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ARBOR LOW CALCITE MINE, YOULGREAVE, DERBYSHIRE

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Abstract: This account follows that on the adjacent Long Rake Spar Mine (Shaw, 1995) and outlines the history of the mining of calcite, also known as spar, Derbyshire Spar, Calcspar, at Arbor Low Mine, the other larger calcite producer on Long Rake. Brief additional notes on Long Rake are appended.

INTRODUCTION

These notes are intended to provide an outline of the mining activities of the Arbor Low Calcite Mine. It is not intended as an extensive study of the mine, incorporating information gained by visits to the mine, but only literature readily available to the author has been consulted.

Arbor Low Mine worked a length of approximately 800 m at the western end of Long Rake, near Youlgreave, Derbyshire from about 1922. Underground working ceased about 1970 following an overwind, though dressing of "ore" brought to the mine from elsewhere in the orefield continued for some years. Readily accessible reserves of calcite were almost exhausted at the time of the overwind and the shaft was not refurbished.

DESCRIPTION OF THE SITE

The mine was worked by a shaft, at SK 172 640, around which dressing sheds etc were located, and a by decline, later known as the Old West Decline, at SK 167 640, both immediately south of the Youlgreave to Parsley Hay road.

The vein is hosted by poorly bedded Monsal Dale Limestone (Brigantian (D2) (Cox and Bridge, 1977). The vein, up to 8 m wide, is filled with massive columnar and saccharoidal, opaque, white calcite (spar) occasionally stained with hematite. Galena, which is less abundant here than in the Long Rake Mine to the east, occurs as strings and spots, usually close to the vein walls and occasionally in the centre of the vein. At Arbor Low Mine the rake has an ENE-WSW orientation. It has variable hade that changes both laterally and with depth. At the shaft (collared approximately on the vein) the vein hades to the north at the top, becomes vertical with increasing depth and towards the bottom of the shaft hades steeply to the south.

The workings to the east of the shaft terminate, on all levels, in area of disturbed ground where the rake has been lost. This is similar to the conditions encountered in the western end of the workings in Long Rake Mine (Shaw, 1995) only some 100 m away. To the west the vein continues, unworked for calcite, beyond the Old West Decline. The limit of workings of Arbor Low Mine in this direction was the lease boundary though the vein is apparently narrowing to the west in the workings. Apart from a few lead mines/trials to the west of the mine which may be on Long Rake or its branches the rake has not been followed far in this direction. To the east the rake has been followed and mined as far as the shale cover, a distance of around 8 km., producing mainly lead and fluorite, with minor barite.

The spar produced at Arbor Low Mine was mainly used for pebble-dash, artificial facing stone, terrazzo, mosaic, paving, facing, stucco and roof dressing purposes.

MINING HISTORY

Arbor Low Mine originally opened in 1922 (Stephens, 1942). At that time it was worked by a decline driven from close to the western end of the property in an easterly direction with a gradient of approximately 30°. The dressing plant was located near the decline portal.

In 1926 work commenced on enlarging an old shaft to the east of the decline to about 5 ft x 6 ft (1.5 m x 1.8 m) which was sunk to a depth of 280 ft (86 m). This work was complete and the dressing plant transferred to the shaft site by 1932 (Stephens, 1942).

By the early 1940s, when Stephens (1942) reported on the mine, it was owned by the Middleton Mining Co. Ltd, Middleton Estate Office, Bakewell. Stephens reported that the workings in the old part of the mine were reached by the decline and carried out to about the 200 ft (61 m) level. The decision to concentrate workings further east (on the area around Evan's Shaft) was partly because of the difficulty of working the narrower vein and the poorer quality of the spar in the western part of the mine caused by the prevalence of pockets of clay in the vein.

At that date working was chiefly from the 200 ft (61 m) and 300 ft (92 m) levels from the shaft. The 200 ft level extended about 540 ft (165 m) west of the shaft, to within about 150 ft (46 m) of the eastern end of the workings from the decline on that level. From the shaft bottom the 300 ft level had been driven 500-550 ft (153-168 m) to the east and about 300 ft (61 m) to the west. Most work was being done in the western part of this level where the vein was being excavated at a face 60-90 ft (18-28 m) high and the full vein width of 20-30 ft (6-9 m).

Stephens reported that the mine was dry except for surface water percolation through open joints and old workings after heavy rain.

Spar was crushed and sized for use as pebble-dash, artificial stone facing and mosaic cement work (terrazzo).

Houston (1964) gave a description of the mine in 1964. The mine was still being worked by the Middleton Mining Company. The deepest workings then being almost 400 ft (122 m). The mine manager was Mr. J.J. Timmins. Brown (1964) recorded that 12 men were working underground at the mine in August 1964. Houston reported that the mineral rights to some 1280 yards (1174 m) of the vein were owned entirely by the company.

Levels had been developed at approximately 80 ft (25 m) intervals from short cross-cuts driven from the shaft. Stoping was being carried out on the No. 3 level over 1200 ft (367 m) west from the shaft. In order to maintain spar production a 1:3 decline had been sunk, from the No. 3 level near the shaft foot, to the No. 4 level, 90 ft (28 m) deeper. A development heading was then being driven eastwards from the foot of this decline. A rise to the shaft base was planned.

Houston also reported that no mining was being done in the eastern levels due to contamination of the ore by pockets of clay. All stoping was by overhand methods using small blasts. This was to ensure that weakening of the calcite along its good cleavage planes was minimised. Three feet (0.9 m) of vein was left as the roof/floor of each level, with boxholes at 20 ft (6 m) centres for the run of mine calcite to fall through. The calcite was hand- loaded, again because of its friable nature, into wooden or steel end-tipping 8 cwt (0.4 tonne) mine tubs. Preliminary sorting was carried out at this stage to reject obvious waste rock. The tubs were hand trammed on 20 inch (0.5 m) gauge track to the shaft on the No. 3 level or were hoisted up the internal decline from the No. 4 level by a Holman compressed air winch. The winch was then due for replacement with a much more powerful electric winch able to haul three full tubs at a time up the incline.

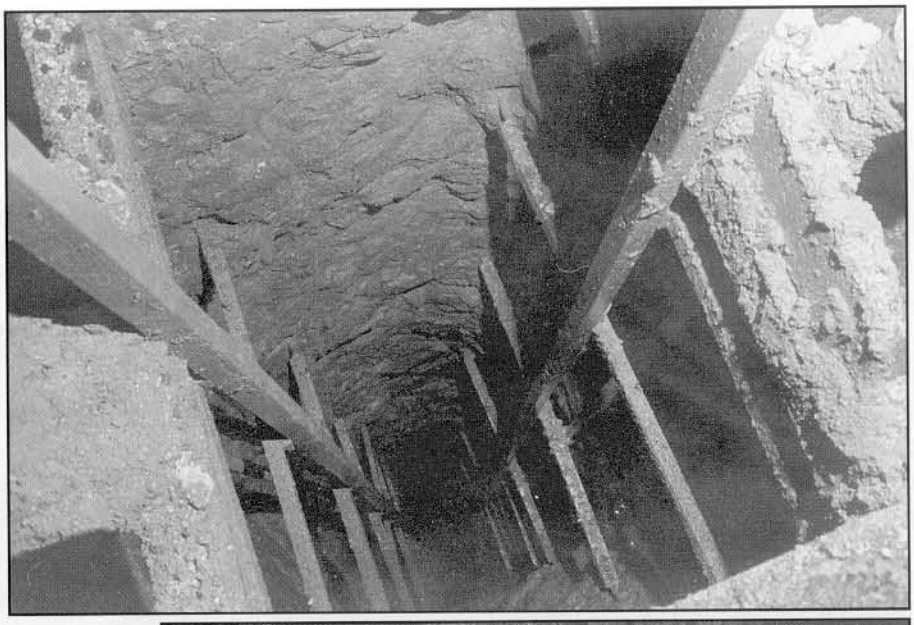
New development drives were driven as 6 ft x 4 ft (1.8 m x 1.2 m) headings along one wall of the vein and later widened to the full width of the vein. No timbering was used in the mine and "stopes are left after cleaning without support or danger"

Because the workings were above the normal water table pumping was not normally required. A two inch (50 mm) Mono pump rated at 1,500 gallons per hour (about 6.8 m^3/hr) was available if required.

The electrically-powered, belt-driven, single-drum winder wound a single cage in the shaft with one tub or up to five men capacity. Compressed air, at 100 psi, for powering the decline winch and rock drills was supplied to the mine via a 3 inch (75 mm) diameter main by a Alley and Maclellan Sentinel compressor rated at 200 cfm (about 5.7 m^3/min) belt driven by a 50 hp electric motor. 120 volt lighting was provided at the shaft bottom.

PROCESSING

If clayey, run of mine ore was washed in a 25 ft (8 m) long log washer. The cleaned ore and the cleaner ore direct from the mine were tipped on to a steel hopper and obvious waste removed by hand. The ore was then visually graded into two types of material - white spar and the rest. The dressing plant had two circuits, one for each grade of ore. The white spar was crushed and graded into 3/8, 3/16, 1/8 and 1/16 inch (~ 10, 5, 3 and



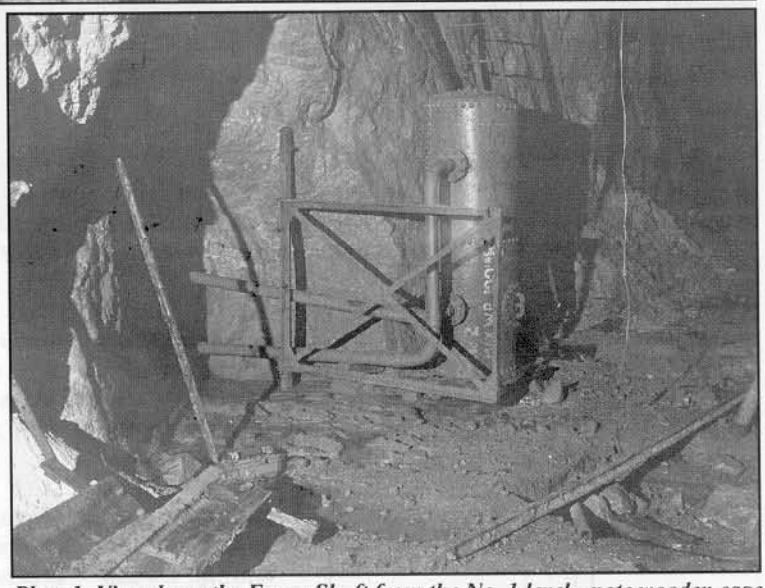


Plate 1. View down the Evans Shaft from the No. 1 level - note wooden cage guide rails and the liberal coating of tailings.
Plate 2. No. 1 level shaft station - note air pipes, air receiver, gate for shaft protection and mining "junk" ready to be removed from the mine.
Plate 3. Wooden stowes on a small internal shaft on the north side of the No. 1 level. ***(Photos RPS).***

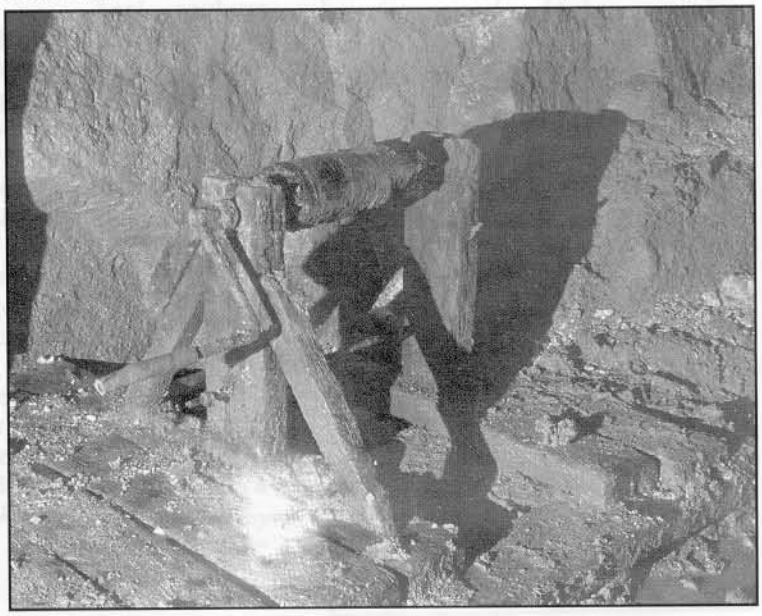


Plate 4. Railway sleepers and rock-cut ledge "catwalk" at the western end of the No. 2 level. (Photo RPS.).

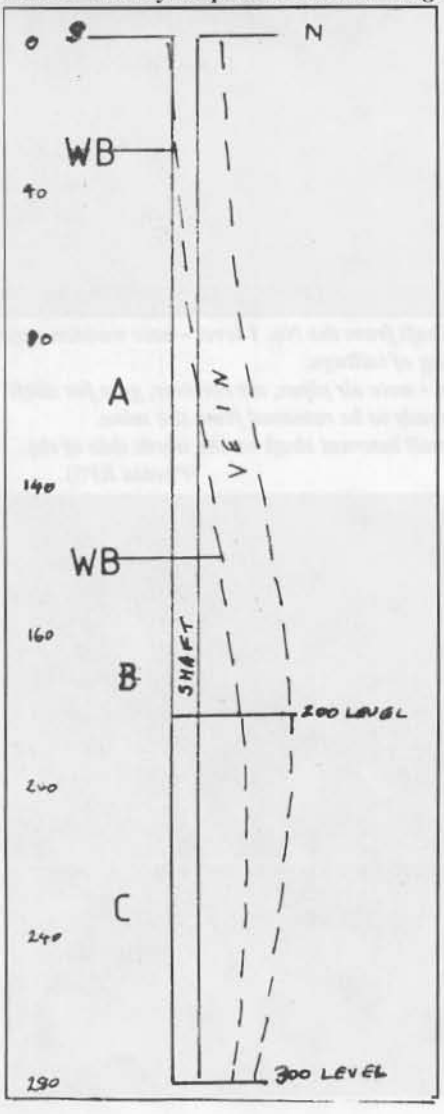


Fig. 1. Section through shaft and rake at Arbor Low Mine (after Stephens 1942). Depths in feet. WB = wayboard; A = grey limestone, B = grey and dark grey limestone; C = Dark grey limestone and chert.

1.5 mm) sizes. Oversized material was returned to the crushing stage. The lower grade ore was crushed and screened into 3/8, 1/4 and 3/16 inch (10, 6.5 and 5 mm) sizes. These fractions were jigged to produce lead concentrate (lump galena) and washed calcite. The fines were cycloned to produce a minus 1/10 inch (-2.5 mm) +100 mesh (-0.25mm) sized ore which was concentrated on Holman James shaking tables to produce lead concentrate and calcite sand. The -100 mesh slimes were rejected.

Average production was 300 tons per week of calcite, mainly destined for the construction industry. Lead production varied, depending on the section of the mine being worked from around 2 to 10 cwt (100 to 500 kg) per week. The higher lead production was from the eastern section of the mine. At this time the market for spar was buoyant but lead concentrate was being stored at the mine pending a significant improvement in the market price of lead.

TERMINATION OF MINING

Underground mining continued until about 1970 when the headgear was damaged by an overwind. Accessible reserves were almost exhausted by this stage. Following closure of the underground workings the property changed ownership a number of times but continued to produce spar from ore trucked in to the plant from small open cast sites and mine dumps in the area. The mill was also modified at this time in an attempt to produce fluorspar as well. Tailings from the plant were disposed of down the Old Western Decline and, in the last phase of working the mill, down the shaft.

Clyde Minerals, a subsidiary of Clyde Petroleum, owned the site from the late 1970s for a few years, using a Portacabin on the site as an office. At this time the plant was intact but not used. The shaft was open with the wooden headgear in place and the Old Western Decline was also accessible.

Derbyshire Aggregates Ltd. took over the site in 1987 and continue to process spar on the site, mainly brought in by road from Bradwell (James and Foster, 2001).

More recently the decline and surrounding area has been landscaped and access to the decline appears to have been obstructed. The corrugated iron buildings associated with the shaft are still standing but the headgear seems to have gone. The site of the mill, yard, etc has been extended and Derbyshire Aggregates Ltd have built a modern washing plant on the site.

UNDERGROUND

The author descended the mine, with permission from Clyde Minerals, in February 1980 and again in August 1981.

The mine was entered at the western end of the property by means of the Old Western Decline and its ladderway, which was the old emergency exit. Recent dumping of rubbish and the former disposal of tailings into the decline made the descent rather unpleasant. A combination of ladders and steep slopes gave access to the western end of the mine.

The first level encountered was the No. 1 level, a few metres from its western forefield. The level is stoped out above and below, leaving about 2 metres of calcite as a floor. Progress to the east was prevented by semi-liquid tailings which were continually slumping from above. Continuing down the ladderway at the west end the No. 2 level was reached; it then continues to the No. 3 level but progress along that level,during the earlier visit,was prevented by the tailings slurry.

The No.2 level was flowed to the east, via a number of "holes in the floor" passed by catwalks or ledges, to the shaft and, beyond, to the eastern forefield. Ladderways near the shaft go both up and down. That downwards gave access to large stopes between the No. 2 and No. 4 levels (No. 3 level having been mined away); the latter was flooded to a point above the No 4 level.

The ladderway upwards gave access to the No. 1 level and onwards to the surface. At this level (No. 1), before further progress to the west was prevented by the tailing slurry, there was an old timber stowes on a small shaft.

Throughout the mine the stopes are generally between 5 and 8 metres in width and almost the full height between the levels (~25 m), with just one or two metres of vein left as the level floors. In some cases this was also removed in the last stages of mining.

Manways to the emergency exits were made by making catwalks from paired railway sleepers supported on drill-steels projecting from shotholes drilled into the walls. "Handrails" of old wire winding rope supported on angle iron bars were provided. The condition of some of the cat walks, by now over 20 years ago, was suspect! Around some of the gaps in the floor ledges were left or cut to serve the same purpose as the sleeper catwalks.

The semi-liquid tailings partially filling the workings via the shaft and decline were a significant hazard at the time of both visits.

On the second descent of the mine it was found that the western end of the No. 3 level was passable with care. After about 70 metres the tailings "flow" descended to the flooded stopes below the level. The shaft area at the bottom of the main shaft was reached where more tailings, up to a metre deep were encountered which had been dumped down the shaft. From here the decline, flooded part way down, led to the deeper stopes.

East of the shaft on the No. 3 level the sole (and roof of the level below, in calcite) has been removed leaving a large stope, flooded towards the bottom, with an unstable catwalk along one wall.

The shaft timbering was in good condition on this level and cabling, signalling equipment, shaft station lighting etc was still intact at the shaft bottom and the other shaft stations.

Large heaps of spent carbide were present in several parts of the mine and the rusting remains of several Premier King acytelene lamps were left lying around.

In some areas rails were still *in situ* and there were also several lengths of rail scattered around, together with compressed air pipes, hoses and other mining "junk" apparently abandoned in the process of being stripped from the mine.

A c.500 litre air receiver was adjacent to the shaft on the No. 1 level and a chemical toilet remained nearby - still half full with valuable information for future archaeologists!

Throughout the length of the mine, except at the east and west ends, the vein has been almost entirely removed. It is generally between 5 and 8 metres wide and composed almost exclusively of white calcite and a little galena. The latter is concentrated into narrow, patchy strings close to each wall and, more rarely, in the centre of the vein. Where slickensides are present they are roughly horizontal.

At the east end, on all levels where it was examined, the vein breaks up into a limestone breccia with strings and pockets of calcite. This is also the case in the western end of Long Rake Spar Mine adjacent to this mine on the east.

At the west end the vein appears to narrow rapidly to a width of about one metre and assumes the banded nature typical of multi-phase mineralisation. Here it also contains small (2 - 3 cm) pockets of soft, red hematite.

Little calcite remains in the existing mine and the evidence suggests that the vein pinches both east and west.

A recent (2001) visit to the site of the mine suggests that both the Old Western Decline and the shaft have been filled in. There has been considerable redevelopment of the mill site which seems to be used as a haulage yard/small factory/workshop. Access underground did not seem to be possible.

CONCLUSIONS

A large quantity of calcite must have been produced from the mine between its development as a large spar producer in 1922 and the cessation of mining around 1970. It is clear that by the time the winding incident put the headgear out of commission that little accessible spar remained. All-level roofs had been removed and a number of large holes had been worked through the level floors. The limits of economically worked ground had been reached to the east and west and any future prospect lay in working the rake to greater depths. This option was rendered unattractive by the need to pump the mine because the workings would have extended below the water table and was probably

even more uneconomic from the need to refurbish the shaft. It would appear some mining equipment had been salvaged from the mine before closure - there were no tubs or drilling equipment left underground and only a small amount of rail remains.

ACKNOWLEDGEMENTS

The author would like to thank Andy Warren and Keith Gregory for providing the information on which the above notes have been based.

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APPENDIX: Additional Notes on Long Rake Spar Mine

As a result of the notes published on the Long Rake Spar Mine in 1995 (Shaw 1995) further information on the mine has been brought to the author's attention.

Andy Warren reports that his father, Cyril Warren, worked at Long Rake Mine in the 1940s. He began work there in August 1940 as a 14 year old school leaver. Cyril's parents ran the village shop in Youlgreave at that time. He worked as a clerk at the mine and was paid 7s 6d per week. His employment at the mine terminated in August 1944 when Cyril was conscripted.

Some of the personnel at the mine during this period were:

Mine owner	P. Potter from Andover in Hampshire
Mine manager	J.F. Spedding from Buxton
Secretary	N. Lever from New Road in Youlgreave
Surface foreman	B. Hadfield from Youlgreave
Underground foreman	J. Rowlands from Youlgreave
Engineer/fitter	R. Wilson from Youlgreave

There were six miners working in the mine and a surface complement of 7 men. Mr Lever eventually became the Director/Secretary of the mine/

Lead concentrate from the washing tables (around 5 tons per month) was sold to H.J. Enthoven and Sons, Darley Dale smelters from 1941 onwards and was smelted in a semi-rotary furnace.

Keith Gregory, well known to many PDMHS members, works for H.J. Enthoven and Sons at their Darley Dale smelter and he recalls that during the 1960s the company was still purchasing lead concentrates from Long Rake Mine. Each year a member of the laboratory staff was sent to the mine to view and sample the concentrate. For reasons unexplained, but possibly due to end-of-financial-year cash-flow requirements, this annual sampling always seem to be undertaken in January or February, when the concentrate heap was as likely as not to have been frozen solid. These purchases stopped because of the effect on sulphur dioxide emissions from the smelting of the sulphide ore, though Keith points out that this would no longer be a problem with modern smelting methods.