

Bude Canal Society

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ROBERT FULTON

by Ken Bennett

Robert Fulton not only proposed the wheeled tub boat, used only on the Bude and Rolle Canals and the "bucket-in-well" method of powering an inclined plane, used successfully only at Hobbacott Down on the Bude Canal, but also invented and built a submarine, the Nautilus, in 1797. Abhorring war, his idea was to make warships futile, hence the submarine. Nautilus was 21'4" long with a coning tower, mast and sail for travelling on the surface. A hand-operated, two bladed propeller took over underwater. On 7th August 1801 Nautilus submerged in the Seine for four hours and twenty minutes using compressed air from a cylinder to sustain her crew. Later, at sea she blew up an old schooner with a twenty pound charge of gunpowder. Fortunately for the British fleet, busy blockading French ports, Napoleon considered this method of warfare as "piratical" and would not use it. The British Admiralty did not want it either and Fulton was offered a life pension to do nothing with his invention. He refused and, dejected, returned to his native America in 1806 where he became profitably engaged in developing steamships, starting with a paddle steamer, "Clermont", in 1807, which plied the Hudson river at four and a half miles per hour for seven years, before being joined by two more in 1808. In 1812 he added the first steam ferry between New York and Brooklyn.

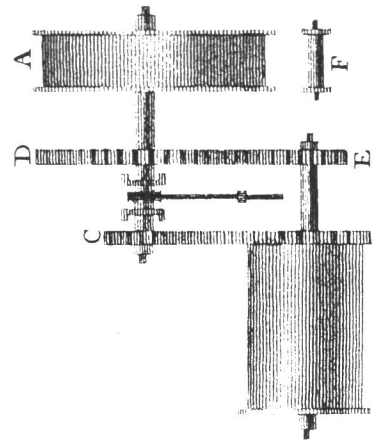
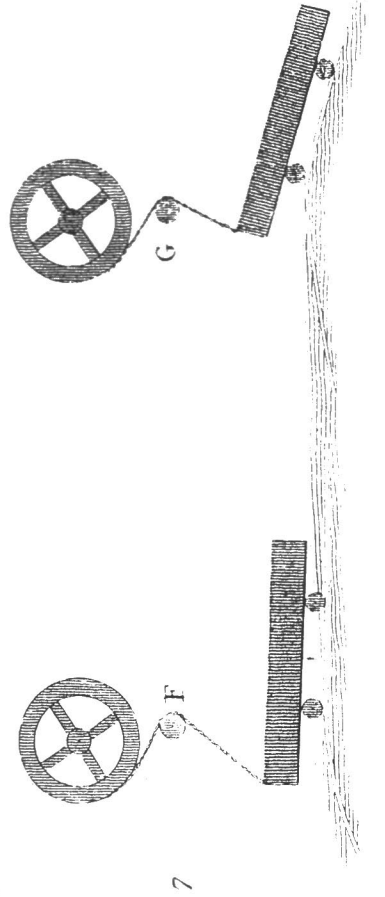
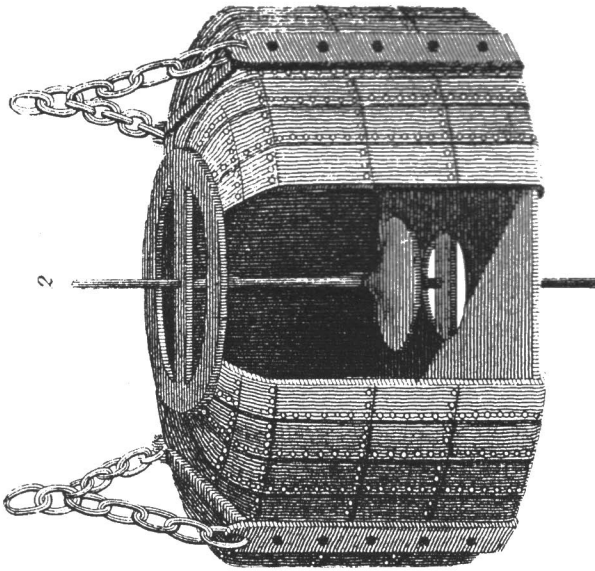
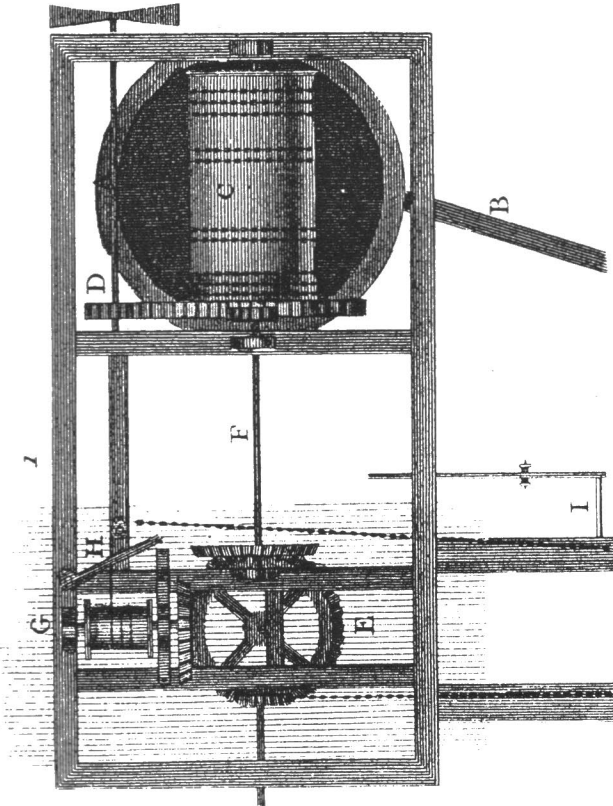
In 1813 he patented the "submarine use of cannons" - guns placed in a ship below the waterline with muzzles in the water - as armament, in effect the first torpedoes. Successful trials took place in 1814.

Robert Fulton was plainly a genius who lived years before his time. He died in 1815 and was buried in Trinity churchyard, New York but his grave was unmarked until 1901 when his genius was finally recognised by the world at large - not unlike Bude's Sir Goldsworthy Gurney, virtually unrecognised until this year.

Note: Bude Canal Society's logo was taken by Robert Harris from a drawing illustrating a possible gearing for the top of an inclined plane from Fulton's "A Treatise on the Improvement of Canal Navigation."

An extract from Fulton's Treatise, showing the machinery which may have been used at the top of Hobbacott Incline

CANAL.



HOBBACOTT DOWN INCLINED PLANE

Very little proven information on the operation of the inclined plane at Hobbacott was known until 1992. Two glass plate photographs and illustrations from Robert Fulton's "Treatise on Inland Navigation" suggested possible working of the continuous chain on to which the tub boats were hooked and provoked much discussion. However, the WRG volunteers who worked on the plane at Easter 1992 under George Stephenson made a number of discoveries proving that two items mentioned in Fulton's book were in use there.

The roots of a forty foot high tree blocked the adit and at the request of the owner this tree was felled and the roots cut into chunks and removed allowing thousands of gallons of water to drain into the basin. The flow of water scoured the floor of the four feet six inches high adit leaving a two feet high "tide line". Beneath this line the round adit is stained red from the iron deposits which had been held in suspension.

The first twelve yards of the adit are lined in brick and an 8' x 4' metal plate is in place overhead at this point. The adit changes direction 30 degrees right rising slightly as it weaves in a north easterly direction. This section is a two thirds drystone and one third bedrock cavern opening to a height of 12 feet in places with various coloured mineral crystals adorning the roof and walls.

Ninety feet from the adit entrance is a sixty foot drystone, service shaft, six feet in diameter in excellent repair. At its base capped with large slate slabs is a mound of mud hiding the remains of a nineteen twenties style pram!

Access beyond the "service shaft" is through a gothic shaped drystone arch, partially blocked by the mound of mud which holds back 18 inches of water. The part drystone and part bedrock adit winds its way to a Y branch giving access to the bottom of both 200ft plus high shafts. A torch inspection of the bottom section of the shafts showed both in good repair.

The removal of the 40' tree from the bottom basin revealed, submerged below "operating" water level, the drystone portal of another adit. A closer investigation of the first bend in the adit with the overhead metal plate disclosed a different colour of drystone wall, which blocks the route of the original adit, sloping down in a south westerly direction. Possible reasons for re-routing of the original adit are: 1 the original adit was underwater and in a direct line with the "down bay" making access into the adit impossible unless the basin was drained; 2 the adit outflow from the emptying bucket, of up to fifteen tons of water, might have swamped the tub boats - the brick-lined adit has a right-angled bend which might have reduced the flow and power of the fifteen tons of water; 3 the original adit collapsed.

Twenty feet from the bottom of the inclined plane, below operating water level and linking both "up" and "down" bays is a three feet diameter round culvert. It is probable that this culvert relieved the tub boat bow-wave pressure within the bays, there being only three inches of wall clearance each side of the tub boat. Also there was probably only three inches of water under the tub-boat in the "up bay". This small clearance possibly accounts for the level compressed bed of the "up" bay, hard as concrete with usage. When trade was about 50,000 tons of sand each year an average of 30 tub boats a day passed through this bay.

Set into the walls of the "down" bay are horizontal 12" x 15" elm timbers supporting parallel inclined timbers of the same size which are shaped and drilled to accommodate the missing iron channel rails in which the wheels of the tub boats ran. Several fixing nails remain in the down bay which had less wear since more of the down boats would have been empty. Some 1" diameter bolts remaining in timber around the perimeter of the bottom basin would have secured the timber frame supporting the wheel housing the endless chain

which pulled up the boats.

A 12' diameter iron horse trough with a hard puddled clay bottom lies at the foot of the west embankment. Its interesting use was to take the force out of the tail-leaf water from the blacksmith's waterwheel at the top of the incline. The field west of the incline is called engine field because it housed the blacksmith's waterwheel.

The horse trough was partially destroyed in the 1960s when the Min of Ag dredged Hobbacott bottom basin. They also levelled the top basin - in the interest of the cattle - and pressed the owner, Mr Daw, to level the incline to the original field contours. Thankfully, he firmly declined.

Readers are reminded that access to the plane is with the owner's permission only. The public right of way does not go down the plane but parallel with it one field to the east.

(The information for this article was supplied by Ken Bennett)

Footnote to the above: A culvert carrying a stream under the canal some yards before the bottom basin recently collapsed. English Heritage have outlined the work to be done but the owner wanted this done professionally rather than by volunteers. I suggested asking NCDC for the names of the men who did the stonework on the Broomhill and other bridges and they referred this to Robert Harris. The cost is to be divided between the owner and English Heritage. Ed.

Waterways Recovery Group

The BCS committee have received a letter opposing the plan for WRG to install a by-wash at Rodds Bridge lock. The reasons given were that they were not included in the original working canal when excess water spilled over the gates; that the BCS should leave any 'changes from the original' to other authorities; due to 'lack of space' at most lock-heads it would not be possible to make by-wash mouths wide enough to forward a spate flood capacity; and that by-washes transfer water around the lock which is wasteful of water and could create water shortages.

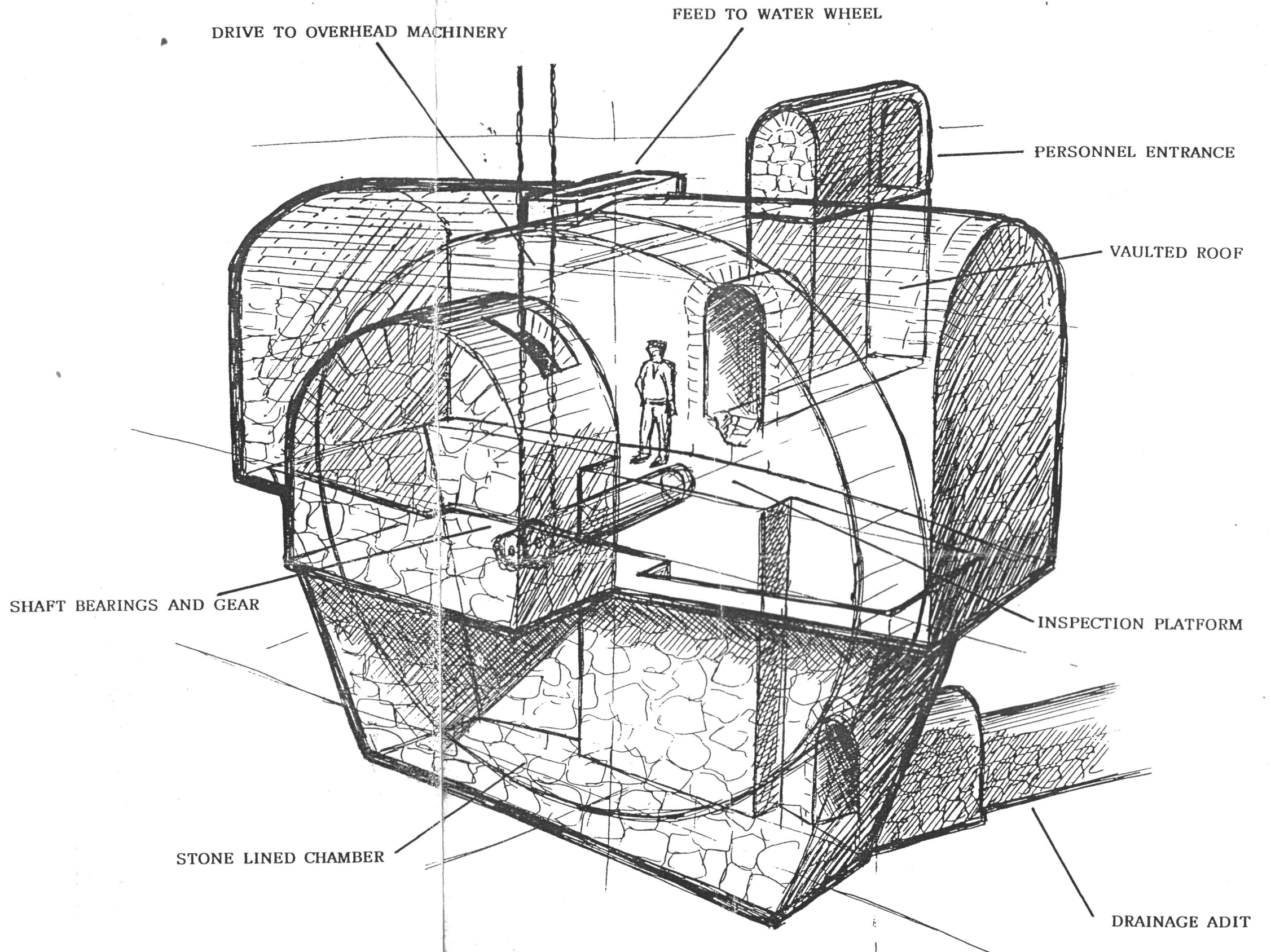
I should be interested to hear the views of members of BCS but if, as I understand, a by-wash takes excess water in a channel around the lock it would not waste water since once the level dropped below the mouth no water would flow along it. I think it is better to take water round the lock rather than through it taking debris and silt into the lock chamber. I have seen these channels working successfully on many canals in the Midlands and have suffered on those in which the overflow went through the lock from rubbish getting behind the lower gates making it difficult to get the gate open wide enough to get a narrow boat through a narrow lock.

An opposing view was expressed by another member who wrote: "The great advantage of using the Bude Canal as an emergency flood relief channel is we can get the whole canal restored, dredged, maintained, with a new bridge by the Falcon at NRA expense. That is surely worth while, apart from stopping future damage to the town. By-washes are a small price to pay for this great step forward.

I look forward to hearing the views of other members on this and any other matters connected with the Society's operations. Ed.

There were six inclined plane boat lifts on the Bude Canal, and motive power at five of these was provided by underground waterwheels. The sixth - at Hobacott Down - was powered by a large cylinder of water being lowered in a vertical well. At three of the lifts, Tamerton, Werrington and Merrifield, the underground wheel pits are still intact and in good condition, although the machinery itself has long been dismantled and scrapped. All these sites are on private land, and it is imperative that anyone wishing to explore them seeks permission from the landowners. To prevent inconvenience to the owners, it is suggested that you contact Ken Bennett (Bude 355061) in the first instance as the Society can organize visits.

Ken has been active recently at Merrifield, clearing undergrowth and improving access at the head of the incline. The sketch reproduced here was drawn by member Tim Martindale following a descent into the pit. Examination of the structure raises some interesting questions: the wheel was presumably fed through the central opening at the top - was this sited in the channel of the canal itself, and what sort of sluice gear controlled it? The main drive to turn the endless chain which pulled boats up the lift must have travelled through the side shaft, which is steeply angled to the surface. Was this drive carried by means of chain, connecting rod or a shaft turned through gearing? And was it direct from the spindle of the waterwheel or did it pass through reducing gears? The wheel itself is believed to have been 29ft in diameter; - was it pre-fabricated and put together inside the pit, or was the roof of the pit built over following the installation? If anyone can provide answers - or reasonable guesses - or elaborate on the above, please let us know.



MERRIFIELD WHEEL PIT