May of the following year, in full literary flood, at his estate in St. Teath, Cornwall, aged 76. The MJ favoured him with a kind obituary. Ennor outlived poor Captain Harpur, who had gone to Lady Bertha Mine and died, aged 51, in 1869; his obituary failed to mention his decade with MHMC.

THE RAKES IN 1984 (Fig. 13)

Ubley and Charterhouse Rakes are deep rock-walled gullies hundreds of metres long. Half way along Somers's Lode, on the NE side, is the tip of grey limestone rubble from New Shaft (Plate 4b) which is marked by a large hollow in the ground above. About 140 m further SE the rake is filled to ground level by the flat-topped tip from Somers's Shaft, beside which on the north is a level area where a horse-whim (Burgess 1971) was sited. A large flat stone exhibits a vertical drilled hole that probably seated the axle of the whim.

The horse-whims at Ubley and Charterhouse seem to have been able to raise rocks up to c 150 kg weight, such as are found, bearing traces of large shotholes, on all the Cornish tips.

Southeast of Somers's Shaft, in the next field, the rake is being obliterated by agricultural tipping. In the other direction, at the foot of Somers's tip in the floor of the rake, is a circular enclosure, rudely constructed of rocks against natural outcrops, with a doorway and a stone bench seat, that probably served the miners as a shelter. "Part of a clay smoking pipe, circa 1850" was found in this structure when it was cleaned out about 1970 (Burgess, 1971). Twenty metres NW of it is a hollow in the rake floor surrounded by a small tip that may mark the first attempt at a Cornish shaft ("It was the intention ... to have sunk Somers's whim-shaft in the great workings, at H, but it was found that the workings were too extensive to timber" – MJ 1844, p. 419).

From near here the 'caunter lode', a shallow grassy rake, runs obliquely across 'gruffy' (heavily mined) ground to link with the SE end of Stainsby's Lode. Close to the junction, in Stainsby's Lode, is a small Cornish tip and possible whim area on the north side of a deep cleft (Plate 4c). This could be the costean pit opened by Capt. Harpur in 1846 (p. 33).

If Stainsby's Lode is followed to the NW, Barwell's Shaft is reached at a junction of rakes (Plate 5a). Dry stone walls on two sides were rebuilt over the Cornish tip. Further NW, Stainsby's Lode is lost in the clump of twisted beech trees that were probably planted by a mine manager to shelter his residence, Bleak House, and the adjacent tenements. The foundations of these buildings are still visible.

Above and south of Barwell's Shaft, across the wall and parish boundary, is the circular floor of Barwell's horse-whim, partly hewn out of the solid rock. Close by, in the deepest and southernmost of the labyrinthine Charterhouse Rakes, with their foundering rock pinnacles, is a small Cornish shaft and tip composed almost wholly of large rocks. No horse-whim is recognisable, unless Barwell's whim was used. Sixty metres SE in the same rake is the large flat-topped tip surrounding 'Charles Moore's' Shaft (Plate 5b). This rake follows an important fault, for chert beds are common in one wall and absent in the other.

Although the Charterhouse Rakes are extensive, no other Cornish works have been recognised in them. South of them is a wide area of gruffy ground, closely pockmarked by small hollows and hummocky tips. Each hollow has a shaft beneath it, covered over or filled in. The few open shafts are narrow, with circular dry stone walling at the top, typical of 16th to 18th century mining. Similar hollows dot the floors of some of the rakes.

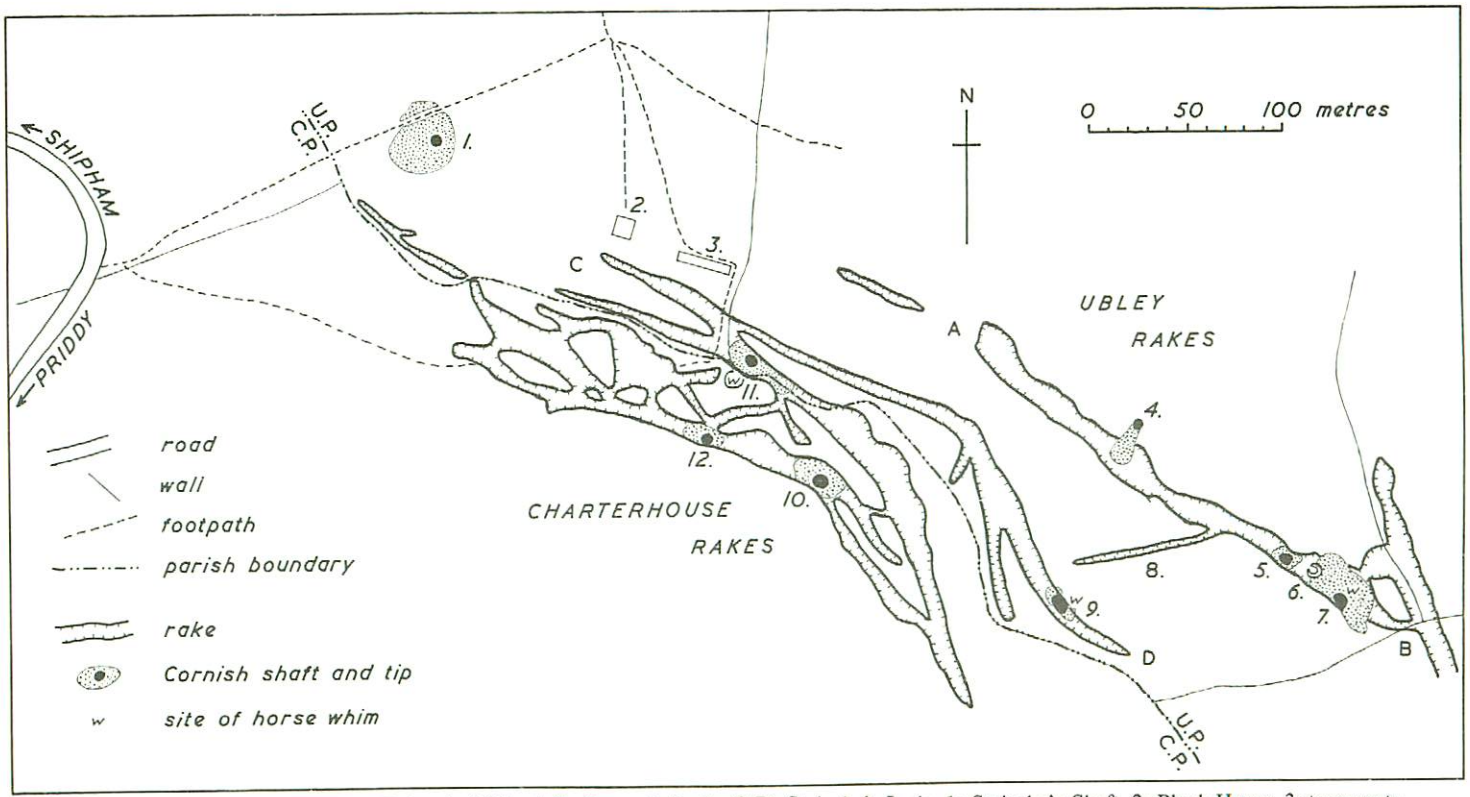

Fig. 13 Charterhouse and Ubley Rakes in 1984. A-B: Somers's Lode. C-D: Stainsby's Lode. 1: Stainsby's Shaft. 2: Bleak House. 3: tenements. 4: New Shaft. 5: trial shaft. 6: shelter. 7: Somers's Shaft. 8: caunter lode. 9: costean pit (?). 10: Charles Moore's Shaft (?). 11: Barwell's Shaft. 12: un-named shaft. U.P.: Ubley Parish. C.P.: Charterhouse Parish (1844).

The rakes are confined to the hilltop. They are thought to have contained rich residual deposits of galena (lead sulphide, PbS), mixed with soil and stones of insoluble materials such as chert (Stanton, *in prep.*), which were largely worked out during the period of Roman mining.

THE VALLEY IN 1984 (Fig. 14)

At the upper or NE end of the valley, a stream that is large in a wet winter but almost vanishes in a dry summer flows into the main MHMC reservoir, below fields sloping up to Blackdown. Between the reservoir and the wood (in which there are other, overgrown, reservoirs) are 4 round buddles and the grassy heaps of waste sand thrown up out of them. The sand is mixed with gravel and stones that were separated out when the lead-bearing debris was passed through screens. These buddles probably washed debris from the adjacent valley floor and from Town Field (Fig. 10), which can be seen 2 fields away beside a bungalow. The brick and concrete foundations on the south side of the reservoir are the remains of a modern local water supply worked by wind pump.

Next encountered downvalley are extensive tips of glassy black slag produced at the younger (Blackmoor 2) blast furnace site with its 2 sets of long masonry flues (one set partly refurbished in 1982 by Somerset County Council, the Mendip Society and the Manpower Services Commission). The track through the wood from here to Nordrach is the route along which the cartloads of lead metal or concentrates left the property on their way to Bristol.*

The rushy swamp downvalley of the reservoir is a big MHMC tailings pond, in which muddy water from the buddles cleared by settlement. It is retained behind a bank of slag 6 m high. Skirting the NW side of the pond are traces of the 'large drain' or ditch that at times carried the stream round the Blackmoor and Ubley slag grounds to Waterwheel Swallet and beyond. The modern stream flows through the tailings pond, round the end of the slag bank and into a small pond held back by a partly blocked culvert. On the left are high heaps of sand and gravel from the Blackmoor 1 buddles. On the right are ridged deposits of less glassy slag that may have come from Dr. Somers' operations.

The valley is now in limestone, having left the soft impermeable Lower Limestone Shales, and is narrower with steeper sides. Along the upper banks are the small quarries from which MHMC obtained building stone. The partly blocked culvert runs beneath heaps of waste sand and gravel and the remains of the Blackmoor 1 dressing floors (5 round buddles partly buried beneath debris washed over them by the great flood of July 10th 1968) to emerge briefly in a flat area of valley floor occupied by rectangular catch pits in which lead-bearing slimes were concentrated.

Some way up the bank on the left, in a hollow among buddle sand heaps, a round steel lid covers the entrance to Blackmoor Flood Swallet. This was one of several natural caves into which MHMC ran the muddy

* In 1984 Mr. Ernest Young of Haydon Grange told the authors that his great-grandfather, tenant of Ubley Warren Farm, had carted MHMC lead to Bristol. He had paid a rent to the Somers family at Langford every month and had cured the Somers' pet dog of obesity by taking it to the farm and "starving it!"

water from its dressing floors and buddles, avoiding the need to build a tailings pond but polluting the springs at Cheddar. Huge banks of grey or black lead-rich mud lined the narrow underground stream channel when it was first explored, and the cave ends where it is full of mud to the roof. MHMC maintained a dam of planks a short way inside the cave, and regularly removed the coarser sediment that settled out behind it. This action helped to keep the cave open and added to the sand heaps around the entrance (Stanton, 1976).

Now the track from Charterhouse crossroads traverses the valley on a causeway at the pre-MHMC valley floor level. The 'large drain' up on the right bank has a double channel here. The stream from the catch pits enters 2 stone-lined culverts roofed by large flat slabs; one reappears at the Ubley 1 floors and the other, seen briefly where its roof is holed, emerges close to Grebe Swallet. MHMC culverted the stream to keep the valley floor dry and available for tipping or other works.

South of the track causeway, the main valley is joined by a left-bank tributary. A branch of the track rounds the promontory between the two valleys, passing on its left the cobbled floor of an MHMC stable (Hawtin, 1971). Immediately beyond it, also on the left, was the Pattinson silver separation plant, from which a small flue, buried under stone slabs and turf, led up the hill to a chimney. The chimney base (marked on some O.S. maps as "shaft") and the partly collapsed flue are still recognisable, but the Pattinson building was bulldozed away, in ignorance, to mend the breach in the causeway made by the 1968 flood (Hawtin, 1970).

Beyond the Pattinson site, in the mouth of the tributary valley, an area of flat valley floor with a gentle reversed slope is the surface of a pre-MHMC tailings deposit. The old track to Bleak House crosses it beside a deep cutting which is a surviving face of the MHMC excavations. The face advanced into the deposit, in which the grey and brown lead-rich mud and silt was 3 m thick at this point (as proved by augering), and was followed by a backfill of buddle sand and gravel to a level several metres higher. Rabbits burrow deeply into the loose sand, but avoid the heavy tailings.

Below the track causeway the main valley floor runs for a short distance between high heaps of waste sand and gravel. On the left is the remnant of a circular masonry structure buried, like other ruined buildings here and there, in the sand. On the right at a high level, shortly before an inclined plane leading up to the old "carriage road", is an elongate hollow with a steel lid covering a cave dig: Waterwheel Swallet. The dig revealed the axle, bearings, gears and drive rod of a 6 m diameter waterwheel, in situ in a deep rock rift, built up and partly arched over with masonry. The whole was quickly reburied for preservation when vandals began to take an interest in it.

The rift was probably revealed by leakage in the bed of the 'large drain', which continued beyond for some metres until it passed beneath a sand heap. It is now filled with tip from the waterwheel dig. MHMC installed and operated the wheel, abandoning it when the rift walls became unstable and a gear wheel broke. They then ran buddle water into the rift along a small wooden launder, creating a massive choke of black tailings in the cave passage below.

Waste sand heaps now block the valley except for a narrow defile along which a tram road ran. The heaps end abruptly at the parish boundary, which was also the boundary between the Charterhouse and Ubley properties (Lord Clifden and Dr. Somers). On the left, hidden among the heaps, are the 5 round buddles of the Ubley 1 floors, spread out at various levels. Low down among them is the collapsed entrance of the lobby into Stainsby's Shaft, close to the end of the culvert from the catch pits. In wet weather it swallows a powerful stream. Immediately above, on the hillside, is Stainsby's Shaft itself, a typical square Cornish shaft on a spar vein (Plate 4a), cleared out by cavers to 10 m depth (Cotter and Knibbs, 1967). The flat-topped tip with the usual rocks of horse-whim size was cut through by a later cart or tram road (now a footpath) and shows by the nature of the tipstuff that the 108 m deep shaft reached the Lower Limestone Shales, and the lodestuff included calcite spar, red Triassic marl and brown Lias limestone.

On the buddle sand heaps NE of the Ubley 1 floors, a crude stone-lined shaft over 5 m deep and less than 1 m diameter was revealed in 1977 by collapse of its cover of rotted planks and earth held up by iron bars. It had been constructed to preserve access to something buried under the heap – possibly a culvert. It soon became filled with sand.

Downvalley from the parish boundary, where the other culvert emerges, is a section of almost empty valley that was originally full of pre-MHMC deposits to the level of the old carriage road, up on the right bank. At the foot of the right bank is a small trial pit in a barren lode one metre wide containing only calcite spar and ochreous earth. The 1968 flood caused collapse of the central valley floor on the continuation of this lode, and an 18th century lead mine, Grebe Swallet, now covered by a steel lid, was revealed.

Between Grebe Swallet and the paved road are the 7 round buddles of the Charterhouse 3 dressing floors. There was no culvert beneath the road in 1968, and the road was overtopped and the embankment breached in the great flood of that year (Hanwell and Newson, 1970).

Beyond the repaired and culverted embankment the valley is again empty. If Captain Harpur's carriage road along the right bank is followed, the way in which the deposit on the opposite bank was carried away via successive tramroads, the lines of which are still obvious, can be seen. Soon the Charterhouse 2 dressing floors are reached, with 10 well-preserved round buddles and water channels, heaps of building stone, and mounds of buddle sand and coarse screenings both up and down valley (the latter gullied by the 1968 flood). Buddle water from the floors was sent down to a long narrow tailings pond that extends from the lower sand heaps, past a low retaining bank, to a dam 4 m high on which the carriage road crosses to the left bank of the valley. The tailings in this pond are brown and black thinly laminated clay and silt. In places on the left bank are areas of pre-MHMC tailings on which no vegetation grows. Beside the dam, and a modern hut, is an ancient yew tree, possibly a last relic of the Carthusian monks, that has miraculously survived the fires and other onslaughts of thoughtless visitors.

The empty valley, with terraces on both sides marking the old floor level, continues down until the slag heaps from the older (Charterhouse 1)

smelter are reached. Here, at the foot of the right bank, is a stone-lined shaft 3 m deep, like a well, but dry. On the right bank beyond the slags are the Charterhouse 1 floors, comprising 8 complete round buddles and the remains of 4 earlier ones, with, above them, the ruins of the short flues constructed by Captain Harpur and possibly extended by Captain Hornblower. Opposite, on the left bank and downvalley, the heaps of buddle sand are high and extensive, overtopping field walls and dwarfing the mounds of slag. Possibly there were times when the Blackmoor water supply failed and material was brought down to be treated using the reliable supply from Longwood.

On the right bank, beyond the buddles and 4 m higher, the water route from Longwood arrives through a short culvert at the 1846 ground level. The first dressing floors were at that level, alongside the flues; the existing buddles having been built later, after removal of the mineral deposit.

Downvalley of the sand heaps the valley resumes its familiar form: an empty centre with terraces on the sides marking the old floor level. The terraces broaden and soon coalesce, forming a wide flat field of coarse grass. This is not, however, the pre-MHMC valley floor. The 'field' is a very large MHMC tailings pond in which buddle water from the Charterhouse 1 floors settled out, locally submerging old field walls. Trenches dug by the authors in the sides of the empty centre exposed 3 m to 4 m thickness of soft brittle thinly laminated grey to black silt and clay (MHMC tailings) overlying more than 3 m of stiff brown to grey silty or sandy clay, poorly or not stratified, with signs of slumping or collapse (pre-MHMC tailings). Evidently, towards the end of its life, MHMC was so short of mineral that it was forced to quarry deposits that it had buried beneath its own tailings ponds. Gough (1967, p. 195) suggested that MHMC finally closed down because of the steadily falling price of lead, but this evidence indicates that the company had virtually exhausted the original slag and slime deposits.

The first, very large, tailings pond (furthest from the camera in Plate 5c) is retained behind a dry stone dam and earth bank 2 m high. The second pond is much smaller, but the dry masonry dam is 3 m high. Above it on the right bank a line of small trees marks Captain Harpur's cutting through the "point of hill". The third pond is larger, but it never filled to the top of the massive dam 4 m high of locally won stone. The fourth pond is even smaller, with a 3 m dam, and the fifth, behind a 1 m dam, is the last of the MHMC works except for two low earth banks that were probably thrown up to catch overspills. Near the last is a partly natural shaft, called Timber Hole by cavers, that may have absorbed the final runoff water from the ponds. Beyond it the dry valley continues, unaffected by mining activity, to join Cheddar Gorge.

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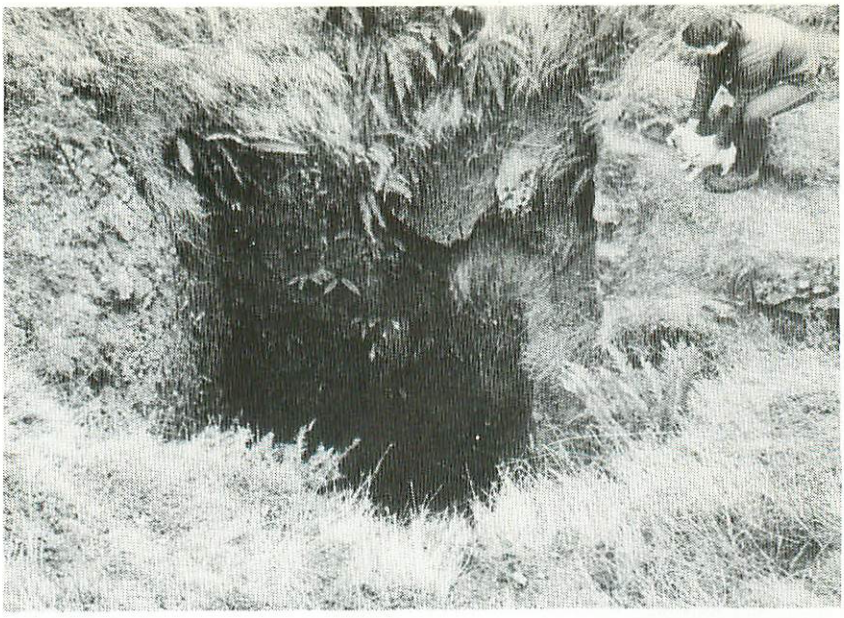


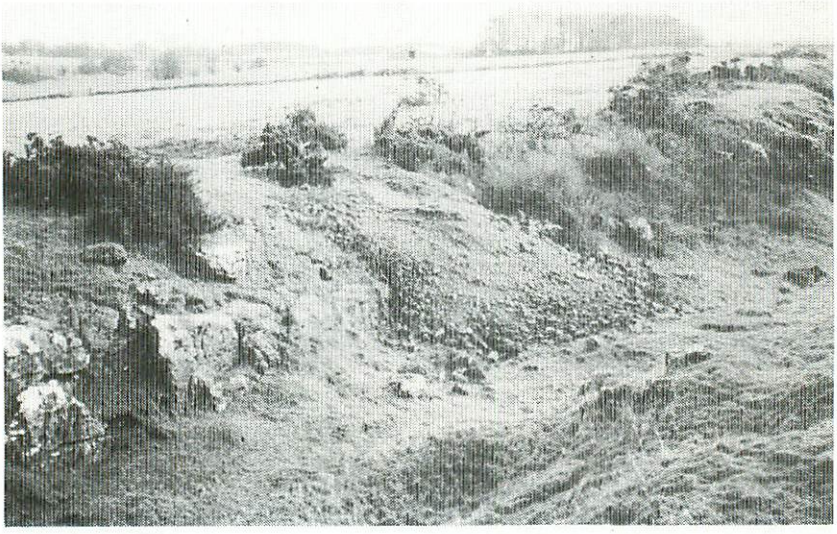
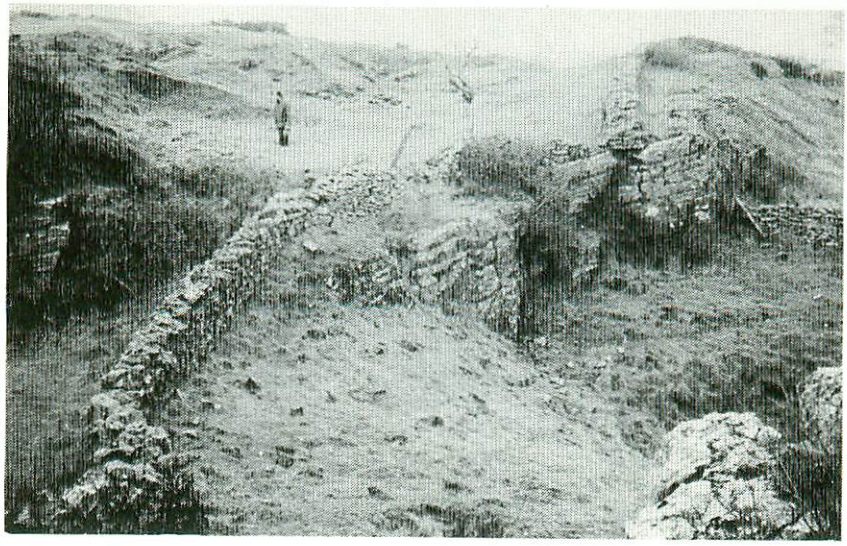


Plate 4 a) The square mouth of Stainsby's Shaft.
b) The tip of limestone rubble from New Shaft (upper left) down the side of Somers' Lode.
c) The costean pit (?) in Stainsby's Lode, with levelled whim area (upper left) and rocks of horse-whim size on tip (lower left).



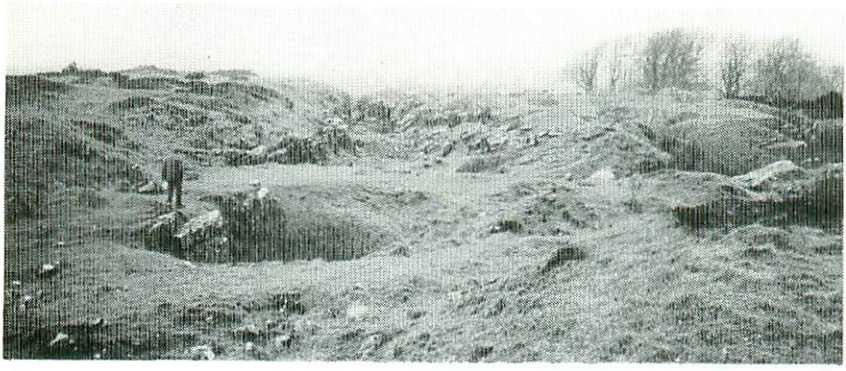


Plate 5 a) Barwell's Shaft (lower right) on Stainsby's Lode. At upper left, across the wall (parish boundary) the figure stands at the centre of the horse-whim circle.
b) Charles Moore's Shaft (?) in Charterhouse Rakes. The flat-topped tip surrounds the shaft.
c) The tailings ponds in Charterhouse Valley (Velvet Bottom).

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APPENDIX

Glossary of mining terms used in the MHMC reports.

Attle: worthless material.
Back: upper part or outcrop of a lode.
Buddle: device for concentrating ore by washing it.
Bunch: a small pocket of ore.
Caunter lode: a lode joining another at an oblique angle.
Course: a regular lode.
Costean pit: a trial pit.
Driving: advancing a tunnel or shaft.
Flookan: soft or clayey material in the lode.
Footway (in a shaft): a stairway of ladders.
Good work (rich work, saving work): rich ore.
Gossan: weathered ferruginous ore.
Grass: the surface
Gunnis: open level or working.
Halvans: low grade ores.
Hill: rock floor beneath a surface working (*take the hill:* reach r
Jigger: a device for concentrating ore by shaking it.
Kibble: a large bucket or tub used for raising ore.

Kibble filler:	a man who sends ore up to the surface.
Kindly:	promising.
Lander:	a man who receives the kibble on the surface.
Launder:	trough or gutter for conveying water.
Level:	horizontal gallery driven on the lode.
Lobby:	a short tunnel.
Lode:	a course or vein with or without ore.
Old men:	earlier miners, ancients.
Plat:	a level working area.
Raise (rise):	a shaft driven upwards.
Sett:	property in which mineral rights are held.
Slimes:	fine-grained ore and mud from the dressing floors.
Spar:	crystalline material.
Stones of lead:	loose lumps of galena.
Stope:	a horizontal layer of ore or ground being cut away; to excavate horizontally, layer after layer.
Strake:	narrow trough in which ore or slag was washed in fast flowing water.
Stuff:	mineralised material.
Tailings:	fine-grained waste from a dressing floor.
Winze:	shaft driven downwards from a gallery.
Whim:	winding engine worked by hand or by a horse.

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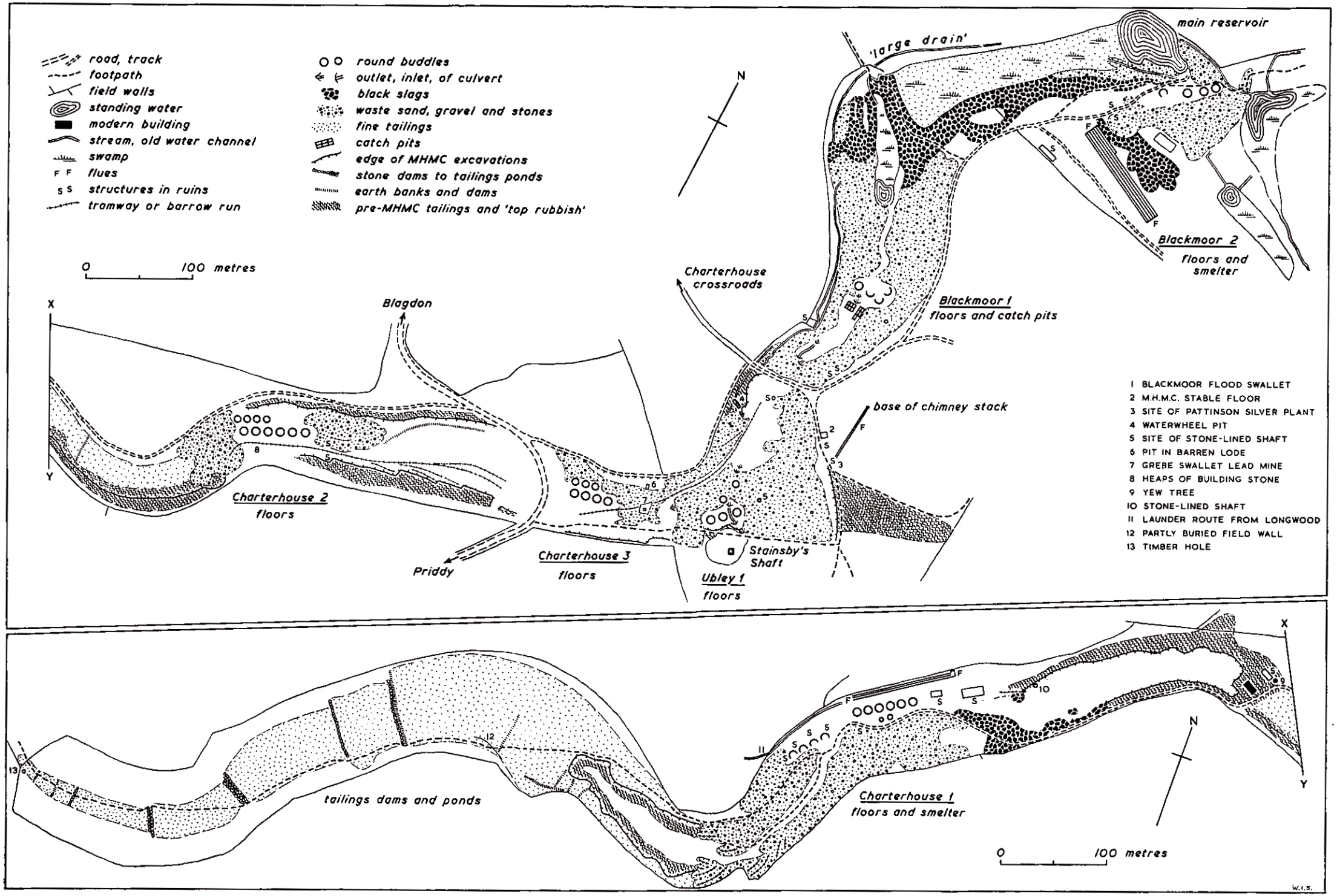

Fig. 14 The valley in 1984.