# ASTBURY HYDRAULIC LIME WORKS, NEWBOLD, CHESHIRE.

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**Abstract:** A Lower Carboniferous inlier of high quality limestone outcrops unconformably against Triassic sandstones and Keuper Marl to the west, and Lower Minns Sandstone and ganisters to the east. The limestone was both quarried as well as mined at depth from early times. No other such mineral existed within an economic distance of early transport. Recent access was gained into the main level by clearing a blockage in a shaft, down to a long-lost 560-yard pony-level or adit. This paper records our findings underground, with a brief outline of the history.

Coal mining in the Biddulph valley at the northernmost point of the Staffordshire coalfield is no longer carried out and is now of academic interest only and this is also the case with small scale mining for other essential minerals that local industry and agriculture was once based upon. The Astbury Hydraulic Limestone Works, just over the border in Cheshire is an example. No mine plans are known to exist, there is a paucity of documentary evidence and most surprising, given the unique nature, no geological survey of the mine is known. There has been generations of lengthy speculation on the exposed geology, which in some respects conflict with our observations underground.

The Lime Works lie on land farmed by the Potts family at Limekiln Farm since c.1880. Both land and mineral rights of the area have been in the ownership of two distinct estates up to the 20th century. Limekiln Farm and adjacent lands were in the ownership of the Egertons, Dukes of Bridgwater, and the Cheshire land owning family of Shakerly Ackers. On the latter's land 400 yards to the south another limestone mine is indicated by limekiln remains, run-in shafts and an open shaft believed to be 150 feet deep but flooded to within 20 feet of the surface. Nothing is known of these juxtaposed enterprises, except an unusual brick-built steam engine-house, 'corbelled' out over the above shaft, and a chimney stack demolished c.1920 after many decades of use as a farm store (Mr Potts, pers comm.). Recent attempts at filling the shaft with surrounding material have uncovered large gritstone engine beds. Both enterprises are shown on Burdett's map of Cheshire (1777) and were repeated on that by Bryant (1831). However, the original workings at Limekiln Farm are thought to be much older than this.

Brick marl and coal was also mined by the same company c.1890, both to diversify their interests and to obtain a cheap and secure fuel supply for lime burning etc. Neither proved a success, given the money spent, and must have cost the investors dearly. About a mile east of Limekiln Farm (at SK 8696 5897), a drift mine was driven by a group of local colliers which followed the very steep Ringinglow Coal down, above the Chatsworth Grit on the Western Rearer Dip. This small-scale venture was known variously as the Pilacosha Coal Pit, the Mountain Mine, and finally, in the *Macclesfield Memoir* as the Newbold Colliery. This gives the mine section as follows: coal 10 to 12 inches, inferior coal 3 to 10 inches, coal 24 to 36inches, and clay 48 inches. After the failure of this short-lived venture, the mine was abandoned for a considerable time until registered 'significantly' as the Newbold Colliery Company. It is therefore likely that the directors and shareholders of Newbold Astbury Lime Works were the same in the two companies.

Tangible evidence still exists on surface of the huge investment by the new owners. A steam engine of considerable size was installed for winding, pumping, and driving a large coal screening plant, said to have been big enough to screen all the coal in North Staffordshire. An aerial flight from the pit bank was later installed for a distance of 1.25 miles to the railway siding at Newbold. The kilns at Limekiln Farm were demolished, and four, possibly of a more efficient type were built. Two were sited near the then recently completed pony level portal at Baytree Farm, and two actually in the railway goods yard that produced white lime for plaster i.e. free of coal and ash. The latter are still intact at the time of writing. In addition, rails had to be laid throughout the workings and the new deep level to the kilns, a compound needed to be built for coal materials and the finished product, together with a new substantial gunpowder magazine and stables etc. The reason for all this expense of re-siting the whole infrastructure is outlined below.

A further substantial business was sited nearby, for the manufacture of common bricks, land drain pipes, up to 12 inches diameter, and other products derived from glacial pocket deposit clays (i.e. not Keuper Marl) obtained from the adjacent fields. Evidence of the scale and layout can be seen on the 1908 6 inch OS map. A fatality is recorded when the boiler of the steam engine used to extrude the clay pipes etc exploded, killing the operator and injuring others, c.1895 (Potts Family Records pers comm.). A member of the Potts family gave evidence at the inquest.

It is impossible to give even an approximate date of the commencement of limestone working, as surface working could easily go back to medieval times. Where stone outcrops at surface, it would have been obvious when disturbed by early agriculture and by search and quarrying for building stone, as is the case with most coal and metal ore mining. As noted above, Burdetts map of Cheshire (1777) shows a limeworks already well-established and further unsubstantiated claims exist of working lime c.1630. Today, the area around Baytree Farm has been leveled and restored to agriculture. The earlier works at Limekiln Farm have been reclaimed by nature and the big open cut is now a secluded fishing lake several acres in extent directly above the mine workings. This is a slightly disconcerting prospect when progging around underground.

Three distinct phases of working are evident from the 25 inch OS maps, enabling a reasonable assessment to be made of each phase and method of working. The Geological Survey map shows two tight anticlinal parallel folds trending approximately

northeast/ southwest through the limestone, the ends of which are supposed to plunge steeply below the Trias, thereby forming a periclinal structure. However, black cherty limestone and lime-shale samples have been recovered by the writer from ploughed fields south of any documented exposures that suggest limestone may be nearer to surface than previously recorded.

A further anomaly exists with the positioning of the Red Rock Fault, the inferred position as shown by the Geological Survey crosses the main pony-level midway between Nos. 2 and 3 shafts. We have explored this level in detail and no faulting exists up to the Trias/Limestone unconformity. Therefore, it is likely that the red rock displacement is part of the unconformity.

**Phase One: Commencement Unknown**

The first phase of working at the northeast end compromises a quarried area now mostly backfilled, which is attenuated at the south of the main mass by a volcanic vent of tuff and massive agglomerate. While fascinating in itself, it was a costly inconvenience commercially. This appears to be the earliest area worked, and when surface working was exhausted due to the increase of cover, the stone was mined directly below the quarry from drawing shafts, and a shallow drainage adit, driven southeast approximately 150 yards from a stream gully into the limestone, probably c.1750. Clear evidence of an early steam enginehouse is seen 40 yards south west of an old shaft shown on the 25 inch OS map of 1873, but it is not known how this fits in with the phases of working.

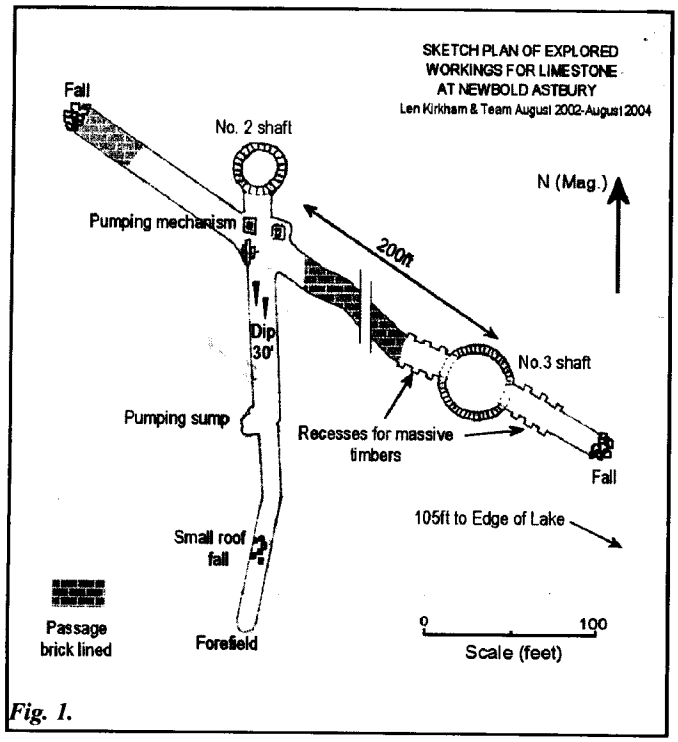


*Fig. 1.*

**Phase Two: 1805 onwards**

On completion of Phase 1, it is likely that the works lay idle for some years, possibly due to the considerable capital investment required to re-site the kilns and to strip the Triassic Marl overburden to reveal the limestone for quarrying. What is known is that in 1805 the powerful industrialist family of Gilberts, agents for the Egertons, Dukes of Bridgwater (Lead 1989), took over the Newbold Astbury Limeworks in partnership with the Williamsons. The Williamsons were related by marriage and were business partners of James Brindley (1716 – 1772).

Three years after the purchase, the limekilns were described as supplying a large district to the south east of the county with this most valuable commodity. By 1808, Gilbert and Williamson offered the lease to persons able to superintend the whole concern, presumably after development of the big open cut, now the lake. The period 1808 to the 1870s was likely to have been the most profitable phase, due to the low cost of large-scale surface extraction. The 1873 OS 25 inch map shows two shafts in the quarry bottom, and crown holes are to be seen near the waters edge on the west side, indicative of shallow mining below the quarry floor as in Phase 1. The works are described as disused.

**Phase Three**

The third and final phase of working was a much more ambitious undertaking which involved a large financial investment and, taken at face value, it is difficult to see how this could have been justified at this late stage. As outlined above, the whole infrastructure above ground was rebuilt below Baytree Farm adjacent to the brick and pipe works. A 560-yard long adit level of a section big enough to take horse-drawn wagons was driven from Baytree to the new workings under the quarry (now the lake), with three vertical shafts that drop down onto the level as follows (Fig. 1).

No.1 shaft midway up the level collapsed in recent times but is known to have been of square section and brick-lined at the top, 4 feet square by 50 feet deep. This was clearly an air-shaft, and would have allowed the adit level to be driven both ways.

No.2 shaft, nearly 90 feet deep by 4 feet diameter may have been driven at a later date, to accommodate a pumping mechanism, see below. This was our access shaft after clearing a substantial blockage of rubbish and stabilising the brick-lined top section with a 9 feet long steel liner (provided courtesy of Steve Mills at Alderley Edge). This most curious shaft changes section to oval, approximately 3 feet wide by 2 feet, hades slightly, and at one point is convoluted to change alignment. This is quite an SRT challenge after a day's work down the mine.

No. 3 shaft is 120 feet deep by 8 feet diameter, brick-lined to the bottom, and was proved to go deeper by probing. It was probably a pumping sump while double-driving the adit, a theory supported by the direction of the few shot holes to be seen. This was our preferred access exit using SRT. An inspection along the partly flooded level (before we drained it) between No. 2 and No. 3 shafts confirmed that the No. 3 shaft was completely blocked with rubbish, including an old motorcar.

The survey established the in-fill to total 16 feet or 9 feet above the roof of the level. How were we to get it up the shaft? The problem was solved by Mr Eric Potts, who volunteered to 'haul it up' with his vintage tractor. A headgear was fabricated and 300 feet of old SRT rope was duly threaded over the pulley, the tractor on one end and a building materials bag down the shaft. An escape way was then excavated up through the rubbish and a ladder placed for the bag fillers to descend while winding full bags up. It worked well and gave us access beyond the big shaft to a major collapse on the Triassic / Lower Limestone unconformity just short of the lake-edge above the workings: 'disappointing but predictable.' At this point, the roof of the level has migrated up a further 8 feet, above the collapse, and based on our survey figures, we were approximately 40 feet below the lake bottom in ground that had been 'worked up to surface?'. Further thoughts of digging through into the workings evaporated. The blockage has to be substantial, as the water make throughout is only a gallon per minute.

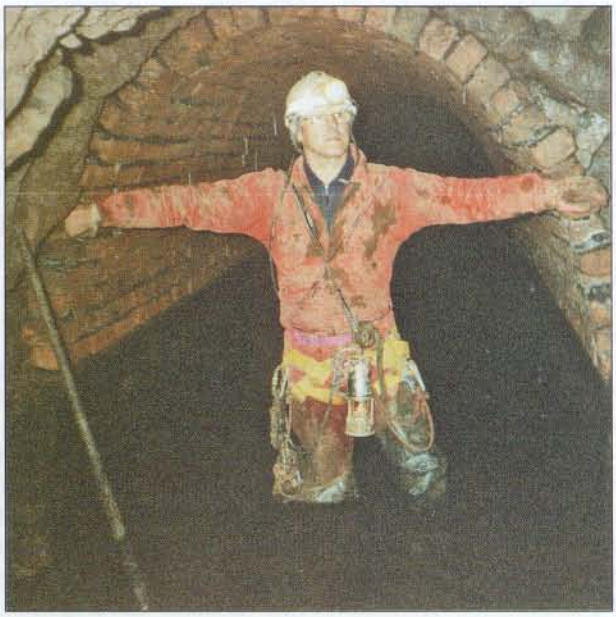

*Plate 1. The main horse-drawing adit.*

*Plate 2. The level during pumping via the adit.*

*Plate 3. Part of the pumping gear in the level.*

*Plate 4. Near the end of the horse-drawing level just before the fall.*

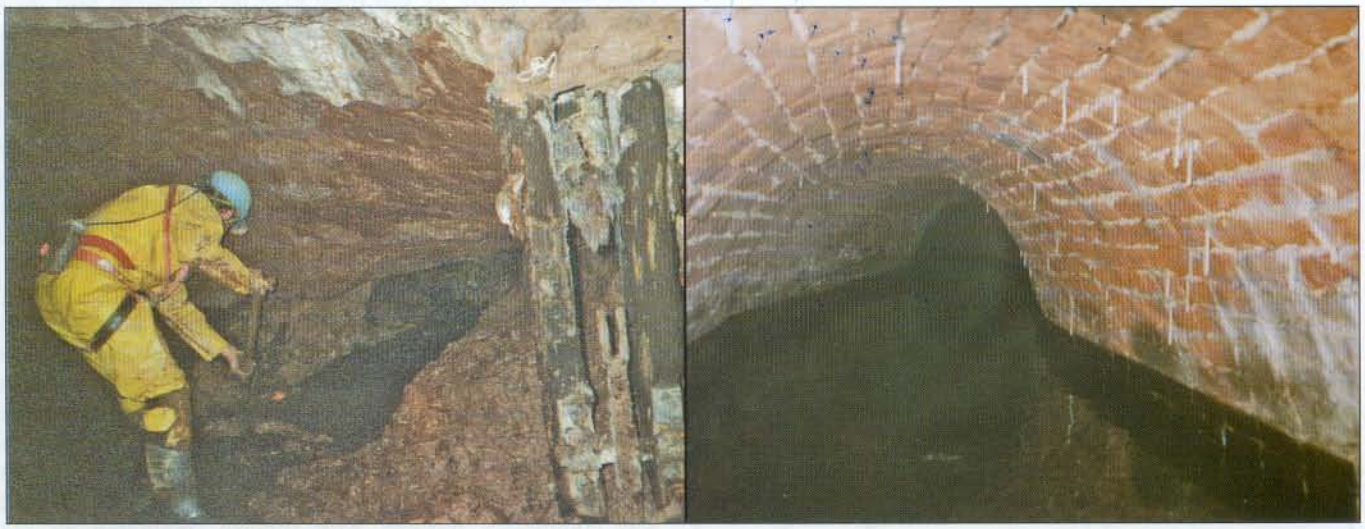

*Plate 5. The team with their drawing stow.*

*Plate 6. The 18th century powder house.*

At the foot of the unusual shaped No. 2 shaft, an equally curious working was discovered by enlarging a small hole in the side of the level, and in line with the curve of the shaft bottom high up in the side of the main pony-level. An equally curious mechanism is seen that follows the same alignment. When excavated, two brick bearing piers and various other items were revealed. Further digging revealed a square, hand- picked, dip decline 5½ wide by 4 feet high, driven due south at 1 in 2. A small hand-winch was set up at the end of the dip- top to wind up washed-in waste, and a pumping system was installed to de-water the dip.

One hundred feet down at dip-bottom, a small-section, hand-picked level was revealed in the roof, and after much pumping, access was gained into a trial that ends at a fore field with no change in the geology whatever. No ingress of water was encountered in the dip. However, a small amount enters through the roof of the lower level. On our return the next day to video, the lower workings were flooded and reached approximately 15 feet up the dip where the water perch is now established.

Clearly, the mechanism was used for pumping and was of a reciprocating type used to operate a simple lift pump situated in a small sump observed at the dip-bottom. How this was powered, and from where, is not known.

As can be seen from the plan, both the dip and the working roughly follow the strike of the limestone, with a parallel separation of approximately 120 yards at this depth i.e. 150 feet vertical. This clearly precludes a trial for limestone, so what was this expensive failure?

**Marl and clay mining**

A series of small mines, approximately 1.5 miles south (two were explored recently) were worked for red-marl clay. This was used to manufacture items from teapots to chimney pots within living memory. These seem contemporary with the limeworks Keuper section and the hand picked method of working is the same except 1½ inch' diameter hand auger shot-holes are occasionally seen in the harder sandstone bands. A similar decline in one 30 yards long ends in a silt blockage. The superb pickwork observed throughout the project could easily have been attributable to much earlier working. Could the working below the adit at Limekiln have been a late stage attempt to mine marl clay? It is not mentioned by Henshaw (see Appendix). Maybe they knew something that we don't to justify such a costly speculation?

**Geology**

The geology seen underground is entirely in Keuper Marl, separated in places by discrete bands of sandstone of variable thickness. Where this occurs, it has resulted in stability problems, hence the brick lining and timber support. The regional dip is approximately 30° to the NNW increasing to 45° at the marl-lime interface collapse. Inby from No.3 shaft to the fall, a huge amount of thick, knee-deep ochre is encountered, obviously associated with the intrusive volcanics. Samples of agglomerate recovered by the writer appear to contain calcite, gypsum, chlorite, iron mineral and small traces of copper and barite. A large sample of the latter was recovered from a foundation trench, south of the lake, by Mr E. Potts.

What made the limestone here so valuable was its hydraulic properties. Hydraulic limes set chemically by crystallisation as with cement, therefore it will set in very thick masonry, bridge piers and underwater, e.g. mine workings, foundations etc.

**Conclusion**

Tangible evidence is still to be seen of the scale of working. The three shafts on the pony level, the special kilns in the old rail sidings are as when last fired, and amazingly a beehive gunpowder magazine of the 18th century has survived intact. An attempt to get it listed has been made but without response.

It is clear that the limeworks had a long and chequered history of feast and famine. By 1910, according to Henshaw, the works were beyond profitability and closed for the last time a few years later. We have capped the two open shafts and stabilised the decaying powder magazine. The old mine is now quiet again and left to nature.

**Acknowledgements**

The author wishes to thank friends and colleagues who contributed so much to this project. Fellow members of Crewe Climbing and Potholing Club; Derek Wheelhouse of Biddulph Historical Society. (Documentation); Steve Mills DCC. Supply of shaft liner; The Potts family for their support and unrestricted access to their property; Mr Eric Potts, resident of Lime Kiln Farm for 75 years and whose empathy and practical help proved invaluable; Ralph Johnson (Video record).

**Reference**

Lead, Peter 1989 *Agents of Revolution: John and Thomas Gilbert, Entrepreneurs*. Keele University.

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**Appendix.**

**Extract from a 1911 report on Astbury Lime Works, by A.M. Henshaw Engineer of Stoke on Trent**

I have examined all the open workings in the limestone underground, the roadways, stone faces or drifts and considered their relation to the previous working in the stone left and now being worked or remaining to be worked in the future. I have also looked carefully at the method of carrying on the work, the wages paid, the output of the workmen, the cost of the timber and stores and other expenses and have discussed with the manager the conditions, difficulties and proposals for improvement or extension. I also talked with the workmen and found them to be skilful and experienced and apparently willing to help in any way to improve matters for their employers. The underground cost is very high but the difficulties are such that little improvement can be expected in the present area and present depth. They are due and natural to the method of working of the stone in former years. The stone has been worked from the surface downward to the present level for many generations in descending stages, first by headings and afterwards by the extraction of pillars more or less until subsidence brought down the overlying strata. In this way the stone has been completely honeycombed down to the tunnel level, a good deal being left in places for the support of roads as part of the pillars not being extracted. Frequent subsidence filled up the abandoned workings with stone and debris so that above the present level the whole of the ground consists of irregular patches of broken stone,

marl and surface clay with little or no virgin stone in situ. For many years past practically all the stone has been obtained by reworking in this broken ground and in some places reworking more than once, until all the stone has been exhausted. Such work is naturally precarious and uncertain. In the absence of plans of the old workings it is impossible to locate the best areas. Considerable cost is involved in exploring and in sinking, maintaining and timbering roads and places under such conditions and as the discovery of stone is more or less haphazard the tonnage and cost must inevitably vary accordingly. The work requires a great deal of skill and special knowledge of the peculiar conditions and the workmen appear to have the skill and knowledge necessary. They are industrious and turn out a fair output per man. Their wages are much below those paid in the more populous mining districts in the area. The Manager in charge appears to have made the best of the difficulties as I can find no fault whatever in the way the work is being done. There is no prospect of materially increasing the output of stone in the future except by deeper workings in the virgin stone. This would necessitate lowering the tunnel and making new roads for haulage and drainage but even if this were done I do not think the output per man when working in the solid and consequently the costs per ton would be any better than at present."

(This report is deposited at Chester Record Office under document reference DEO 182)

In the report which covers all costs of production of the limestone there is none for pumping.

D.J.W. Nov. 2002
Report on the Astbury Hydraulic Limestone Company
By A.M. Henshaw 28th July 1911

**Costs of production, output and profit and loss for the previous year - 1910**

| | | | |
|---|---|---|---|
| Output of lime | 2366 tons | | |
| Total cost of lime | £1782 | | |
| Underground costs | | | |
| For stone gotten | | £472 | 3s.11.9d./ton |
| Timbering & repair of roads | | £49 | 4.97d./ton |
| TOTAL | | £521 | 4s.4.85d./ton |
| Bringing stone out of tunnel to kilns | | £80 | 8.11d./ton |
| Other surface costs charged to lime | | £278 | 2s. 4.2d./ton |
| TOTAL | | £358 | 3s. 0.31d./ton |
| Material costs | | £133 | 1s.1.5d./ton |
| Coal for lime burning | | £366 | 3s.1.12d./ton |
| Corn etc | | £22 | 2.23d./ton |
| Powder & sundries | | £40 | 4.06d./ton |
| TOTAL | | £561 | 4s.8.9d./ton |
| General expenses | | £46 | |
| Rent | | £220 | |
| Railway siding rent | | £96 | |
| Rates & taxes | | £30 | |
| TOTAL | | £346 | 2s.11.1d./ton |
| Lime output | 2366 tons | | |
| Total cost of lime | | £1786 | 15s.1d./ton |
| Average selling price of lime | | | 13s.3d./ton |
| **Profit/Loss** | **1s.10d./ton loss** | | |

D.J.W. Jan