(No Model.) 7 Sheets—Sheet 1.

C. H. SOUTHER.

DREDGING MACHINE.

No. 477,827. Patented June 28, 1892.

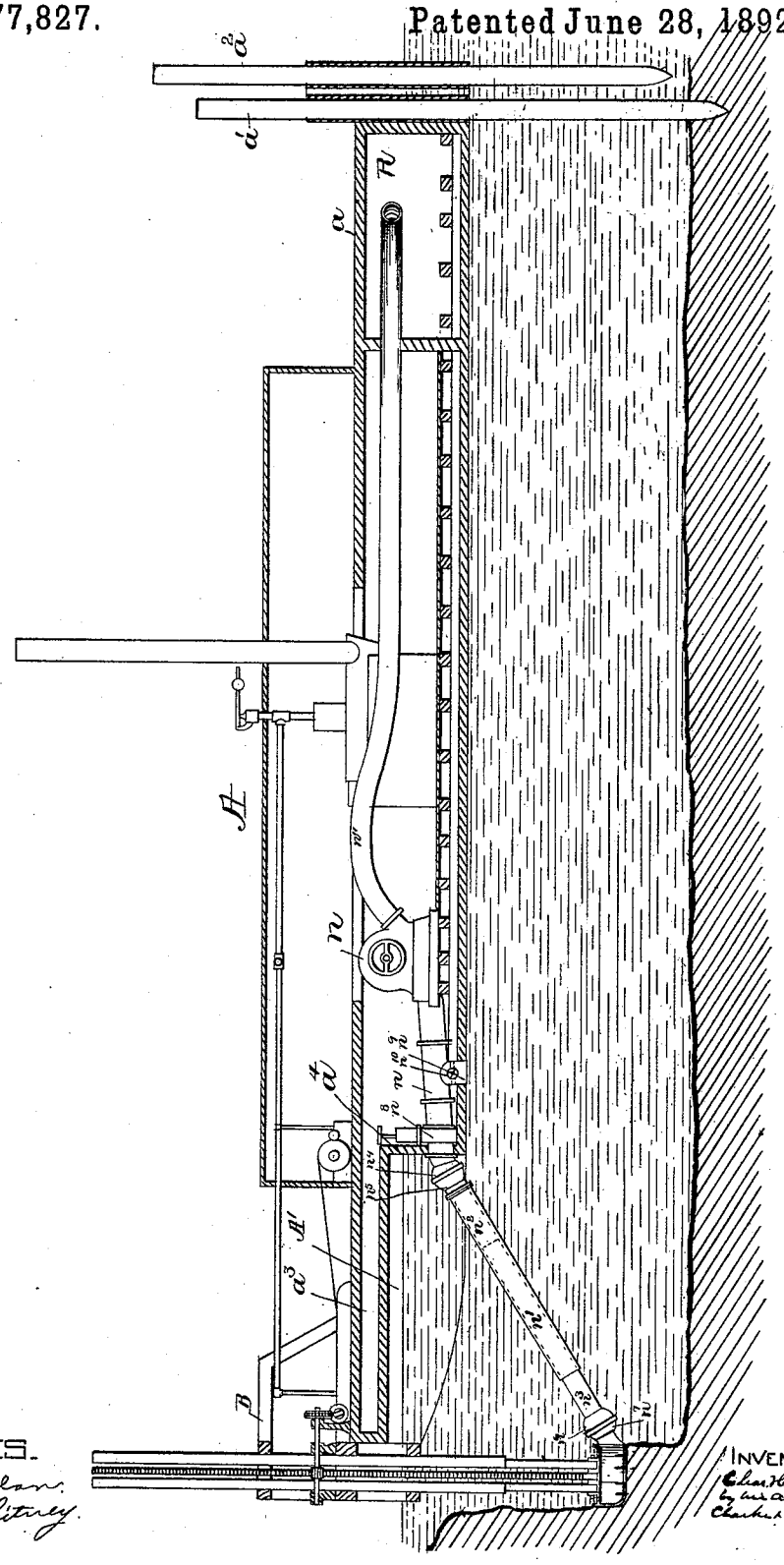


FIG. 1.

WITNESSES.
J. W. Dolan.
W. N. Whitney.

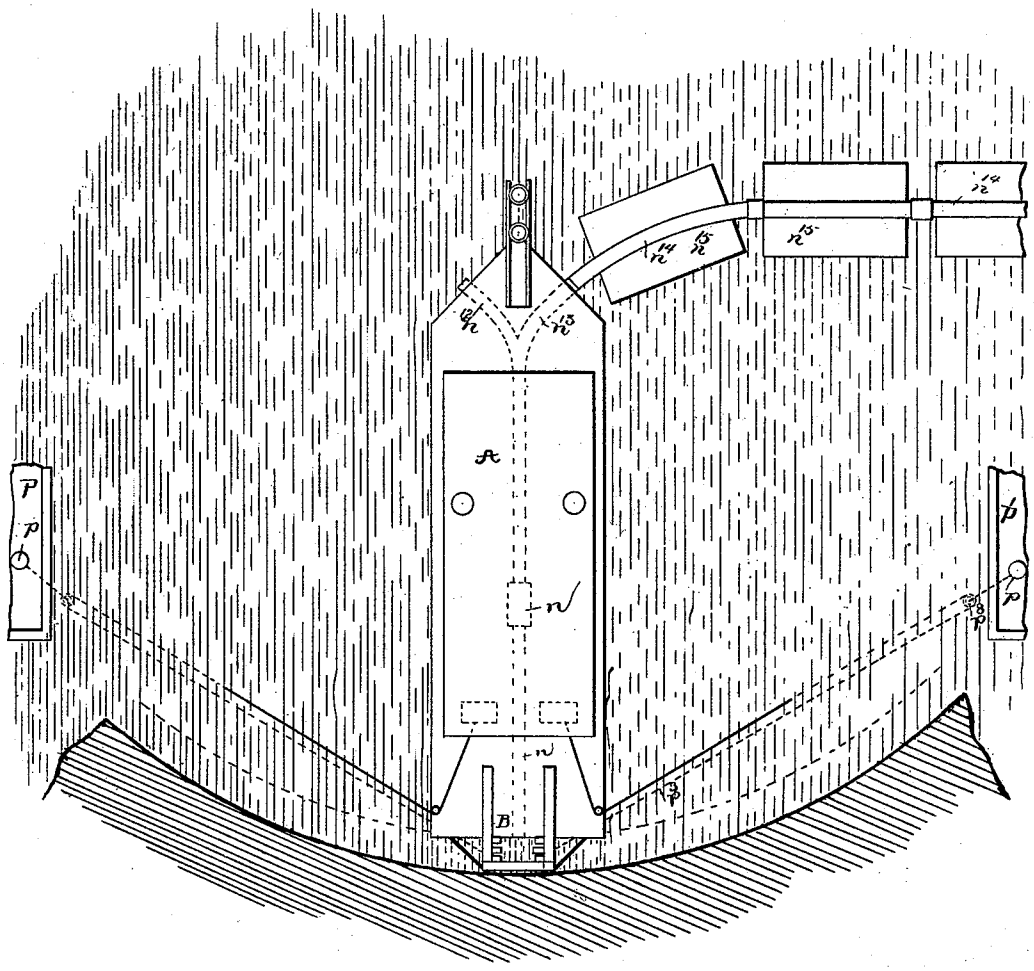
INVENTOR.
Chas. H. Souther
by his attys
Church & Rymond

(No Model.) 7 Sheets—Sheet 2.

C. H. SOUTHER.

DREDGING MACHINE.

No. 477,827. Patented June 28, 1892.



WITNESSES.
J. M. Dolan.
W. N. Whitney.

Fig. 2.

INVENTOR.
Chas. H. Souther
by his Attys.
Church & Raymond

(No Model.) 7 Sheets—Sheet 3.

C. H. SOUTHER.

DREDGING MACHINE.

No. 477,827. Patented June 28, 1892.

Fig. 3.

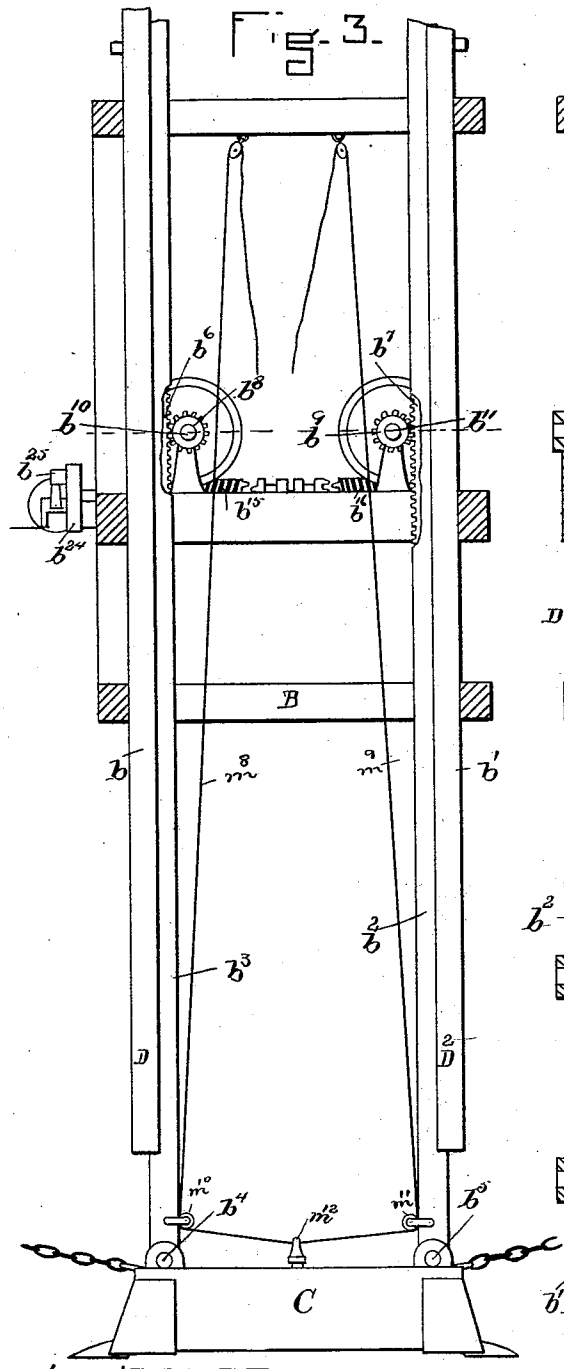
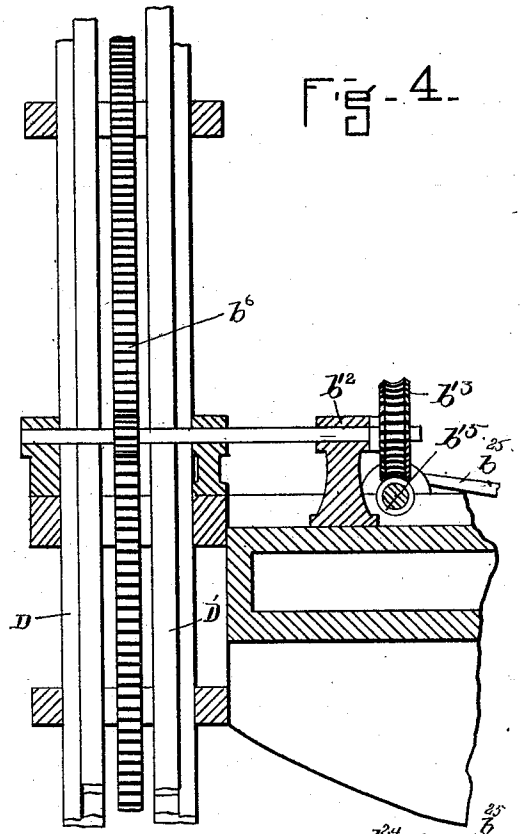


Fig. 4.



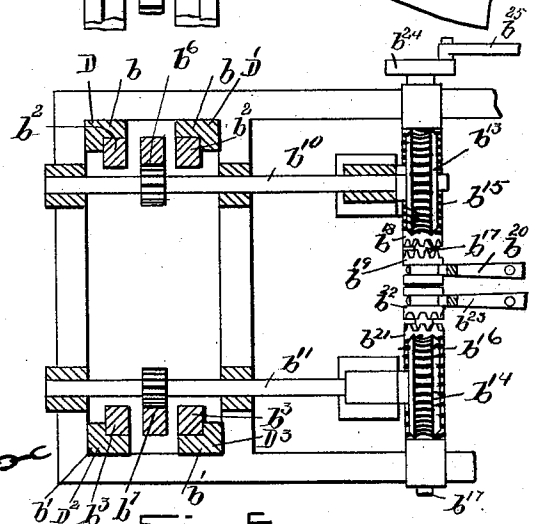


Fig. 5.

WITNESSES.

L. M. Dolgn.
W. H. Whitney.

INVENTOR.

Chas. H. Souther
by his attys.
Church & Sprague

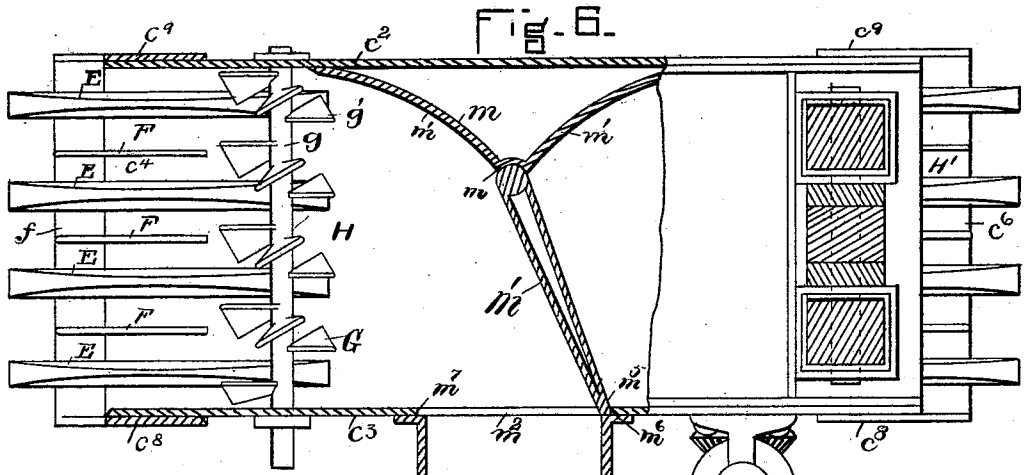
(No Model.) 7 Sheets—Sheet 4.

C. H. SOUTHER.

DREDGING MACHINE.

No. 477,827. Patented June 28, 1892.

Fig. 6.



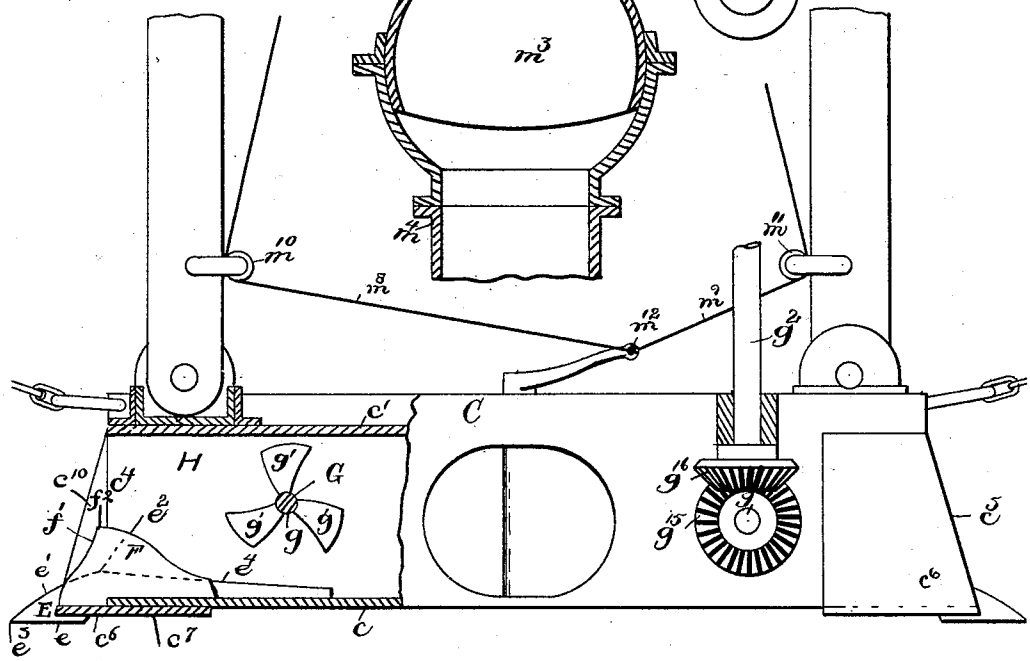


Fig. 7.

WITNESSES.

J. M. Dolan.

W. N. Whitney.

INVENTOR.

Chas. H. Souther

by his Attys

Clarke & Seymour

(No Model.) 7 Sheets—Sheet 5.

C. H. SOUTHER.

DREDGING MACHINE.

No. 477,827. Patented June 28, 1892.

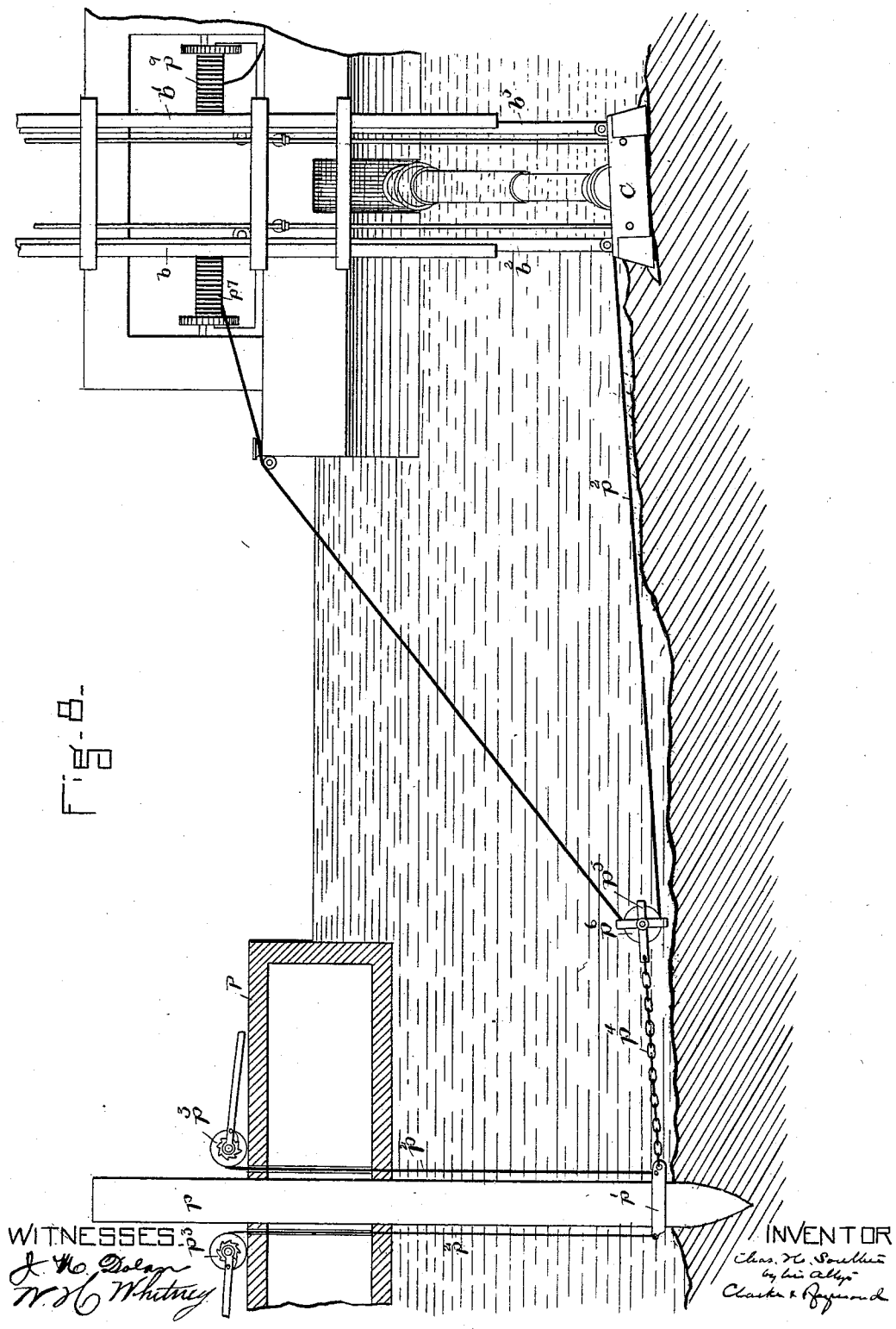


Fig. 8.

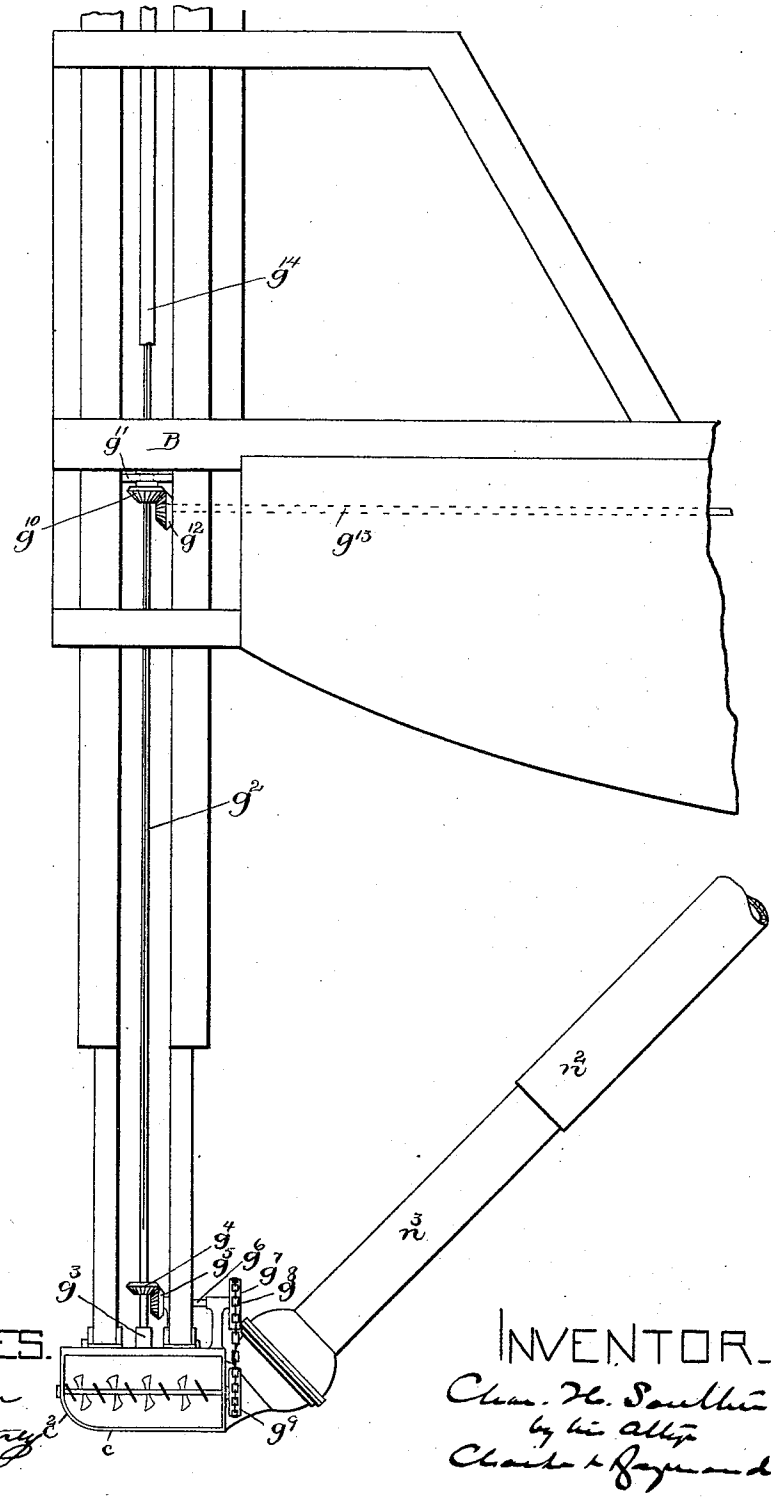
(No Model.) 7 Sheets—Sheet 6.

C. H. SOUTHER.

DREDGING MACHINE.

No. 477,827. Patented June 28, 1892.

Fig. 9.



WITNESSES.
J. McDolan
W. H. Whitney

INVENTOR.
Chas. H. Souther
by his Attys
Charles & Raymond

(No Model.)

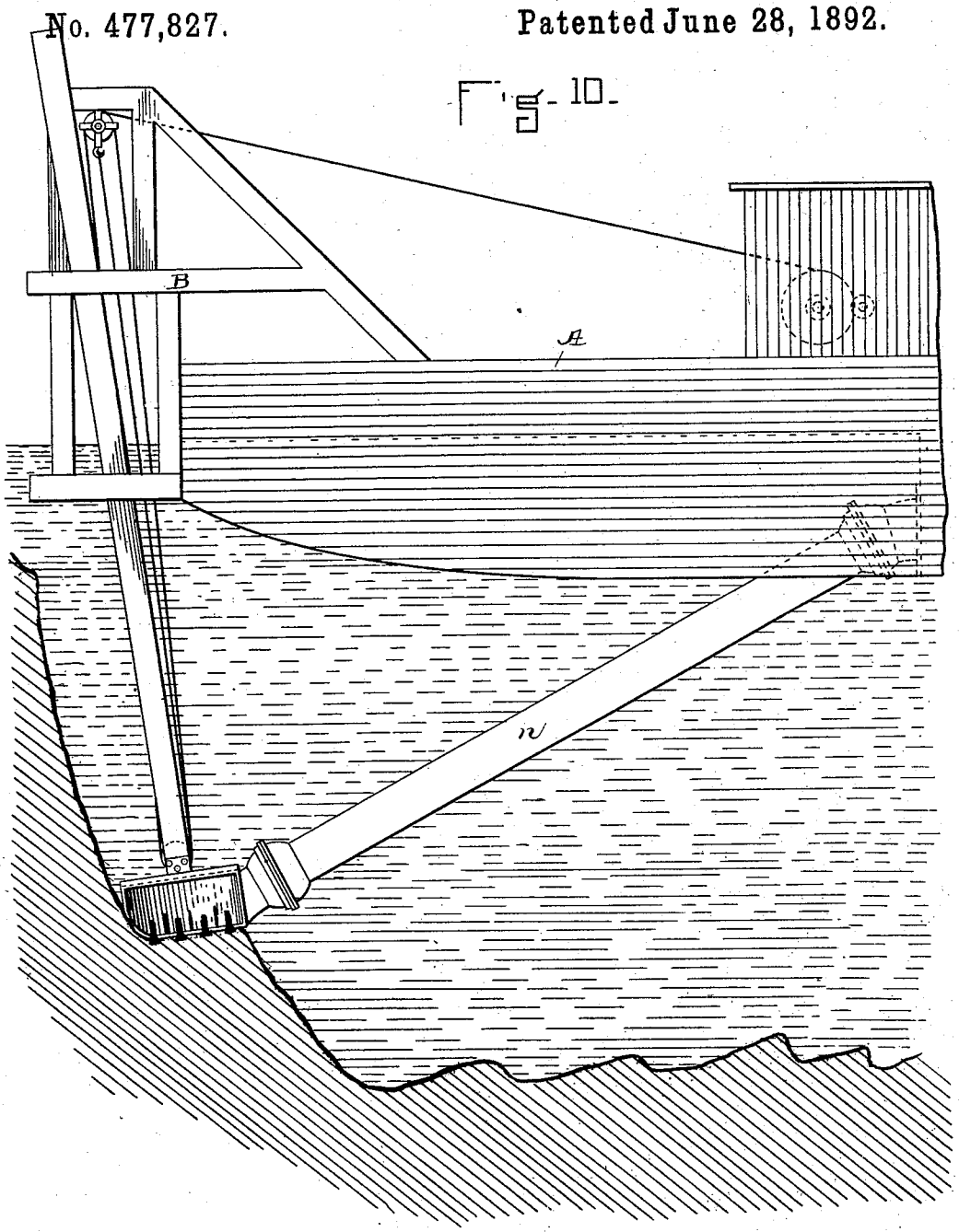
7 Sheets—Sheet 7.

C. H. SOUTHER.

DREDGING MACHINE.

No. 477,827. Patented June 28, 1892.

Fig. 10.



WITNESSES.

J. McDolan

W. H. Whitney

INVENTOR.

Chas. H. Souther

by his Attys.

Clarke & Raymond

UNITED STATES PATENT OFFICE.

CHARLES H. SOUTHER, OF BOSTON, MASSACHUSETTS.

DREDGING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 477,827, dated June 28, 1892.

Application filed January 26, 1891. Serial No. 379,205. (No model.)

To all whom it may concern:

Be it known that I, CHARLES H. SOUTHER, a citizen of the United States, residing at Boston, in the county of Suffolk and State of Massachusetts, have invented a new and useful Improvement in Dredging-Machines, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming a part of this specification, in explaining its nature.

The invention relates to dredging-machines having what is known as a "scoop-bucket;" and it comprises a bucket of novel construction having two mouths or openings, preferably upon opposite sides, whereby it is adapted to be operative whichever way it is caused to be moved in making what is known as a "cut;" also, to the combination of such double-acting bucket with an exhausting device or pump; also, to the construction of the bucket; also, to the manner of connecting the same with the dredging boat or support and to the means for operating or moving the bucket both vertically and horizontally; also, to a valve for alternately connecting the operative sections of the bucket with the exhaust pipe or device; also, to a scoop of the character specified having a device for breaking up the material forced into its cavity by the action of the scoop to better prepare it for passage through the exhaust-pipe; also, to various other features of construction, which will hereinafter be more fully described.

Referring to the drawings, Figure 1 represents, principally in longitudinal vertical section, a dredging-boat having the features of my invention. Fig. 2 is a view in plan thereof and of certain necessary adjuncts, to which reference will hereinafter be made. Fig. 3 is a view, enlarged, showing, principally in front elevation, the scoop and devices for suspending it and giving it vertical movement. Fig. 4 is a detail view, in section and side elevation, to further illustrate said mechanism. Fig. 5 is a view, principally in horizontal section, upon the dotted line of Fig. 3. Fig. 6 is a view, enlarged, in horizontal section, of the bucket and a portion of the exhausting-pipe. Fig. 7 is a view, enlarged, principally in front elevation, of the bucket and attachments, a portion of the vertical wall of one end of the bucket being removed to show its interior construction. Fig. 8 is a view, principally in front elevation, to show the means employed for giving horizontal movement to the scoop. Fig. 9 is a view, principally in side elevation, illustrating a modified form of the mechanism for actuating the cutters in the scoop, which will hereinafter be described. Fig. 10 is also a view, principally in side elevation, of a modified form of the connection between the scoop and the exhausting-pump on the dredging-boat.

Referring to the drawings, A represents the dredging-boat or boat supporting the operative parts of the machine. It carries at its rear end a the spuds a' a^2 and suitable mechanism for operating the same. These spuds are alternately used as pivots upon which the boat is swung, as hereinafter specified. The forward end a^3 of the boat is formed with a channel A′ in its bottom extending from the point a^4. This end of the boat supports a frame-work B, which extends beyond the end of the boat and provides vertical guides and supports b b' for the slide rods or supports b^2 b^2 and b^3 b^3 and rack-bars b^6 b^7 of the scoop C, the slide-rod or supports and rack-bars being separated from each other by very nearly the length of the scoop and being attached, respectively, to each end of the scoop by pivots b^4 b^5, which extend through ears upon the scoop and the ends of the rods.

The bucket or scoop C and the slide rods or bars b^2 b^3 are provided with vertical movement by the rack-bars b^6 b^7, with which the pinions b^8 b^9 respectively engage. The pinions are supported by shafts b^{10} b^{11} and the shafts have suitable bearings in the frame-work B and standards b^{12} upon the deck of the boat. The shaft b^{10} has a worm-wheel b^{13} at its front end and the shaft b^{11} a worm-wheel b^{14} at its front end. There is arranged to engage the worm-wheel b^{13} the worm b^{15}, and the worm-wheel b^{14} the worm b^{16}. (See Figs. 3, 4, and 5.) These worms are carried by a common operative shaft b^{17}, which is free to turn in the worms, excepting when engaged with one or both of them by a clutch, and for this purpose the worm b^{15} has at its end the member b^{18} of a clutch, with which the rotary member b^{19} of a clutch is adapted to be engaged by means of a lever b^{20} or in any other desired way. (See Fig. 5.) The worm

b^{16} has a member b^{21} of a clutch, with which the rotary member b^{22} of a clutch is adapted to be engaged by means of the lever b^{23} or in any other desired way. The shaft b^{17} is rotated by means of a crank b^{24} and pitman b^{25} (see Fig. 5) or run by an independent or donkey engine, if desired, or in any other suitable way. This provides means whereby the scoop or bucket C is vertically moved, and also whereby each end is adapted to be moved independently of the other end and its inclination varied. (See Fig. 8.)

The uprights of the frame B are in four sections D D′ and D^2 D^3, two on each side of the frame B. Each of these sections is shaped to form a guideway for the vertically-movable bars, the sections D D′ thus forming guides and supports for the bars b^2 and the sections D^2 D^3 forming guides and supports for the vertically-movable bars b'. The bars b^2 b^6 b^2 on one side and b^3 b^7 b^3 on the other are firmly united with each other.

The bucket or scoop C is made of heavy sheet-iron properly reinforced by angle-braces. It is represented in the drawings as rectangular in plan and vertical section, excepting at its lower front corner, (see Fig. 9,) it being represented about twice as wide as it is high. The bottom plate c of the bucket extends its full length and is connected with the top plate c', which also extends its full length, by side plates c^2 c^3. Each end c^4 c^5 of the bucket is open. The side plate c^2 is curved inwardly upon its lower side and corner to meet the bottom plate c. Each opening is provided with a knife or cutter c^6 c^6. Each knife or cutter is formed by means of a bent metal plate of a shape to provide the bottom c^7 and side wings c^8 c^9, (see Figs. 6 and 7,) the wings having the inclined edges c^{10}, and the wings are of such size to lap upon the sides c^2 c^3 of the scoop or bucket, while the bottom c^7 bears against the bottom plate c of the scoop or bucket and extends beyond its end. (See Figs. 6 and 7.)

There may be in each mouth or opening of the bucket or scoop the metal picks, points, or projections E, fastened firmly to the bottom of the scoop and extending beyond the opening, and preferably below the same, as represented in Fig. 7, and also preferably having the flat under surfaces or feet e and the inclined upper surfaces e', extending to the point e^2 and having the pointed ends e^3, the surface e^4 of the projections from the point e^2 inward preferably inclined downward to the inner end, the feet e or lower portions of the points preferably extending through recesses formed in the front edge of the knife c^5. These points are preferably flat at e^3 and narrowed upwardly, each of the pieces E being formed comparatively thin at the top and increasing in thickness from the top downward to the base. This is for the purpose of improving the clearance of the material as it passes or is forced through the scoop or bucket. The points E serve to enter the earth or material to be dredged in advance of the scoop and to loosen and break it up, so that it enters or may be forced into the mouth of the scoop or bucket more readily. In addition to these breaking-up points or projections there may be used blades F, (see Figs. 6 and 7,) interposed between the breakers E, but thinner than the breakers and preferably not extending beyond the edge f of the scoop. These separators are shaped to bear upon the bottom plate c and the scoop extension c^5 and have an inwardly and upwardly extending curved sharpened edge f' (see Fig. 7) to the point f^2. These plates F act to cut and divide the loosened material into smaller bits or masses than it otherwise would be in after it has been loosened by the points E and dragged into the mouth of the scoop, and also to prevent large rocks or other solid matter of a size too large to be forced through or handled by the pump to enter the scoop. To still further separate the mass of material into smaller parts, there may be used well within the mouth of the scoop a rotary breaker or separator G, comprising a shaft g, extending across the scoop-chamber from side to side, having suitable bearings upon each side and at the middle, if desired, and supporting breaking or separating arms g' of any desired form or shape. In the drawings I have represented them as enlarged or widened at their ends and as obliquely placed upon the shaft.

It will be understood that each of the two operative sections of the scoop or bucket, which for convenience I have lettered H H′, respectively, are similarly equipped with the parts herein named, or as many of them as may be desirable for the material being dredged or excavated, it being understood that different materials require different treatment—for instance, sand and gravel one, clay another, and dock-mud still another.

The two sections H H′ of the scoop or bucket are separated from each other by a partial partition M, which extends from the wall c^2 to the point m and has a curved surface m' on each side of the point extending to the side plate c^2. This partition extends from the plate c^2 about a third of the width of the scoop-chamber and there is pivoted or otherwise secured to the point m a gate or valve M′, which serves to separate or divide the scoop into its two operative sections H H′, and which also alternately connects the two sections with the hole m^2 in the plate side c^2, which opens into the passage m^3 in the conveying or exhaust pipe m^4. (See Fig. 6.) When in a position to open the section H of the scoop and to close the section H′, the end m^5 of the gate or valve bears against the shoulder m^6, (see Fig. 6,) and when in a position to close the section H and open the section H′ it bears against the shoulder m^7. In the construction represented in Fig. 6 this gate or valve is automatic in its action—that is, the movement of the scoop or bucket in a direction to force the material

into the section H causes the material to force or throw the gate or valve into the position represented in Fig. 6, and the draft and passage of the material and water through the opening m^2 maintains the gate or valve in this condition during the feeding movement of the scoop or bucket in this direction. Upon the reverse movement of the scoop or bucket the section H is no longer used, the section H, becoming operative and being forced into the bank or material. The gate or valve M′ is then automatically swung or moved to a position to connect the section H′ with the opening m^2, and this position of the gate or valve is maintained during the reverse feeding movement of the bucket or scoop.

In Figs. 3 and 7 I have represented the gate or valve as operated from the deck of the dredging-boat by means of chains or cords m^8 m^9, extending from the deck to the sheaves m^{10} m^{11}, secured to the slide-bars b^2 b^3, respectively, to the lever m^{12} above the top plate of the scoop or bucket, and attached or secured to the pivot of the gate or valve M′. By this means the gate or valve may be moved from the deck of the dredging-boat, as desired, and also held in any desired position. The shafts g may be rotated or turned in any desired way. In Fig. 9 I have represented each of them as rotated by means of the vertical shaft g^2, having a bearing at g^3 upon the top of the scoop and having at its lower end a bevel-gear g^4, which meshes with the bevel-gear g^5 upon the short horizontal shaft g^6, supported by standards upon the top of the scoop or bucket. This shaft has a sprocket-wheel g^7, from which a chain g^8 passes to the sprocket-wheel g^9 upon an extension of the shaft g through the inner side c^3 of the scoop or bucket. The vertical shaft g^2 is rotated, when desired, by the bevel-gear g^{10}, having a bearing at g^{11}, attached to the frame B and the bevel-gear g^{12}, with which the bevel-gear g^{10} meshes and which is upon the end of the horizontal shaft g^{13}, operated by any convenient engine or power upon the boat. The vertical shaft is free to move vertically in the gear g^{10} and is steadied at its upper end by the sleeve g^{14}, carried by the frame B.

In Fig. 7 I have represented the vertical shaft g^2 as somewhat differently placed from its position in Fig. 9 and so as to operate directly the shaft g, the shaft in such case having a bevel-gear g^{15} at its end, which meshes with the bevel-gear g^{16} on the lower end of the vertical shaft g^2.

The scoop or bucket is connected with a centrifugal or other exhaust-pump or equivalent device N in the boat A by means of a suitable connecting conduit or pipe. This pump is represented as placed upon the lower floor of the boat toward its front or scoop end and near the beginning of the channel A′, and I have represented it as connected with the two sections H H′ of the scoop or bucket by means of the pipe n, extending from the pump through the vertical wall a^4 of the boat, and the extensible or telescopic pipe n', which extends from the end of the pipe n to the side of the scoop or bucket. This extensible pipe n' is composed of the members n^2 n^3, the member n^3 sliding in the member n^2. There is secured at the outer end of the pipe n one section n^4 of a ball-joint and upon the member n^2 of the extensible pipe the other member n^5 of a ball-joint, the two members n^4 and n^5 of the ball-joint permitting the extensible pipe to be moved in any relation to the pipe n. The member n^3 of the extensible pipe has at its lower end the section n^6 of a ball-joint, and there is secured to the side plate c^3 of the bucket or scoop by the section n^7 of a ball-joint. This connection between the extensible pipe and the bucket permits the bucket to take any required angle in relation to the extensible pipe as it is moved or fed. In the pipe n there is placed a cut-off valve n^8 to close or vary the size of the opening in the pipe. There is also connected with the pipe n a pipe n^9, extending through the side or bottom of the boat to take water and which opens into the pipe n, and this pipe has a valve n^{10}, by which its opening may be closed or regulated in size. The object of this connection is to provide the pump with such relief as may be desired from time to time, either from the nature of the material being worked upon by the scoop or bucket or from its being clogged or partially clogged or for any other reason.

The pump discharges the dredged material through the discharge conduit or pipe n^{11}, which extends through the boat to the rear end of the boat where it has branching ends n^{12} n^{13}, each of which is provided with a suitable valve, (not shown,) and either one of which is adapted to be connected by pipes or conduits n^{14}, carried upon pontons or scows or other floating supports n^{15}, by which the dredged material is conveyed to any desired point of ejection.

To operate the scoop or bucket, it is necessary to swing the dredging-boat, and therefore the bucket, upon the spud-pivot and at the same time to draw the scoop or dredge through the material or bank which is being excavated. This is represented as accomplished by means of two scows P P′. (See Fig. 2.) These scows are anchored or made fast one upon each side of the dredging-boat and at a suitable distance therefrom, and the scoop or bucket is connected with each by means of chains or ropes, one passing from near one front of the scoop or bucket to a sheave carried by the scow P and thence back to a windlass or winding-drum, preferably operated by power, and the other rope or chain extending from the other end of the scoop or bucket over a sheave attached to the scow P′ back to a suitable windlass or winding-wheel upon the dredging-boat.

In Figs. 2 and 8 I have represented each scow as having an anchoring-spud p. This spud is provided with vertical movement in relation to the scow in the ordinary way, and

there is arranged to slide upon the spud a collar or ring p'. (See Fig. 8.) This collar or ring is adapted to be raised and lowered by means of chains or ropes p^2, extending upward from it through the scow to windlasses or winding-drums p^3. (See Fig. 8.) To this ring or sleeve p' is attached a chain p^4, which bears at its outer end a skeleton frame p^5 for supporting a sheave p^6. A chain or rope P^2 extends from one end of the bucket or scoop about the sheave to the winding-drum or windlass p^7 upon the deck of the dredging-boat. A chain or rope P^3 extends from the other end of the scoop or bucket C about a sheave p^8, attached to the spud of the scow P', and back to the windlass or winding-drum p^9 on the dredging-boat. (See Fig. 2.) The sheave-chains p^4 or the sheaves may be attached directly to the lower ends of the spuds. I prefer, however, to make the chain-supports vertically movable upon the spuds, as above specified, also to connect the sheaves with the spuds by chains of sufficient length to bring the sheaves and their frames beyond the sides of the scows, so that they shall not bear against the bottoms or sides of the scow and wear them or receive injury from them. By connecting the sheaves or pulleys with the spuds they are brought near the bottom to be dredged and held there, so that a straight or very nearly straight draft upon the bucket or scoop is obtained. I do not limit myself, however, to this method of anchoring or supporting the sheaves over which the draw-chains P^2 P^3 pass, but prefer it as being the one having the fewest objections and most readily adapted for all occasions.

In operation at the beginning of a cut the scoop or bucket C is inclined any desired extent by lifting one of its supports b^2 b^3. The lowermost end of the scoop or bucket is then drawn into the material until it has reached the desired level or position, when its rear end is lowered to bring the scoop or bucket to substantially a horizontal position. It is then drawn through the material toward one of the scows with the end of the dredging-boat by one of the draw-chains, the angle of the scoop or bucket to a horizontal plane being varied as the exigencies of the work may require. When the scoop or bucket has been thus moved up to the sheave or scow, its movement is reversed, and it is then fed in the opposite direction by the other draw-chain; but preparatory to making this second cut the scoop or bucket is set into the material by elevating the rear end and depressing the front end until it has entered the bank to a sufficient extent, when it is moved substantially horizontally, and this feed movement continues until a cut has been made which extends across to the scow or sheave upon the other side, and the operation of excavating continues in this way until as many cuts have been made as are desired, when the dredging boat and scows are moved forward to bring the bucket or scoop into a new operative position.

It will be seen that the action of the scoop or bucket is continuous in both directions; that one end or division of it acts when it is being drawn or fed in one direction, and the other end or division acts when it is being drawn in the reverse direction. The drawing of the scoop or bucket through the material to be excavated forces it into the mouth of the scoop or bucket, and it is drawn from the cavity or chamber of the scoop or bucket with the water with which it is mixed as it is forced into it through the conduit n by the exhausting action of the pump N.

The plows or advance points E serve to break up or loosen the material in front of the bucket as it is moved, and the separators and rotary breakers serve to still further separate or beat the mass into a condition to be more readily drawn through the conduit n. When the bucket or scoop has reached the end of its movement in one direction, the valve or gate m' is changed in position to shut off the section of the scoop or bucket last operating and to open the chamber of the next operating-section to the exhaust-conduit. In lieu of the construction above specified there may be used that shown in Fig. 10, in which the supporting-bars b^2 b^3 of the scoop or bucket, instead of having a vertical movement only, are supported or held by the frame B to have a tilting or swinging movement, whereby its vertical angle may be automatically changed or varied as the inclination of the scoop or bucket from side to side varies. This construction is employed when the scoop or bucket is connected with the dredging-boat by a conduit or pipe which is not extensible. When such construction is employed, the scoop or bucket is raised and lowered by means of a tackle, one for each end of the scoop or bucket, instead of by means of racks and pinions.

When an inextensible pipe is used, it is connected at its upper end with the pipe n by a ball-and-socket joint or by any other form of joint which will permit the change of the angle of the conduit in relation to it, and it is connected with the side of the bucket or dredge either directly or by means of a ball-and-socket or similar joint. When this construction is employed, as the excavation proceeds in depth the angle of the scoop or bucket from side to side becomes greater to a horizontal plane, and this requires that its supports be capable of inclination. (See Fig. 10.)

In order that the parts at the scoop end of the boat may be elevated above the water and easily reached for the purposes of repair or for other reasons, I have formed in the other end of the boat a water-tight chamber R, which is adapted be filled by water when desired to sink or lower this end of the boat, and thus elevate its bucket end. There are suitable

water inlets and outlets to the compartment (not shown) and a pump for filling and emptying it. While I have shown the bucket or scoop as having a single discharge-outlet common to both operative mouths or sections thereof, I would say that each mouth or section of the bucket may have an independent or separate discharge-outlet and be connected by a suitable conduit or pipe with the exhausting device; also, that the discharge outlet or outlets instead of being in the inner side of the scoop or bucket may be in its top.

While I have represented the draft-chains P^2 as extending from sheaves to power-driven windlasses or winding-drums upon the dredging-boat, I would say that they can be drawn by windlasses or winding-drums upon the scows P P'.

I consider that a dredging boat or apparatus having two independent or separate buckets or scoops and independent discharging conduits and apparatus, one so located that the mouth or operative end is opposite or away from the mouth or operative end of the other, and so that their movement shall cause one of them to be operative in one direction, and the other to be operative in the reverse direction, to be the mechanical equivalent of the construction which I have herein described.

The shafts *g*, carrying the breaking-arms, may be rotated by mechanism similar to that used in street-sweeping machines for revolving broom-shafts or in mowing-machines upon the movement of the scoop or bucket, the movements of the scoop causing the wheels or rolls placed upon the inner side of the bucket to rotate the shafts as the bucket is moved.

Having thus fully described my invention, I claim and desire to secure by Letters Patent of the United States—

1. A dredging-boat having a scoop or bucket having an operative mouth or section at each end thereof and a discharge-outlet adapted to be alternately connected with each of said operative mouths or sections, substantially as described.

2. A dredging scoop or bucket having an operative mouth or section at each end, a discharge-outlet common to both mouths or sections, and a gate or valve for connecting either section or mouth with the discharge-outlet and cutting out the other section or mouth, substantially as described.

3. A dredging bucket or scoop having two operative mouths or sections, a discharge-outlet common to both operative mouths or sections, a valve or gate for cutting out one section or mouth and connecting the other section or mouth with the discharge-outlet, and devices for moving the said valve or gate from without the scoop or bucket, as and for the purposes described.

4. In a dredging apparatus, the combination of a scoop or bucket having two operative mouths or sections, a discharge-outlet common to both mouths or sections, an exhaust pump or apparatus, and an extensible pipe connected at one end with the discharge-outlet of the bucket or scoop by a universal joint and at the other end by a universal joint with a pipe or conduit extending to the exhausting apparatus, substantially as described.

5. The combination of a hull or boat, a scoop or bucket, a steadying and suspending structure or support for the same, provided with vertical movement in a frame attached to the hull or boat, and to the lower end of which support the scoop or bucket is hinged to be movable upon a vertical arc, a discharge-outlet in said bucket or scoop, an exhaust pump or apparatus on said boat, a conduit connecting said discharge-outlet of the scoop or bucket with the exhausting apparatus, a pivot or spud upon which the hull or boat is adapted to be turned, and means for drawing the bucket and swinging the end of the boat upon said pivot or spud as a center, as and for the purposes described.

6. The combination of a hull or boat, a spud or pivot upon which one end of the hull or boat is adapted to be swung, a scoop or bucket having an operative mouth or section at each end thereof and connected with the swinging or movable end of the boat by two suspending supports to which the bucket or scoop is pivoted, as specified, an exhausting apparatus or pump carried by the boat, and a conduit or suction-pipe connecting the said apparatus with the operative mouths or sections of the scoop or bucket, as and for the purposes described.

7. The combination of a hull or boat, a spud or pivot upon which one end of the hull or boat is adapted to be swung, a scoop or bucket having an operative mouth or section at each end thereof and connected with the swinging or movable end of the boat by two suspending supports to which the bucket or scoop is pivoted, as specified, an exhausting apparatus or pump carried by the boat, a conduit or suction-pipe connecting the said apparatus with the operative mouths or sections of the scoop or bucket, and means for varying the longitudinal inclination of the bucket, as and for the purposes described.

8. The combination of a hull or boat, a spud or pivot upon which one end of the boat is adapted to be swung, a bucket or scoop having two operative mouths or sections secured to the movable end of the dredging-boat to be vertically movable or adjustable in relation thereto, and rack-bars connected with said scoop or bucket and pinions for engaging said bars, an exhaust pump or apparatus upon the boat, and a conduit or suction-pipe connecting the two mouths or sections of the scoop or bucket therewith, as and for the purposes described.

9. The combination of a hull or boat, one or more spuds or pivots upon which one end of the boat is adapted to be turned or swung, a

scoop or bucket having two operative mouths or sections arranged back to back in a common non-rotating frame suspended from the movable or swinging end of said boat, an exhaust pump or apparatus carried by said boat, a suction-pipe connecting the operative mouths or sections of said dredge with the exhaust-pump, and one or more draw chains or ropes extending from the bucket or scoop to one or more power-driven windlasses or winding-drums, as and for the purposes described.

10. The combination of a boat or hull, one or more spuds upon which one end of the boat is adapted to be swung or moved, a suspended bucket or scoop having two operative mouths or sections carried by the swinging or movable end of the boat, one of which mouths or sections is operative when the boat is movable in one direction and the other of which mouths or sections is operative when the boat is movable in the opposite direction, an exhaust pump or apparatus carried by the boat, a suction-pipe or conduit connecting the mouths or chambers alternately as they are operated with said exhaust apparatus, and draw chains or ropes extending from each end of the scoop or bucket to anchored sheaves or pulleys located in relation to the operative end of the dredging-boat, as specified, and thence to the windlasses or winding-drums upon the said dredge or boat, as and for the purposes described.

11. In combination, a dredging-boat one end of which is movable, a scoop or bucket having two operative mouths or sections suspended from the movable end of said boat and adapted to be longitudinally inclined to depress either end thereof, an exhaust pump or apparatus carried by the boat, a conduit or suction-pipe connecting both operative mouths or sections of the scoop or bucket with the said apparatus, and drawing devices for drawing the end of the dredge or boat successively in opposite directions, as and for the purposes described.

12. A swinging or movable dredging-boat having a suspended vertically-movable longitudinally-tipping scoop or bucket provided with two operative mouths or sections back to back and a discharging apparatus therefor, as and for the purposes described.

13. A swinging or movable dredging-boat having a suspended vertically-movable longitudinally-tipping scoop or bucket provided with two operative mouths or sections back to back and a discharging apparatus therefor and also movable toward and from the end of the boat, substantially as described.

14. The combination of a boat or hull, a suspended bucket or scoop of the character specified, held with its mouth always pointed and opened in the direction in which the bucket is moved, a discharge-opening, passage, or conduit therefor, and a sheave anchored at one end of the cut which the said scoop or bucket is to make and upon or approximating the line of said cut, and a draft chain or rope extending from said scoop or bucket over said sheave thus located to a windlass or winding-drum, as and for the purposes described.

15. The combination of a boat or hull having a suspended bucket or scoop provided with a discharge or suction pipe or conduit, a sheave or pulley located upon or near the line in which the bucket is moved, a draft chain or rope extending from the bucket over said sheave or pulley, and devices for adjusting or moving the sheave or pulley vertically, as and for the purposes described.

16. The combination of a dredging-boat, a scoop or bucket carried thereby, a scow anchored at or near one end of the cut or path of the scoop or bucket, a spud carried thereby, a sheave or pulley attached to said spud, and a draw chain or rope extending from the bucket or scoop over said sheave or pulley to a windlass or winding-drum, substantially as described.

17. The combination of a hull or boat having a suspended scoop or bucket, a discharge or exhaust passage or conduit connected therewith, a scow or ponton anchored at one side of the dredge, a spud carried thereby, a collar or support vertically movable upon said spud, a sheave or pulley attached to said movable collar or support, and a draw chain or rope extending from said scoop or bucket over said sheave or pulley to a windlass or winding-drum, substantially as described.

18. The combination of a hull or boat having a suspended bucket, a discharge or exhaust pipe or conduit extending from the bucket, an anchored ponton or scow, a sheave or pulley attached to the scow or ponton or a post or spud secured thereto to be beyond the side thereof, and a draft chain or cord extending from the bucket or scoop over the said sheave or pulley to a windlass or winding-drum, substantially as described.

19. The combination of a dredging-boat, a dredging apparatus carried by said boat, having two oppositely arranged or located scooping-mouths or operating-sections adjustable in relation to said boat and provided with suitable discharge or exhaust passage or passages, an anchored ponton or scow upon each side of the dredge, a pulley or sheave for each ponton or scow, supported in whole or in part thereby, and two draw cords or chains, one of which extends from one end of the apparatus over one of the sheaves or pulleys to a windlass or winding-drum and serves to operate or draw the dredge in one direction, and the other of which chains or ropes extends from the other end of the apparatus over the other sheave or pulley to a windlass or winding-drum and serves to draw the dredge in the opposite or reverse direction, as and for the purposes described.

20. The combination of the scoop or bucket C, having the operative mouths or sections H H′, the vertically-movable suspending bars b^2 b^3, attached to the scoop or bucket, respectively, at each end thereof, as specified,

the rack-bars and racks thereon, the pinions b^8 b^9, the shafts b^{10} b^{11}, the worm-wheels b^{13} b^{14} thereon, the worms b^{15} b^{16}, loose upon the shaft b^{17} and having members b^{18} b^{21} of clutches, and the members b^{19} b^{22} of clutches independently secured to said shaft b^{17} to be engaged, respectively, with the members b^{18} b^{21}, as and for the purposes described.

21. The scoop or bucket C, having the mouths or operative sections H H′, the outlet m^2, and the partial partition M and the valve M′, hinged to said partition, and stops m^5 m^7 therefor, substantially as described.

22. The scoop or bucket C, having the operative mouths or sections H H′, the discharge-outlet m^2, centrally located in relation to both mouths or sections, the partial partition M, having the curved surfaces m', and the valve M′, substantially as described.

23. The bucket or scoop C, having the operative mouths or sections H H′ and the curved outer side and corner c^2, as and for the purposes described.

24. The scoop or bucket C, having the operative mouths or sections H H′ and formed, substantially as specified, with the reinforcing scoop end pieces c^5, substantially as described.

25. The scoop or bucket C, having the operative mouths or sections H H′ and the independent teeth or points E, shaped substantially as specified and extending from each mouth near and at the bottom thereof, as and for the purposes described.

26. A bucket having an end mouth H, a discharge-outlet m^2, and the teeth or picks E, having the straight or substantially straight lower surfaces e, which extend below the line of the under surface of the scoop and act as feet or shoes, as and for the purposes described.

27. A bucket having an end mouth H, a discharge-outlet m^2, and the teeth or picks E, having the straight or substantially straight lower surfaces e, which extend below the line of the under surface of the scoop and act as feet or shoes and also having the inclined surfaces e', extending from their points e^3 to or substantially to the mouth of the bucket, as and for the purposes described.

28. The scoop or bucket having the discharge-outlet m^2 and picks or teeth E, extending therefrom, having wide tapering points e^3 and decreased in thickness from their lower sides upward, inclined from their points upward to the point e^2, and then downward, as and for the purposes described.

29. The bucket or scoop having an opening at one end, the discharge-outlet m^2, and the stationary separators F, substantially as described.

30. The bucket or scoop having an end opening, a discharge-outlet m^2, the scoop end c^5, the picks or teeth E, shaped as specified, and the separators F, substantially as described.

31. The combination of the bucket having an end opening, the outlet m^2, and the rotary separator G, substantially as described.

32. A bucket having an end receiving-opening, a side discharge-outlet m^2, the teeth or picks E, the stationary separators F, and the rotary breakers G, substantially as described.

33. A combined bucket or scoop having two operative mouths or sections H H′, a separate outlet for each mouth or section, and picks or teeth and separators in each mouth or section, as and for the purposes described.

34. The combination of the slide-scoop or bucket having a receiving-mouth at one end, the rotary breaker G, and a vertical movable rotary shaft connected with the shaft of said breaker to rotate it, as and for the purposes described.

35. The scoop or bucket having the side discharge-outlet and a section of a ball-joint secured to the side of the bucket about said outlet, and a conduit or suction-pipe having at its end the other section of the ball-and-socket joint connected with the first-named section of said joint, as and for the purposes described.

36. A dredging-boat having at one end the section or extension a^3, supporting the frame B, a bucket or scoop and its suspending bars carried by said frame B, a suction pipe or conduit connecting the bucket or scoop with an exhaust-pump upon the scow, extending through the end a^4 of the boat, as specified, and a compartment in the other end of said boat, adapted to be filled with water to depress said end of the boat and elevate the bucket end, as and for the purposes described.

CHARLES H. SOUTHER.

Witnesses:
F. F. RAYMOND, 2d,
J. M. DOLAN.