(No Model.) 4 Sheets—Sheet 1.

W. HARWOOD.

DREDGING MACHINE.

No. 301,364. Patented July 1, 1884.

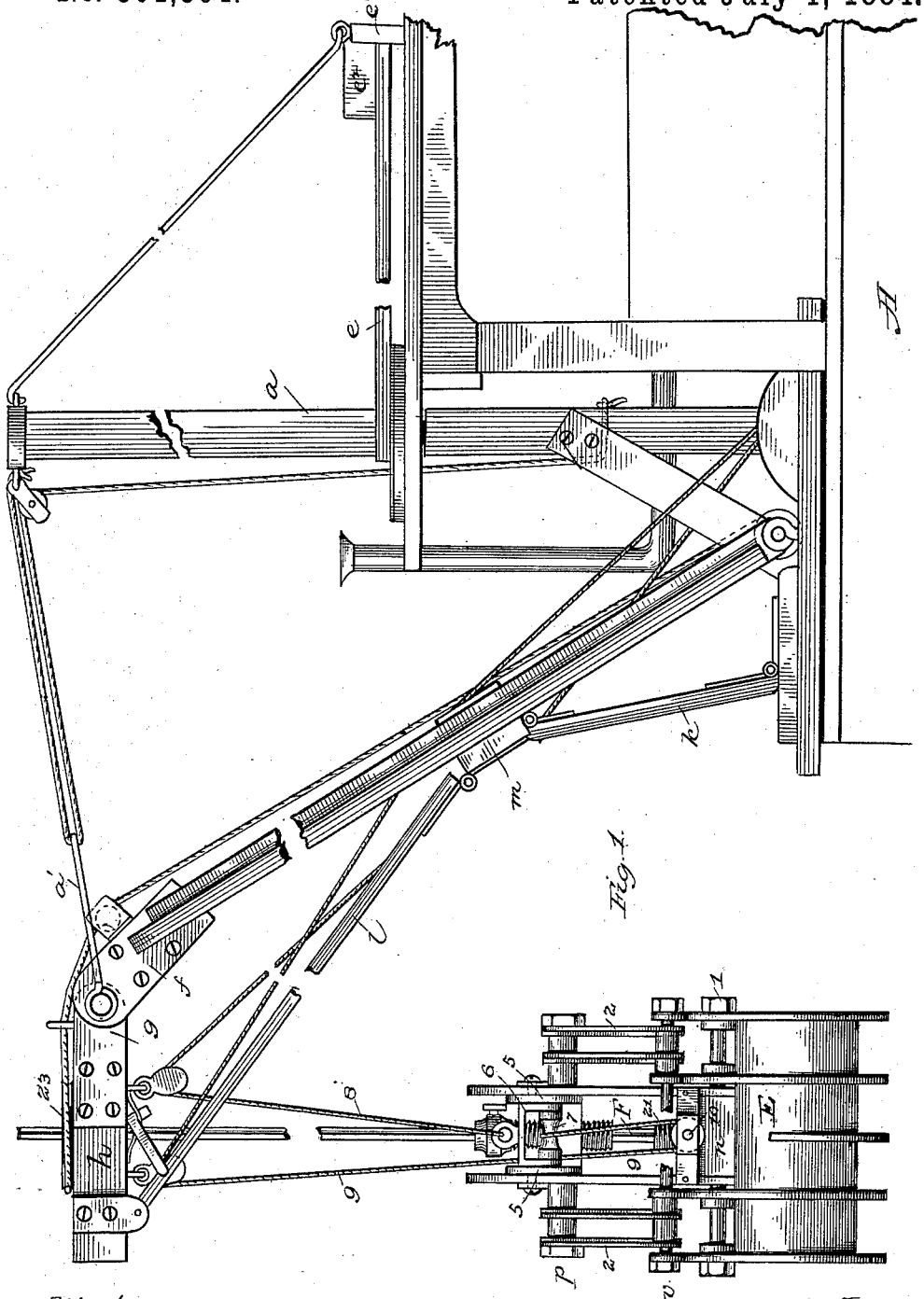

Fig. 1.

Attest:
F. L. Middleton
L. W. Seely

Inventor
William Harwood
by Edwin Spear
Atty.

(No Model.) 4 Sheets—Sheet 2.

W. HARWOOD.

DREDGING MACHINE.

No. 301,364. Patented July 1, 1884.

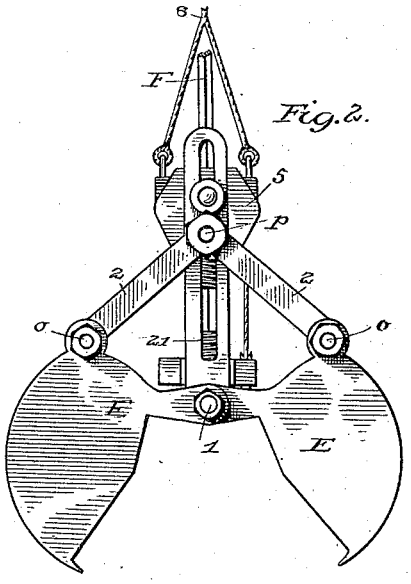

Fig. 2.

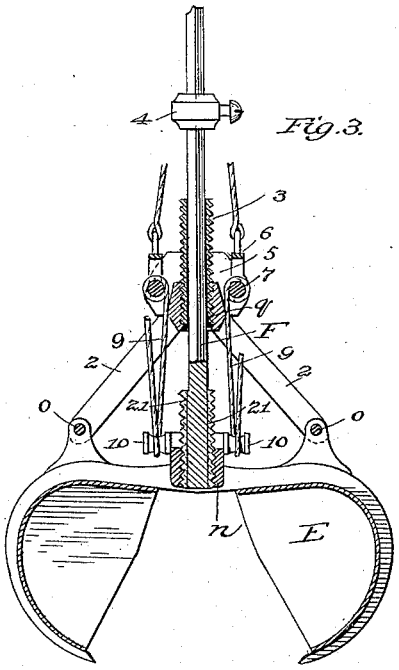

Fig. 3.

Attest:
F. L. Middleton
S. W. Seely

Inventor
William Harwood
by Ellis Spear
Atty.

(No Model.)

4 Sheets—Sheet 3.

W. HARWOOD.

DREDGING MACHINE.

No. 301,364. Patented July 1, 1884.

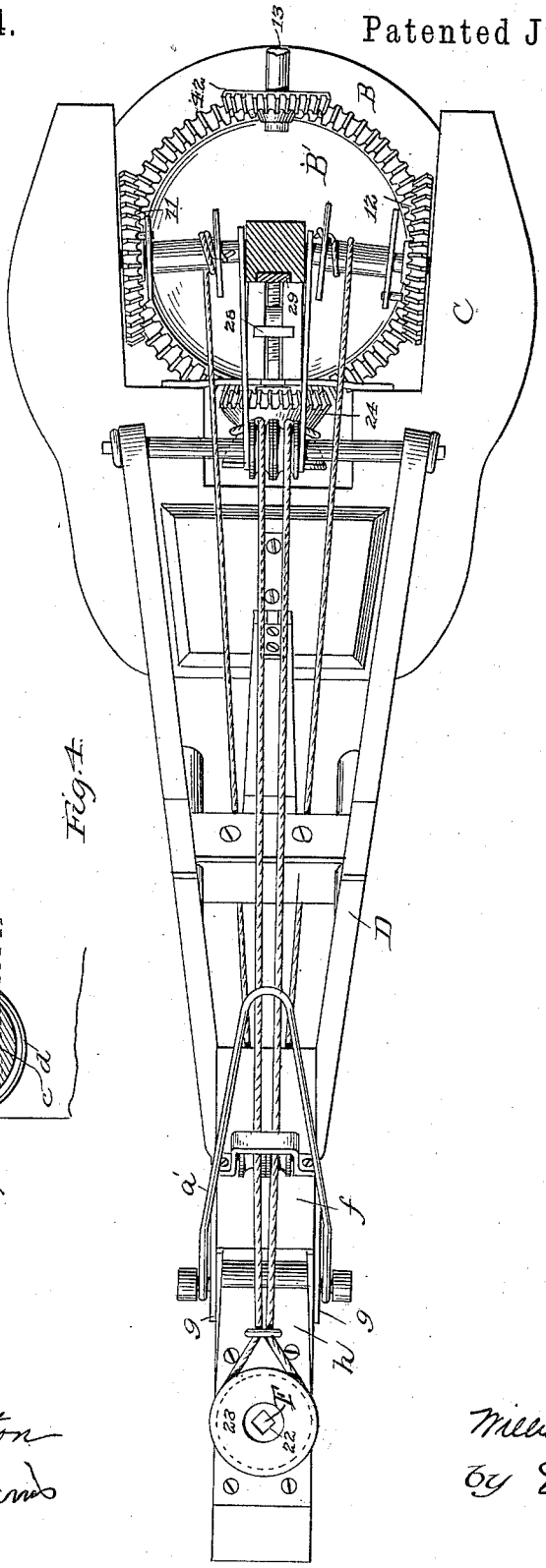

Fig. 1.

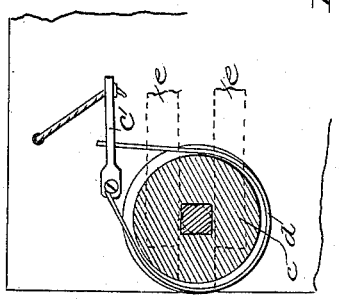

Fig. 6.

Attest:
F. L. Middleton
W. C. Williams

Inventor
William Harwood
by Ellis Spear
Atty's.

(No Model.) 4 Sheets—Sheet 4.

W. HARWOOD.

DREDGING MACHINE.

No. 301,364. Patented July 1, 1884.

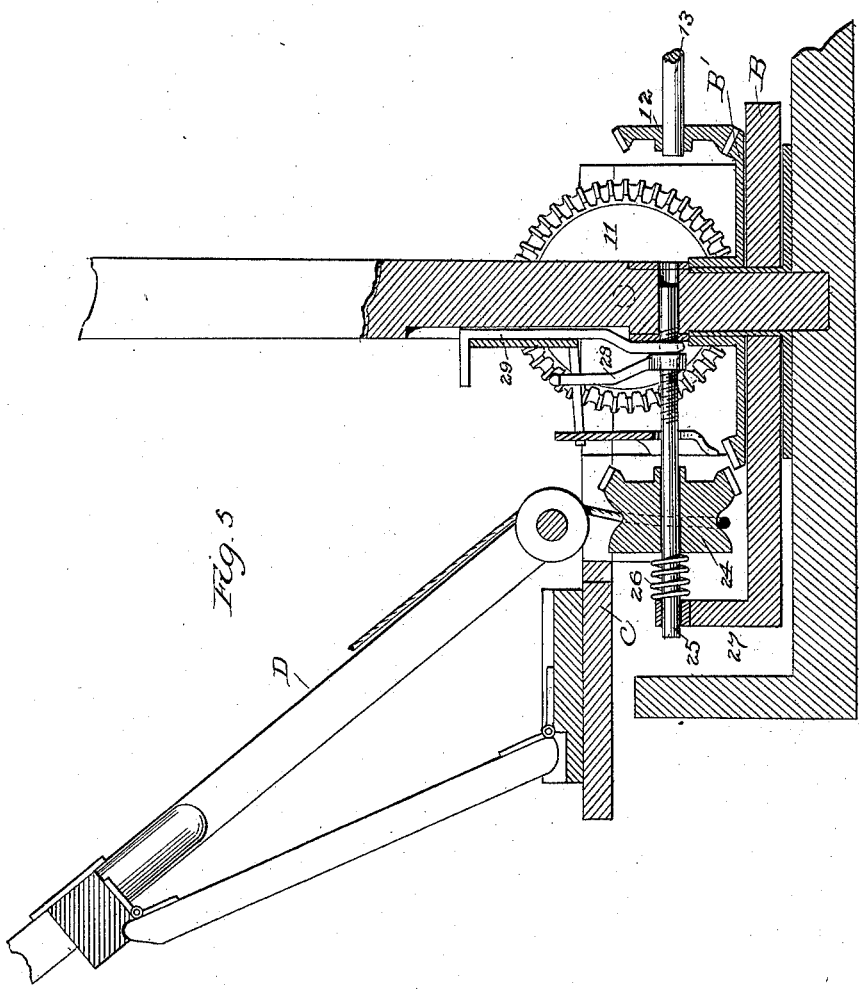

Fig. 5

Attest.
F. L. Middleton
W. Wallace

Inventor
William Harwood
by Ellis Spear
Attys.

UNITED STATES PATENT OFFICE.

WILLIAM HARWOOD, OF OAKLAND, CALIFORNIA.

DREDGING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 301,364, dated July 1, 1884.

Application filed November 21, 1881. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM HARWOOD, a citizen of the United States, residing at Oakland, in the county of Alameda and State of California, have invented certain new and useful Improvements in Dredging-Machines, of which the following is a specification, reference being had to the accompanying drawings and the letters marked thereon.

My invention relates to dredgers for excavating material from the bottoms of rivers and like places, and more especially to that class of dredging-machines which are carried upon a scow or boat.

The invention consists in the devices and combinations of devices hereinafter fully described and particularly claimed.

In the accompanying drawings, Figure 1 represents a side elevation of a scow with my dredging apparatus in place. Fig. 2 shows a detached view of the bucket open in side elevation. Fig. 3 is a sectional view of the bucket and its operating mechanisms. Fig. 4 is a plan view of the derrick and turn-table. Fig. 5 is a sectional detail of the turn-table and its connections. Fig. 6 is a detail.

I have represented the scow in the drawings at A. This may be of any suitable construction, capable of carrying the mechanism hereinafter described, and of any size adapted to the purpose. I prefer to construct it in the form shown, provided with a mast, *a*, in the center of the scow between the sides, but preferably near one end, to better sustain the dredging mechanism. This rests upon a crown-wheel in the bottom of the vessel, which in turn is supported upon a revolving plate or table hereinafter more fully described. The frame carrying the dredging apparatus is also supported from this table, and suitable braces from this frame to the mast serve to steady and support it. A platform is provided above the deck of the vessel, extending to the rear of the mast, from which the attendants may adjust the lateral position of the bucket, as will be described hereinafter. The mast passes through the platform, which is cut away to receive it, and just above the top thereof the mast has secured to it a disk, *c*, preferably grooved to receive a flat metal strap, *d*, which passes entirely around the disk, one end of it being secured to the short arm of a lever, *c'*, pivoted to the platform, and the other end, after passing around the disk, being secured in a slot in the same lever. (See Fig. 6.) This device acts as a friction-band to prevent turning of the mast when the lever is turned to tighten the strap, and it may be operated from below by means of cords attached to the lever. Upon the top of this disk, and extending to the rear, are two beams, *e e*, which embrace the mast, and are adapted to move with it. They are provided with cross-pieces *e'* at the other end, between which is a box, *e²*, containing stone or other heavy material to counterbalance the strain upon the other side of the mast. Braces extend from the top of the mast to the cross-piece at the end of the box.

I now proceed to describe the bucket and supporting and operating devices therefor. In suitable bearings in the hold of the scow is a turn-table, B, of substantially the form shown, supporting the crown-wheel B' and mast before referred to. To this turn-table are fixed upon each side the divided ends of the platform C, which directly supports the crane and mechanism for operating the bucket. This platform extends to the front, and on a shaft having its bearings in eyebolts secured to the said platform the lower beams of the crane D have their bearings. The arms or beams of the crane extend upward until they are joined by a head-piece, *f*, and in ears *g g* on this head-piece is pivoted a piece, *h*, extending horizontally to the front, and, as hereinafter described, adapted to directly receive the end of the bucket-rod. From pins extending from the ears *g g* a bail of wire, *a'*, or suitable material, extends to the rear, and is connected by cords to a pulley on the top of the mast. This allows the forward movement of the crane, and the consequent lowering of the outer end to be adjusted at will. The crane is supported at all times by the braces *k* and *l*, the brace *k* being hinged to a block on the platform C, and also to a cross-piece, *m*, and the braces *l* extending from ears in the forward part of the crane-head and hinged to the upper part of the cross-piece. This cross-piece *m* is adapted to slide upon the beams of the crane, and this sliding movement allows the crane to be shifted forward to any extent, changing the angle of the braces only and not their relative positions.

The bucket E is shown in Figs. 1, 2, and 3. The jaws are of ordinary construction, and are pivoted upon a rod, 1, by means of their ribs being extended and perforated to receive the rod. This rod 1 passes through or is made a part of an internally-threaded piece, *n*, which is adapted to receive the threaded part of the rod F, from which the bucket is suspended and operated. This screw-thread is not on the rod proper, but upon a sleeve fixed thereto, and the thread is a left-hand thread. At the top of the bucket, upon each side, is a rod, *o*, running through the ribs of the bucket, and from these rods to a rod, *p*, extend toggle-arms 2 2. The rod *p* passes through or is formed with a similarly-threaded piece, *q*, as that marked *n*, with the exception that the threads are adapted to receive the right-hand threads of a sleeve, 3, having longitudinal movement on the rod F, but limited in its movement by a collar, 4, provided with a set-screw. The arms 2 2 serve to open and close the bucket-jaws, and their manner of action is to close the jaws when their upper ends fall, and to open the jaws when the movement is reversed. Thus it will be seen that the opening and closing of the jaws must be accomplished through the piece *q*, as this piece, through its extensions, controls the action of the arms 2 2, and consequently the opening and closing of the bucket-jaws. Slotted guide-plates extend from the shaft upon which the bucket-jaws are hinged up past the piece *q*, and thus guide the said piece in its vertical movement.

The opening and closing of the jaws may be performed in two ways, and the first, that of operation by ropes or cords, I will now describe. The rod F is square in cross-section, and is supported and manipulated in the crane-head, as hereinafter more fully described in connection with the second method of operating the jaws. Upon each side of the piece *q*, resting upon the same rod, are plates 5 5, which extend beyond the piece *q*, and are provided upon each side thereof with a small rod, 7, upon which is fitted a bail, 6, said bail having independent movement on the rod. The bails have eyebolts for the reception of cords or ropes, and these ropes are joined at a suitable distance above the bails, and the single rope 8, thus connected with the bails, is passed up to the crane-head through a suitable pulley, and from thence down to a drum on one side of the mast. Pressure upon this rope, it is obvious, will lift the piece *q* and its connections, and through them the arms 2 2, to open the bucket-jaws. To close them I employ the ropes 9 9, one end of which, on each side, is securely fastened to the rod 7, whence the ropes pass down under pulleys 10 10, secured upon each side of the guides a little above the piece *n*. From these pulleys the ropes pass upward, preferably on the inside of the sleeves and bails, and through suitable pulleys on the crane-head, similar to the cord 8, pass to a drum on the opposite side of the mast. Pressure upon these cords, therefore, will practically make the rod *p* the pivot of the jaws and will draw up the lower rod, and thus close the jaws. These cords, as before explained, pass to drums on each side of the mast. The drums are of ordinary construction and work loosely upon the shafts of beveled gear-wheels, marked, respectively, 11 and 12. The drums are thrown into engagement with the gear-wheels by pins upon the drums registering with corresponding holes in the face of the gear-wheels. Thus when it is desired to open or close the jaws, the drum carrying the rope which it is desired to operate upon is put in operation by engaging the drum with the gear-wheel, which is driven by power from a suitable source, and thus the manipulation of the buckets is performed at will. The bevel gear-wheels receive their motion from the crown-wheel in the hold of the scow, which has hereinbefore been referred to, and power is communicated to this crown-wheel by a bevel gear-wheel, 42, on a crank-shaft, 13, connected with the shaft of the engine or other source of power.

From the description thus far given it will be seen that if the bucket is in an open position ready to be lowered, the operator, by allowing the crane to swing forward, will lower the bucket, and when it has reached the bottom of the river, or where the dredging is to be done, the drum which holds the ropes 9 9 is placed into engagement with the gear-wheel, which is rapidly rotated with the drum, thus winding on the cords and closing the jaws. The rope connecting the bail at the neck of the crane with the mast is then drawn upon, supposing the jaws to be filled and ready to be elevated and discharged, and thus the crane is drawn in and upward. When the bucket is above the surface of the water, the friction-band *d* is loosened from the disk *c* at the center of the mast, and the revolution of the beveled gear 42 will, through the crown-wheel with which it engages, cause the turn-table to move toward the way in which the wheel 12 revolves. Thus the crane and bucket will be swung to the right or left, as the case may be, and may be directly over a scow adapted to receive the mud or other dredged material. While in this position the drum carrying ropes 9 is thrown out of connection with its gear, which thus slackens the ropes, while the opposite drum is put into connection, thus drawing on the rope 8 and opening the jaws to discharge the material. The crane is then returned to its first position, the friction-band tightened, and the operation continued.

Under ordinary circumstances the devices above described for operating the jaws will be found sufficient, but where the material to be excavated is hard and stiff more pressure is necessary to manipulate the jaws, and for this purpose I have provided the following means: These devices have been heretofore slightly referred to, and consist, essentially, of the threaded pieces *n* and *q*, fixed, respectively, to the rods 1 and *p*, and of the screw-threaded

sleeves upon the rod F. As before stated, the piece *n* is fixed to the rod 1, and is internally threaded to receive a sleeve, 21, fixed to the rod F, and having left-hand threads. Above this piece *n*, upon the rod *p*, is the piece *q*, screw-threaded internally, and adapted to receive a sleeve, 3, with right-hand screw-threads loose on the rod F, but adapted to revolve with it. It will thus be seen that by the revolution of the rod F in one direction (to the right) the jaws will be opened, and an opposite movement of the rod will close them, as the sleeves are caused to move toward or away from each other to open and close the jaws, the respective movements separating and drawing together the pieces *n* and *q* for that purpose.

In order to give the necessary revolution to the rod F, I arrange it in the following manner: In the forward part of the horizontal portion of the crane-head I place a sleeve, 22, which extends entirely through the head from top to bottom, so arranged as to have an easy movement therein. It is square in cross-section for a part of its upper portion, but is preferably bell-shaped at its lower end. The rod F is adapted to enter this sleeve, and fits easily in the squared part, the bell-shaped part allowing movement laterally or forward without binding. The rod and bucket are supported in this head and sleeve by the cords or ropes before described. Fixed to or connected with the upper portion of the sleeve 22, which projects slightly, is a grooved band-wheel, 23, from which extends the band or strap for imparting a rotary motion to the sleeve through the wheel 23, and from the sleeve to the rod F, which, by reason of its adaptation to the sleeve, is revolved with it. The band from the wheel 23 passes over suitable friction-pulleys on the crane to a drum, 24, splined to a shaft, 25, so as to have a limited horizontal movement thereon, Fig. 5. This drum 24 has beveled teeth upon its face, which, in the normal position of the drum, are in gear with the crown-wheel B′, and from which its power is derived. The drum is provided with a spring, 26, in its rear, to keep it in this normal position.

In order to automatically operate the mechanism for opening and closing the bucket by means of the revolution of the rod F, as described, I screw-thread the forward part of the shaft 25 (which has free bearings in a standard, 27, and in the mast, as shown in Fig. 5) and fit thereto a shifting-lever, 28, which moves back and forth upon the screw in the right-and-left-hand motion of the drum. A stop-bar, 29, is fitted to a groove in the mast, so as to have vertical movement therein, and is provided with a handle at the upper part, while the lower part is bent slightly toward the front beyond the plane of the mast, the end and face of the bent portion being cut out or made concave, as shown, to adapt it to the shape of the shaft 25 and the shifting-lever. The shifting-lever is so adjusted upon the screw-threaded shaft 25, and travels thereon at such speed, that when sufficient rotary motion has been communicated to the rod F, through the drum 24, to close the bucket-jaws, the shifting-lever will have reached the stop-bar 29, resting upon the shaft 25, and projecting beyond the plane of the mast, as described, and as the revolution of the shaft 25 continues it will force the shifting-lever against the projecting face of the bar and throw the drum out of gear with the crown-wheel. The windlass-drums are then put into gear, and as the crown-wheel continues to revolve the hoisting-ropes are wound upon said windlass-drums and the bucket is raised and its contents ready to be discharged. The stop-bar 29 is then raised from its position on the shaft 25 and from behind the shifting-lever, which action allows the spring 26 to force the shaft back and to re-engage the drum 24 with the teeth of the crown-wheel, holding it in this position. The engine is then reversed, and consequently the motion of the shaft 25, and the shifting-lever moves forward. The power from the drum 24 is communicated, as before described, to the rod F and to the jaws of the bucket, opening them and allowing the contents to be discharged. The bucket is then lowered and the operation repeated.

Suitable braces may be provided for the different parts of the apparatus, in order to strengthen the whole and permit the machine to work effectually.

Having thus described my invention, what I claim is—

1. A dredging apparatus consisting of a scow provided with a suitable mast, a derrick pivoted upon said scow and adjustably supported thereon, connections between the derrick and mast of the scow for adjusting the position of said derrick, a rod, F, carrying a bucket on its lower end, said rod working in the derrick-head and having vertical and rotary motion therein independent of said head, connections between said bucket and the engine on the scow for raising and lowering the same, and means, substantially as described, for operating the bucket to open and close the same, substantially as described.

2. A dredging apparatus consisting of a scow, a derrick pivoted upon said scow and adjustably supported thereon by means of the hinged and sliding frame *k l m*, of the rod F, working in the derrick-head and having independent movement therein, and of rope connections 8 9 between said bucket and drums driven by the engine on the scow, whereby the bucket and rod are raised and lowered, substantially as described.

3. In a dredging apparatus, the combination, with the scow, of the derrick mounted and adjustably supported thereon, the rod F, working in the derrick-head, adapted to be revolved therein by means of the pulley 23 and connections with the driving-power, and mechanism, substantially as described, between said bucket and rod, whereby the jaws

of said bucket are opened by the revolution of said rod in one direction and closed by the reverse revolution, substantially as described.

4. In the described apparatus, the combination of the derrick, the rod F, working in a square-shaped sleeve, 22, in the head thereof and carrying the bucket on its lower end, the sleeves 3 and 21, the blocks *q* and *n*, corresponding to said sleeves, and suitable connection between said sleeve 22 and the engine in the scow, whereby rotary motion is communicated to the rod F, and by the means described the bucket is opened and closed.

5. In the described apparatus, the rod F, working in a sleeve in the derrick-head, the pulley 22, connections between said pulley and a drum, 24, on the scow, for revolving said rod and pulley, and means, substantially as described, for automatically throwing said drum 24 in and out of gear with the driving power in the scow, substantially as described, and for the purpose set forth.

6. In the described apparatus, the rod F, working in the derrick-head and having the sleeves 3 and 21, the bucket provided with the blocks *q* and *n*, corresponding to said sleeves, and the toggle-rods 2 2, connecting the block *q* with the bucket-sections, all constructed and operating substantially as described.

7. In the described apparatus, the rod F, working in the derrick-head, and having the described connections between the said rod and bucket, the bail 6, having rope 8 secured thereto, and the sleeves 7 and pulleys 10 for the ropes 9, whereby when power is applied to said ropes the bucket is raised, substantially as described, all combined as described, and operating in connection with each other, as set forth.

8. In the described apparatus, and in combination with the rod F and its connections, the drum 24 on the shaft 25, the crown-wheel B′, the spring 26, for keeping said drum 24 in engagement with said crown-wheel, the shifting-lever 28, and the stop-bar 29, the parts operating in connection with each other, substantially as described.

9. In combination, a scow provided with a turn-table in the hold thereof, a derrick supporting the dredging mechanism supported upon said table, a mast, and connection between the same and the derrick, whereby the latter may be raised or lowered, said mast also mounted on said turn-table, which also supports suitable driving mechanism operated from an engine in the rear of the scow, the parts being so constructed and arranged as to allow the turn-table and the mechanism supported thereby to be turned to the right or left without interfering with the action of the engine, substantially as described.

10. In combination with the turn-table and mast supported thereby, the friction device, substantially as described, whereby the mast, and thereby the turn-table, is prevented from turning when the machine is at work, substantially as described.

WILLIAM HARWOOD.

Witnesses:
JOHN H. REDSTONE,
ALBERT E. REDSTONE.