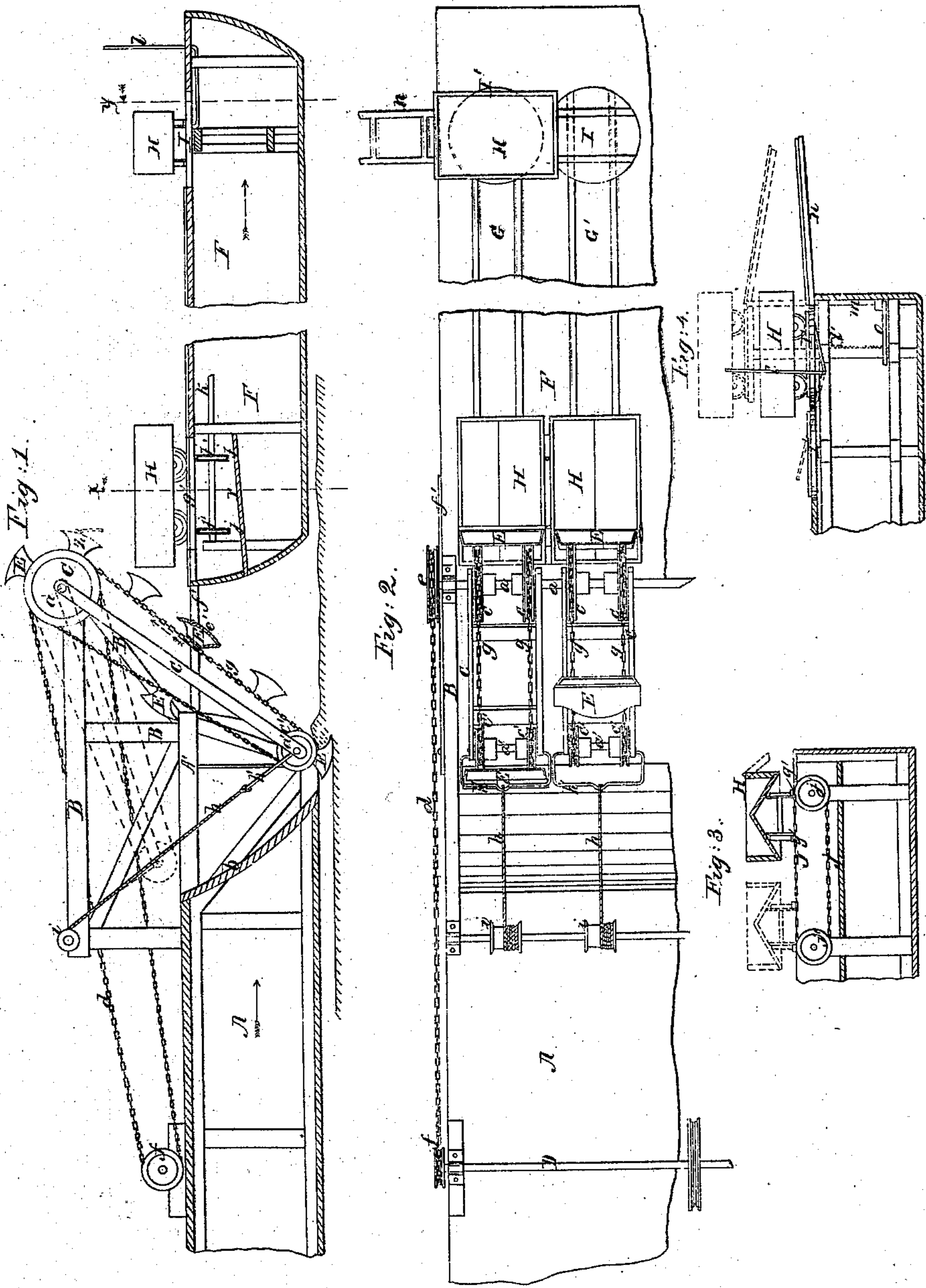


*B. & D. Hughes.*

*Dredging Apparatus.*

*No. 95,114.*

*Patented Sept. 21, 1869.*



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# UNITED STATES PATENT OFFICE.

BERNARD HUGHES AND DANIEL HUGHES, OF ROCHESTER, NEW YORK.

## IMPROVED DREDGING APPARATUS.

Specification forming part of Letters Patent No. 95,114, dated September 21, 1869.

*To all whom it may concern:*

Be it known that we, BERNARD HUGHES and DANIEL HUGHES, of Rochester, in the county of Monroe and State of New York, have invented certain new and useful Improvements in a Dredging Apparatus; and we do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, making part of this specification, in which—

Figure 1 is a vertical longitudinal section of the dredge and accompanying lighter, showing portions of the apparatus in elevation. Fig. 2 is a plan view with one-half of the apparatus broken away. Fig. 3 is a vertical transverse section of the lighter F at the line *x*, Fig. 1. Fig. 4 is a similar section at the line *y*.

Similar letters refer to corresponding parts in the different figures.

The nature of our invention consists, mainly, in combining with a dredge of peculiar construction a lighter or lighters so arranged and operated as to greatly facilitate the removal of earth from the bottom of a canal or channel.

To enable others to make and use our invention, we will describe its construction and operation.

We construct the dredge-boat A, Figs. 1 and 2, with false sides A', extending beyond the bow of the boat, as shown, upon which is erected frame-work B, supporting at its outer end, in proper boxes, the transverse shaft *a*. Upon this shaft we suspend the swinging frames C, each of which carries at its lower end a short shaft, *a'*, the number of such frames employed depending upon the width of the boat. The chain-wheels *c* are keyed to the shaft *a* at proper distances apart, and the corresponding wheels, *c'*, are similarly secured to the shafts *a'*, two upon each. The shaft *a* is driven by chains *d*, running over chain-wheels *e* upon the outer ends of the shaft, power being communicated from a steam-engine located in the rear of the boat through shaft D and chain-wheel *f*.

We provide the endless chains *g*, running upon the chain-wheels *c* and *c'*, to each pair of which, corresponding to one swinging frame, is secured a row of buckets or shovels, E. These buckets may be constructed of boiler-iron with steel cutting-edges, and provided with hinged bottoms *e'*, Fig. 1, held by a latch

or other suitable device, for the purpose of dumping their load when they arrive at the proper point.

The frames C, when working, swing somewhat back of a vertical line, as shown, and are held in any desired position by ropes *h*, connected to bails *h'* and winding upon drums *i*. These latter may be secured to a shaft "boxed" upon the frame-work B or located upon the deck of the boat, the ropes being conducted over pulleys upon a suitable transverse timber. The suspending-shaft *a* must be located sufficiently forward of the bow of the boat to allow the swinging frames to be drawn up by the ropes, and the frame-work B must be strongly constructed to sustain the weight and strain imposed upon said shaft. The bails *h'* are bent in such a shape as to permit the free passage of the buckets.

In the above-described arrangement it is evident that each row of buckets is made independent of every other in its adjustment through the separate swinging frames C, and also that when motion is given to the chains *g* in the direction indicated by the arrow in Fig. 1 the buckets are drawn into the soil just as far as the adjustment of the ropes *h* will allow. The buckets E are not located upon the different sets of chains in the same transverse line, but are arranged so that but one, or at most two, are in the soil at the same time, as shown in Fig. 2 and in outlines in Fig. 1.

The advantages of this arrangement of the dredging machinery are: The buckets will readily enter and excavate soil or rubbish of any kind; but upon meeting an obstruction too large to enter the buckets the swinging frames rise and pass over it. We are also enabled to make a wider excavation than is possible under the old system, while the strain upon the machinery is no greater. In case any accident occurs to the buckets or chains they may be readily elevated for repairs by the ropes *h* and drums *i*, as shown by the red lines in Fig. 1.

To receive and convey away the dirt from the dredge, we provide a lighter, F, having upon its upper deck four railways, G and G', two of which are shown in Fig. 2, laid longitudinally with the boat, and upon which cars H run. The lighter is attached to the dredge-boat by bars *f'*, secured to the sides of each in such a manner as to allow an independent



vertical movement to both and prevent transverse or longitudinal separation, and at the same time admit of the boats being readily joined or separated, as desired. At the stern of the lighter we provide the endless chain  $j$ , running transversely to the lighter over chain-wheels  $j'$ , Figs. 1 and 3, the latter placed at a proper distance apart and driven by a shaft,  $k$ , which receives power from a small engine located in the hold. Across these chains, at such points as to register with two of the railways, we secure the sections of track  $g'$ , upon which the cars  $H$  stand when receiving mud from the bucket.

In Figs. 2 and 3 we have shown the position of the cars upon one set of endless chains, the set upon the other half of the boat being similar and similarly operated. If desirable, rods with rollers fitted to their ends may be attached transversely to the chains  $j$ , the rollers running upon a track bolted to suitable timbers in the boat for the purpose of supporting the chains and cars. The object of this arrangement of endless chains is to shift cars from one track to another when replacing loaded with empty ones.

It will be seen that on account of the inclination of the elevating apparatus on the dredge the cars may be run under the periphery of the upper chain-wheels,  $c$ , Figs. 1 and 2, far enough to receive the mud from the buckets as they are successively dumped at the point shown by the red lines  $z$ , Fig. 1. The inclined floor or platform  $r$  is laid under the shifting-chains  $j$ , to conduct away mud and water which may fall from the buckets or cars above.

The lighter  $F$  may be constructed of any required length and provided with a sufficient number of cars to fill the two central tracks.

At the bow of the lighter we locate the turn-tables  $I$  and  $I'$ , Figs. 1, 2, and 4, having tracks laid across them, as shown, the outer one,  $I'$ , of which can be elevated as desired by means of bent levers  $l$ , or by a rack upon its spindle and pinion  $l'$ , Fig. 4, operated by power. We also provide the tramway  $n$ , having a section of railway laid upon it, and hinged at the inner end to a vertically-sliding frame,  $m$ , Fig. 4, so placed that the tracks register with the tracks upon the turn-table  $I'$ . The inner end of the tramway may be elevated with the turn-table by means of the arm  $o$ , secured to its spindle, by catching under a projection upon the frame  $m$ . This elevating apparatus becomes necessary from the fact that the banks of channels and canals are of varying height, and it may be desirable to unload the lighter where the banks are considerably higher than the deck, involving unnecessary labor in rolling the cars up the incline. Our plan allows the tramway to lie in such a position (shown in red lines, Fig. 4) that the cars may roll easily off by their own gravity. Two or three sections of tramway may be used, if necessary, hinged to each other, so as to fold up out of the way when not in use. In case it is practicable

to anchor the lighter with the end to the bank, the turn-tables need not be used.

The operation of our invention is as follows: When the dredge, with lighter attached, is propelled forward in the direction indicated, and the machinery put in motion, the mud and debris are excavated by the buckets and elevated far enough to allow it to drop into the cars  $H$ , at which point the buckets are dumped by suitable means. Suppose the cars to be standing upon the two outer railways,  $G$ , we roll one upon the endless chains  $j$ , which are then given part of a revolution, transferring the car to the position shown in red lines, Fig. 3, in line with the empty railway  $G'$ . Another car is now rolled forward upon the outer track, filling the place of the transferred one. Since the same operation takes place at both sides of the boat, four cars now stand side by side under the elevator-buckets. When these are filled, the dredging machinery is stopped and the two central cars pushed down the tracks  $G'$  to the bow of the lighter, and the two outer ones shifted to the center by the endless chains and moved down the same tracks. This leaves the space under buckets clear, and the other cars may be moved up, as before, to be filled. As soon as the two central tracks are filled with loaded cars the lighter is detached from the dredge and propelled to any place where it is desired to deposit the load. For this purpose the boat is drawn alongside the bank or towpath, and the cars successively run upon the turn-table  $I$ , and from thence to  $I'$ , where they are elevated sufficiently to give the tramway the proper inclination, and rolled off to be dumped. They are then rolled back upon  $I'$ , turned and rolled upon the outer tracks,  $G$ , for use, as before described. Meanwhile another similar lighter may be loading, so that no time be lost.

We have shown in Fig. 2 one set of buckets  $E$  to each car  $H$ ; but it may be desirable to use more than one, since in such case the strain upon each bucket in excavating would be reduced.

The cars may be constructed with bottoms inclined from the center outward, as shown in Fig. 4; and with hinged sides retained by a catch, so that they may be easily emptied.

The cars and buckets may be provided with small holes near their upper edges, to allow the water that may be drawn up to drain out.

The motion of the boats and that of the dredging machinery may be in the opposite direction to that indicated by the arrows, in which case the buckets would be self-emptying, as they pass over the upper chain-wheel.

The boats may be propelled in the usual manner, or, if necessary a series of "poles" may be arranged operated by machinery, the resistance being at the bottom of the channel. In the case of a canal, a capstan secured at a proper point upon the bank and drawing the boats by a hawser might be employed.

Our invention is particularly adapted to deepening canals—an operation which in cold



climates has hitherto been attended with great expense. With this arrangement the work may be done when the water is in the canal and the soil soft and easily removed. All the machinery may be arranged in boats that will enter any lock, and the width of the excavation is only a trifle less than the width of the boat. The lighters also greatly facilitate the removal of the mud, since the latter does not require to be handled at all, but only shifted in bulk and dumped.

What we claim as our invention, and desire to secure by Letters Patent, is—

1. In combination with a dredging apparatus, a detachable lighter, F, constructed and arranged substantially as described.

2. Providing the lighter F with one or more turn-tables, for the purposes set forth.

3. Providing the outer turn-table, I', with a suitable elevating device, as and for the purposes specified.

4. The elevating tramway n, arranged substantially as described, in combination with the lighter F, for the purpose set forth.

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