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WATERWHEEL PUMPING ENGINES ON THE STRAITSTEPS VEIN AT WANLOCKHEAD

G. Downs-Rose

The Clerk of Eldin's Drawing

A wash drawing, in the burgh museum at Dumfries by the Clerk of Eldin in 1775 gives a general view of lead mining operations on the surface at the Straitsteps vein, Wanlockhead, Dumfriesshire. It is the only pictorial record we have for that period in the mines' history and of interest to the industrial archaeologist being relevant to one of his main tasks, the identification of early industrial sites in Scotland.

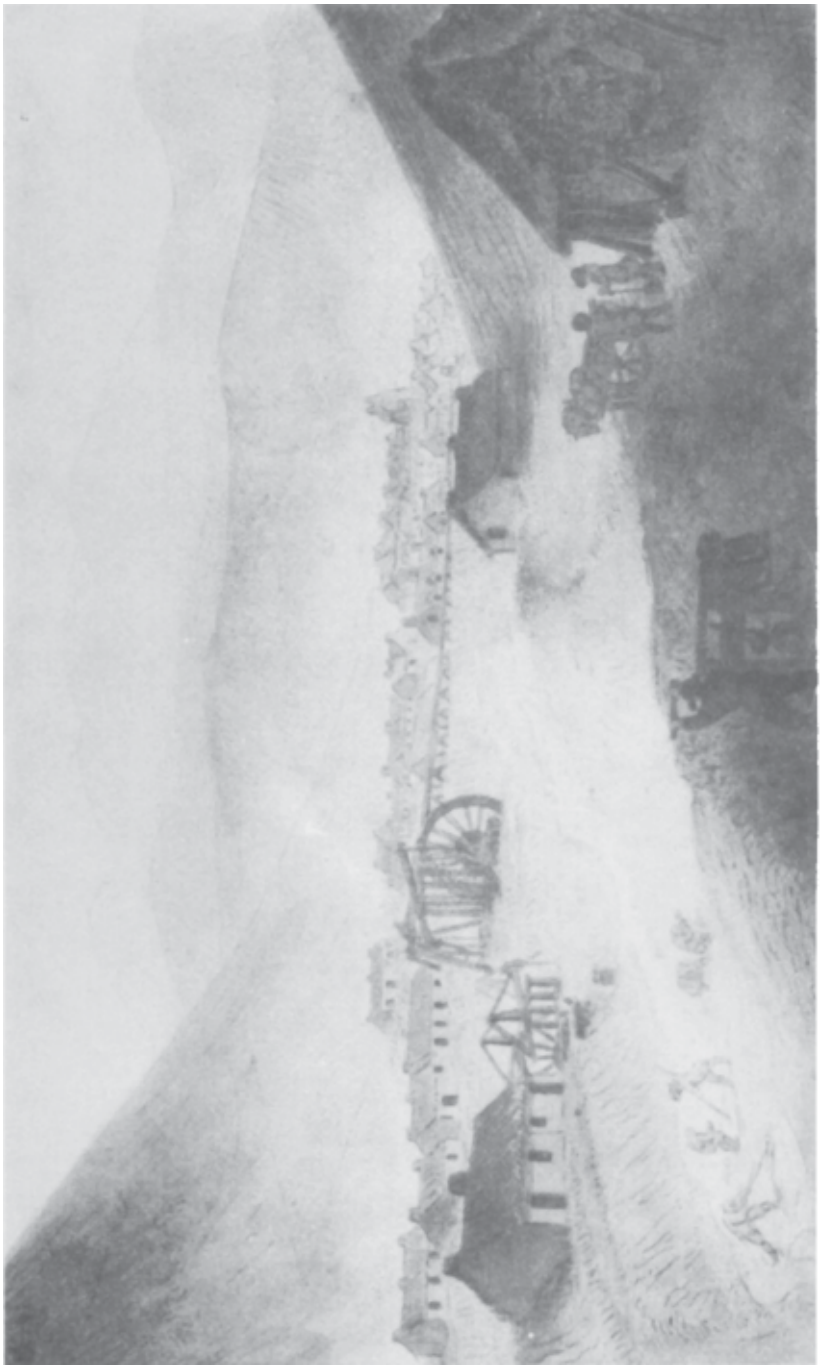
With the aid of the drawing and research in the Buccleuch Muniments at Drumlanrig, the Scottish Records Office, Edinburgh, and the Hornel Library, Kircudbright, it is possible to locate the site and trace in detail the history of the mining operations centred on the Straitsteps vein over a period of two hundred years.

The drawing shows in the foreground two waterwheel pumping engines, two winding shafts and a small group of workmen engaged in dressing and washing ore beside the Wanlock burn which flows through the mining valley. In the middle distance are the miners' austere, two-roomed cottages, and flanking the scene to the left is Wanlook Dod, height 1808 ft., and to the right the foot of the Black Hill, or Old Glencrave as it was once called, height 1801 ft. In the background is Stake Moss with the Lowther Hills, height 2403 ft., behind. (Figure One).

The two pumping engines, which provide a focal point, are sited on the left bank of the Wanlock burn. The larger engine, driven by an overshot waterwheel, is supplied with water by means of an elevated wooden trough which comes from behind the Black Hill. From the tailrace of this larger engine, which has a higher position on the bank than the other, the water turns the breast wheel of the smaller engine and then flows into the burn.

The Straitsteps Pumping Engines.

The Straitsteps vein which these pumping engines drained was first mined by the partnership of William Blackett of Newcastle on Tyne, John Lindsay of London, and Sir John Stansfield of Edinburgh during the period 1675 to 1681. The vein, which crosses the Wanlock



WANLOCKHEAD 1775 Plate 1

valley in a diagonal direction, has a strike of N 12 degrees W and dips 60-70 degrees to the east. The workings at this time were relatively shallow, though drifts and levels are recorded,[1] and dewatered with hand-operated pumps of the kind used at that time to empty ship's bilges.

Systematic mining on the vein began in 1710 when a lease was taken by a group of wealthy merchants. As the shares in the venture changed hands and temporary mergers with other companies operating in the area took place, the names by which the company was known was altered, those commonly used being: 'The Governor and Company for smelting lead with pit coal' and 'the London Company'. In the year 1729-30, 184 tons of lead (3680 bars) were produced at a cost of £761, giving a profit of £389.[2] In the final years of their lease, when every effort was made to bring to surface as much ore as possible with a minimum of expenditure, the company's workings yielded 440 tons (8405 bars). During the period of this lease, with more capital available and using water-driven pumps to solve the drainage problems, the company searched for ore below day level. A plan of the village and the mining area dated 1744[3] shows a min drainage adit (figure two) marked 'Low Level' driven parallel to the course of the Wanlock burn, having its mouth approximately 800 yards downstream from, and passing through, the Straitsteps area to a forehead 200 yards further upstream. There is a crude representation of an overshot waterwheel working two pumps in a shaft on the vein and powered by water taken from the burn at a point opposite the present village clubhouse, 200 yards upstream from the engine. A second engine was erected between 1744 and 1750 by the Governor and Company in order to sink lower on the vein.[4]

Some details of the construction of the engines he.ve survived for in 1756, at the end of toot company's lease, a dispute occurred between the company and the landowner, the Third Duke of Queensberry concerning the latter's right to possess, under the terms of the lease, all machinery and materials then in use. The dispute went to arbitrators who were supplied with an inventory.[5] Information given in respect of 'The New Engine' and 'The Old Engine on Straitsteps' was:-

New Engine

32	Fathoms of Pumps 7½" dia.
3	iron barrells 7" dia.
90	fathoms of spears
6	brass boxes, four iron chains
2	Bobbers and 6 Headstocks
2	Regulators and 2 Cranks
1	Water wheel

Old Engine

17	fathoms of pumps 7½" dia.
2	Iron working pieces, 7" dia.
48	Fathoms of spears
4	Brass boxes and 2 iron chains
2	Bobbers and 4 headstocks
2	Regulators
1	Wheel, 2 cranks, 2 headstocks.

Note: The Cast iron Barrells are contained in the length of the above mentioned pumps.'

By comparing the 1744 plan with the First Edition 6 Inch O.S. sheet 7 N.W. a section can be, taken along the line, of the Wanlock burn from the Straitsteps area to the Low Level mouth which gives a fall of approximately 100 feet, or 17 fathoms. Allowing a fathom or so rise for drainage purposes over the distance from the Level mouth to Straitsteps, then the depth from the surface to the Low level at the engines was probably 15-16 fathoms. In 1756 the depth from the surface to the lower workings was reported as 31 fathoms,[6] and on the basis of the engine data given in the inventory the old engine pumped from 8½ fathoms and the new engine from 16 fathoms below the Low Level.

The Governor and Company's gross neglect of the mines and machinery towards the end of their lease led the Duke of Queensberry to appoint a new agent to represent his interests, keep an accurate account of the tack lead due to him annually under the terms of the lease, and to report frequently to him on the mining operations.[7]

The agent's early reports underline the problems which faced the new lessees, Messrs. Crawford and Co. who took over the mining grounds in August 1756, in their endeavours to mine the Straitsteps vein. Ore had been to a depth of 30 fathoms but the vein was in check in several of the foreheads. The combined power of the two engines was insufficient to permit further sinking on the vein, and the older engine appears to have been beyond repair. Furthermore, such was the state of the Low Level that the new company had to 'about-drive', ie tunnel afresh off the course of the old level for 70 fathoms.

These problems, replacing 'the Governor and Company's old engine making good the waygates and shafts, and improving the drainage system took up the first four years of the lease. At the end of July 1757 the new engine, referred to as the 'High', and later as the 'Black Engine' was set on and in September, 1758 twenty-four pickmen were employed in the Straitsteps workings of a total of one hundred and eighty five men in the mines. At that time the company began to

sink the High Engine shaft 14 fathoms deeper, but shortly after the sinking began the remaining engine built by the Governor and Company by this time called the 'Little Engine', failed and work below the Low Level was continually interrupted. References to repairs to Little Engine occur in the agents' reports from early 1760 to the end of 1762 during which period it is probable that the engine was completely rebuilt.

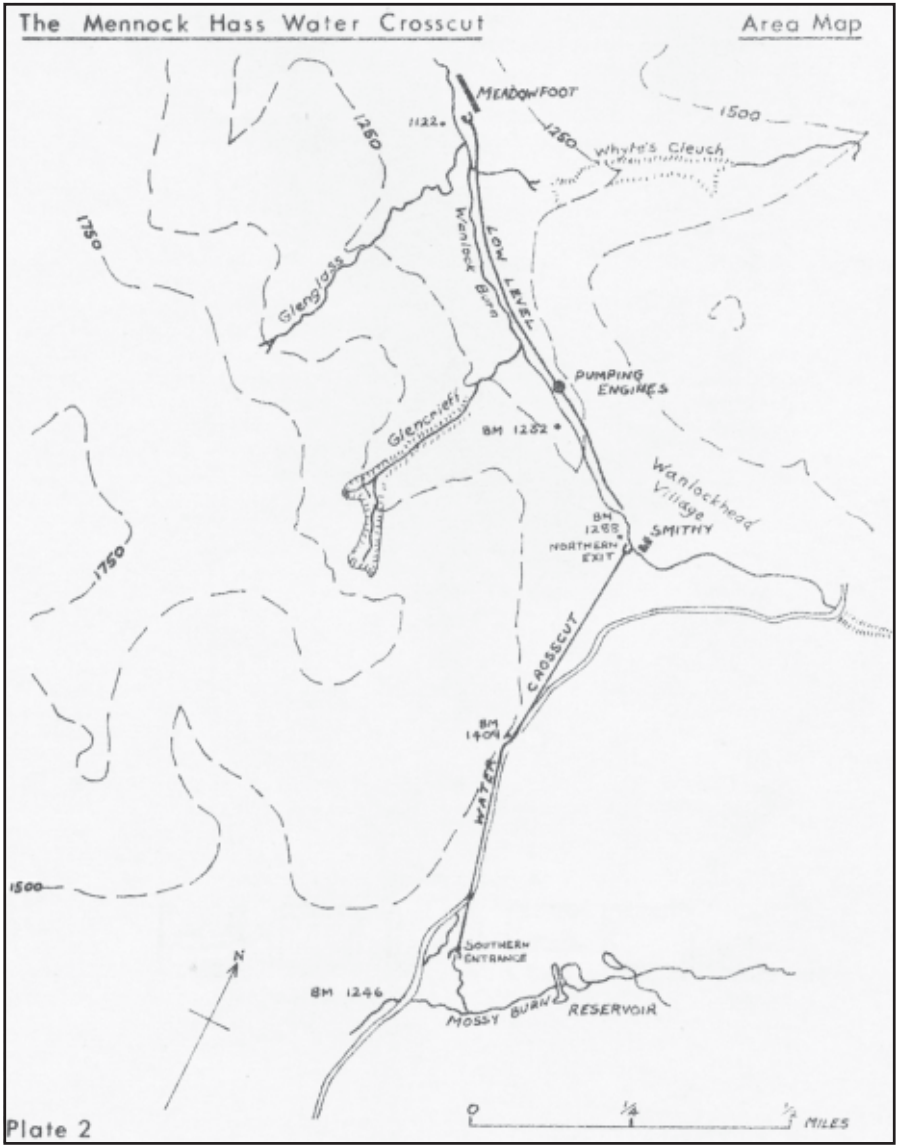
But the underlying problem which persisted throughout this period and was reported with monotonous regularity, stemmed from a combination of the malpractices of the previous lessees and the vagaries of the local climate, and this early comment is typical of many which followed:-

'The workings at this Engine (ie High Engine, Straitsteps) must always be very precarious and uncertain because the great Rains and Snows which are very frequent here in the winter season swell the Springs and Feeders so very much that the Engine cannot manage them. Consequently the men are very often driven out on these occasions. And in the Summer Season in times of Drought the day Water is so scanty that it is not sufficient to move the Wheel, at least to give it such motion as is necessary to draw out the water.'[8]

One can appreciate the feeling of frustration on the part of the company, unable to pursue plans aimed at mining rich, profitable ore from relatively shallow depths, and also the effect on the miners' earnings when the bargain system[9] was disrupted by the transfer of men from the lower workings to less well paid work in the higher, older workings each time flooding occurred.

In desperation the company attempted 'to bring in Whyte's Cleugh by trowing it', the Duke's agent reported in l758. The Whytes Cleugh is a small burn which flows into the Wanlock below the engine site. An attempt to provide extra water power from this source had been made before '…. though it never answered the purpose … (and) … it is doubtful whether we shall meet with better success now ….'. The agent went one, '…. the only method to secure a constant power of water would be to cut a Drift from the High Mill to the other side of Mennock Hass, so as to lift the Mossy Burn.'

The Mossy burn is on the other side of the Black Hill. It is a tributary of the Mennock which flows down to Nithsdale. Five years after the agent's forlorn comment the task of bringing the Mossy burn water into the Wanlock valley began. It took eleven years and four months to complete.


The Mennock Hass Water Crosscut
Area Map
MEADOWFOOT
1122
1250
1500
Whyte's Cleuch
1250
1750
Glenglass
Wanlock Burn
LOW LEVEL
PUMPING ENGINES
BM 1282
Glencrieff
Wanlockhead Village
BM 1288
NORTHERN EXIT
SMITHY
1750
CROSSCUT
BM 1404
WATER
1500
SOUTHERN ENTRANCE
N
BM 1246
MOSSY BURN RESERVOIR
0
1/4
1/2
MILES
Plate 2

The Mennock Hass Water Crosscut
A mining report for the period 1st July to 1st October 1763 records:

> 'David Cock and Partners, 8 Pickmen, employed in the Mennock Hause Crosscut at the Quaker Company's high Miln at £1 per fathom having driven 6 fathoms from the 1st July to 1st October upon these terms.'

During the next quarter a start was made from the Mossy burn end:

> 'Thoms Thompson and Partners, 5 Picknen, employed in in the South end of Mennock hause Crosscut at 17/- per fathom having driven 18 fathoms from 1st October upon these terms.'

The north end of the water crosscut is near the Wanlock burn, close to the present old smithy where previously the Quaker Company's smelter stood. At the south end, 1266 yards a-way, the Mossy burn is lifted from a point below the existing dam, as shown on the plan.

The mining journal gives a detailed account, summarised below, of the costs of driving the tunnel for the period 25th July 1763 to 1st January 1769:-

Year	Advance			Cost		
	fms.	ft.	Ins.	£	s	d
1763/64	142	1	8	350	7	9
1765	92	1	5	387	19	3
1766	56	5	7	421	12	6½
1767	97	1	6	403	13	7
1768	82	5	4	446	1	0
1763/68	471	3	6	2009	14	1½

At the end of 1768 the north drivage had advanced 233 fathoms 5 feet 4 inches, and the south drivage 237 fathoms 4 feet 2 inches.

There is a gap in the mining records from 1st April 1769, when only 162 fathoms remained to be cut, to the 8th January 1774. From the latter date to 5th November 1774, when the two drivages met, 21 fathoms 7 inches were driven. Thus an average advance of only 28 fathoms per year was maintained during the unrecorded five years compare with an average advance of 90 fathoms over the preceding and a half years. What had happened to delay the completion of such an urgent task?

The rock cut was very hard for most of the way and although earlier records give detailed costings of tools and consumable

items, there is no evidence that gunpowder was used in the mines at that time, probably because of inadequate ventilation. Certainly the arduous nature of the work is reflected in the bargain rates which reached £11 per fathom.

The correct answer is gleaned from records of operations elsewhere in the mining ground. Despite gaps in these records it is clear that the problem of de watering the Straitsteps vein during these eleven years had. been endured rather than solved. Output from the vein had reached a peak before the water crosscut was completed and diminished afterwards;

Number of Bars of Lead smelted from Straitsteps Vein[10]

1757	60 bars	1767	4378 bars	1777	197 bars
1758	618	1768	4371	1778	223
1759	477	1769	3144	1779	255
1760	223	1770	923	1780	22
1761	267	1771	1151	1781	95
1762	353	1772	1418	1782	117
1763	720	1773	4269	1783	-—
1764	137	1774	2885	1784	—-
1765	578	1775	2858		
1766	118	1776	1074		

At no time during this period did lead, production from the Straitsteps vein account for much more than forty per cent of the total output from the mines, as the sample figures from the journal entries show:

Number of Lead Bars Smelted

Year	Total Output	Straitsteps Output
1764	6662	137
1765	6000	578
1766	12202	118
1768	9728	4371
1774	8543	2885

The decrease in production from Straitsteps vein on completion of the tunnel was not due to exhaustion of the vein. In driving the water crosscut another vein, the Margaret, which is strongly related to the southern end of Straitsteps, was cut in 1768 beneath Mennock Hass. Inadequate working capital was at all times an important factor in the operations of the company, and work on the crosscut was no doubt deliberately slowed down when skilled pickmen were

transferred to development work to increase income by the sale or ore from the new vein. This shift in policy is reflected in the cutting of another crosscut in 1768 southwards from Straitsteps to the Mennock Hass crosscut to 'relieve between 20 and 30 fathoms of Margret Vein and thereby give an opportunity for making a proper tryal in it'.

By the time the water crosscut had been completed and the Mossy burn water carried underground to the Wanlock valley and conveyed to power the waterwheels along elevated wooden troughs in the manner shown in the Clerk of Eldin's drawing, the function of the Straitsteps engines was changing. The drawing therefore depicts the pumping engines at a time of transition when one chapter in the history of these mines was ending. The decision to embark on the costly plan to bring extra water power so as to secure the regular working of a difficult though valuable vein had been rewarded by the discovery or rich ore in another vein, and one where there was no legacy of imprudent mining methods and consequential drainage problems.

'…. Mr Meason set out from Wanlockhead for England.' A laconic entry in the journal for 8th July 1777 points to the dividends reaped indirectly by driving the water crosscut.

New Power

Gilbert Meason, Edinburgh merchant and partner in the Crawford Company, at that time directed the management of the mines, and the purpose of his visit to England was to meet James Watt and Matthew Boulton in Birmingham.[11] On his return to Wanlockhead an immediate start was made on the sinking of a steam engine shaft on the Margret vein, Mennock Hass, on which was erected the second Watt pumping engine in Scotland. Steam was to provide the chief source of power for draining the mines during the next fifty years, and from 1780 the Straitsteps engines had a subordinate role.

In 1790 when development of the northern end of Straitsteps vein, called Charles vein was under consideration it was concluded that …. 'both engines were so greatly failed and all their parts so much worn that there could be no dependence on them ….'.[12] However, in 1795 they were still used to drain water which leaked from sealed-off workings in the disused Margret vein to prevent the seepage flowing north into Charles vein to hinder operations there.[13]

Twenty years later there is a final reference to the Straitsteps water engines in a letter from James Taylor, a consulting engineer and son of John Taylor who as manager of the mines had been

responsible for the driving of the Mennock Hass crosscut. Writing in 1815, James Taylor advised the company that the command of fall, 54 feet, from the Mennock Hass crosscut to the …. 'Black and Little Engines, the one 30 and the other 24 feet dia ….' could provide increased power for a waterwheel pumping engine in use on the Glencrieff vein.[14] It seems that the engines were by that time not in use. The Margret-Straitsteps-Charles vein complex had been worked and abandoned.

It was not until the second half of the nineteenth century, when the 5th Duke of Buccleuch worked the mines and decided to re-open Charles vein that the need arose to pump water from the Straitsteps area to cope with the feeders coming south on Margret vein. Lead prices by this time had dictated the displacement of steam pumps at the mines by less costly water-pressure engines. The evidence suggests that the function of the old waterwheel pumping engines was this time served by erecting the water bucket pump which still stands to the east of the old shafts.

Today, grassy hillocks and rubbish-filled depressions mark the disturbed surface of the mining ground above the Straitsteps vein and denote the site where the waterwheel engines worked. Apart from the Clerk of Eldin's drawing, little remains to remind the industrial archaeologist of those distant, thrustful years at Wanlockhead.

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