**“THE CUT” REFERENCES. Andrew Freckingham.** January 2023.

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10) Seaton Sluice and old Hartley local history society……Sections :-

The Harbour.

Bottle works.

Rocky Island.

Churches.

Seaton Delaval Hall.

The watch house.

The salt pans.

Robert’s battery.

 COVER IN COLOUR. **DRAFT,** December 2023 **SEATON SLUICE.**

Seaton Sluice lies a few miles north of Whitley Bay. As far back as 1236 salt pans were in the area. “Seaton” comes from the old English meaning a settlement (ton) by the sea.

The mouth of Seaton burn has served as a natural haven for fishermen over the centuries, but unsuitable for economical coal shipping. Harbour construction became an imperative.

In 1670 Charles 11 made a grant of £1500 to Sir Robert Delaval “for having made a harbour” at a cost of £7000. The first payment of £500, by the crown, was the only money received.

The burn entered the sea in a north westerly direction. The mouth of the burn was exposed and the entrance from the sea was oblique, making it difficult for ships to enter and once inside there was little space to moor.

Sir Ralph Delaval decided to have a pier constructed at the east mouth of the burn. Square stones were used with each dovetailed to its neighbour, both horizontally and vertically with oak pegs. The haven began to silt up and this led Sir Ralph to design and build an ingenious mechanism of a sluice gate.

The sluice gate was situated near the present-day road bridge across the burn and was closed as the tide ebbed. This caused a “back up” of water from the burn. When the harbour had emptied a horse and plough cleared the bed rock of sand and silt. When the sluice timbers were hauled up, the burn backwater raced into the harbour clearing even more debris, as it flowed into the sea.

The system was much admired, one such person who visited Seaton Sluice, was the famous 18th century civil engineer, John Smeaton.

The tidal harbour was still far from ideal. Sometimes there was not enough water for a collier-brig to load completely within the harbour. A bold plan was conceived. A seaway would be constructed from the mouth of the burn directly to the sea through the rocky headland in an easterly direction.

 This “cut” would have stop gates at each end and would serve as an alternative channel.

 *Picture of the entrance* *Seaton Sluice*.

**THE CUT.** From an engineering perspective.

When both stop gates were closed it would function as a small wet dock and allow loading no matter what the state of the tide. Piers would protect the seaward entrance. The “cut” is nine hundred feet (270m) long 30 feet (9.0m) wide and 52 feet (16m) deep through the sedimentary rock. There were no passing places, ships loaded to capacity could only leave at high tide.

To supervise the works Sir John Hussey Delaval (17th March 1728 – 17th May 1808) brought his brother Thomas from Hamburg, Germany, where he had received commercial training. The plan was to excavate through the solid rock by **hewing and lime,** to make an all-weather dock The cost of the enterprise was £10,000 and started in 1761. It was the boldest civil engineering scheme of the 18th century proposed by a single landowner and is unique to this day. In 1777, 177 brigs sailed from the harbour with 80,000 tons of coal 1,75 million bottles and 300 tons of salt.

The cut was closed at each end by huge baulks of timber known as booms and were raised and lowered by a quay side crane. The first appointed harbour Master was a George Raffeld.

The water depth was 11-18 feet when working and was opened on 20th March 1764. The first ship was “Warkworth” with 270 T of coal. The cut was deepened in 1772.

The last ship used the dock in 1862, to export coal. The groves for the booms and the iron rings used by the ships are embedded in the solid rock on the harbour dockside can be seen.

 *Picture of the finished cut in the 18th century?* Chase up National Trust.

**CONSTRUCTION**

The method of excavation was by using lime Ca (OH)2 cartridges fitted into predrilled holes. Water is injected and as the lime expands, steam is produced, and the canister expands and in doing so fractures the rock. The rock is then hewed into manageable chunks to be transported and tipped off site.

Slaked lime as the “explosive” was cheaper than gunpower (15% Charcoal, 75% Saltpetre, 10% Sulphur) and was not as susceptible to the wet conditions. Compressed lime cartridges exploit the exothermic properties of quicklime to break up the rock. A particular method was patented by Sebastian Smith and Moore for the Shipley Collieries, near Derby in 1881.

The process is to calcify lime by heating limestone, to 900oC and then ground to a fine powder. The powder is compacted to double its density into airtight canisters.

Several canisters were placed into predrilled” shot” holes which are then sealed. The injection of water generates steam in the canister which expands by a factor of 5. Tests have shown that the expansion force is 4700 lbs to the square inch, which was sufficient to fracture the sedimentary rock in the Cut. The debris resulting from the fracture was then broken up with picks, as used in the pits and carted to tip. The cut took 3 years to construct.

**4th May 1881 reference 1939**. Smith, C. S., and Moore, T. Patent class mining :-

*“Finely ground lime is compressed into cartridges grooved along the side. A perforated or slotted iron tube cased with cotton or fibrous material and having a tap or check valve, is inserted into the bore hole and the cartridges are introduced with the grove next to the tube and are rammed in. The cartridges (or cartridge) having been enclosed by a bung or by tamping with clay, cold or hot water or dilute sulphuric acid is conveyed to it which by a force pump connected with a tube which is afterwards closed. A small internal channel may be formed on the tube to permit the escape of air during the entrance of the water, but not to permit the escape of much steam. Instead of being grooved, the cartridge may have a central hole into which, or the front part of which, the iron tube is to be inserted. Sometimes a rod is inserted into the bore hole and is withdrawn and replaced by a tube after the cartridge has been inserted and enclosed. Loose lime may replace the cartridges. Other substances may be mixes with the lime. A permeable tube may replace the* *iron tube.”*

 I envisage a hammer and chisel used to make a hole in the rock. The hole would then be dried, lime added, top of hole sealed, iron tube inserted to the bottom of the hole and water added. **Stand back** as the lime expanded and the rock was lifted and fractured.

There would NOT be an explosion, as such, so no evacuation of the labours, and several holes could be prepared at the same time. Lime was locally available to be refined.

**DRAFT.**

 Andrew Freckingham 25th December 2022.