

Backbarrow Ironworks – The Water Lift



This indistinct photo is the only one we know of that shows a brick-built tower next to the furnace stack at Backbarrow. The tower would have contained the original 'water-lift' installed to transport raw materials to the top of the stack.

Although Alfred Fell's book on 'The early iron industry of Furness' suggests 1855 as the year when the lift was installed, Mike Davies-Shiel supports 1870, a time when the stack was being re-built to increase its height. This re-build would have made it impossible to continue with the previous practice of pushing heavy barrows up a ramp outdoors in all weathers to the top of the stack. This lift was in operation for around 50 years until a new one was built across the road, connected to the stack by a bridge. (More about that one in a later Bulletin).

The question is – how did the lift work? Here are three suggestions. If any of you reading this can help us understand which of these systems is more plausible, or identify a better option, please get in touch. Our knowledge and expertise is very limited, so your help would be much appreciated.

These options all involve the use of a stone-built building (below) – constructed at about the same time as the lift – on the hillside above, about 30ft higher than the stack. This building (40ft long by 21 ft wide and up to 14ft high) contained a large water tank (referred to as a balancer tank), insulated by a thick layer of charcoal. A pipe leads out of the building at its lower end, facing the ironworks. There is what could be an inlet pipe at the top end, although the only obvious source of water is a small tarn higher along the hillside.



Option One. The terms used to describe it would suggest that this was a balance lift, as commonly used at other ironworks including the famous example still standing at Blaenavon which dates from 1839. The principle was adopted for the cliff railways built later that century for the Victorian tourist, many of which are still in operation although now electrically powered (except for the one at the Centre for Alternative Technology).

The balance lift would operate as a pair, linked by cables over a pulley at the top of the lift. Filling and emptying tanks which supported the lift platforms would result in them moving up and down with the weight of the water in them. Raw materials could in this way be carried to the top of the furnace stack in one lift whilst the other returned to ground level for another load.

A generous supply of water was needed to fill and re-fill the tanks on the lift, because when emptied the water went to waste rather than being re-cycled. In Backbarrow's case that generous supply would have come from the tank up the hillside, which in turn would need to be continually replenished. Was the supply to the tank from the tarn sufficient to do that? It seems unlikely.

Option Two. One way to avoid the constant demand for water from the hillside tank would be to re-cycle the supply to the lift, rather than letting it go to waste after every lift movement. This would involve the use of pumps to move water from the bottom lift tank to the top. Some of the cliff railways did this, but they came later when gas engines and electricity were available to power the pumps. A steam engine was used at Blaenavon, but there is no evidence of one in place at Backbarrow at that time. A pump could have been run off the waterwheel, but there is no evidence for that.

Option Three. In 1847, hydraulically powered lifts were installed in the new warehouses at the docks in Liverpool. They employed the force of water under pressure to push a ram that propelled the lift upwards. Elsewhere, different versions of the machinery were developed which meant that the ram could be situated outside rather than under the lift, or in a horizontal rather than vertical position.

What created the pressure? In your car it is your foot on the brake pedal. In the mid-1800s it could be by hand or steam pumps, or simply a head of water. This could be a reservoir at a higher level, a tall tower creating the same effect (the one at Grimsby Docks is 300ft high), or a low tower containing a weight-loaded accumulator (as at Liverpool).

In most of these systems the water – after powering the lift or other machinery – went to waste. But this was not always the case – return valves and pipes could be installed back to the source. Or the ram could operate within a sealed chamber, as do the brakes on your car, so nothing was lost.

Would this work at Backbarrow? The hillside tank is 60ft higher than the foot of the stack where the hydraulic system would be located. Not much, but there are examples elsewhere that suggest it could be enough. The lift at Osmaston Manor in Derbyshire (built 1846-49) was supplied by water from 80ft above. A head of water of only 35ft was sufficient for the lift at Sudbury Hall in the same county in the 1870s. It operated with a weight limit of 4cwt – similar to that required at Backbarrow.

My guess is that this option would make a better bet i.e. an hydraulic lift rather than a water lift, using the pressure of water to push the lift up rather than the weight of water to pull it down. That goes against the evidence of the names given to the lift and the tank, although we have no contemporary documents using those names. But it would solve the problem of how it worked with such a meagre water supply.

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