

ART. XII – *The sinking of Saltom Pit, Whitehaven.*

By JEAN E. WARD, M.A., B.LITT.

PART of the wealth of the Lowther family was based on the possession and exploitation of rich coal reserves below their estate in West Cumbria. These ran in thick bands which dipped down steeply to the sea and most of the early 17th and 18th century workings below the town of Whitehaven were by adit or shaft on the Preston Isle area, comprising the Howgill Collieries. In the 1720's, preliminary exploration indicated that the coal measures dipped below the sea to the south of the town, and were a potential source of further coal. A bore was put down on the seashore about a mile south of the town at Saltom Bay (Fig. 1), and this indicated that the Main Band lay at a depth of 480 ft. Sir James Lowther was encouraged to begin this enterprise, for although careful with his money,¹ he never shirked investing in the town and port of Whitehaven. He had already encouraged the planning and construction of the most elegant town in Northern England by selling and renting land parcels to the local merchants and supporting the building of a fine church, and he saw that it was made to prosper on behalf of himself and its citizens by making loans towards the improvement and enlarging of the Harbour.² When the idea of a colliery extending below the sea was proposed to him, he was therefore prepared to risk a huge sum of money on this uncertain enterprise, in an undertaking as ambitious and speculative as any of the South Sea investments of 18th century England.

His two chief local advisers must have influenced his decision to begin work at Saltom. John Spedding, son of one of his tenant farmers, had risen by great natural ability with figures and an astute mind, to become Sir James' chief steward. He kept meticulous accounts of all Whitehaven enterprises, exposed fraud and deceit and carried out a voluminous correspondence with his largely absentee master. This was often in code, and included recommendations as to land purchase, details of local landowner rivals in the coal monopoly and bookkeeping of the highest order.³ In his rise to such a powerful position in the town, he had also promoted the cause of his family and particularly his younger brother, Carlisle.⁴ The latter was a very practical and inventive man and by the 1720's he was the chief overseer of the collieries, having a good grasp of current mining techniques and an ingenuity for invention. The Whitehaven pits, constantly beset by roof falls, inundation, fire damp and choak damp were a constant challenge to this engineer. He had to venture into the pits in appalling conditions before workmen would return after a disaster, try to offset the effects of the lethal gas and still provide a steady income for his absentee master. By 1729, he had shown great aptitude in coping with the early Newcomen Engine installed at The Ginns and was approached by the proprietors with a view to leaving Whitehaven for a more lucrative position. His loyalty to his benefactor however meant that in 1729, at the age of thirty-four, he was about to "begin the pit at Saltom, which is a great undertaking and hope it will answer all the ends proposed."⁵ The earliest recorded workings undersea were carried out in 1618 from Culross, Fife,⁶ where shallow galleries went a mile below the River Forth, but the

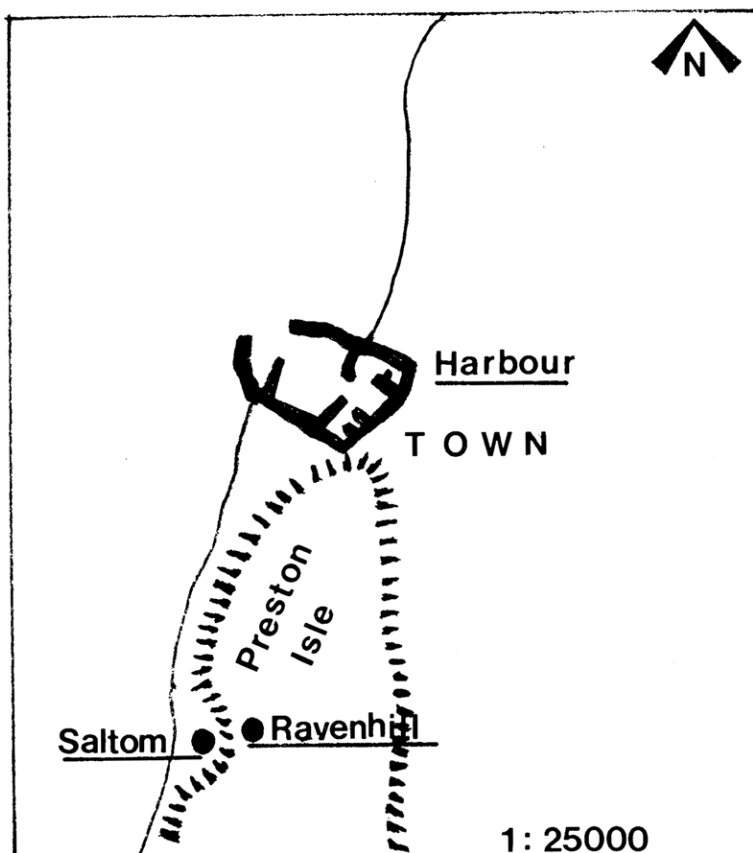


FIG.1. Location of Saltom.

Saltom enterprise was to be much deeper and as well as winning coal would also assist the drainage of many of the inland pits. With preparatory boring carried out, John Spedding's accounts dealing with the sinking of Saltom Pit began on 4 March 1729.⁷

Lady Day Quarter 1729

Work began within 20 yards of the high water mark by using workmen to 'ridd' or clear a platform for the work. On this, 'standards' or measurements were laid out by Carlisle for the pit shaft and sand and stones carted to level off the platform. To keep the site safe from the waves, a gang of masons and labourers began to erect a stout sea wall on the shore edge.⁸ As Whitehaven was constantly in need of such skilled craftsmen for the town and harbour works, the Speddings must have had to offer attractive wages. Carlisle was largely absent in April, due to a great fire in Corporal Pit, where the workmen refused to venture without his presence.⁹

Midsummer Quarter 1730

Once the levelling was completed, sinking of the shaft began. In the 18th century this was carried out by specialist gangs of 'Sinkers' who would be contracted to carry out the work at a certain rate per fathom. This would vary in amount, depending on the nature of the material they were cutting through, the volume of water encountered and other additional hazards. They usually operated in small teams of perhaps six to eight men, often related by blood, who would travel to different coalfields in search of work. When a shaft was dug, it could adopt the name of the gaffer of the sinkers, this in turn being passed on to the colliery. These men provided their own tools (Fig.2) but the contractor may have had to keep them sharpened, as well as providing timber for the lining of the shaft and protective clothing and lanthorns.

At Saltom they sank the shaft to bedrock, walling the top section and winding out the water and waste 'mettle' by a hand windlass. The dimensions of the shaft laid out by Carlisle were an 8 ft by 10 ft oval¹⁰ and they would have used the winding rope for ascending and travelling down the shaft, standing in the bucket or corf.

While the shaft proceeded, extra workmen were employed to set out the measurements for the pit head buildings. Using explosives,¹¹ they levelled the site of the Ginstead, a circular area used by horses who would turn a large wheel to raise the coals out of the pit (Fig.3). Saltom, however, was going to employ a Newcomen Fire Engine

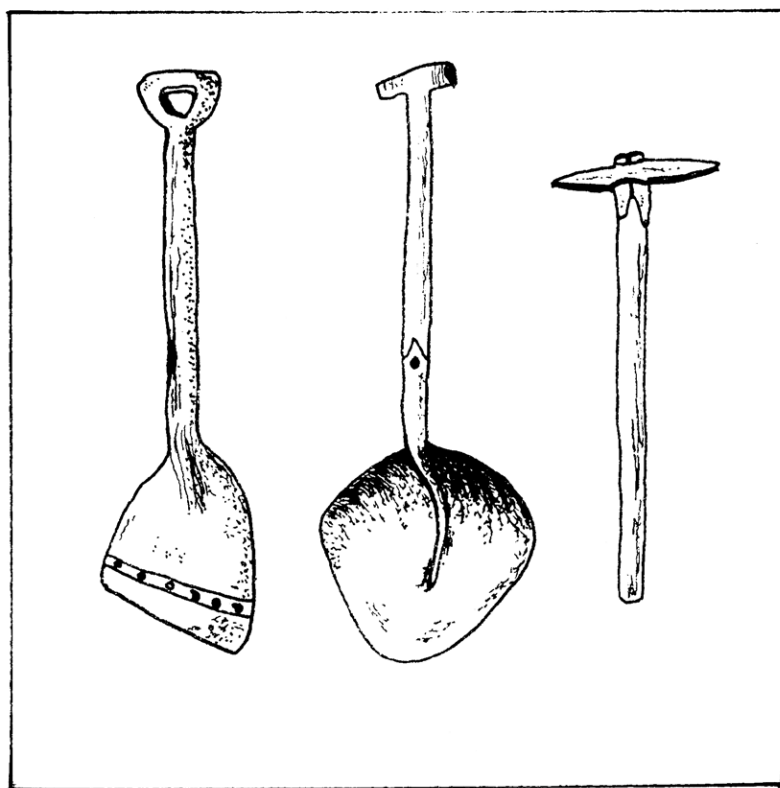


FIG 2. Sinkers' hand tools.

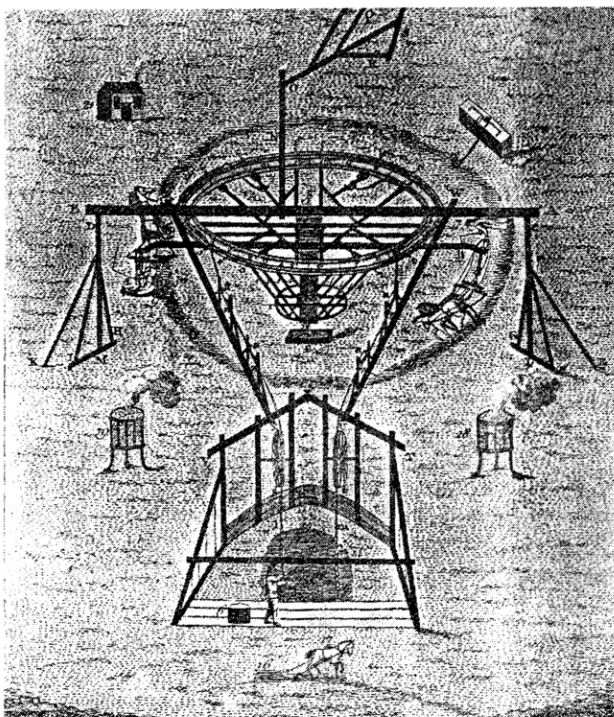


FIG.3. Whim Gin 1765 (London Magazine)

on site and the foundations of the engine house were prepared. Lowther had already used an Engine at the Ginns pit in 1715 to raise water¹² and his engineer had persuaded him to do the same at the new pit, for although the outlay was considerable – more than 100 guineas – it would save over the long period, as the Ginstead horses could be used exclusively for raising coal, and the engine could use waste coal at the pit.

Michelmas Quarter 1730

By the end of this quarter, the shaft lay at 22 fathoms and a wooden framing was added inside by carpenters who were already working on the superstructure of the Bobgin. Water was a problem, as Carlisle had to spend £1. 14s. 2d. on leather coats for the sinkers and leather for pipes was purchased. It had been thought that Saltom was one of the earliest pits to employ blasting in the sinking and certainly four barrels of gunpowder were shipped to Whitehaven Harbour by the “Neptune” from London, where there was a note of 2s.9d. in harbour fees and 5s. in freight. The walls of the engine house were built from stone quarried from the cliff above the shaft, so gunpowder would have been useful for that. The accounts stated that some ironwork for the engine was carried out, indicating that the surface force of labourers, masons and carpenters may have had a blacksmith also on site, to carry out that work as well as repairing tools.

Christmas Quarter 1730

Carlisle Spedding must have been very busy at this stage, for not only would he be constantly overseeing Saltom, but he would have had to ride the mile up to Whitehaven to regulate the Howgill collieries several times a day. The sinkers reached $33\frac{1}{2}$ fathoms by the end of this quarter and further framing and kerbing of wood was carried out on the shaft and other timberwork on the engine house. A reference to 'partitioning' was made and this indicated the beginning of the division of the shaft into two sections, by bratticing built as the pit was sunk (Plate 1). One section was eventually used to draw water, while the other drew coal. Spedding is given the credit for inventing the improved ventilation system of "coursing the air" which he may have done, but it may have been naturally assisted by the double shaft arrangement. An early sketch of this shaft division was made by Sir John Clerk in 1739.¹³

The Yard Band of coal was reached and 'eyeing, ringing and shoring' was carried out. This indicated an opening made into the band which was then framed and shored ready for coal extraction. Some coal was taken out at this point and "Ale at coaling" amounted to £2. 17s. 4d., but the shaft work was obviously hard as repairs to the 'Backskins' or leather waistcoats were carried out. There may already have been a saddler permanently based at the pit head to cope with this work and also to prepare the large quantity of leather pipes which would eventually be required. Work continued on the engine house. A pond was dug on the hillside to collect water and a small adit was driven in the cliff



PLATE 1. Top of shaft showing 'waist' and methane pipe (Whitehaven Museum).

side to take coal, which would probably be used for work on the site and also to fire the engine when it was erected. The boiler was brought to Saltom by sea and a large piece of timber was also towed round, perhaps intended for the great beam arm. Leather pipes and wooden pumps were bored and iron pump hoops fitted round them, while additional material was brought from London. As no harbour dues were included for these items, they may have been landed direct at Saltom by being put into a small boat and landed on the shore.

Lady Day Quarter 1730

The surface of the pit area became increasingly busy, with masons and labourers used to cut a roadway through the cliff bank, which would provide a land route for the movement of coal to the harbour at Whitehaven. The Gin was constructed and a carpenter paid for this and also building a stable block for the gin horses. Some coal was hauled up the shaft and ale was provided for this at 6s. 8d. while "other expenses" of 5s. 6d. may have been a bonus for the sinkers. It is possible that a group of colliers may have been operating in the shaft from that time in order to try and get some small return for the vast capital outlay, for the erection of the Gin would provide a faster means of drawing up both coal and waste material. The engine assembly began, certainly under the close supervision of Carlisle.¹⁴ The regulating beam, jack head and boiler were fitted in position and extra items of fire bricks and furnace bars purchased from the foundry at Clifton, near Workington, for the construction of the fireplace. A blacksmith on site was producing items for the engine.

Down in the shaft, however, the sinkers encountered a serious problem. This was detailed in a paper written by Carlisle Spedding and communicated to the Royal Society by Sir James Lowther in 1733 (Appendix 1). At 42 fathoms, below a layer of black stone, they broke into a reservoir of damp air. This hissed and bubbled through the water at the bottom of the shaft and was ignited by the flame of a candle, producing a flame over two yards high. In alarm, the sinkers beat this out with their pitched leather hats and ascended the rope to the surface. Carlisle Spedding then descended to inspect this phenomena, for he had already become familiar with the dangerous and often fatal presence of this gas in some of the other Howgill pits, where several miners had already been "burnt".¹⁵ He set the gas alight again and it burned for over an hour, in no way affected by the water rising at the foot of the shaft. It was again beaten out by the use of hats, and despite the great danger, Carlisle made a larger opening in the black stone. It seems unlikely that the sinkers would have remained at the bottom of the narrow shaft for the next stage in the experiment! The gas was ignited again and rose in a column of flame one yard across and three yards high. This could not be extinguished by beating, and was only finally put out by dropping a column of water from the top of the shaft. No candles were permitted in the shaft after this until they got below the stone bed. Carlisle had already been experimenting with alternative ways of lighting in dangerous conditions. In early days, a glimmer of light had been created by the use of luminosity from fish-skins,¹⁶ but the Royal Society paper refers to the use of flint and steel at Saltom in these circumstances. Spedding invented the Steel Mill for illumination and this may have had an early trial at Saltom. By means of two rotating wheels and cogs, a piece of flint

was made to give off a constant shower of sparks when the mill was pressed against a solid surface (Plate 2). While tiring for the worker of the mill, the sparks would provide some light, and Spedding was convinced that the sparks would not ignite fire damp like a naked flame. This was an incorrect premise, but the steel mill was widely used from the middle of the eighteenth century in British pits until the discovery of the safety lamp. In order to cope with the gusher of gas, the pit was framed tightly at the point of breakthrough, and behind this casing was inserted a hollow tube which ran up the shaft to the surface and into the open air.¹⁷ It continued to discharge gas for many years at a constant rate, and was often set alight for visitors to note.¹⁸

Midsummer Quarter 1731

Having overcome this hazard, sinking continued to 50 $\frac{3}{4}$ fathoms, with notes in the account of repairs carried out, perhaps due to some damage caused by the firedamp. Partitioning or 'hedging' continued in the shaft and a hole five yards deep was dug to house a pump lift. A pricker was purchased and as this was a rod which was placed in a hole packed with gunpowder, leaving a touch hole on its removal, explosives were obviously being used.

Further work continued on the engine and the pumps were sealed with leather, linen and oakum and the pipes connected. Locks and hinges were purchased for the pit head

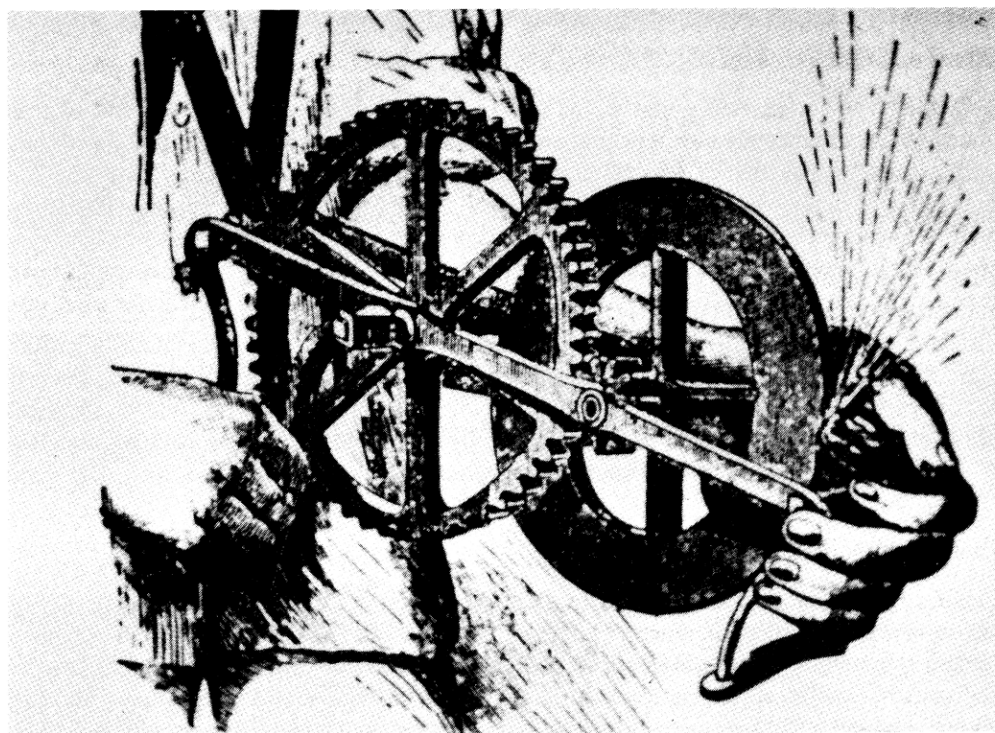


PLATE 2. Spedding's Steel Mill.

buildings and the engine house roof was slated over. A great quantity of gunpowder was purchased, an expenditure of £32. 8s. 11½d. indicating about twelve barrels in all, in preparation for the work required on routeways out for the coal from the remote Saltom Bay. Some leather was purchased from Kendal, suggesting that it must have been for something more special than the pipes and waistcoats.

Michelmas Quarter 1731

The Bannock Band was reached at 61½ fathoms and a 'trayling' or grating inserted as well as a step notched in the pit side for a cross beam. "Mending and searching" were noted in the accounts and again seems to indicate damage and subsequent inspection by Carlisle. Work continued on the engine and timber was brought round by boat, with the workmen receiving ale several times, perhaps after unloading. Bearing beams were fitted at the pump lifts and a well was dressed at the bottom of the pit to collect water. Purchase of fodder indicated that the horse gin was in operation. Work began on a new road through the rocks behind the pit and a wooden kerbing was added for the wagons or sleds which would be required to use it.¹⁹ A land rent of half a year £2. 10s. 0d. was paid, but as the land was owned by Sir James, it seems likely that the rental would have been transferred from the colliery account into his personal account!²⁰

Christmas Quarter 1731

Despite further mending of the shaft, 70 fathoms were reached by the end of this quarter. The engine was now working and "boreing off the water", but it had problems, perhaps due to the size of its cylinder in relation to the depth worked (Plate 3). The fireplace was repaired, not for the last time, and the engine itself was painted. The latter work was carried out by a local landscape and portrait painter, Matthias Read, who was obviously in need of money at that point.²¹ A new smithy was built, and this would have coped with the needs of the gin horses, manufacture and repair of tools when coal was extracted and also the vagaries of the engine. Ten more barrels of gunpowder were purchased for the roadway works. This was eventually to run to the bottom of a shaft at Ravenhill pit. The ginstead was paved over, covering an area large enough for the 24 ft gin arm which was propelled by two-horse teams.

Lady Day Quarter 1731

Sinking was completed at 73¼ fathoms and the team of six sinkers given a gratuity of £6 on completion of their work (Fig.4). A note was made at the edge of the account, "begin to get coals the 9th February" and "ale at coaling the pit" was recorded. Clearly the colliery was in operation after an enormous expenditure of £1,907. 14s. 7¼d., but the engine still had work carried out on it, indicating that it was not very efficient. The engine house was plastered and a chimney built beside it for the fireplace. Plumbers were

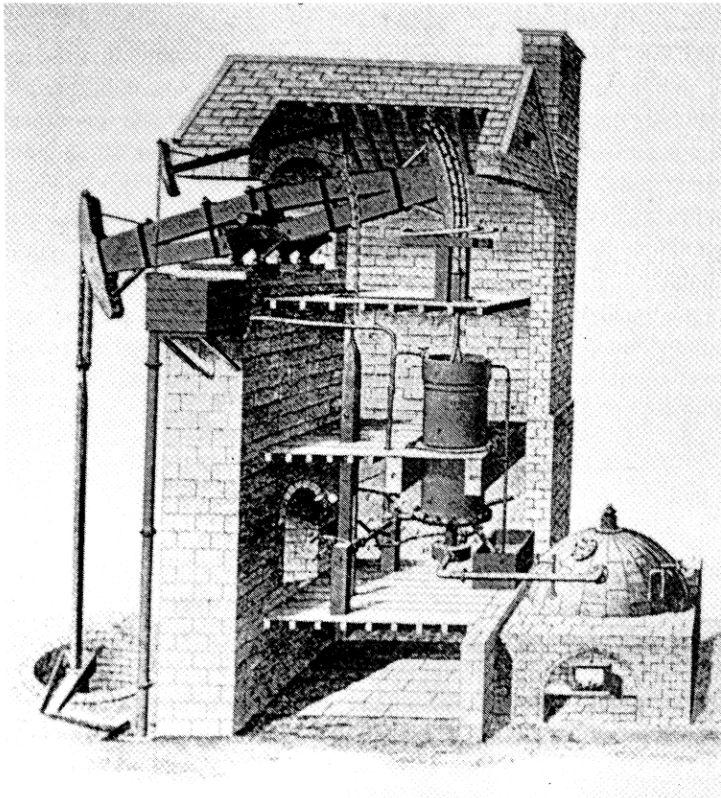


PLATE 3. Engraving of Atmospheric Engine.

required constantly to work on the pipes and pumps and a copper smith was brought down from the city of Carlisle for 21s. to work on the boiler.

In addition to providing a land route for the movement of coal, it was decided to construct a pier at Saltom so that ships might load directly. Labourers began to blast out rocks and erect a harbour wall. Coal extraction was begun by driving thirty-four yards into the Main Band, but it was not recorded how many colliers were working although extra corves of split hazel were purchased to speed extraction with the horse gin. Some coal was banked at the pithead and this work went on over twenty-four hours with braziers providing illumination and teams of horses and hewers being changed.

Midsummer Quarter 1732

Further problems arose with the engine, as John Spedding wrote to Sir James Lowther on 9 June, "I expect the workmen every day from Penrith to fit up the boyler for Saltom",²² and by 30 August, "the Saltom Fire Engine was got to work again today."²³ The accounts referred to mending the fireplace, firing the lowest lift of the

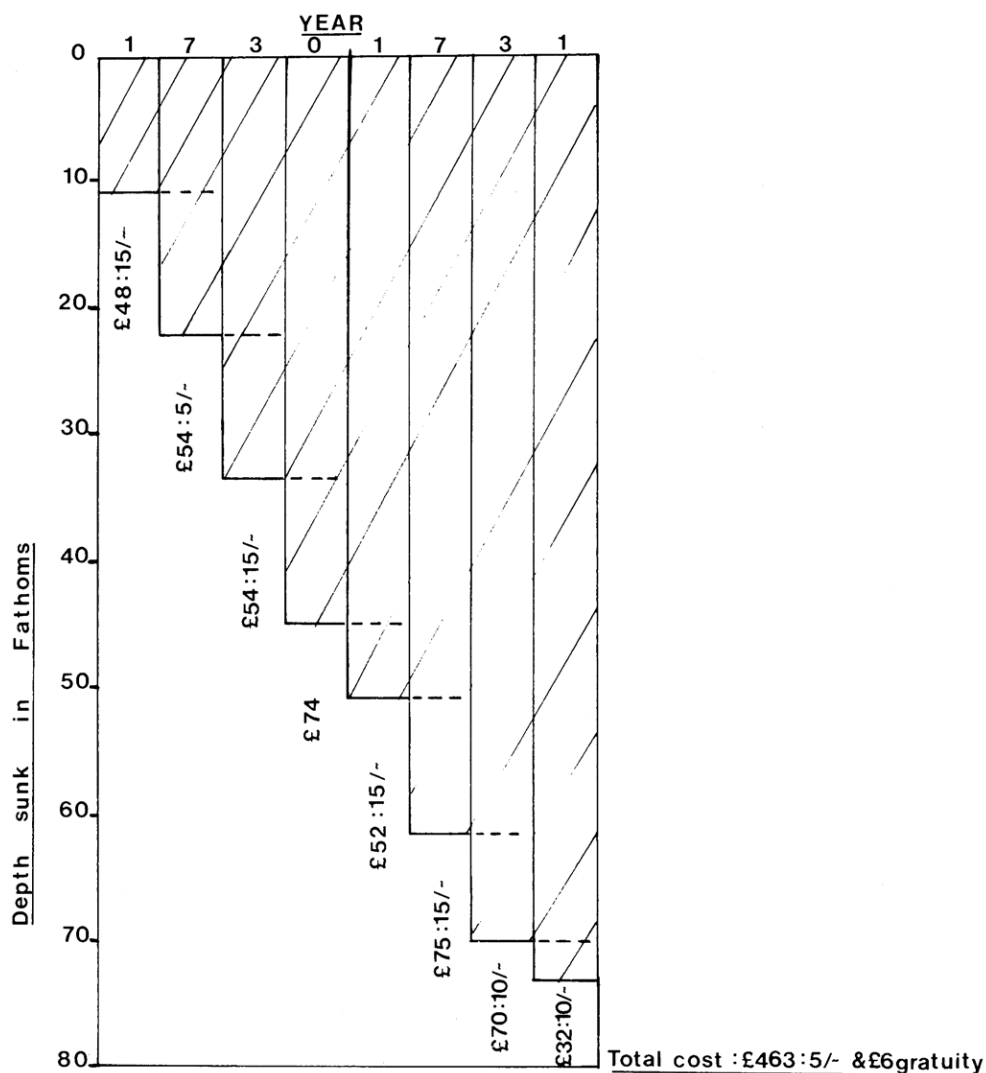


FIG.4. Sinking Costs per Quarter.

pumps, the purchase of a 'sheeve'²⁴ of iron and purchase of extra burning charcoal for the smithy.

The harbour work continued with further blasting of the foreshore rock, while a wooden framework was erected for the pier which was filled with lime, sand and rubble. Extra gravel and sand was dug out from the strand to improve the depth inside the anchorage.

Christmas Quarter 1732

The new harbour, however, had been erected on a very exposed stretch of coast and a heavy storm caused damage to the quay and created a large repair bill of £96. os. 3d. . The engine house was now completed, with glass windows inserted for 16s. 6d., but the 17 inch cylinder could not cope with the volume of water and a larger cylinder of 35½ inches was purchased from the York Buildings in London for £164. 17s. 3d., with an extra £160. 19s. 4d. for a copper boiler. The cylinder was freighted from London on the ship "Providence" in March and the boiler brought from Bristol, replacing the old one which was sent in part exchange. Extra items purchased for the new engine construction included brass 'forcers' or plungers on the pumps, wooden lifting blocks, four brass barrels and eighty-eight Swedish pan plates from London, freighted on the "Princess". Both ships used the pier at Saltom for direct unloading, and no harbour dues were recorded.

Michelmas Quarter 1732

Despite strengthening of the harbour walls before a storm on 11 September, further repairs had to be carried out and Spedding may have realised the futility of using "this dangerous place" as the only means of moving the coal, so work was continued on the cartway to the foot of Ravenhill pit. There, the coals were loaded into corves and hoisted up a shaft of 182 feet to the top of Preston Isle, then emptied into wagons which ran on a gravity wagonway of timber down the main harbour at Whitehaven. The failure of Saltom harbour was reflected in the coal shipping figures;

| | |
|------|-----------------------|
| 1733 | 861 tons |
| 1734 | 1607 tons |
| 1735 | 22 tons |
| 1736 | 10 tons ²⁵ |

with the harbour finally abandoned in 1738.

Lady Day Quarter 1732

Sir James referred to the quick loading of the 'Ann and Mary'²⁶ at the quay. Work continued on setting up the new boiler and the accounts ended with a series of sundries not included before, e.g. £450 for further framing and partitioning the pit, £150 for nails and £110 for roadbuilding. The last total mentioned was £4,521. 13s. 3¼d., but this was itemised as "carried over" and there was obviously a missing section, as John Spedding's other accounts were all neatly rounded off to give a total expenditure.²⁷

The sinking of Saltom Pit, detailed in the accounts produced by Carlisle and John Spedding, was very costly, but despite problems with the fire engines, the works produced 270,000 tons of coal between 1734-51 from seams which could not have been reached from the Howgill pits. In addition to the income from that source, Sir James also benefitted from two salt pans erected on the site in 1734, which used coal from the pit

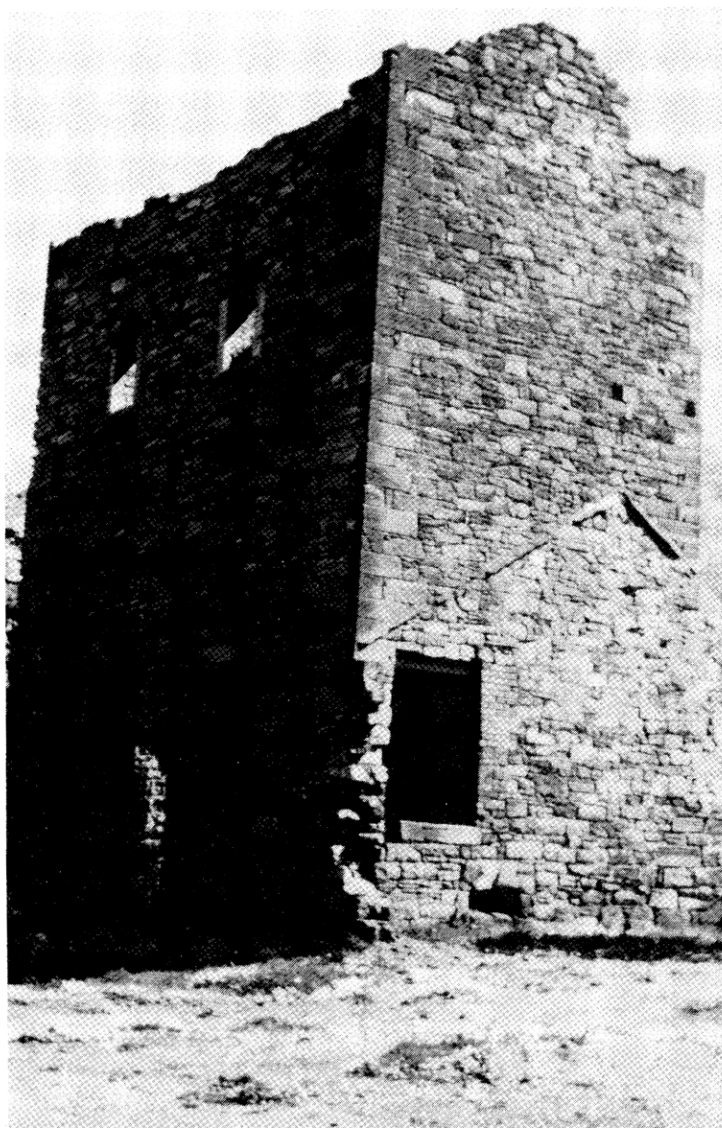


PLATE 4. Remains of Later Engine House at Saltom.

and water pumped by the fire engine. John Spedding predicted 18–19 bushels of salt per day from each pan and by 1748, £9 per week duty was being paid on salt manufacture at Saltom. In 1732, an extra account sheet recorded the driving of an air race into the Bannock Band at Saltom, completed in 1733 at a cost of £950. This consisted of two partitions 600 yards long, used to improve the ventilation of Corporal Pit, which had already been badly affected by fire damp and also draw off water to Saltom which could then be raised by the engine. Later visitors to Saltom marvelled at the undersea workings, which extended at least three quarters of a mile by 1765. In a visit in 1739, Sir

John Clerk noted in a letter to Gale, "Sir James' riches in part swim over his head, for ships pass daily above the ground where his colliers work. . . if the roof gives way in any one place, the coal will not only be drowned in a moment, but above two hundred people will lose their lives."²⁸ A descriptive poem by Dr Dalton²⁹ eulogised this work and the man who made it possible – Carlisle Spedding (Appendix II). The site at Saltom (Plate 4), worked until 1848, remains as the foremost monument of Cumbrian 18th century industrial enterprise, a legacy of the financial management of one man, the ingenuity and bravery of another and the gamble taken by their employer.

Notes and References

- ¹ W.A.J. Prevost, "A Trip to Whitehaven to visite the coalworks there in 1739, by Sir John Clerk", *CW2*, lxxv, 312.
- ² MS Copy *Minutes of the Whitehaven Harbour Trustees*. Whitehaven Library.
- ³ Cumbria Record Office (Carlisle). Letter Books of John Spedding. D/Lons/W2.
- ⁴ J.V. Beckett, "Carlisle Spedding (1695–1755), Engineer, Inventor and Architect", *CW2*, lxxxiii, 131–140. This provides an excellent outline of his activities.
- ⁵ C.R.O. (Carlisle) John Spedding to James Lowther March 8 1729.
- ⁶ R.L. Galloway, *Annals of Coal Mining and the Coal Trade* (1898), 346.
- ⁷ C.R.O. (Carlisle) "Charge of Saltom Pitt, Begun 4th March 1729". I am indebted to the Record Office and the Earl of Lonsdale for access to this and other items in the Lowther Archive. In the detailed daily account sheet, the enterprise on 4 March is itemised No. 10, and the earlier missing costs must have related to the trial boring.
- ⁸ This wall is still visible, although substantially rebuilt.
- ⁹ C.R.O. (Carlisle) John Spedding to James Lowther 24 April 1729.
- ¹⁰ When the shaft was recapped in recent years, the shape of the shaft and the original stone walling was clearly visible.
- ¹¹ It has been speculated that some of the gunpowder mentioned in the accounts may have been used to sink the shaft.
- ¹² J.S. Allen, "The 1715 and other Newcomen Engines at Whitehaven, Cumberland", *Transactions of the Newcomen Society* XLV(1972–3), 237–68.
- ¹³ *ibid.* Prevost, 308.
- ¹⁴ He would have been able to draw on his previous experience with engines at the Ginns.
- ¹⁵ The Register of Deaths at Holy Trinity: 1721–"8 October, Jane Key, Burnt" and 1727–"20 December, John Gibson killed in ye damp".
- ¹⁶ *The Pitman's Infallible Guide*. Copy in Whitehaven Museum. I am indebted to Harry Fancy, Curator, for this and other photographic material.
- ¹⁷ C.R.O. (Carlisle) John Spedding to James Lowther 10 May 1731. "I shall consider with my brother about bellows and leather pipe for curing firedamp."
- ¹⁸ See Plate 1. The later metal pipe was still drawing off the methane.
- ¹⁹ Spedding would be familiar with the wagonways already in use on the North East Coalfield.
- ²⁰ John Spedding's Coal Account Books C.R.O. (Carlisle) note that Sir James was paid when his own domestic staff and horses at the Castle were used for extra cartage of coal to the harbour.
- ²¹ Matthias Read (1669–1747) was a professional painter who came to Whitehaven from London. He painted portraits, panels in houses, altar-pieces and several views of Whitehaven. When commissions were few, in common with other artists of the period he would carry out mundane tasks such as this. Some of John Spedding's letters refer to him decorating some rooms in Whitehaven Castle in 1732.
- ²² C.R.O. (Carlisle) John Spedding to James Lowther 9 June 1732.
- ²³ C.R.O. (Carlisle) John Spedding to James Lowther 30 August 1732.
- ²⁴ A sheave of iron was a bundle of iron rods, usually about 30 in total.
- ²⁵ O. Wood, *West Cumberland Coal 1600–1982/3* (1988), 23.
- ²⁶ C.R.O. (Carlisle) James Lowther to John Spedding 29 March 1733.

²⁷ MS Copy. "Vestry Book of Holy Trinity Church". Whitehaven Library.

²⁸ W. Hutchinson, *History of the County of Cumberland* (1794) Vol II, 62.

²⁹ John Dalton (1709–63), son of the Rev. John Dalton of Dean, Cumberland. He was a Divine and a poet. This poem was accompanied by "Thoughts of Building and Planting" which was dedicated to Sir James Lowther in 1755. It seems likely that Dalton must have visited the Whitehaven mines before the death of Carlisle Spedding in 1755, and based his tour in the poem on his experiences. He may indeed have visited in company with the two ladies of the dedication.

APPENDIX I

Philosophical Transactions of the Royal Society. Vol XXXVIII (1733,34), 109–113

An Account of the damp air in a Coal-Pit of Sir James Lowther, Bart. sunk within 20 yards of the Sea; communicated by him to the Royal Society.

Sir James Lowther having Occasion to sink a Pit very near the full Sea-Mark, for the draining one of his principal Collieries near Whitehaven, in the County of Cumberland, which was known would be near 80 Fathom in Depth to the best Seam of Coals, which is three Yards thick; the Work was carried on Day and Night very successfully, through several Beds of hard Stone, Coal, and other Minerals, 'till the Pit was sunk down 42 Fathom from the Surface, where they came to a Bed of Black Stone, about six Inches thick, very full of Joints, or open Cliffs, which divided the Stones into Pieces of about six inches Square, the Sides whereof were all spangled with Sulphur, and in Colour like Gold. Under this Black-Stone lies a Bed of Coal two Foot thick: When the Workmen first prick'd the Black-Stone Bed, which was on the rise Side of the Pit, it afforded very little Water, contrary to what was expected; but instead thereof a vast Quantity of damp corrupted Air, which bubbled through a Quantity of Water, then spread over that part of the Pit, and made a great hissing Noise; at which the Workmen being somewhat surpriz'd, held a Candle towards it, and it immediately took Fire upon the Surface of the Water, and burn'd very fiercely; the Flame being about half a Yard in Diameter, and near two Yards high, which frightened the Workmen so that they took the Rope, and went up the Pit, having first extinguished the Flame, by beating it out with their Hats; the Steward of the Works being made acquainted with it, went down the Pit with one of the Men, and holding a Candle to the same Place, it immediately took Fire again, as before, and burnt about the same Bigness; the Flame being blue at the Bottom, and more white towards the Top. They suffer'd it to burn near half an Hour, and no Water being drawn in that time, it rose and cover'd the Bottom of the Pit near a Yard deep, but that did very little abate the Violence or Bulk of the Flame, it still continuing to burn upon the Surface of the Water. They then extinguished the Flame as before, and opened the Black-Stone Bed near two Foot broad, that a greater Quantity of Air might issue forth, and then fired it again; it burn'd a full Yard in Diameter, and about three Yards high, which soon heated the Pit to so great a Degree, that the Men were in Danger of being stifled, and so were as expeditious as possible in extinguishing the Flame, which was then too strong to be beaten out with their Hats; but with the Assistance of a Spout of Water, of four Inches Diameter, let down from a Cistern above, they happily got it extinguished without further Harm. After this no Candles were suffered to come near it, 'till the Pit was sunk down quite through the Bed of BlackStone, and the two Foot Coal underneath it, and all that part of the Pit, for four or five Foot high, was fram'd quite round, and very close jointed, so as to repel the damp Air, which nevertheless, it was apprehended, would break out in some other adjoining part, unless it was carried quite off as soon as produced out of the Cliffs of the Stone; for which End a small Hollow was left behind the Framing, in order to collect all the damp Air into one Side of the Pit, where a Tube, of about two Inches Square, was closely fixed, one End of it into the Hollow behind the Framing, and the other carried up into the

open Air, four Yards above the Top of the Pit; and through this Tube the said damp Air has ever since discharged itself, without being sensibly diminished in its strength, or lessened in its Quantity, since it was first opened, which is now two Years, and nine Months ago: It is just the same in Summer as in Winter, and will fill a large Bladder in a few seconds, by placing a Funnel at the Top of the Tube, with the small End of it put into the Neck of the Bladder, and kept close with one's Hand.

The said Air being put into a Bladder, as is above described, and tied close, may be carried away, and kept some Days, and being afterwards pressed gently thro' a small Pipe into the Flame of a Candle, will take Fire, and burn at the End of the Pipe as long as the Bladder is gently pressed to feed the Flame, and when taken from the Candle, after it is so lighted, it will continued burning 'till there is no more Air left in the Bladder to supply the Flame. This succeeded in May last before the Royal Society, after the Air had been confined in the Bladder for near a Month.

The Air, when it comes out at the Top of the Tube, is as cold as Frosty Air.

It is to be observed that this sort of Vapour, or damp Air, will not take Fire except by Flame; Sparks do not affect it, and for that Reason it is frequent to use Flint and Steel in Places affected with this sort of Damp, which will give a glimmering Light, that is a great Help to the Workmen in difficult Cases.

After the damp Air was carried up in a Tube, in the Manner above describ'd, the Pit was no more annoy'd with it, but was sunk down very successfully through the several Beds of Stone and Coal, without any other Accident, or Interruption, 'till it came to the main Seam of Coals, which is three Yards thick, and 79 Fathoms deep from the Surface; and the said Pit being Oval, viz. ten Foot one way, and eight the other, it serves both for draining the Water by a Fire-Engine, and also for raising the Coals.

Whitehaven, Aug. 1 1733.

APPENDIX II

A Descriptive Poem

Addressed to the Misses Lowther, Daughters of the Late Lord Lonsdale¹

by Mr Dalton²

"Welcome to light, advent'rous pair!
Thrice welcome to the balmy air,
From sulph'rous damp, in caverns deep,
Where subterranean thunders sleep;
Or, wak'd with dire Aetnaen found,
Bellow the trembling mountain round,
'Till to the frightened realms of day
Thro' flaming mouths they force their way;
From bursting streams, and burning rocks,
From Nature's fierce intestine shocks;
From the dark mansions of despair,
Welcome once more to light and air!
"But why explore that world of night,
Conceal'd till then from female sight?
Such grace and beauty why confine
One moment to a dreary mine?
"Was it because your curious eye

The secrets of the earth would spy,
How intervein'd rich minerals glow,
How bubbling fountains learn to flow?
"Or rather that the sons of day
Already own'd your rightful sway;
And, therefore, like young Ammon, you
Another world would fain subdue?
"What, tho' sage Prospero³ attend,
While you the cavern'd hill descend;
Tho' warn'd by him, with bended head,
You shun the shelving rock, and tread
With cautious foot the rugged way,
While tapers⁴ strive to mimic day?
Tho' he, with hundred gates and chains,⁵
The daemons of the mine restrains;
To whom their parent, jealous Earth,
To guard her hidden stores gave birth:

At which, while kindred furies sung,
 With hideous joy pale Orcus⁶ rung;
 Tho' boiling with vain rage they fit,
 Fix'd to the bottom of the pit,
 While at his beck, the spirits of air,
 With breath of Heaven, their taints repair;
 Or, if they seek superior skies,
 Thro' ways assign'd by him they rise,⁷
 Troop after troop, at day expire,
 In torrents of perpetual fire:
 Tho' he, with fury-quelling charms,
 The whoole infernal host disarms,
 And summons to your guarded sides
 A squadron of aetherial guides,
 You still, when we together view
 The dreaful enterprise and you,
 The public care and wonder go
 Of all above and all below.
 "For at your presence toil is o'er,
 The restless miner works no more,
 Nor strikes the flint, nor whirls the steel,
 Of that strange spark-emitting wheel,⁸
 Which, form'd by Prospero's magic care,
 Plays harmless in the sulphurous air;
 Without a flame diffuses light,
 And makes the grisly cavern bright.
 His task secure the miner plies
 Nor hears the Tartarian tempests rise;
 But quits it now and hastes away
 To this great Stygian holiday.
 "Agape the sooty collier stands,
 His axe suspended in his hands;
 His Aethiopian teeth the while
 Grin horribly, a ghastly smile,
 To see two goddesses so fair
 Descend to him from fields of air.
 Not greater wonder seiz'd th' abode
 Of gloomy Dis, infernal god,
 With pity, when th' Orphean Lyre
 Did every iron heart inspire,
 Sooth'd tortur'd ghosts with heavenly strains,
 And respited eternal pains.
 "But on you move through ways less steep,
 To loftier chambers of the deep,
 Whose jetty pillars⁹ seem to groan
 Beneath a pond'rous roof of stone.
 Then with increasing wonder gaze
 The dark inextricable maze,
 Where cavern crossing cavern meets,
 (City of subterranean streets)¹⁰

Where, in a tripple story, end
 Mines that o'er mines by flights ascend.¹¹
 "But who in order can relate,
 What terror still your steps await?
 How issuing from the sulphurous coal
 Thick Acherontic rivers roll?¹²
 How in close centre of the mines,
 Where orient morning never shines,
 Nor the wing'd zephyrs e'er resort,
 Infernal Darkness holds her court?
 How, breathless, with faint pace and flow,
 Thro' her grim, sultry realm you go,
 'Till purer rising gales dispense
 Their cordials to the sickning sense?¹³
 "Your progress next, the wond'ring muse
 Thro' narrow galleries pursues;
 Where earth, the miner's way to close,
 Did once the massy rock oppose
 In vain: his daring axe he heaves,
 Tow'rds the black vein a passage cleaves;
 Dissever'd by the nitrous blast,¹⁴
 The stubborn barrier bursts at last.
 Thus urg'd by Hunger's clam'rous call,
 Incessant labour conquers all.
 "In spacious rooms once more you tread,
 Whose roofs with figures quaint o'erspread,
 Wild nature paints with various dyes,
 With such as tinge the evening skies.
 "A different scene to this succeeds;
 The dreary road abruptly leads
 Down to the cold and humid caves,
 Where hissing fall the turbid waves.¹⁵
 Resounding deep thro' glimmering shades,
 The clank of chains your ears invades.
 Thro' pits profound from distant day,
 Scarce travels down light's languid ray.
 High on huge axis heav'd, above,
 See balanc'd beams unwearied move!¹⁶
 While pent within the iron womb
 Of boiling cauldrons, pants for room
 Expanded steam, and shrinks or swells,
 As cold restrains, or heat impels;
 And, ready for the vacant space,
 Incumbent Air resumes his place,
 Depressing, with stupendous force,
 Whate'er resists his downward course,
 Pumps, mov'd by rods from pond'rous beams,
 Arrest the unsuspecting streams,
 Which soon a sluggish pool would lie;
 Then spout them foaming to the sky.

"Sagacious Savery!"¹⁷ taught by thee,
 Discordant elements agree;
 Fire, water, air, earth, cold unite,
 And, lifted, in one service fight;
 Pure streams to thirsty cities send,
 Or deepest mines from floods defend.
 Man, richest gift, thy work will shine;
 Rome's aqueducts were poor to thine!
 "At last the long descent is o'er;
 Above your heads the billows roar;¹⁸
 High o'er your heads they roar in vain;
 Not all the surges of the main
 The dark recess can e'er disclose
 Rocks heap'd on rocks th' attempt oppose:
 Thrice Dover's cliff from you the tides
 With interposing roof divides!
 "From such abyss restor'd to light,
 Invade no more the realms of night:
 For heroines it may well suffice
 Once to have left these azure skies.
 Heroes themselves, in days of yore,
 Bold as they were, achiev'd no more.
 Without a dread descent you may

The mines in their effects survey,
 And with an easy eye look down
 On that fair port and happy town.¹⁹
 "Where late along the naked strand
 The fisher's cot did lonely stand,
 And his poor bark unshelter'd lay,
 Of ev'ry swelling surge the prey,
 Now lofty piers their arms extend,
 And, with their strong embraces, bend
 Round crowded fleets which safe defy
 All storms that rend the wint'ry sky:
 And bulwarks beyond bulwarks chain
 The fury of the roaring main.²⁰
 The peopled vale fair dwellings fill,
 And lengthning streets ascend the hill;
 Where Industry intent to thrive,
 Brings all her honey to the hive;
 Religion strikes with reverent awe,
 Example works th' effect of law;
 And Plenty's flowing cup we see,
 Untainted yet by luxury.
 "These are the glories of the mine,
 Creative Commerce, these are thine."

¹ The two daughters of Sir William Lowther of Holker. Inherited Whitehaven 1755. Died 1756.

² John Dalton (1709–63). Poet and Divine.

³ The 'wise man' of the mines who was also a 'magician' with his inventions was Carlisle Spedding.

⁴ A poetic description of tallow candles.

⁵ The system of doors developed by Spedding to assist in the control of the air.

⁶ God of the Underworld.

⁷ Spedding's method of piping off the damp air from the pit to the surface. There it was set alight and burned constantly.

⁸ The steel mill invented by Carlisle Spedding. When a handle was turned, wheels rotated against a flint to provide a constant stream of sparks. It was thought (wrongly) that this would not ignite the fire damp. Spedding himself died burned by the damp in 1755.

⁹ The method of leaving large square pillars of coal to support the roof of the workings. Miners were constantly being fined for trimming these for an easy supply of coal, despite the risk to themselves.

¹⁰ The grid pattern of workings underground.

¹¹ At this visit, the mine must have been worked at three levels, or else it referred to the three seams of Yard, Bannock and Main Bands.

¹² A river in the classical underworld.

¹³ Coursing the air, a method supposed to have been developed by Spedding to improve ventilation by doors and partitions in the workings.

¹⁴ The use of gunpowder in the mine to break down stubborn barriers.

¹⁵ The well at the bottom of the shaft where the water was collected for raising.

¹⁶ The Newcomen Fire Engine used to raise water from the mines.

¹⁷ Although Savery patented a mine pump, these were not used at Whitehaven.

¹⁸ The reference suggests workings undersea, which can only mean Saltom Pit was the one visited by the ladies.

¹⁹ The vista of Whitehaven seen from Preston Isle, which lay above Saltom.

²⁰ The great harbour works constructed in the 18th century to protect shipping. The piers do curve out like arms.

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