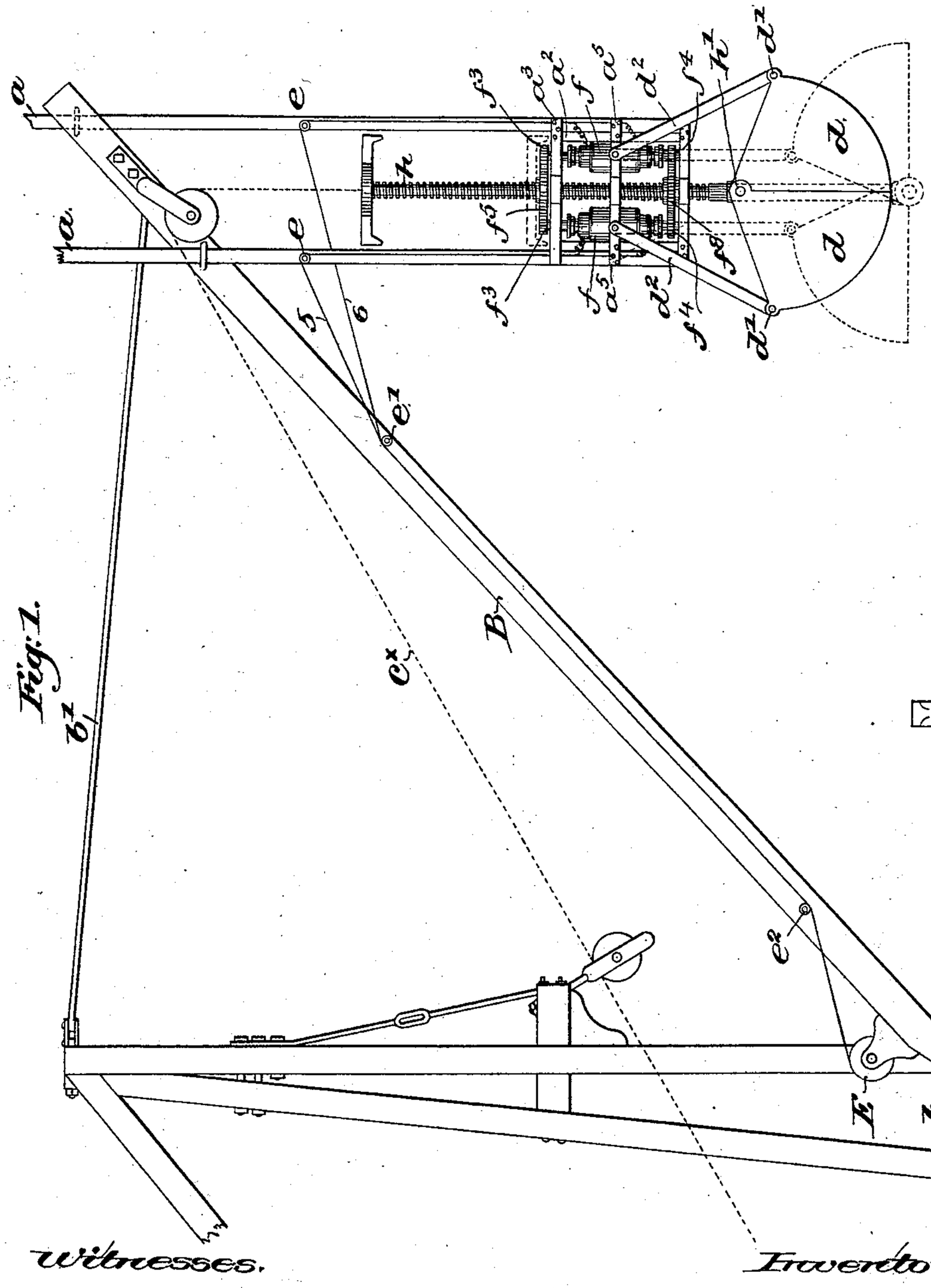
(No Model.) 2 Sheets—Sheet 1.

C. UPTON.

DREDGING MACHINE AND ELECTRICALLY ACTUATED BUCKET THEREFOR.

No. 531,486. Patented Dec. 25, 1894.



Witnesses.
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(No Model.) 2 Sheets—Sheet 2.

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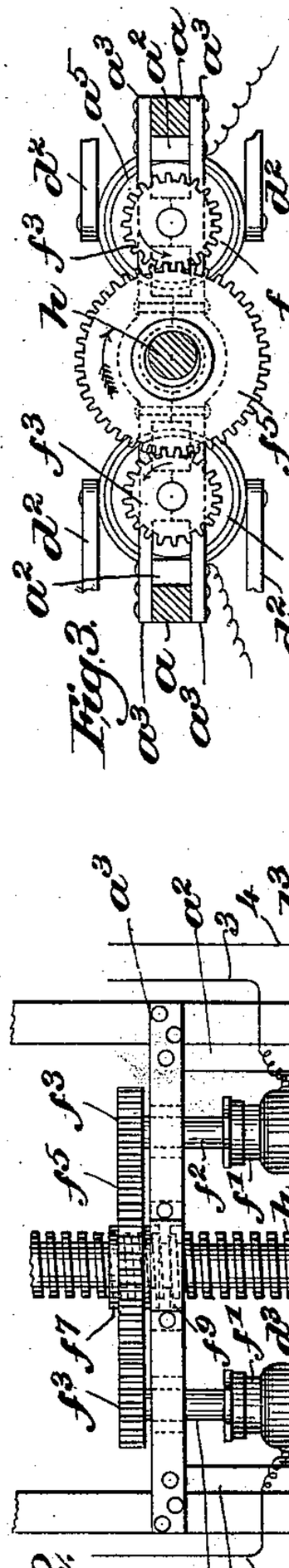
Fig. 3.

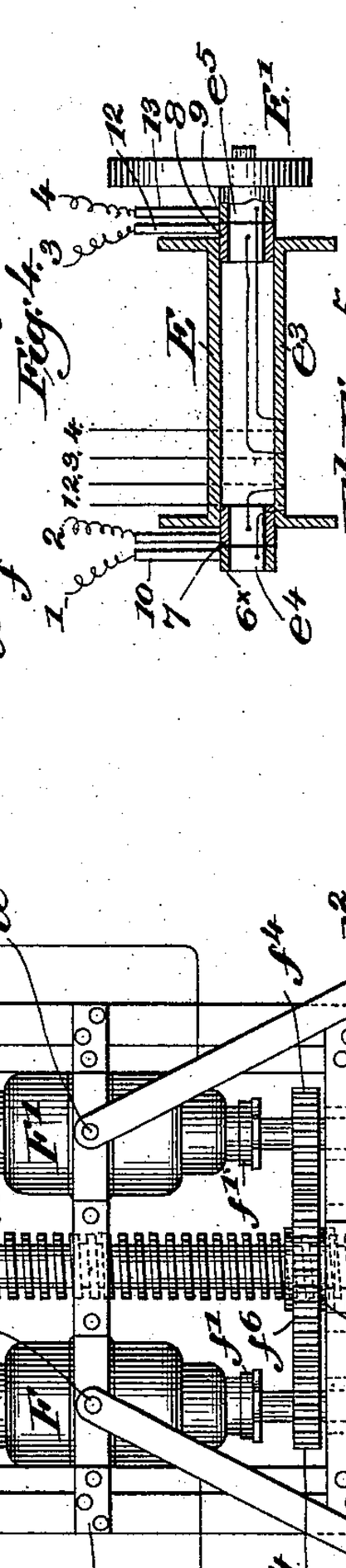
Fig. 4.

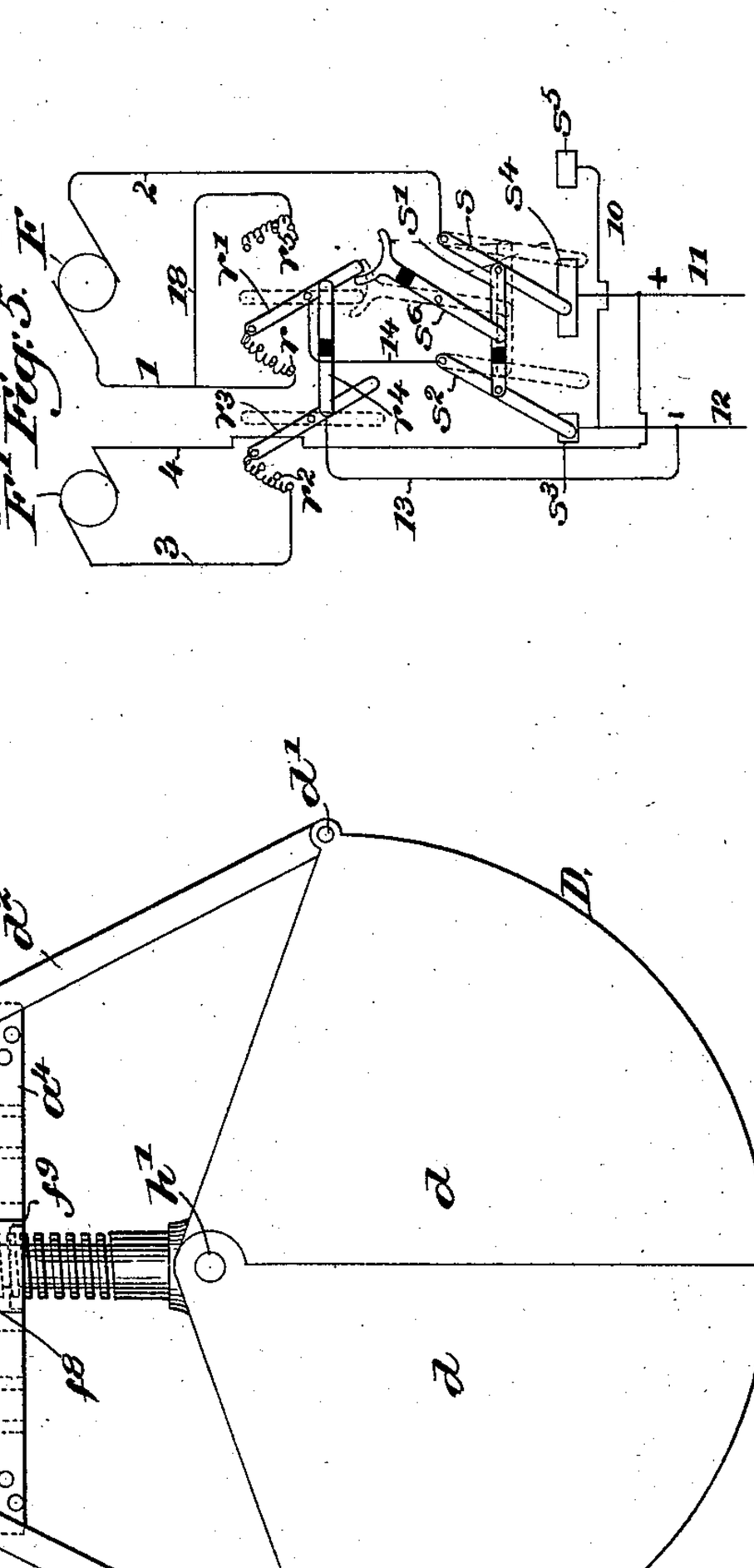
Fig. 5.

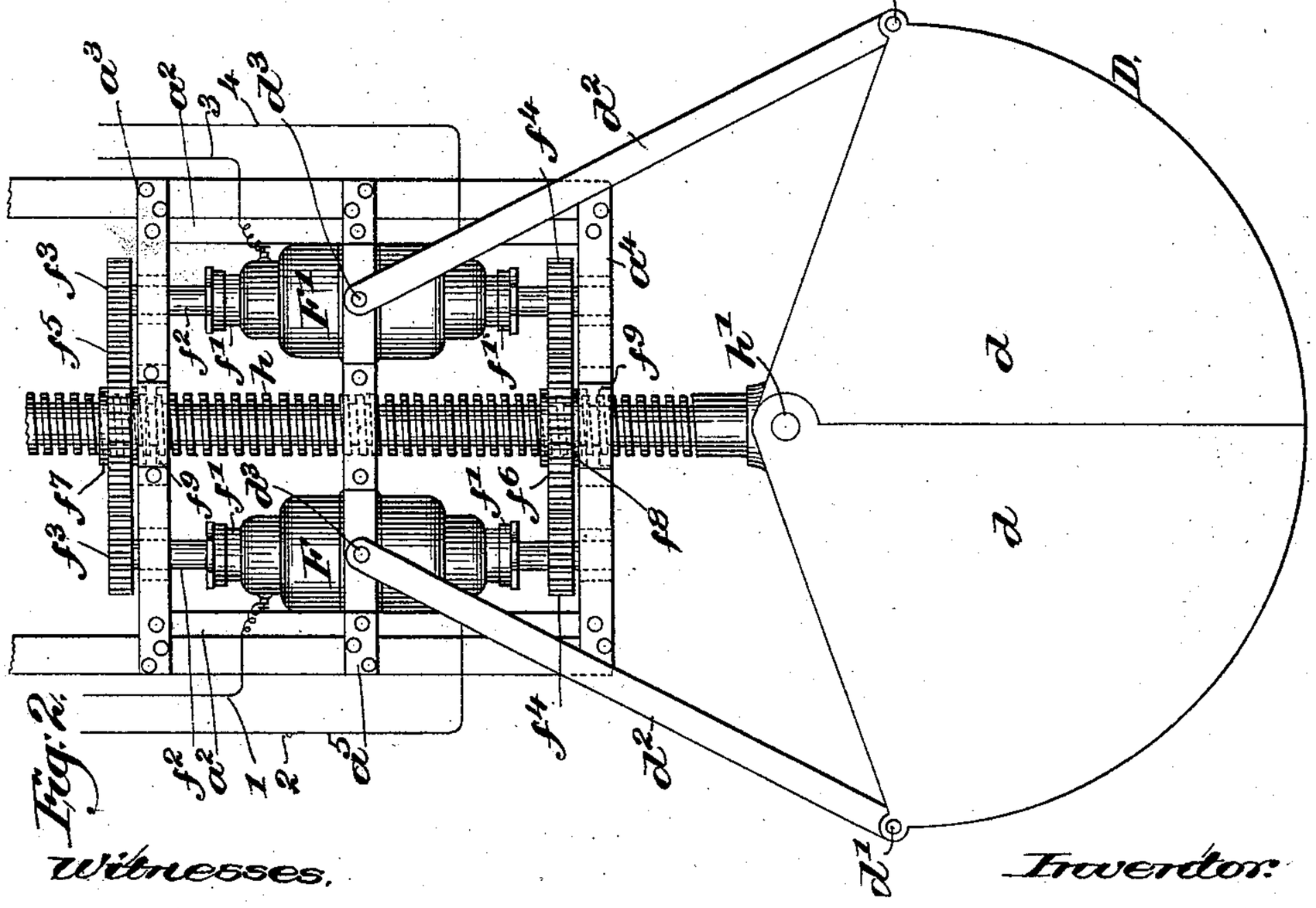
Fig. 2.

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UNITED STATES PATENT OFFICE.

COLCORD UPTON, OF SALEM, MASSACHUSETTS.

DREDGING-MACHINE AND ELECTRICALLY-ACTUATED BUCKET THEREFOR.

SPECIFICATION forming part of Letters Patent No. 531,486, dated December 25, 1894.

Application filed October 15, 1894. Serial No. 525,943. (No model.)

To all whom it may concern:

Be it known that I, COLCORD UPTON, of Salem, county of Essex, State of Massachusetts, have invented an Improvement in Dredging-Machines and Electrically-Actuated Buckets Therefor, of which the following description, in connection with the accompanying drawings, is a specification, like letters and figures on the drawings representing like parts.

This invention has reference to dredging and other machines fitted with movable jaws, either in the form of a bucket for dredging or raising mud or coal, or in other form as a grip for engaging articles of merchandise and the like, to be removed from holds of vessels or other inaccessible places, the invention having especial reference to the means for operating the jaws.

Prior to this invention, so far as I am aware, it has been the usual custom to operate jaws in machines of this class, by means of cables or chains controlled from a distant engine, and it has been attempted also to operate the jaws by means of a steam cylinder mounted upon the frame carrying the jaws.

The first method above referred to is objectionable because of the difficulty of controlling long chains and cables and of securing the desired movements of the jaws, and the latter method because steam or other fluid under pressure cannot be practically conveyed to a distant point and employed in a machine of this type.

In accordance with this invention, I employ one or more electric motors which are connected in suitable manner with and to operate the said jaws and raised and lowered with the said jaws, said motor or motors being provided with proper electrical connections leading to the distant operating point, whereby the whole is under the control of the operator, as will be hereinafter described.

To illustrate my invention, Figure 1 represents in side elevation a portion of a dredging machine having the jaws of its bucket operated in accordance with my invention. Fig. 2 is an enlarged side view of the bucket and one form of mechanism for opening and closing the same; Fig. 3, a top or plan view of Fig. 2; Fig. 4, a vertical longitudinal section of the spool which I prefer to employ for taking up the slack in the electrical conductors; and Fig. 5, a diagram showing one form of rheostat or controlling switch by which the operation of the bucket is controlled.

In the embodiment of my invention, shown in the drawings Fig. 1, A, is the scow or float upon which is mounted the usual boom B hinged at b and sustained by a suitable rod or guy b' at its outer end, said boom at or near its said outer end being shown provided at opposite sides with guide-eyes through which are dropped the bucket poles a, a, attached at their lower ends in suitable manner to the side bars a^2, a^2, of the bucket frame, as best shown in Fig. 2.

The bucket frame, as herein shown, comprises the two vertical side bars a^2, a^2, connected top and bottom at their opposite sides by top and bottom bars a^3, a^4, and at their middle by the middle bars a^5. The top, bottom and middle bars a^3, a^4, a^5, are bolted together from opposite sides and embrace the side bars a^2. See Figs. 2 and 3. Between the middle bars a^5, and, as herein shown, close to the side bars of the frame, I have bolted or secured the fields f, f, of two motors F, F', said fields being substantially cylindrical in shape, and provided at their opposite ends with packing boxes f', f', through which the armature shafts f^2, f^2, are passed, said armature shafts, between their respective packing boxes and within the fields of the motors, having secured to and insulated from them suitable armatures of usual construction, and not herein shown.

Motors of this type capable of running under water are known in the trade at the present time, and this invention is, therefore, not restricted to the particular type or form of motor herein shown, as any motor suitable for the purpose may be employed.

The armature shafts f^2, f^2, are journaled at their opposite ends in suitable bearings formed in or between the top and bottom bars a^3, a^4, see Fig. 3, said shafts, at their opposite ends, being provided with pinions f^3, f^4, which mesh with intermediate toothed wheels f^5, f^6, provided with large hubs f^7, f^8, also journaled in suitable bearings formed in or between the said top and bottom frame bars, as shown in Fig. 3, the hubs of one or both of the said toothed wheels, as shown in dotted lines Fig. 2, being provided with a

peripheral groove f^9 which receives a suitable corresponding projection of the bearing to restrain it from vertical movement with relation to the frame.

The hubs f^7, f^8, of the toothed wheels f^5, f^6, are shown interiorly threaded to receive the screw h, to the lower end of which are jointed at h' the two members d, d, of the clam-shell bucket D, the outer ends of the said jaws d, d, being jointed at d', d', to the lower ends of the links d^2, jointed at their upper ends at d^3 to the middle bars a^5 of the motor frame. See Fig. 2. The outer ends d', d', of the bucket jaws being held by the links d^2, it is evident that if the fulcrum or pivotal point h' of the jaws be moved down or up, the said jaws will be opened or closed, as shown by dotted lines Fig. 1.

The line wires 1, 2, 3, 4, for the motors are connected in suitable manner with the latter, and are preferably twisted or formed into two separate cables, indicated by the figures 5 and 6, Fig. 1, the cable 5 containing the wires 1 and 2, and the cable 6 the wires 3 and 4, said cables preferably being passed upwardly along the poles a, a, to and over suitable sheaves e, e, and as herein shown, to and over a sheave e' on the boom, thence down along the boom to and under a sheave e^2, from which the said cables pass to the coiling spool or take-up E controlled by a spring E', and shown as mounted upon and at the base of the boom B near the fulcrum of the latter which gives out and takes up the cables as the bucket is lowered or raised.

Referring particularly to Fig. 4, the spool E, as shown, consists of a hollow flanged core e^3, said core also having hollow journals e^4, e^5, the journal e^4 being provided with suitable contact rings $6^\times$, 7; and the journal e^5 with the contact rings 8, 9, upon which rings bear respectively the contact springs 10, 11, 12, and 13, the springs 10, 11, bearing upon the rings $6^\times$, 7, respectively, and the contact-springs 12, 13, upon the rings 8, 9, respectively.

In Fig. 4, the wires within the cables are shown as again separated, as in Fig. 3, the wires 1 and 2 from the cable 5 being coiled around the core of the spool and passed inwardly therethrough and electrically connected with the rings $6^\times$ and 7 respectively, as shown, while the wires 3 and 4 of the cable 6 are coiled about the core in similar manner, passed inwardly therethrough and connected respectively with the rings 8 and 9.

Referring now to Fig. 5, the wire 1 is shown connected with the first of a series of resistances r, while the wire 2 is connected with the pivotal point of a reversing lever s. Connected with the lever s by a rod s', is a similar lever s^2, the two levers moving always in unison and adapted to co-operate with contacts s^3, s^4, s^5, the contacts s^3 and s^5 being joined by a wire 10, while the contact s^4 has connected to it a wire 11 leading to one pole of the generator. Not shown. The connecting rod s' is jointed to the lower end of a pivoted arm s^6, forked at its upper end to receive the end of the pivoted contact arm r' adapted to sweep the series of contacts r. The wire 3 from the motor F' is connected with the first of a series of resistance contacts r^2, adapted to be swept by the pivoted contact arm r^3 connected by a rod r^4 with and to be moved by the arm r', said arms, however, being insulated, as shown. The wire 4 from the motor F' is connected with the wire 11 leading to the + pole of the generator. The wire 12 leads from the contact s^3 to the — pole of the generator, a branch 13 from said wire 12 leading to the pivotal point of the contact arm r^3. The contact arm r' is connected by a wire 14 with the lever s^2. A second series of resistance contacts r^4 is arranged in the same arc with, but separate from the series r, and adapted to be swept by the same arm, said series r^4 being connected by a wire 18 with the wire 1 between the series r and the motor F.

Assuming the jaws of the bucket to be opened, as in Fig. 1, and the bucket below the surface of the water in position to dig, the operation of the device is as follows, viz: The operator, by means of a suitable handle, not shown, moves the arms r', r^3, from their central vertical dotted line position to the left, to cause said arms to sweep over the contacts r and r^2, the number of contacts swept determining the strength of the current admitted to the motors to rotate the latter in opposite directions, as indicated by the arrows Fig. 3, rotation of the motors with their pinions rotating the toothed wheels f^5 in the direction of the arrow Fig. 3, to draw the screw 8 up toward and into its full line position to close the jaws in the mud. When the jaws have been fully closed, the motors are of such power that they will be unable to continue in operation, thereby avoiding danger of breaking any of the parts. The operator then returns the contact arms r', r^3, to their central position to cut off the current from the motors, and by means of the usual lifting chain $c^\times$, Fig. 1, raises the bucket filled with mud. The boom B is then swung to one side to carry the bucket filled with mud into proper position to deposit its contents, the operator then moving the contact arms r', r^3, to the right from their central position, causing the arm r' to sweep over the series of resistance contacts r^4, such movement of the said arms also acting through the forked arm s^6 to reverse the polarity of the current passing to the motor F, to thereby cause it to operate in a reverse direction from before, to screw down the screw h, to open the jaws and deposit the mud where desired, the motor F' in the meantime remaining stationary, inasmuch as its controlling contact arm r^3 when moved to the right does not sweep over or co-operate with any contacts, the said motor F' being always rotated in one direction, and only rotated when the screw is to be raised and the jaws closed.

This invention is not restricted to the particular construction of apparatus herein shown, for it is evident the same may be varied in many ways without departing from the spirit and scope of the invention.

I have herein illustrated my invention in connection with a dredging machine, the electric motors operating the jaws thereof, but my invention is not limited in its use to dredging machines, for my said invention is equally applicable to apparatus employed in handling coal or handling articles of merchandise such as the raising and lowering of bales of cotton in loading and unloading ships, the only difference being in the particular kind of jaws employed, the jaws for dredging machines and such work being adapted to engage mud, and the like, whereas for articles of merchandise the jaws will be suitably shaped to grip the particular articles operated upon.

I consider myself to be the first to operate the jaws of an apparatus such as described by means of an electric motor raised and lowered with the jaws, and that I am entitled to claim such a construction broadly without reference to details.

The advantages resulting from such a method of operating a bucket are obvious, for with the several parts properly insulated and protected from the water, as they may readily be, the said motors may be operated beneath the surface of the water without the drawbacks incident to the use of steam, which has hitherto been attempted, and much more satisfactory than by hydraulic pressure now in use to a limited extent.

It is easier and more practicable to run electric conductors, properly insulated, below the surface of the water or for a considerable distance, than any pipe suitable for containing either hydraulic or steam pressure, and easier even than to use the usual operating cables or chains now generally used.

Having described one embodiment of my invention, and without limiting myself as to details, what I claim as new, and desire to secure by Letters Patent, is—

1. The combination with a bucket having two movable jaws, of a frame to which said jaws are connected, an electric motor mounted on said frame, and means actuated thereby to close said jaws, substantially as described.

2. The combination with a bucket having two jaws hinged at their inner adjacent sides, of a frame to which the outer ends of said jaws are connected; an electric motor mounted on said frame, its armature; and connections between the motor and joint connecting said jaws, whereby the said joint may be moved to open and close said jaws, substantially as described.

3. The combination with a clam-shell bucket having two hinged jaws, and a frame in which the outer ends of said jaws are connected, of two electric motors attached to said frame, a screw connected with the hinge of said jaws and moved longitudinally by operation of said motors to open and close said jaws, substantially as described.

4. In a machine of the class described, a bucket composed of two jaws hinged together, a frame to which the outer ends of said jaws are connected, a screw connected with the hinge joint between said jaws, a toothed wheel in which said screw is threaded, and one or more electric motors to rotate said wheel and thereby cause longitudinal movement of said screw to open and close said jaws, substantially as described.

5. In a dredging machine, the combination with a bucket, and supports to enable the same to be immersed below the surface of the water, of a water-proof electric motor connected to and movable with said bucket and to operate the latter to open and close its jaws, substantially as described.

6. A machine of the class described, containing the following instrumentalities, viz;—a frame adapted to be raised and lowered, a plurality of jaws connected thereto, an electric motor raised and lowered with and connected to and to operate the said jaws, a distant circuit-controlling device, and connections between the same and said motor whereby said motor is controlled from a distant point, substantially as described.

7. A machine of the class described containing the following instrumentalities, viz:—a frame adapted to be raised and lowered and a plurality of jaws connected thereto, an electric motor raised and lowered with and connected to and to operate the said jaws, a distant circuit-controlling device, flexible connections connecting the same with said motor, and a take-up to take up and give out the slack in said connections to permit the said bucket to be raised and lowered, substantially as described.

8. A machine of the class described containing the following instrumentalities, viz;—a boom, a bucket connected therewith, and means to raise and lower the said bucket; two electric motors on and to operate said bucket, a distant circuit-controlling device to control the operation of both motors in one direction and to reverse one of the said motors and not the other, for the purpose specified.

9. A movable frame, one or more movable jaws carried by said frame, an electric motor carried by and movable with said frame and connected with and to operate said jaws, substantially as described.

10. In an apparatus such as described, the combination with a boom, a frame suspended therefrom and adapted to be raised and lowered with relation thereto, a plurality of engaging jaws carried by said frame, and one or more electric motors also mounted on said frame and connected with and to operate said jaws, substantially as described.

11. In an apparatus such as described, the combination with a boom, and a bucket and its frame suspended therefrom and adapted to be raised and lowered with relation thereto,

of one or more electric motors attached to and movable with said bucket frame and to control the operation of said bucket, substantially as and for the purpose specified.

12. A support, a grip or bucket having a plurality of engaging jaws suspended from said support, one or more electric motors also suspended from said support and connected to and thereby moved with said grip or bucket as the latter is raised, lowered, or otherwise changed in position with relation to said support, and connections between the said motor or motors and said jaws, whereby the latter are operated by the former, substantially as described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

COLCORD UPTON.

Witnesses:
FREDERICK L. EMERY,
EMMA J. BENNETT.