ART. XXVII.—*The Archæology of the West Cumberland Coal Trade.* By ISAAC FLETCHER, M.P., F.R.S.

Read at Whitehaven, Dec. 10th, 1877.

IN endeavouring to put into a connected narrative all that is known respecting the archæology of the West Cumberland Coal Trade, a few observations as to the geographical distribution and geological aspect of its coal field seem to be a necessary preliminary. So far as has been proved by boring, or otherwise, the coal field in question may be said to commence at its southern extremity at St. Bees, where the Main Seam has recently been proved to exist at a depth of 240 fathoms, and, no doubt, it extends in a south-westerly direction, along the coast and seawards, in which direction the strata are dipping, over an enormous area. The coal-bearing strata at St. Bees are overlaid by a great thickness of Permian rocks and shales, the upper portion of which forms the promontory of St. Bees Head, and extends far to the south-west. The coast-line from St. Bees to Maryport is upon coal-bearing stata throughout its length, but at Maryport, under the new dock, there is an enormous downthrow fault to the north, which puts on a thick covering of Permian sandstone, under which there have been no attempts to find coal, though its existence can hardly be doubted. From Maryport its boundary is the line of the Permian sandstone which, speaking roughly, passes in a north-east direction through the villages of Birkby, Crosby, Oughterside, Aspatria, Bolton Low Houses, and from thence, by Westward Cottages and Green Quarries, to Holm Hill, the residence of Colonel Salkeld. Its south-east limit is the escarpment of the carboniferous limestone which underlays the lowest seam of coal worked at Whitehaven, at a depth

depth of about eighty-seven fathoms. Commencing near Egremont, the limestone, proceeding in a line not far from parallel to the one already described, comes to the surface at or near to the following places, viz: —Cleator, Mockerkin Tarn, Ullock, Dean, Eaglesfield, Brigham, Broughton Crags, Dovenby, Tallentire, Moota, Warthole Lime Works, Torpenhow, Catlands, Snow Hill, to Caldbeck. Its length is thirty-five miles, and average breadth four miles; but it must be observed that workable seams of coal do not extend over the whole of this area, which is intersected by numerous faults and dislocations running, as a general rule, in a north-westerly direction.

In any attempt to delineate the archæology of the Cumberland Coal Trade, Whitehaven must occupy by far the most prominent place, not only from the extent and importance of its collieries, but because it is unquestionable that here coal was first worked in Cumberland for sale and exportation. Whitehaven owes its existence as a town and harbour entirely to the Coal Trade, and the Coal Trade was there initiated and has been carried on by one family, and one family only,—the Lowthers. The history of the three is therefore inseparably united.

The thickness of the regular carboniferous system or coal-bearing strata at Whitehaven may be estimated at 227 fathoms, reckoning from the base of the purple sandstone, — named by the officers of the Geological Survey, the "Whitehaven sandstone," a full section of which is visible from the railway, a little to the north of William Pit,—to the carboniferous limestone which, at John Pit, Harrington, two miles and a half north of William Pit, has been proved by direct sinking to be eighty-seven fathoms below the Six Quarters Seam,—the lowest seam worked at Whitehaven, though two workable seams are known to exist below it. Taking Wellington Pit, just south of the harbour, as a guide, the three seams of coal which have been worked on an extensive scale are found at

at the following depths from the surface a few fathoms above high-water mark.

SEAM.	DEPTH.	THICKNESS.
Bannock -	80 Fathoms -	6 to 7 Feet.
Main - -	100 ,, -	8 to 10 ,,
Six Quarters -	140 ,, -	5 to 7 ,,

To the north of Whitehaven, at William Pit, the Main Seam is also 100 fathoms deep, and at Saltom Pit, also on the coast, half-a-mile west of Wellington, it is found at a depth of about eighty fathoms. From Saltom Pit the strata continue to follow the general dip of the district to the south-west at the rate of about one in eight. The west dip again brings into view on the coast section, near Barrow-mouth, the Whitehaven sandstone before alluded to. This very peculiar sandstone was first described many years ago by Professor Sedgwick, who considered it as the local representative of the Permian sandstone,—this opinion being chiefly based on the fact that it is unconformable to the coal measures which it overlays. This proves that it was deposited at a period probably long subsequent to the formation of the regular coal measures. The more recent researches of geologists seem to establish conclusively that this sandstone cannot be ranked among the Permian rocks, because at two collieries near Maryport two workable seams of coal have been found above this sandstone, and one of them,—the Senhouse High Seam,—has been worked near Maryport, where it was found upwards of three feet thick. At Mr. Wilson's Pit in Flimby wood the Senhouse High Seam was found, and underneath it the pit was sunk through seventeen fathoms of Whitehaven sandstone. At Whitehaven these seams have not been found, and its thickness, where it is not diminished by denudation, may be taken to be the same as at Flimby, viz., seventeen fathoms. To illustrate its unconformability to the regular coal measures, I may mention that, at William Pit, it is

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140 fathoms above the Six Quarters Seam, whilst at Dean Moor, about six miles distant in a north-east direction, it is only twenty-five fathoms above the same seam, and in the intermediate country it is found in varying relations to the underlaying coal seams. It contains many of the coal plants found in the regular measures. It may, perhaps, be most properly described as a secondary carboniferous formation, intermediate between the main carboniferous series and the Permian rocks reposing upon it, which I shall proceed very briefly to describe.

As the strata visible on the coast west of Saltom pit gradually pass underfoot, and the Whitehaven sandstone is submerged, we find on the top of it the first representative of the true Permian series,—a *breccia*,—on the coast only a few feet thick, but inland in some places it is found twenty or even twenty-five fathoms thick. This breccia is a very remarkable deposit, but it would be foreign to the objects of this Society to describe it at any length. I will, therefore, only add that it has been thoroughly examined by Mr. Russell, of the Geological Survey, and described by him in an able paper read before the British Association at Belfast, in 1874. This breccia is surmounted by the magnesian limestone which ranges from fifteen to thirty feet in thickness. Above this we find a considerable thickness of alternate beds of red shales, or marles, and gypsum beds, the whole being surmounted by the splendid developement of Permian sandstone which forms the promontory of St. Bees Head, and which probably exceeds 150 fathoms in thickness.

The Whitehaven Coal Field is divided into two distinct and separate portions. One embraces the vast tract laying between the St. Bees' valley and the sea, and under the sea, and the other lays to the north-east of the same valley. The former is called Howgill Colliery, and the latter Whingill Colliery.

It may be safely asserted that the whole of the tract of ground

ground, containing an area of eight or ten square miles, laying between St. Bees valley and the sea, is or has been full of coal. The Six Quarters Seam lays under the whole of it, as do also the Main and Bannock Seams, except along a narrow strip on the west of Pow Beck, beyond their out-crop. The Main Seam crops out to the surface nearly on the line of the low road to St. Bees, and has been worked at a very early period along the line of out-crop from Whitehaven to St. Bees, as far as Partis Pit, near Stanley Pond, on the Furness railway, a distance of two-and-a-half miles. The Bannock Seam crops out at a correspondingly higher level, and another seam, twenty fathoms above it, still higher, on the eastern face of the hill, whilst on the coast-line the Main Seam is found at depths varying from about eighty fathoms at Saltom, to 240 at the recent bore-hole near the sea at St. Bees. Bearing these facts in mind and remembering that the tract in question,—called Preston Isle,—rises to a height of upwards of 400 feet above the level of the sea, whilst the valley nowhere exceeds fifty feet, it is obvious that large tracts of coal can be readily and easily drained by gravitation,—a matter of great importance at all times, but of absolute necessity in almost all instances before the invention of the steam engine. It was on the out-crop of the Bannock Seam, on the hill side close to the town of Whitehaven, and I conjecture about the year 1620, that coal was first worked for sale and exportation in this county.

Early in the seventeenth century, Sir John Lowther, of Lowther, purchased and presented to his second son Christopher, the lands belonging to the dissolved monastery of St. Bees, at Whitehaven. This gentleman (who afterwards was created a baronet) settled at Whitehaven, where he built a house under the cliff and close to the harbour. He died in 1644. He discovered the existence of coal on his newly acquired estate, and commenced to work it for sale and exportation about the year I have mentioned. He

He also converted the little creek at Whitehaven into a harbour by protecting from it the south-west winds by means of a small pier. A print is in existence giving "a South-East View of Whitehaven in 1642,"—two years before Sir Christopher's decease,—which shows this small pier and six or eight three-masted ships sheltered behind it. The town appears to contain about forty houses and a small chapel, and a string of pack-horses is shown conveying, as has been surmised with some show of probability, coals to the ships in the harbour. For various reasons I doubt the accuracy of this surmise, and think it more likely they are carrying some other description of merchandise either to the town or harbour. The first authentic document which throws light on the history of Whitehaven, which I have met with, bears no date, but I have no difficulty in assigning it to the year 1705. A copy of this document was lent to me by my friend Mr. R. S. Ferguson, from a broad-sheet preserved in Lincoln's Inn, and is headed "Case of Sir John Lowther, Bart., and the inhabitants of the town and port of Whitehaven with reasons against a bill for laying a duty on coals to make a harbour at Parton, a small creek within a mile of said town."

I shall extract all the important portions of this document.

"In the year 1566, as appears by a survey of the shipping and Trade of the County of Cumberland (taken by a Commission under the Great Seal) there were but six houses and no shipping except one small Pickard of eight or nine Tun at Whitehaven, and only one of ten Tun in the whole county; no mariners except a few fishermen, nothing exported besides a small quantity of Herrings and Codfish, nor anything imported but salt."

"Sir John Lowther's family were the first that introduced any considerable Trade by sea into that County, and by building a Peer and some ships at Whitehaven, they made some advances towards it."

"Nevertheless the town was still very small till Sir John Lowther applied himself with great charge and Industry to raise it."

"The County adjacent afforded Coals sufficent for a staple export,

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but a great part of them were in the hands of small freeholders, and could not be wrought without great and expensive Levels, which must go through several people's Lands and draining all upon the *Rise* would enable such as have none of the charge to under sell and ruine those who did, so that the working of them under these circumstances was impracticable and they were lost as well to the owners as to the County until Sir John Lowther at his own cost introduced the art of carrying on Levels, and of working what was under Level by Engines, a thing unknown in that country before."

"He laid out a considerable sum at Whitehaven in repairing the old, building a new Peer and deepening the Harbour, and made a further enlargement wherein the inhabitants assisted him by a voluntary contribution."

"He took away many Salt Pans of his own that were very beneficial to him because they annoyed it (the town.)"

"And has no other assistance to defray the expense but a small ancient duty upon *Keelage* amounting to about a Farthing a Tun which is paid as an acknowledgement of his being Lord of the Manor, and Proprietor of the soil of the harbour, all which Duty and more he lays out in necessary repairs of it."

"He also procured at his own charge the renewal of a Fair and Market which had been gotton in Times of Usurpation."

After enumerating other great benefits to the town such as granting building leases on easy terms, granting a site for a church and grave-yard, giving a salary for encouraging a common carrier from London, and benefactions to St. Bees school, the "Case" continues: —

"By these and divers other benefactions and encouragements, great numbers of people have been drawn to bring their effects, settle their Families, and build Houses at Whitehaven to carry on a trade there. And the town has now advanced to that degree as to own about Eighty Sail of Ships of a considerable Burthen, many of them are employed in the plantations and other foreign Trades whereby Her Majesty's Revenue is considerably augmented and the whole County much benefitted by the employing of Poor, enhancing and taking off the native Products and raising the value of Land."

"In 1680, Mr. Fletcher (Father of the Petitioner for the Bill) attempted to build a Peer and make a harbour at Parton near the Low Water mark (upon the Ground conveyed as aforesaid to Sir John Lowther by King Charles the Second) he having some land adjoining, which he was in hopes to improve by Buildings, if he could draw over some

so ne of the shipping and Inhabitants from Whitehaven, a thing altogether impractictable if Sir John Lowther's encouragement had not brought them so near to hand."

"These attempts did for a while prejudice the growth of Whitehaven for several persons who had purposed to bring their effects and to settle there became apprehensive that the Interest of Trade would be distracted or lost between the Two Places and declined fixing themselves at either."

"Whereupon the then Attorney General (at the Relation of Sir John Lowther) exhibited his English Bill in the Court of Exchequer against the said Mr. Fletcher and others his accomplices, setting forth the ill-consequences of such an attempt to the Revenue, to trade, to the Rights of Sir John Lowther, and of Persons who have settled in Whitehaven, and to the Interest and benefit of the County in general, and after the Defendants answer, upon a full hearing of the matter, the Court prohibited the said Mr. Fletcher by a perpetual Injunction."

In 1695, Mr. Lamplugh (who is now the chief Promoter of the Bill pretending to act by some agreement with, and claiming under the said Mr. Fletcher, made a further attempt to erect a Peer at Parton upon the ground granted to Sir John Lowther as aforesaid, whereupon the Court of Exchequer (after hearing the then Attorney General Sir Tho. Trevor afterwards Lord Chief Justice) and other Council on behalf of Sir John Lowther prohibited the said Mr. Lamplugh and his agents by a perpetual Injunction from making or erecting any new Peer upon the Premises."

"Nevertheless there being a little old Peer at Parton to which Mr. Fletcher pretended a Right by Prescription, Sir John Lowther was not solicitous to hinder Mr. Lamplugh from repairing the same so long as he confined himself to the old foundations."

"Whereupon the said old Peer was repaired, and the said Mr. Fletcher and the petitioners for the Bill have ever since and still do, make use of the same without disturbance from Sir John Lowther, and Peoples minds being thus quieted, they set themselves to build houses and promote a trade at Whitehaven more vigourously than before, and there is reason to believe if the said inhabitants meet not with discouragement the good effects of their Industry will duly increase."

"But the bill now desired for making a new Peer at Parton (in a different place from the old one) and to charge the owners of Coals for that purpose was a sensible Discouragement."

* * * * *

"Whereupon

"Whereupon for these Reasons it is humbly hoped that no encouragement will be given to a Bill of so extraordinary a nature."

"But if the occasions of Trade and shipping require the aid of an Act of Parliament as it can nowhere in the County be applied to better purposes than at Whitehaven; so it is presumed that Sir John Lowther who hath given such an instance of his advancing the shipping Trade of the Country, may with most reason hope for it in favour of a Town which in so peculiar a manner owes to him its growth and improvement.

Notwithstanding Sir John Lowther's opposition, Mr. Fletcher and the inhabitants of Parton were successful with their Bill, and an Act of Parliament was passed in 1705, for enlarging the pier and harbour of Parton. The Mr. Fletcher alluded to was the owner of Moresby Hall, and lord of the manor of Moresby.

So much for the early history of Whitehaven.

The Sir John Lowther who appears in the above "Case" succeeded his father, Sir Christopher, in 1644, and it may be assumed that at that date a harbour had been established at Whitehaven, and the export of coal commenced on a small scale.

The coal worked during the first five-and-twenty years would be very easily obtained, and hardly any capital would be required for working it. We may assume that at first the Bannock and Yard Seams were worked in the hill side adjoining the town, and now built over by the houses at Mount Pleasant and the Gins, by means of drifts driven from various points, and in the position of those Seams it seems probable they might be able to follow them some distance to the dip without trouble from water. The Howgill Colliery must have been on a small and primitive scale in 1644, but Sir John Lowther, who held the Whitehaven estate from that date to the time of his death, in 1706, seems at once to have been impressed with the idea that he had an immense undeveloped source of wealth beneath his feet, of which he determined to avail himself to the utmost. Tradition relates that he resided almost constantly

constantly at Whitehaven, where he built a mansion called Flatt Hall, on the site of the present Castle, and devoted his whole time and energies to the developement of his colliery property. His first engineering performance of consequence was the driving of a level from Pow Beck, which, starting at a point a little to the west of the present town, was driven in a westerly direction under the farm-house at Monkwray, and cut the Bannock Seam at about 100 yards beyond. Its length to this point was nearly 900 yards, but I think it highly probable that it was driven on sufficiently far to cut the Yard Seam twenty fathoms above the Bannock. Sir John speaks, in a document just quoted, of his having been the first to introduce "Engines" for the purpose of drawing water below level, and no doubt it would be in this district they were first applied. These "Engines" were pumps so arranged as to be worked sometimes by manual labour and sometimes by the application of horse-power. Probably this level was driven between the years 1650 and 1660, and it drained a sufficient area of coal to serve the requirements of the trade until near the close of the century, but in the meantime the Main Seam of coal, far superior in quality and thickness, had been discovered at a depth of about 21 fathoms; it extended under that part of the town now occupied by the lower portion of Lowther Street, Duke Street, and George Street, and in order to win it, a pit was sunk at the Gins, (a portion of the town which afterwards acquired that name from the number of horse-gins which were erected for drawing water and coals,) about the year 1700. Several other pits were sunk in the same neighbourhood to the same seam, at depths of from 10 to 20 fathoms. The water was drawn by horse-gins, either in vats or by means of pumps, whilst the coals were raised by jack-rolls, or winches worked by manual labour.

From the Main Seam at the bottom of the first pit in the Gins a level was driven in in a south-westerly direction until

until it intersected the Bannock seam, at a point on which Fish Pit was afterwards sunk. The length of this level is about 1350 yards, and it drained, as it passed in its course, a large area of Main Seam, but the water from this field had to be lifted to the surface by horse power. I have had an opportunity of examining a number of the weekly pay bills for the year 1709, still preserved at Whitehaven Castle, which throw much light on the state of mining operations at that period. It seems there were then seven pits working in this district and yielding in the aggregate about 800 tons per week. Two of them, viz., Gameriggs and Murrah pits were working the Main Seam, Grayson, the Yard Seam, and Fox, Boll, Mawson, and Darby pits, the Bannock Seam, and the average cost of getting coals appears scarcely to exceed 1s. per ton, whilst the selling price at the pits mouth was only 2s. per ton. Haggers were paid at the rate of 10d. per day, Trailers 8d., Bankmen 8d., Winders 8d., and Corvers or Basket makers 1s. At this time carts seem to have come into use, and the cost of carting to the ships was 9d. per ton. The price put on board ships was 3s. per ton. It is to be noted that at this time everybody, including the colliers (or haggers as they were then and still are universally called in Cumberland) were paid by the day, but a very few years afterwards, probably about 1720 or 1730, the far better practice was introduced of paying the colliers by the ton. This seems the proper place to remark that the coal ton in use from the earliest times, and far into the present century was not a ton by weight, but a ton by measure. It contained thirty-six Winchester bushels, and I have ascertained, by careful measuring and weighing, that the pit ton weighs 21 cwt. 2 qrs. 11 lbs., but as these no doubt a little overweight obtained, we may assume that practically it was 22 cwt., and the Whitehaven railway waggon first used, soon after 1730, contained 44 cwt. (and continued of that size for a century afterwards) or two

two pit tons. It must therefore be understood, that throughout this paper, whenever "ton" is mentioned, it is the ton I have just described. The ton was subdivided into eight "loads," a term supposed to be derived from the fact, that originally coals were carried on the backs of horses.

The following table shows the output of the colliery for the week ending Nov. 9th, 1709:—

PIT.	TONS.	LOAD.
Gameriggs	169	0
Murrah	228	0
Fox	141	0
Boll	124	0
Grayson	72	7
Mawson	3	1
Darby	57	2
Total	795	2

Every item of expenditure appears to be included in the weekly pay bills, except the agent's salaries, and the amount of the bill for the above week amounts to £72 14s. 7d., but this includes £32 13s. 5d. for cartage, which being deducted leaves £40 1s. 2d. as the cost of raising 793 tons, or 12d. per ton.

An examination of eleven of these weekly bills gives an average of 743 tons raised per week, and on this basis the total production of the colliery for the year 1709 would be 38,636 tons.

I think we may assume that the working of coal in the manor of Moresby, on the estate of Mr. Fletcher of Moresby Hall, commenced very soon after the opening of the Whitehaven colliery, and at an early period several extensive levels were driven for the purpose of draining that coal-field, but I can find no record of what was done beyond the meagre information given in Sir John Lowther's

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Lowther's Case already quoted. It is certain that in 1680 Mr Fletcher was anxious to extend the harbour at Parton, and, therefore, we may assume that the export of coal there had attained some importance. In an account of some levelling made in 1713, in the neighbourhood of the Keetle and Priest Gill, mention is made of "Mr. Fletcher's Pit on the Moor," and from the same document I learn that coal was then working near the Keetle. "Christian Pit" and "Water Pit" are mentioned, and allusion is made to "Capt. Senhouse's Yard Band last wrought towards Sands Close."

Sir John Lowther died in 1706, and was succeeded by his son Sir James Lowther, who died in 1755, unmarried, and at a very advanced age. Like his father, he resided almost entirely at Whitehaven, and in the course of the fifty years he held the property he expended an immense sum in driving levels and sinking pits. To him must be ascribed the opening out of the Whingill colliery, to the east of Whitehaven. In 1685, Edward Spedding settled at Whitehaven as principal steward of the Lowther estates. His eldest son, (afterwards John Spedding, Esq., of Armathwaite Hall, and sheriff of Cumberland,) succeeded to that important office, and his fourth son, Carlisle Spedding, a man of great eminence from his scientific attainments, was appointed engineer to the Whitehaven collieries about the year 1718.

He invented the Steel Mill,—a machine by which a disk of steel is made to revolve with great rapidity against a piece of flint,—by which a constant shower of sparks is produced, and until the Davy lamp was invented, in 1816, it was the only means of obtaining an artificial light with safety in an explosive atmosphere. It is said that, before entering on his important duties at Whitehaven, he went to Newcastle incognito and worked as a collier in some of the principal mines there, in order to observe the best mode of working coal, and the various machines in use in that locality.

locality. He also made a great improvement in the art of ventilating mines by "coursing the air," as it is termed; but this is a technical matter on which I need not enter.

I have already alluded to the pits working at Whitehaven in 1709, and to the fact that those pits, which could could not be drained by gravitation, were cleared of water by machinery worked by horse power. But, luckily for Whitehaven, the steam engine assumed a practicable shape for mining purposes just at the time when the increase of water in the Howgill division of the colliery would have occasioned its early abandonment. Tradition says, that in 1718, Sir James Lowther purchased a "fire engine," as it was then termed, which had been erected at some water-works in London, and sent it by ship to Whitehaven, where it was erected at a pit in the "Gins," afterwards known as the "Gins Fire Engine Pit." The erecting and starting of this novel machine for pumping water was probably one of Carlisle Spedding's earliest performances. The pit was sunk to the Main Seam, and was 21 fathoms deep; the pumps were of wood, and probably ten or twelve inches in diameter. It was a most decided success, and all the expensive and inefficient horse machines for raising water were got rid of at once and for ever. It is said this was the second fire-engine erected in England for pumping purposes, but it is certain that it was among the earliest, because Steward observes "that in 1714 there were only four steam-engines in existence, two of which were upon mines in Newcastle. It may be reasonably assumed that this engine was working in London, in 1714, and was one of the four mentioned.

In or about 1710, Newcomen made the first fire-engine that could be applied to any practical use, and it was for many years used for pumping water only. Although we have no drawings or descriptions of the "Gins Fire Engine," there are plenty of drawings of Newcomen's early "fire-engines" (of which this was one) in existence,

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and a brief description of the principle on which they were constructed will not be out of place at this stage.

The foundation of the engine was the boiler, about ten or twelve feet in diameter, and shaped exactly like a hay-stack. The lower half was generally made of wrought iron plates where exposed to the action of the fire, and the upper half, above the brick setting, of cast iron. On the top of the boiler was placed a cylinder of cast iron, closed at the bottom, but open at the top. In the early fire-engines this cylinder was generally thirty to thirty-six inches in diameter, and perhaps five or six feet long. In the cylinder was placed a piston, a disk of cast iron about six inches thick, made so as to move up and down the cylinder freely, and made steam-tight by hemp packing at its circumference. A rod from the centre of the piston was connected to one end of a huge beam of wood about twenty feet long, and at the other end a rod was attached which worked the pumps in the Pit. This rod was always made sufficiently heavy to more than counterbalance the weight of the piston at the other end. Steam being got up in the boiler to a pressure slightly in excess of that of the atmosphere, (say 1 or 2lbs. per square inch,) and all being ready for a start, the action of the engine was as follows: — The engineman opened a valve communicating with the boiler, and admitted steam into the cylinder, and another valve or tap from the cylinder to the atmosphere being opened for a few moments, all the air was expelled from it, and its place supplied with steam. A valve was then opened admitting a jet of cold water into the cylinder, which condensed the steam and created an instantaneous vacuum. The pressure of the atmosphere on the top of the piston (14lbs. on the square inch) then caused the piston to descend, and at the same time lifted the column of water by the other end of the beam. This completed the first stroke of the engine, and a repetition of the process by the engineman kept the engine going at the rate of five or six strokes per minute.

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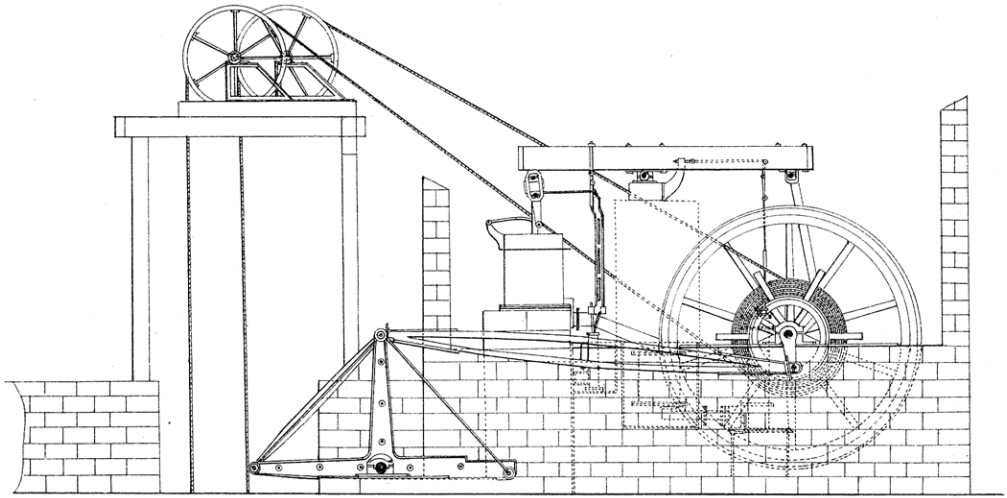
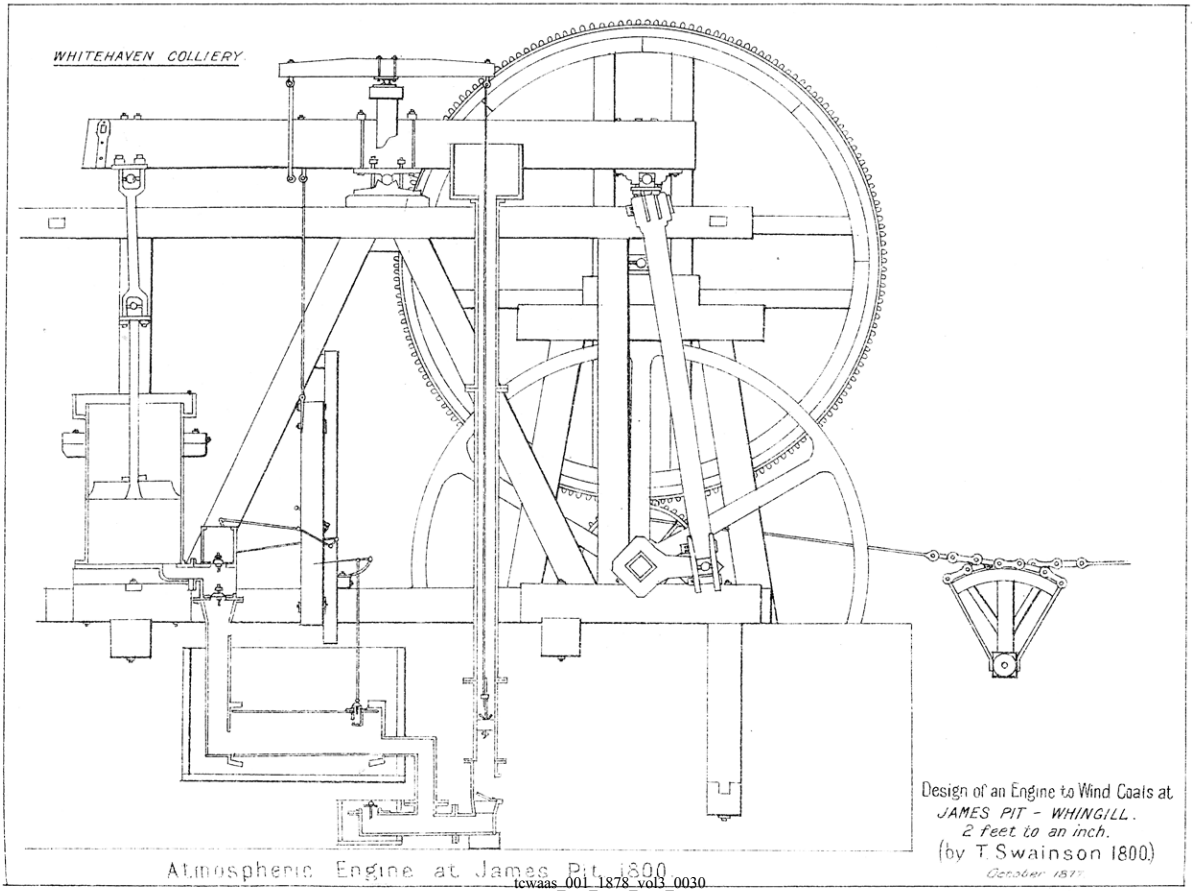


Atmospheric Engine at Stubsgill for Pumping & Winding.

October 1877.



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This was Newcomen's "atmospheric engine," as he termed it, and of course the description applies to the "Gins Fire Engine." The engine was afterwards made self-acting, and many improvements were made, by the celebrated Smeaton and others, in its details, but in its main features it remained as left by its inventor, and was the only pumping engine used for draining mines, for a period of fifty or sixty years, and, indeed, with the addition of a separate condenser and air-pump invented by Watt, there are to this day many examples of the "atmospheric engine" at work, notably the very fine one at William Pit. I may here mention that a second "fire-engine" was afterwards erected at the Gins, of the same dimensions as the first, and these continued in daily work till about the year 1780, when they were removed, and one engine of much greater power than the old ones was erected in their place.

The successful application of the atmospheric engine at the Gins, situated at the rise and nearly at the outcrop of the Main Seam, led Carlisle Spedding to propose to Sir James Lowther a most comprehensive scheme for developing the Howgill Colliery, by draining a tract of coal which would serve the requirements of the trade for several generations. At Saltom, on the sea shore, half-a-mile to the full distant from the Gins workings, he made a boring and found the Main Seam in perfection, at a depth of nearly eighty fathoms. He proposed to Sir James Lowther to sink a pit there just above high water, and erect a powerful pumping engine, which would drain many hundreds of acres under the land, and an unknown but enormous extent under the Solway Frith. Sir James seems to have entered with enthusiasm into the scheme, and the sinking of the pit was commenced in 1729. This winning was, undoubtedly, the most remarkable colliery enterprise of its day, and a curious incident during the process of sinking led Sir James Lowther to communicate to the Royal Society, in the year 1733, a very interesting paper, no doubt from the pen

pen of Carlisle Spedding. The paper is headed : — " An account of the Damp Air in a coal Pit sunk within twenty yards of the sea."

This paper describes a great eruption of fire-damp encountered in sinking Saltom Pit, from which I give some extracts : —

" Sir James Lowther having occasion to sink a Pit very near the full sea-mark, for draining one of his principal collieries near Whitehaven in the County of Cumberland which was known would be eighty fathoms in depth to the best Seam of Coals, which is three yards thick; the work was carried on very successfully, through several Beds of hard Stone, Coal and other minerals till the Pit was sunk down forty-two Fathoms from the surface, when they came to a Bed of black stone, about six Inches thick, very full of Joints and open Clifts, which divided the Stone into Pieces about six Inches square, the Sides whereof were all spangled with Sulphur, and in Colour like Gold. Under this Bed of black Stone lies a Bed of Coal two foot thick. When the Workmen first pricked 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 surprized held a Candle towards it, and it immediately took Fire upon the Surface of the Water, and burned 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 with about the same Bigness, the Flame being blue at the Bottom and more white towards the Top."

The paper proceeds to give a graphic description of the phenomenon, and of the method adopted to get rid of the annoyance. After satisfying themselves that the feeder of gas was a permanent and not a temporary one, and that it was a source of danger which must be got rid of, they adopted the following expedient.

After

"After this no Candles were suffered to come near it 'till the Pit was sunk quite enough through the Bed of black Stone, and the two Foot Coal underneath it, and all that Part of the Pit for four or five foot high, was framed 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 quite carried off as soon as produced out of the Clefts 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 the Tube the 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." * * * * * * * *

"After the damp Air was carried up in a Tube in the Manner above described, the Pit was no more annoyed with it, but was sunk down very successfully through the several Beds of Stone and Coal till it came to the Main Seam of Coals, which is three Yards thick, and seventy-nine Fathom deep from the Surface, and the said Pit being oval, viz., ten foot one way and eight foot the other, it serves both for drawing the Water by a Fire Engine, and also for raising the Coals."

The paper is dated Whitehaven, August 1, 1733.

In the above paper mention is made that some of the gas was exhibited to the Royal Society in the previous month of May, and some experiments made with it. It would also appear that at this period the Steel Mill had been invented, for the paper says "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." The above date gives us the year when the Saltom Shaft reached the coal. Allowing nine months for the remainder of the sinking, which proceeded without "Accident or Interruption," the Main Seam would be reached during the spring of 1731. It is remarkable that the shaft is *oval*. I know of no other oval shaft in Cumberland, except that at Linefitz Colliery, in the Manor of Clifton, sunk about the year 1780. It is smaller and the proportions somewhat different, viz., nine feet by six feet.

Hutchinson

Hutchinson gives an interesting letter from Sir John Clerk, addressed to Mr. Gale, and dated Aug. 19, 1739. In a subsequent letter he describes himself as "being a Coal-Master of near forty years experience." Visiting Whitehaven, he says :—

"Among the extraordinary works of this place I could not but admire those on the sea side to the westward. The sink (at Saltom) goes down perpendicularly eighty fathoms below the sea, and many underneath it. Sir James' riches in part swim over his head, for ships pass daily above the ground where his colliers work. The Coals are drawn up by an engine, moved by two horses, which go a full trot every eight hours, and three changes are employed in a day and a night. The quantity drawn up is about twenty corfs in an hour, each corf consists of an oblong square thirty-two inches long, eighteen inches broad and twenty-two inches deep which costs 7½d. Thus I found the greatest quantity of coals brought up in a year (Sundays excepted) amounted to the value of about £4,200 sterling; out of which Sir James has the colliers to pay, and all the expenses of that work, which made me positively sure that he could not clear above £500 or £600 of free money yearly from this coal work. It is true he has others, but nothing near so great and rich as this is. He draws water from his coal works by an engine with four pumps and four lifts; one of the pumps goes down eighty fathoms, which brings up the water to a cistern sixty fathoms deep, from thence another pump raises it to a cistern of forty fathoms deep from the surface or top of the sink, and a third pump brings it up to twenty, and a fourth quite up to the level of the sea at high water."

* * * * * * *

"The coal, when brought up to the level of the sea, is put on slips, and conveyed into a cavity of the hill, whence it is drawn up by a second engine. The strata of the coal are five or six in number, the greatest is above six feet in thickness, and sometimes seven or eight; the next is about five feet, one is three feet, and another is about two feet thick. The quantity yet left to work, is in my opinion no great matter, though they talk of two miles under the sea, for a few years will exhaust it; and 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."

The pumping engine at Saltom was similar to the one at the Gins, but probably larger. The cylinder was forty inches in diameter, and the boiler, on which it was fixed, eleven

eleven feet in diameter. A few years afterwards the water seems to have increased, and a second engine, a duplicate of the first, was erected, and these continued to work until about the year 1782, when the engines "being nearly worn out," were pulled down, and a new engine of gigantic proportions for that day was erected. The cylinder was seventy inches diameter, with a stroke of six feet six inches; it was on the atmospheric principle, but with a separate condenser and air pump three feet in diameter, afterwards added. This engine continued to pump at Saltom until the year 1867, when it was pulled down and broken up, and the water pumped at Wellington Pit by the huge engine erected in that year. Saltom Pit ceased to draw coals in 1848, after a longevity of 107 years.

This winning certainly answered to the full the expectations of its projector: it drained a tract of coal which continues to be worked (at Croft Pit) to this day, and on which a number of pits, some of them of great depth, were sunk shortly after its completion, on the high table-land between it and the old Gins Colliery. In 1737, I find the following pits working in the Howgill district, and Thwaite and Fish Pits in the act of sinking, viz:—Corpsill, Watson, Hind, Saltom, Harrison, Banks, and Parker Pits, and these on the average were raising about 1900 tons per week. Banks Pit seems to have ceased working in this year. I find the following quantities raised in the week ending September 7th, 1737.

PIT.	TONS.
Corpsill	480
Watson	540
Hind	486
Harrison	75
Saltom	342
Parker	15
Total	1938

For

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For this week the total cost of the above, delivered on board ship, was £159 9s. 10d., being 19¾d. per ton, and the price 3s. 4d. per ton. In the pay bill for Corpsill Pit, for Aug. 10, 1737, there is an entry which tells a sad tale.

"5th Friday, Fire Damp Killed 22 at 4 o'clock in ye M." and also an item of £8 3s. 10d. "for searching for and taking up 22 dead (men) and 3 Horses, mending Thirls &c. after the Great Fire Damp."

This, I think, was the most fatal catastrophe that ever occurred at Whitehaven, but all memory and tradition of it seems long to have passed away. Sir James Lowther immediately ordered £100 to be distributed among the unhappy families of the sufferers.

The cost of hewing and trailing at the above date was 5½d. per ton; at Saltom, from 7d. to 9d.

At Saltom the coals were raised by a horse-gin to the surface near the shore; they were then run into a drift some distance into the hill side and lifted by another gin to the summit of the cliff (twenty-seven fathoms higher) by a vertical shaft, when they were put into waggons of 44 cwts. each, and conveyed by means of a wooden railway to the harbour, where they were either shipped or deposited in an immense staith or store-house built along the quay, at the south side of the harbour. About the same time, or possibly a little earlier, a similar railway was laid down from Parker Pit to the harbour, and all the arrangements connected with them, especially the inclined plane from Ravenhill, (where the Saltom Coals were lifted,) were of the most complete and ingenious character.

Before the completion of the Saltom winning, Sir James Lowther seems to have turned his attention to the developement of the Whingill Colliery to the east of Whitehaven, which is completely separated from the Howgill Colliery by a large downthrow fault to the east, which at the north wall of the Harbour is about forty fathoms. It passes inland in a south east direction, nearly

nearly under Richmond Hill, but increases enormously in magnitude in that direction. No connection has ever been made between these two districts except by means of a single stone drift driven to convey water from some workings below level in Whingill district to Saltom, in the year 1798. The physical peculiarities of the Whingill Colliery are quite as favourable for gravitation drainage as in the case of the Howgill Colliery, for the ground rises from sea-level to an elevation of 500 feet, in the neighbourhood of Harras Moor, and upwards of 2,000 acres of land containing the Bannock, Main, and Six Quarters Seams have been drained by a level, driven before 1730, which commences at the bottom of Bransty Brow and terminates at Bateman Pit, where the Main Seam was worked at a depth of fifty-three fathoms. This level is a mile-and-a-half long, and drained more than twenty different pits which were afterwards sunk in the Whingill district.

Several of these pits worked coal below the level, and the water was lifted into it by pumps in some instances, and by vats in others, whilst North, Harras, Lady, George, and James Pits were drained to Saltom Pit by the stone drift from the Howgill Colliery. These pits were all sunk before the close of the last century, and many of them before 1750, and an immense sum must have been expended upon them and the plant necessary for working them. Pedler, Carr, Pearson, and Taylor Pits were all drawing coals as early as 1731, and produced from 300 to 400 tons per week in the aggregate.

The following pits were exhausted before 1755, viz: — Taylor, Hunter, Carr, Fox, Daniel, Green, Watson, Pedler, Harras and many others the names of which are not known.

Wooden railways were laid from all the Whingill Pits to the Arch at the north entrance to Whitehaven, where they were deposited in a large staith, and carted from thence

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to the ships. The Arch was built with the intention of carrying the railway over it by an inclined plane to the harbour, but the plan was never executed.

Sir James Lowther and his celebrated engineer, Carlisle Spedding, both died in the year 1755,—the latter being killed by an explosion of fire-damp.

During the half century of Sir James Lowther's tenure of the Whitehaven collieries, and under Carlisle Spedding's engineering, it has been calculated that nearly half a million sterling was expended in developing the collieries.

In addition to the Whingill and Howgill collieries, I should mention that very early in the eighteenth century, and perhaps even earlier, pits were worked at a shallow depth in the neighbourhood of Priest Gill, and drained by levels from the river Keetel, and also at Scalegill, where the Main Seam was only a few fathoms deep. The Six Quarters Seam was afterwards worked in the same neighbourhood.

The following Pits were sunk under the direction of Mr. Carlisle Spedding: — in the Howgill colliery, Duke, King, Thwaite, Ravenhill, Saltom, Kells, Fox, Country, Moss, Arrowthwaite, Parker, Fish, Hind, and probably some others. In the Whingill colliery, Taylor, Hunter, Carr, Fox, Daniel, Green, Watson, Pedlar, Harras, Pearson, and Jackson Pits. Many of the Howgill Pits were of great depth. Thwaite Pit was 149 fathoms to the Six Quarters Seam, and was for many years noted as the deepest pit in the kingdom.

On the death of Sir James Lowther, the Whitehaven estate passed to his kinsman, Sir James Lowther, afterwards created Earl of Lonsdale, Mr. James Spedding, son of Carlisle Spedding, being appointed engineer, and afterwards principal steward. Under the new *regime* the Coal-Trade continued to be prosecuted with great vigour, and as the old pits became exhausted new ones were sunk. Between 1755 and 1802, the date of Lord Lonsdale's death, the

the following winnings were made by Mr. Spedding and his successor Mr. Bateman: — Croft, Wilson, James, Lady, George, Davy, North, Bateman, Howe, Wolfe, Scott, Harras, and Moss Pits. Probably there may have been two or three more. Between the years 1755 and 1780, the average annual output was about 150,000 tons, and the price on board ship about 3s. 4d. per ton.

Mr. Spedding retired from the management of Lord Lonsdale's affairs at Whitehaven in the year 1781, and was succeeded by Mr. John Bateman. He died in 1788, and the following obituary notice of him appeared in the "*Cumberland Pacquet*," August 27th of that year.

"James Spedding, Esq. was for many years principal engineer and steward to the late Sir William Lowther, Bart., and his successor the present Earl of Lonsdale. To the employment of an engineer, he was introduced at a very early age, and succeeded his father (Carlisle Spedding, Esq.) in the management of the Whitehaven Collieries, in Aug. 1755. Afterwards, on the death of his uncle (John Spedding, Esq.) he was appointed steward; uniting two offices and duties of the greatest importance in this part of the Kingdom. In his conduct as steward he displayed great integrity, prudence, and humanity. In his duty as an engineer, the many masterly productions of his genius, by which the Whitehaven Coal-works have been improved and extended, will long remain a monument of his superior skill and unwearied application. He was the last of a family who rendered themselves eminent by equal industry and ingenuity, and of whose great attainments in philosophy, the most scientific men in the course of the last seventy years, have given repeated and ample testimony. To that knowledge, the result of long experience and observation, (joined with the greatest personal intrepidity in the various dangers which frequently attend the practice) not only this port, but the coast in general, owes an indissoluble obligation. The character of the deceased in this particular view, may not improperly be summed up in a short extract from the eulogium pronounced on his father and predecessor, by a writer who well knew how to appreciate the worth he described: — 'Nor did he waste his time in vain projects or fruitless speculations but heartily joined theory and practice, wholly applied his talents to serve the real purposes of life and business; and with so much industry, steadiness, and ingenuity, that perhaps he has scarce left his equal, in all respects behind him.' After a severe illness,

illness, which he supported with great fortitude and resignation, he departed this life at his house in Roper Street, in the month of August 1788, in the fifty-ninth year of his age."

Between 1780 and 1800 the average output was about 160,000 tons.

I have already mentioned that at an early period the Main Seam, under a portion of the town of Whitehaven, had been worked at a very shallow depth. The old workings were full of water, which, of course, gave a considerable support to the roof and kept it unbroken for many years. In the course of underground operations, however, this great body of water was suddenly tapped into some adjoining workings, and the small pillars of coal left to support the roof being unable to sustain the superincumbent strata, were crushed, and what is technically called a "creep" set in, the effect of which is thus described in the "*Cumberland Pacquet:*"

"About two o'clock, on Monday the 31st of January 1791, in the afternoon, the ground suddenly shrunk in the garden of H. Littledale Esq., behind his house in Duke Street, and the noise of subterranean waters was heard on the spot by a servant there at work. Near the same time, the ground sunk in a garden behind the house once occupied for a Dispensary, in Scotch Street, and in the burial ground behind the Anabaptist's meeting-house in Charles Street, all on the north side of the town. This event caused much alarm, as it was evident it proceeded from the falling in of some of the old coal works; and it afterwards appeared that a great discharge of water had flowed in upon the working pits, and two men and a woman, with five horses were drowned in the works. On Wednesday evening another plot of ground sunk within a few yards of the former settling in Mr. Littledales garden; and other sinkings, though much more trivial, were observed in different places. The accident was attributed to a workman in a new drift unfortunately striking into a drowned waste or old working. Several workmen and horses were saved from the fate of the others, by remaining in their workings till the water ran off, which was about two hours after its lodgement had been pierced. The number of houses which were in a manner demolished by these sinkings amounted to 18, among which was Mr. Littledale's elegant mansion; and between 60 and 80 families deserted that part of the town.

town. The furniture was saved out of all the houses except two. The pavement in George-Street was rent in many places. Skilful coal-viewers were immediately employed to inspect all the old workings which were accessible, and their report that no further danger was to be apprehended, quieted the minds of the inhabitants, and brought them back to those deserted dwellings which were not shook by the alarming accident. No further calamity has ensued."

Mr. Littledale's "elegant mansion" is well known as "Somerset House," and still deserves the phrase, though it bears to this day unmistakable evidence of great damage, as does also the Colliery Office immediately adjoining. Several actions at law were commenced against Lord Lonsdale by Mr. Littledale and other owners of damaged property, upon whose heads, Lord Lonsdale accumulated much unjust popular odium by immediately closing the whole of his collieries, alleging that it was impossible he could carry them on in the face of the legal proceedings which had been commenced against him. These actions, however, were soon compromised, Lord Lonsdale purchased Mr. Littledale's mansion, the working of the collieries was resumed, and no further damage ensued.

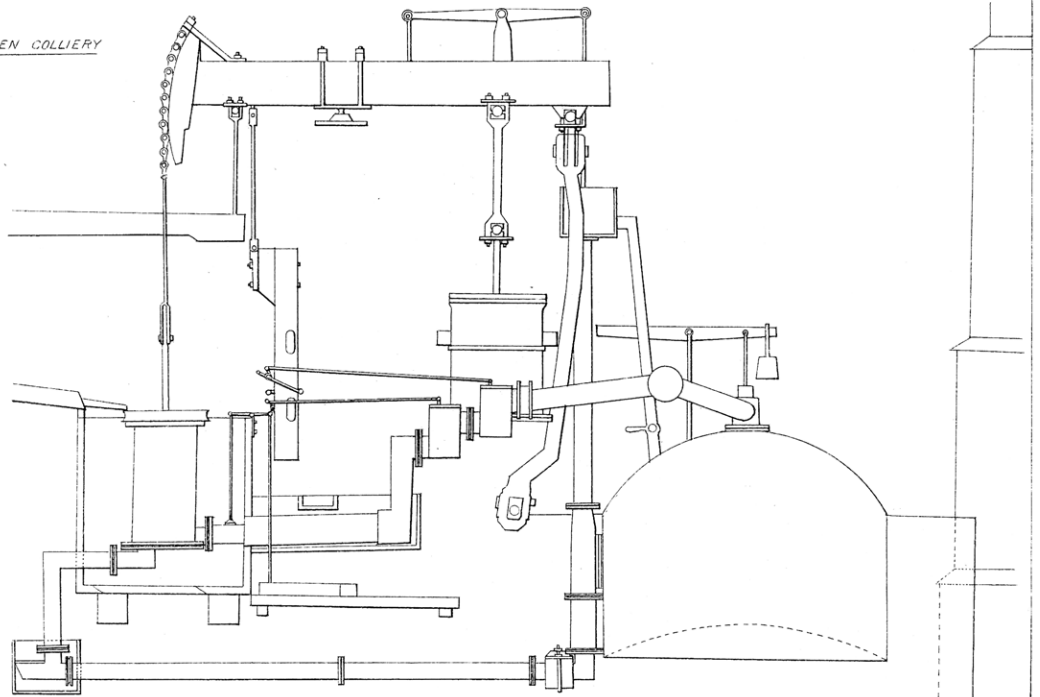
It seems incomprehensible that the steam engine should have been in use for pumping purposes for upwards of seventy years before it was applied to drawing coals, but such is the fact, and probably arose from the idea that seems to have possessed our early engineers—an idea wholly unfounded,—that the crank was not a practical medium for converting rectilinear into circular motion, and at a later period that the steam engine could not be made sufficiently delicate in its movements to render in available for winding coals; it is remarkable that its first application to this purpose, was by making it pump water on a waterwheel to the axis of which the rope rolls were fixed. The wheel was provided with two sets of buckets on its circumference, set in opposite directions, so that by turning the stream of water from one set to the other, the revolution of the wheel could be reversed. A machine of this sort was erected at George Pit in the year 1787,

1787, and cumbersome and difficult to manage as it must have been, it was said to be a great improvement on horse power. A model of this apparatus is still in existence at the Granary Yard and will be exhibited to the Society.

The first direct application of the steam engine at Whitehaven for winding was at Davy Pit, where an atmospheric engine was erected in 1794, and another at Lady Pit, in 1795. About the same time an engine of a novel construction, made at Seaton Iron Works, near Workington, by Messrs. Heslop and Millward, was erected at Kells Pit, and drew coals for many years from a depth of 114 fathoms. This form of engine was patented by Mr. Heslop in 1790, and came into extensive use at the various West Cumberland collieries. As the Heslop engine played a very important part in the developement of our coal fields, and was (I believe) not in use elsewhere, I may be allowed to give a very brief description of it. I have already described the old atmospheric engine and alluded to the invention by Watt of the separate condenser, for which he obtained an extended patent right. Mr. Heslop's object was evidently to maintain a hot steam cylinder without infringing Watt's patent, and he effectually carried out his object, by adopting two cylinders, one at each end of the beam. One of the cylinders called the hot cylinder worked exactly in the same manner as in the ordinary atmospheric engine, but instead of condensing the steam in the cylinder or using a separate condenser and air pump as in Watt's engine, it was passed into the other cylinder, which was immersed in cold water and there condensed. The cold cylinder was fitted with a piston connected with the beam in the same manner as the one in the hot cylinder, and the early engines were without an air pump. Mr. Heslop made two or three very large pumping engines on this principle, and numerous winding engines, both great and small, all of which did their work most efficiently, and economically as regards the consumption of coal, far more

so

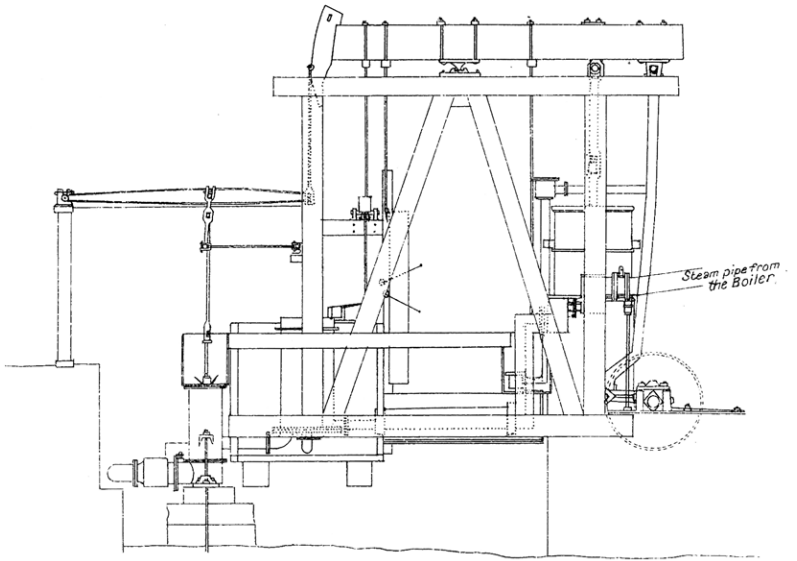
WHITEHAVEN COLLIERY



Heslop Winding Engine at Lady Pit 1795.
Removed to Wilson Pit.

October 1877.

WHITEHAVEN COLLIERY



Heslop winding Engine at Kells Pit 1795.
Removed to Low Wreah in 1823. Working in 1877. October 1877.

so indeed than the modern high pressure engine which unfortunately has now come into such general use.

The Heslop engine at Kells was afterwards removed to Low Wreah Pit, where she is at work to this day, and is well worth seeing by all who are interested in the archæology of the steam engine. She (an engine is always feminine) is upwards of eighty years of age, her faculties are unimpaired, and apparently she is capable of work for many more years. She is the last of her race, and I believe it is the intention of her noble owner, after the exhaustion of Low Wreah Pit, that she shall be carefully preserved either at South Kensington Museum or elsewhere.

At the close of the eighteenth century I do not think there were more than three or four engines employed in winding in this county. Horses still continued to be employed for this purpose at most of the pits. At the deep pits four horses were used, and were driven at full gallop in many instances. From 1780 to 1800, the average output from all the pits was about 150 or 160,000 tons per annum, and the selling price was 4s. per ton.

I must pass very rapidly over the more recent history of the Whitehaven Collieries. Early in the present century the sinking of William Pit, on the shore to the north of the town, was commenced but was not completed until 1812. At that time this was considered to be one of the best equipped collieries in the kingdom. A very fine pumping engine was erected on the atmospheric principle in 1810. The cylinder is eighty inches diameter, and the stroke eight feet. The beam is of cast-iron, with parallel motion at each end, and the diameter of the air pump three feet. She works a twelve inches pump, lifting 109 fathoms, and at her usual speed of eight strokes lifts 320 gallons per minute, with a consumption of nine tons of coal in the twenty-four hours. She is still working, and is in excellent order. The original winding engine was

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a "Heslop" of large dimensions. The hot and cold cylinders were, respectively, forty-four and twenty-eight inches diameter with five-and-a-half feet stroke. This fine engine was pulled down and broken up in 1850, and a high pressure erected in her place. At William Pit the Main Seam workings extend about a mile-and-a-half under the sea, in a direct line, but many of the workings are at a much greater distance from the shaft. A new pit has very recently been sunk, close to William Pit, to the Six Quarter Seam at a depth of 140 fathoms, to which the name "Henry" has been given, and is admirably equipped with all modern appliances. It, however, is out of my province here to describe them. Countess and Castlerigg Pits were sunk by Mr. Peile, who succeeded Mr. Bateman, in 1811. Mr. Peile also drove the Parton level, which commences at the sea at Parton, and goes in an easterly direction about one mile and three quarters. It was stopped before it reached the principal field of coal it was intended to drain.

The most important work carried on during Mr. Peile's tenure of office and under his direction was the great winning at Wellington Pit, the embattled engine house and walls of which form a conspicuous ornament to the town. A pair of pits were sunk 140 fathoms to the Six Quarters Seam which was reached in 1843. It was Mr. Peil's intention to sink these pits a further depth of 160 fathoms and then drift three miles to the full dip of the colliery, at which distance, after cutting the Six Quarters and Main Seam, he expected to reach the Bannock Seam, and thus open out a coal field which he calculated would yield 150,000 tons per annum for at least two centuries. He estimated that it would require twenty years to carry out the project. This certainly was a grand conception, and though much might be said in its favour, it was open to certain objections of great weight. Lord Lonsdale (the third Earl) employed the celebrated George Stephenson to examine and report upon the scheme, which he condemned

condemned chiefly on the ground that the pits would have to be sunk through 100 fathoms of carboniferous limestone, and the drifts would pass through 2000 yards of the same formation, which, being full of joints and hollows, would probably let in so much water as to render the mine unworkable. There is much force in this objection, but Mr Stephenson raised another which one can only smile at in these days. He says in his report, "besides in a shaft of such a depth it would be found expensive and inconvenient to raise the quantity required, setting aside the danger arising from the breakage of ropes!"

The recent discovery of the Main Seam, at a depth of 240 fathoms, at St. Bees, proves, in connection with what is known at the old collieries, the existence of an immense coal field in that locality. I have calculated that a winning at or near the site of the late boring would open out coal enough to supply an output of a quarter of a million tons per annum for a period of upwards of two centuries.

During the half century ending with 1850, the output of coal ranged from 200,000 to 250,000 tons per annum, the shipping price varying from 5s. to 9s. per ton.

In 1796 Parton Harbour was entirely destroyed by a hurricane.

I must now leave the Whitehaven Collieries and pass on to a brief review of those in other parts of west Cumberland.

Harrington Coal Trade.

The Harrington coal field lays between Lowca beck, which forms the northern boundary of the Manor of Moresby, and the Manor of Workington. The west portion of this tract contains the same seams of coal as Whitehaven, and these were worked to some extent before 1750, the produce being carted for exportation to Parton Harbour. Close to Micklam Pit there is a very large upthrow fault to the east, over which the Whitehaven

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Seams do not exist, with the exception of the Six-Quarters. This Seam, together with the Four-Foot, twenty-seven fathoms below it, and the Udale, at a further depth of thirty-eight fathoms, were very extensively worked by means of upwards of a dozen pits, nearly all of them being sunk between 1750 and 1790, and the produce shipped at Harrington, where a harbour was built by Henry Curwen, Esq. about the year 1760. The port of Harrington must not be confounded with the very old village of High Harrington, about a mile inland, from which the ancient family of Harrington derive their name and title. Wooden railways were laid from the pits to the harbour, along which the coals were conveyed to the ships, and a large export trade was carried on for a period of upwards of a century.

As at Whitehaven, the pits were drained by means of levels driven from the sea. One of these known as the "Snout Brow Level" was of great extent, and drained an extensive tract. The coal below this point was drained by a pumping engine at John Pit, which lifted the water into the level. About the year 1825 Mr. Curwen sunk a pit on a large scale, with a view of winning the Whitehaven Seams, to the west of the great fault I have already alluded to. The pit was sunk on the east side of the fault, and at a depth of eighty fathoms a drift was driven through it which cut the Main Seam, but unfortunately the broken ground adjoining the fault seems to have communicated with the sea, and the colliery was "drowned out." It has been recently re-opened successfully by the skill and enterprise of Messrs. Bain & Co., who have become the lessees of Mr. Curwen's Manor of Harrington.

Workington Coal Trade.

No doubt the success which attended the Lowthers in their colliery operations at Whitehaven would naturally lead other owners of property along the coast to search for

for coal, and there is reason to believe that the Curwens at Workington began to work and export coal at that place before the year 1650. Sandford, whose manuscripts are in the Library of the Dean and Chapter at Carlisle, describing Workington in 1676, says, "a fair haven but not so much now frequented with ships, the coleyery being decayed thereabout," and Denton, writing in 1680, says, there is "a salt pan and colliery worth £20 per annum within the demesne." We may therefore conclude that coal had then been worked for some years and that probably the small pits on the crop had become gradually exhausted. These operations appear to have been carried on on a small scale until the invention of the steam engine, which enabled the Curwens, about 1730 or 1740, to sink four pits, which were working in the year 1750, viz., Union, Moorbanks, Hunday, and School House Pits. By means of a level the Curwens were able to open out a colliery on their property adjoining the little chapel at Clifton, which was working in 1750. It could not have been a very lucrative speculation, for the land sale price was only 1s. 4d. per ton, and the shipping price 3s. 4d., from which 2s. per ton must be deducted for the cost of carting to the harbour. Before the last mentioned date, the Lowthers also began to work coal in Clifton on an extensive scale, Sir James Lowther having laid down a wooden railway from his quay on the north side of the harbour to a point near the village of Great Clifton, to which the produce of the various pits was taken in carts. From an inspection of the old plans I conclude that, prior to the abandoment of the Clifton collieries by the Lowthers, in 1781, they must have yielded upwards of 2,000,000 tons. Many of these pits were drained by levels, others by a water-wheel near the Marron at Bridgefoot, and the rest by two large atmospheric engines. One of these, which worked many years, was erected close to the Marron at Little Clifton, and the other at a new pit called Reelfitz, sunk in 1780,

1780, near the Marron, about a quarter of a mile from its confluence with the Derwent. This engine was a very powerful one, having a cylinder cast in two lengths, sixty inches diameter, with about eight feet stroke, working two twelve-inch pumps, each lifting from the Main Seam to the surface, a distance of thirty-five fathoms. In 1781 Sir James Lowther (afterwards Earl of Lonsdale) closed the whole of his collieries in the neighbourhood of Workington at a day's notice, and the circumstances which gave rise to this sudden proceeding are curious and characteristic of the man. In 1763, Sir James granted a lease of a plot of land at Beer Pot near Workington, on a ninety-nine years lease, to Messrs. Hicks, Spedding, & Co., on which extensive works for the manufacture of cast and bar iron were erected. The Spedding, whose name appears in the firm, was Mr. James Spedding, Sir James Lowther's steward and colliery manager. There was a clause in the lease, apparently a proper and reasonable one, that, as long as Sir James worked any pits within a distance of four miles from the Iron Works, those works should be allowed to have coals from the pits at the shipping price. Sir James does not appear to have been aware of this clause in the lease until early in 1781, when it came to his knowledge, and imagining that his interests were thereby prejudiced, he immediately ordered all his pits within the stipulated radius to be closed. This was done, and the plant at the various pits remained untouched (except by thieves) for many years, and, as may be imagined, went to wreck and ruin.

Mr. Cookson, who for several years worked coal in Greysouthen and Clifton to supply some iron works on the Marron, was also obliged to abandon his pits at the same time, they being inundated with the water hitherto lifted by Sir James Lowther's engines. In addition to the Clifton Pits, Sir James Lowther, at the date in question, was also working three or four pits in Seaton, which were abandoned at the same time and for the same reason.

The

The closing of these pits was no doubt a great blow to the trade of Workington, but meanwhile the Curwens were prosecuting their pits with great vigour, a large pumping engine being erected on the shore, near the site on which Lady Pit was afterwards sunk, which drained a large tract of coal. The Workington coal-field is bounded on the north by the Derwent, and lays between two large faults, parallel to each other and to the coast-line. The one is 600 yard seawards of high-water mark, and is a downthrow to the north-west, and the other is one mile inland, and an upthrow to the south-east. Between these faults the Main Seam is found, though over a considerable area in the neighbourhood of the town and harbour it has been swept away by denudation, and its place supplied by hard sandstone. About thirty-four fathoms above the Main Seam, the Moorbanks Seam—six to seven feet thick—has been extensively worked. It has not been clearly established whether this seam is, or is not, identical with the Bannock, at Whitehaven, but my opinion is that it is a seam laying above the Bannock. The rise of the seams is along the coast towards Harrington, in which direction they gradually come to the surface.

When Mr. John Christian Curwen came to the Workington estates he devoted much time personally to his Colliery affairs. In 1794, he completed the large winning on the shore known as "Lady Pit." This pit was eighty-six fathoms deep to the Main Seam, which was found in great perfection. Large pumping and winding engines were erected, and all the equipments were the best of their day. The completion of this winning was celebrated with great rejoicing. At this date Mr. Curwen had nine pits working, from which he annually exported about 100,000 tons, whilst about 50,000 tons more were exported by other proprietors in the neighbourhood, the average price on board ships being about 4s. per ton. A contemporary writer says, "Within these few years Mr. Curwen has erected six fire-engines which

which are employed both in winding up coals and pumping water. Infinite are the advantages resulting from Messrs. Boulton & Watts' improvements in the fire-engine, which can no where be better seen than by these erected here." Between the years 1812 and 1818, the sinking of the great winning at Isabella Pit was proceeded with, and in the latter year the pit was sunk to the depth where the Main Seam was expected to be found, at the depth of 128 fathoms, but unfortunately it was found to be "nipped-out." It was afterwards recovered by drifting a certain distance to the west. I have heard, on good authority, that this winning cost Mr. Curwen £80,000. The pumping engine was the most powerful that had ever been erected in Cumberland, having a sixty-six inch cylinder and nine feet stroke, and worked six sets of pumps, four of them being sixteen inches diameter. She was made by Fenton & Murray, of Leeds, and was on Boulton & Watts' principle. In 1825, about 200,000 tons were shipped at Workington,—one half of which were from Mr. Curwen's Collieries.

On July 29th, 1837, a deplorable calamity happened, by which three of Mr. Curwen's collieries were inundated by the sea, causing an immense loss of life and property. The workings in Lady Pit had been carried on to the rise sa near to the bottom of the sea as was considered safe, and sufficient pillars left to maintain the roof unbroken. Mr. Curwen had recently engaged a new manager, of the name of Coxon, who, anxious to increase the quantity of coal raised, most recklessly and culpably removed some of the pillars to which I have alluded; the roof gave way, the sea rushed in in such a volume as to fill the whole of the workings of Union, Lady, and Isabella Pits to the tide level in the course of a few hours!

I have already mentioned that Mr. Cookson worked coal extensively in Greysouthen for many years preceeding 1781. In 1787 a new firm, Walker & Co., leased the coal under a considerable portion of that township, and they and

and their successors carried on an extensive and profitable business for a period of eighty years. In 1800, another firm, Wilson & Co., in which my grandfather, John Fletcher, was a partner and owner of some of the coal worked by the firm, opened a new colliery in the township. From these collieries a large land sale was carried on, and considerable shipments were made at Workington for many years, the coal being carted there from the pits. A feud existed between the two rival firms which led to litigation, culminating in a memorable Assize trial at Carlisle in 1807, at which it was proved that Walker & Co. had worked a large quantity of coal belonging to Wilson & Co., whose colliery they had also seriously damaged by throwing water upon it, and by other illegitimate expedients. Wilson & Co. obtained a verdict, and upwards of £16,000 damages. This was one of the most important colliery suits ever tried in the north of England, and at the time excited much public interest.

Maryport Coal Trade.

Like Whitehaven and Harrington, Maryport owes its existence entirely to the coal trade. Before 1750 coal had been worked on a small scale for land sale at Dearham, Flimby, Broughton Moor, and on the property of the Christians and Senhouses, in the manors of Ewanrigg and Ellenborough. Extensive coal fields having been discovered within a few miles of the mouth of the Ellen, energetic measures were adopted to establish a harbour there. About 1740 or 1750 the following document (which bears no date) was printed and circulated.

"Reasons for Building a Pier, and making a Harbour at Elnefoot in Cumberland."

"The Coal-Trade being of mighty Benefit to this County, in respect of the great Sums of Money it brings in *Specie* from *Ireland*, it is of no small Importance to make Provision in Time for Supplying Quantities

Quantities of Coal for Exportation, suitable to the Demands of *Dublin*, and other Parts of *Ireland*."

"Since the great Increase of Dublin, where they are still carrying on very considerable Buildings, *Whitehaven* has not been able, with the Help of *Workington* and *Parton*, to supply the Foreign Markets with near the Quantities of Coal that their Consumption requires, and there being few Coals carried to the two last Places in Winter, when they are most wanted for Exportation, *Ireland* will be under a Necessity either of working its own *Collieries*, or of giving great Encouragement to the Scotch and Welsh, which will be so much Loss to *Cumberland*, where there are *Coals* for several Miles along the Shoar, ready for Exportation, if there were Harbours for Shipping them off."

"This Mischief will be likely to increase every Year, as the Trade of *Whitehaven* will be gradually declining, which must certainly be the Case, as the Coals near the Town are almost wrought out, and can not possibly last more than a few Years; after which the Pitts will be so remote, that there will not be above half the Coals shipt there as are at present, and yet *Dublin* will be every year requiring more for its Consumption."

"*Elnefoot*, having great Quantities of the best Coals adjoining to it, and also very good Roads for leading them to the Ships, (and those Coals being generally in the Hands of Noblemen, and Gentlemen of good Estates, that can lay out Money to work them to the best Advantage, and to the great Improvement of their own Revenues) will be the most proper Place for building a new Harbour."

"The whole County will reap great Benefis from such a Work, because Elnefoot lies near the Centre of it, and more commdious than any other Part of it, for supplying the whole Country with *Tobacco*, *Sugar*, *Wine*, *Tarr*, *&c.*, that come from Abroad, also for exporting the Manufactures of the County, and for helping the Gentlemen to a better Price for their Timber, which may be employed there for Building Ships."

"If *Elnefoot* be made a Harbour, it may continue one for many Ages, being situated in a fine rich Part of the Country; whereas *Whitehaven* and *Parton* having a very barren and poor neighbourhood, cannot possibly preserve any considerable Share of Trade, after the *Coals* are exhausted, which can now last but a few Years."

"The Building of a Pier and making a Harbour at *Elnefoot*, will not only preserve and improve the Manufactures now in the neighbourhood, but encourage the setting up of new ones, when they are like to have a Vent for them."

"It will be a Service to the Owners of Ships, as it will be better to have bigger Ships come there for Coals, which cannot run up to the Keys

Keys at *Dublin*, and beat down the Prices, as the small Ships do that load there now; which make no use of Gabarts, but lye close to the Keys at *Dublin*."

"It will be of little Prejudice to the Coal owners at *Whitehaven*, because they will be able to sell all the Coals they have left till they are quite wrought out."

"It will be no Prejudice to *Parton*, because if they repair the Pier, there is no Fear but all the Coals that can be brought down there will be exported, since *Whitehaven* Trade will lessen for Want of Coals, as fast as the Trade of Elnefoot will increase by the Improvements of the Harbour."

"And the Masters of Ships at *Whitehaven* and *Parton*, had better go sometimes for a Loading at *Elnefoot*, than have the *Scotch* and *Welsh* be gaining upon then in the Coal Trade."

"The County in general will be greatly benefitted by this Undertaking, as it tends to perpetuate the Coal Trade; and if any of the Coal Owners and Masters of Ships at Elnefoot, refuse to come in voluntarily to contribute to so useful a Work, it will be easie for the rest to procure an Act of Parliament to oblige all to pay, which will meet with no Opposition, when expous'd by the two Noble Dukes, whose great Collieries in that Part of the County, will by these means be prodigiously rais'd in value, and all the Country for several Miles round *Cockermouth*, where those Noble Lords Interests are so considerable, will receive great Benefit by this Improvement."

The two Dukes here alluded to were the Dukes of Wharton and Somerset, the former being Lord of the Manors of Broughton and Birkby, and the latter in possession of the Honour of Cockermouth. The Duke of Wharton's trustees afterwards sold Broughton and Birkby to the Duke of Somerset, from whom they have descended to the present Lord Leconfield.

"Elnefoot" was converted into a Harbour between the years 1750 and 1760. In the year 1756 several thousand tons of coal were shipped. In 1750, there were only two houses at Elnefoot, but after the establishment of a harbour a town rapidly sprung up, and the name was changed to Maryport. Pennant visited the place in 1774, and thus describes it: —

"Keep along the shore to Maryport, another new creation, the

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property of Humphrey Senhouse, Esq., and so named by him in honour of his lady; the second house was built only in 1750. Now there are above one hundred, peopled by thirteen hundred souls, all collected by the opening of a coal trade on the estate. For the conveniency of shipping, (there being above seventy of different sizes, from thirty to three hundred tons burthen, belonging to the harbour) are wooden piers with quays on the river Elen, where ships lie and receive their lading."

Soon after 1760, a number of pits were opened on Mr. Senhouse's estate, and also on Mr. Christian's at Ewanrigg. Some years before this date, Mr. Christian became the lessee of the manor of Broughton, adjoining his own property and occupying the high laying tract of land to the south-east, rising to a height of 450 feet above sea-level, and containing many hundred acres of Main Seam, at depths varying from ten to sixty fathoms. Being thus able to unite the two properties for mining purposes, he and his son, Mr. John Christian Curwen, developed the Broughton Colliery with great spirit and foresight. They drove a level from the low ground in front of Ewanrigg Hall to the Main Seam in Broughton, which, with its branches, was nearly two miles long, and constructed a wooden railway from the pits to the "Arches," as they are termed, near the present railway station, and from thence the coals were carted to the harbour. The driving of this level and its ventilating shafts must have taken many years to complete, and cost a very large sum.

In the twenty-six years ending with 1781, 765,530 tons (of thirty-six Winchester bushels each) were raised from the Broughton pits and shipped at Maryport. The selling price to ships was 3s. 4d., of hewing 9d., and trailing 5½d. per ton. Collieries were also opened out on Lord Lonsdale's Royalties at Flimby and Dearham, and before the close of the century upwards of 100,000 tons were annually shipped at Maryport, and meanwhile the price had risen to 5s. and 6s. per ton. I do not propose to follow the history of the Coal Trade at Maryport from 1800 to the large proportions

portions it has since attained, as it does not, properly speaking, belong to the archæology of the subject.

The early history of the Coal Trade on the other portions of the coal-field may be passed over very lightly, because, until the introduction of railways, the pits were worked on a small and primitive scale, and only supplied a local demand. Before the close of the seventeenth century coal was worked at Gilcrux, Oughterside, Bolton, and Sebergham. In 1681, William Orfeur, Esq., of High Close, Plumbland, made his will, by which he bequeathed to his eldest son, William Orfeur, "all my husbandry geare whatsoever, and all loose wood about my house, and all manner of geare belonging to my colliery at Outersyde." At Warnel Fell, in Sebergham, a small Seam of coal, only sixteen inches thick, was worked, and it is to be remarked that the Seam was worked on a system which required no pillars to be left to support the roof, for, according to Hutchinson: —

"This roof consists in general of a black slate metal, and they form of it a sort of wall behind them which prevents the roof from tumbling in, as else it might do, inasmuch as they seldom leave any pillars to support it."

This is in effect the "long wall" system of working, which has been followed in Yorkshire for a long period, and has recently been introduced into Cumberland, in the case of small seams.

General Remarks.

Having now described, as fully as the space allotted to me will permit, the West Cumberland Collieries, and brought their history down to the early part of the present century, I will conclude my paper with a few general observations.

Mode of Working Coal.

During the period in question the method of working the

the various Seams in the Cumberland Coal-field has been (with rare exceptions) that known by miners as the "pillar and board" system. In this system "ends," as they are termed, are driven about five feet wide, parallel to each other, at distances varying from twelve to forty yards apart, according to circumstances. Between these ends "boards," or workings, are driven. Where the roof is bad these boards are only three or four yards wide, but where the roof is strong they are driven six or eight yards wide. The coal between these boards are the pillars left to support the roof. At moderate depths one half of the coal, and in some instances much less, is left in pillars, but at depths of from 80 to 100 fathoms, or upwards, the pressure of the overlaying strata is so great that it is necessary to leave two-thirds of the coal in order to keep the mine open. Under such circumstances, where the boards are six yards wide, the pillars are left twelve yards thick. In modern practice these pillars are entirely removed, and the roof allowed to fall, and thus about four-fifths or five-sixths of the coal may be obtained. Before the present century, however, the pillars were never removed, and the consequence is that in all the old pits at least half of the coal has been left, and can never be recovered. In the old pits at Whitehaven — most of them being of considerable depth—about two-thirds of the coal was left, and will remain until the time arrives when the scarcity of fuel will render it profitable to re-open the pits and work the pillars. Under the sea at Whitehaven, for obvious reasons, the coal is still left in pillars, as on the old system, as a rule. It is probable they might be removed, considering the great depth of the pits, with safety, but the interests at stake are so enormous, that, probably, many generations will elapse before so bold an expedient is adopted.

VENTILATION.

In the old pits at a shallow depth, where fire-damp was not

not often found, but little attention was paid to ventilation, and in many instances no artificial means were adopted to secure a circulation of air through the workings. One of the earliest expedients adopted was to carry a box ten or twelve inches square down the shaft, and on the top of the box a large horizontal funnel was placed, (called a "horse-head,") so arranged as to turn its mouth to the wind. Another plan, where the pit was drained by gravitation, was to allow a fall of water down one portion of a divided shaft, which in certain instances was found very efficacious. But in mines yielding explosive gases much more powerful means were found necessary; the one most generally in use was to place a large furnace six or eight feet square at the bottom of the upcast shaft, which created a powerful current of air, which, by means of stoppings and doors, could be readily directed through all the ramifications of the most extensive mine.

This method, though very efficacious, was open to the objection that sometimes explosions occurred at the furnace, and moreover it was costly as regards the consumption of fuel. The fan driven by steam-power is gradually and steadily superseding the furnace.

Carriage under Ground and above Ground.

When coal was first worked it was conveyed from the mine to the surface in small baskets called "korves," from the Danish "korf," carried on men's backs, containing about twelve stone each. In the shallow pits sloping roads were generally driven from the coal to the surface, thus affording ready access to and from the mine without the necessity of vertical shafts. The next step was the adoption of small wooden boxes shod with iron after the manner of a sledge, and dragged or "trailed" by boys. In those days the natural floor of the mine was used for roads, without anything in the nature of pavement or artificial covering.

covering. Sledges on wheels were afterwards introduced, and on the principal road-ways either wooden rails of a very primitive form were used, or in some instances the entire width of the road-way was planked over. I remember seeing an old road of this description in an abandoned colliery at Clifton, which was formed in this manner of elm planks, and though probably more than a hundred years old, it was as sound and perfect as the day it was laid down. Iron rails were first used underground about the year 1812, and for a long period baskets containing six or seven, and in some instances even ten, cwts were in use. These were taken from the main roads, where horses were used, to and from the workings on wheel-sledges. Sidings were formed at intervals on the main roads, where the baskets were arranged in trains of four, six, or eight, according to circumstances, and from thence were conveyed to the shaft by horses. At Whitehaven an improment on this system was effected, by using large wooden trams with high wheels, on the main roads, each tram carrying two baskets which were lifted on by means of cranes. This cumbrous method has now been got rid of, and the modern practice of using large square tubs, on wheels, with iron cages and conductors in the shafts, has entirely superseded every other.

The mode of conveying coal on the surface has already been sufficiently described in this paper, and need only be further referred to in order to mention that, in 1816, a locomotive engine was purchased by Mr. Buddle, at Newcastle, and used for some time on the Howgill railways, but they being then of cast-iron were inadequate to sustain the weight of the engine, and its use in consequence was discontinued. Some portions of the engine are still in being.

APPENDIX.

APPENDIX I.

LIST OF PITS IN THE WHITEHAVEN COLLIERY.

HOWGILL DIVISION.

Pit.	Depth to			Sunk in Year	Working in Year	REMARKS
	Bannock	Main	Six Quarters			
	Fms.	Fms.	Fms.			
Gameriggs ...	...	60	...	...	1709	
Murray ...	...	...	...	...	1709	
Mawson ...	...	...	...	1709	...	
Fox ...	60½	75	...	...	1709	
Ribton ...	...	...	...	...	1709	
Darby ...	...	...	...	1709	...	
Grayson ...	...	...	...	...	1709	
Swinburn ...	...	...	...	...	1709	
Saltom ...	56½	75½	118	1731	...	Sunk 20 fms. deeper.
Ravenhill ...	...	...	...	1737	...	27 fms., supplimen-
Watson ...	...	45	...	...	1737	[tary to Saltom.
Fish ...	63	...	...	1737	...	
Hinde ...	...	...	...	1737	...	
Corpsill ...	...	...	...	...	...	
Parker ...	...	80	...	...	1737	
Country ...	...	34	...	...	1742	
Moss ...	15	37	...	...	...	
Arrowthwaite ...	41	59½	...	...	1742	
Thwaite ...	90	110	149	1737	...	
Duke ...	83	127	...	1747	...	
King ...	99	119	...	1753	...	
Kells (Celts) ...	101½	114½	...	1750	...	[41½ fms. deeper.
Croft ...	99	112	...	1775	...	Now Working. Sunk
Wilson ...	56½	71	...	1757	...	Sunk 18½ fms. deeper.
Pedler ...	...	45	...	...	...	
Partis ...	...	...	3	...	...	
Harrison ...	...	...	...	...	1737	
Banks ...	...	45	...	...	1737	
Baxter ...	...	41	...	...	...	Working before 1731.
Newtown ...	...	31	...	...	...	Working before 1731.
Gins Fire Engine	...	21	...	...	...	
Several Pits at Scalegill ...	...	6	...	...	...	Working in 1731.
Several Pits at Scalegill	...	...	40	...	...	Working before 1750.
William ...	...	...	...	1812	...	
Henry ...	...	...	...	1875	...	Now working.
Wellington ...	...	...	...	1843	...	

LIST

LIST OF PITS AT WHITEHAVEN COLLIERY.

WHINGILL DIVISION.

Pits.	Depth to Bannock	Depth to Main	Depth to Six Quarters	Sunk in Year	Working in Year	REMARKS.
	Fms.	Fms.	Fms.			
Lady ...	In the shallow Pits this Seam would not be found.	75½	120	1765	These Pits all working in 1788.	These dates are taken from a report by Mr. Bateman, in 1781, and are only approximately correct.
North ...		100	...	1773		
George ...		80½	...	1777		
Davy ...		59	101	1763		
Pearson ...		40	77	1731		
Bateman ...		...	53	1771		
Howe ...		57	...	1778		
Jackson ...		68	106	1751		
Little William ...		34	...	...		
Taylor ...		19	57½	...	1731	Exhausted before 1755.
Hunter ...		17	53	...	...	
Carr ...		40	77	...	...	
Fox ...		40	77	...	...	
Daniel ...		33	...	...	...	
Green ...		...	...	...	...	
Watson ...		...	...	...	...	
Pedler ...		22	...	...	1731	
Harras ...		88	...	...	...	
Wolfe ...		59	95	...	...	Exhausted between 1755 and 1781.
Scott ...		...	35	...	...	
Moss ...		...	...	...	...	
James ...		85	...	...	1800	
A number of Pits at Priestgill & Stephen's Riddings		...	...	...	...	Exhausted before 1731.
Wreah ...		...	...	...	...	Working to this day
Castlerigg ...		...	...	...	...	Sunk in present century.
Countess ...		...	...	...	...	
Moresby ...		...	...	...	...	

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APPENDIX II.

"The answer of Sr. John Lowther, to ye petition and papers exhibited by the Lord Mayor and Aldermen of the Citty of Dublin."

(1680.)

"That by the greate and sole Charges, Industry, and divers other unexampled encouragement, given to trade by Sr. John Lowther and Sr. Christopher Lowther his father A considerable navigation is brought in ye County of Cumberland, where there never was any trade before, or very little, by erecting a peere at Whitehaven, by inviting persons from all places, both in England, Scotland, and Ireland to come and inhabit there, and granting the said Inhabitants ground to build upon, at small and Inconsiderable Rents, procuring them a Market from his Mastie and several other advantages, wch ye said Towne enjoys and which Sr. John Lowther has done for them, as building of Wharfs, Mills, and such like things, as are wanted in places newly inhabited, and for which he has not three in the hundred for his money layd out, and done singly for the encouragement of Trade, and his Mastie minding the further Advancement of ye said Towne, and to prevent the erecting of any peere or Wharf near thereunto, by wch ye Shipps resorting thither might be anticipated, his Mastie by his letters pattent, did not only conform in Sr. John Lowther, his heirs, the said peere and benefitt thereof But did also grant to him all the Ground between the High and low water mark, all along by ye sea coast."

"That for answer to ye matters set forth by ye petition presented by the Lord Mayor of Dublyn, Sr. John Lowther saith:—

"That the Reasons suggested by the said petition are these:

"That Dublyn being supplyed with Coals from Whitehaven, are ye most durable and servicable beyond what they have from any other place."

"That the old Mines next ye peere are poor and almost spent."

"The peere at Whitehaven is much decayed and dangerous. That Sr. John Lowther by ingrossing ye Trade to himself occasions Whitehaven Coals to be sold at much dearer rates than formerly."

Answ. "That in all ye said particulars the petitionrs (with submission) are utterly mistaken."

"1st. That 'tis most certain that at Whitehaven there are Coals sufficient to supply Dublyn for all generations, and ye Mine that is pretended to be spent, is not soo, but for that Sr. James Lowther has

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many other Mines, more easy to be wrought, and wch turn to better accompt, he has thought fitt to cease working where he formerly gott Coals, and has opened a new Mine where Coals are had much cheaper than in the said old Works, and may be got in greater quantitys than the Markett will take off."

"2nly. That the peere at Whitehaven is now in better repair, and larger, and more commodious, than ever it was, and to make it yett more commodious Sr. John Lowther is that time enlarging it further into the sea, 140 Foot, and had done it er now if not obstructed by these pretences, And when ye Addition is made to it, noo one can say but that the peere at Whitehaven will be sufficiently Capacious for all ye shipping the Coal Trade can imploy, or any other navigation those Northern parts can have occasion for."

"3rdly. The Price of Coals at Dublyn is so far from being inhanced, that whereas they were formerly Twenty-four Shillings a Chaldron in Winter, and Twenty Shillings in Summer, since Whitehaven gott the Trade, they are now about Fifteen or Sixteen Shillings a Chaldron in Winter and Twelve or Thirteen in Summer, and Sometimes Cheaper, insomuch that the Lord Mayor has several times waved his ancient priviledge of taking out of every Shipp half a Chaldron of Coals, at the rate of Twelve Shillings the Chaldron, for that it would be to his loss to make use of itt, and that they will be yet Cheaper rather than dearer. Dublyn is so sensible thereof that they are now designeing an Imposition hereon, by Act of Parliament of Twelve pence per Chaldron for some particular Charities within that Citty, thereby declaring that in their own opinion, that such further Charge may be imposed, without prejudice to that Citty."

"The Petitiors are equally mistaken in their Reasons, and discouragements suggested in the other prayers."

"For the pretenses of Sr. John Lowther serving the Coal Traders with Writts, or his stopping up the Highways, or cutting their Sacks, or hindering them from staithing, or delaying the Loading of the Shipps, or the like."

"Are all of them in the manner suggested untrue, and nothing of ye nature done in such manner as is suggested."

"And what is or hath at any time been done, and all the Charges that hath thereby accrued, to all the Coal Traders at Whitehaven, by Writts, cutting of Sacks, and the like, hath not in Twenty years amounted to Forty Shillings, and was done only for ye better regulating of ye trade and to prevent the Harbour from being blocked up in ye way pretended, was only upon leave, and noo man wronged thereby."

"And 'tis most certain that ye further enlarging of the peere at Whitehaven,

Whitehaven, and encouragement of the Trade there without any new peere at Parton will be the most effectual means for a constant and and cheape supply of Coals at Dublyn, for the increase of Trade, and Navigation, and Shipps of great burthen, and the advancement of his Magties Customs, for that one large and commodious peere is considered better than two little ones, and the Custome house Officers attend with less charge and with more security to the King's Revenue, for the many small Creeks tend only to the Imbezzelling the customs. Besides that 'tis unjust that when Whitehaven brought in effect from nothing to a port or Haven of so great Trade and consideration, And this by ye sole charges and Industry of Sr. John Lowther, and his family, That Sr. John Lowther and his family should now be prevented of ye benefitt thereof by pretenses that in truth are of noo avayle either to Dublyn or any other, and therefore Sr. John Lowther doth insist, and humbly hope that he shall be dismissed from any further Attendance upon this Accompt."

In conclusion, I wish to thank Lord Lonsdale and Mr. Curwen for ready access to important documents and records. To Mr. Alleyne Robinson, Mr. Liddell, and Mr. Hetherington, I am indebted for much valuable assistance and information.
