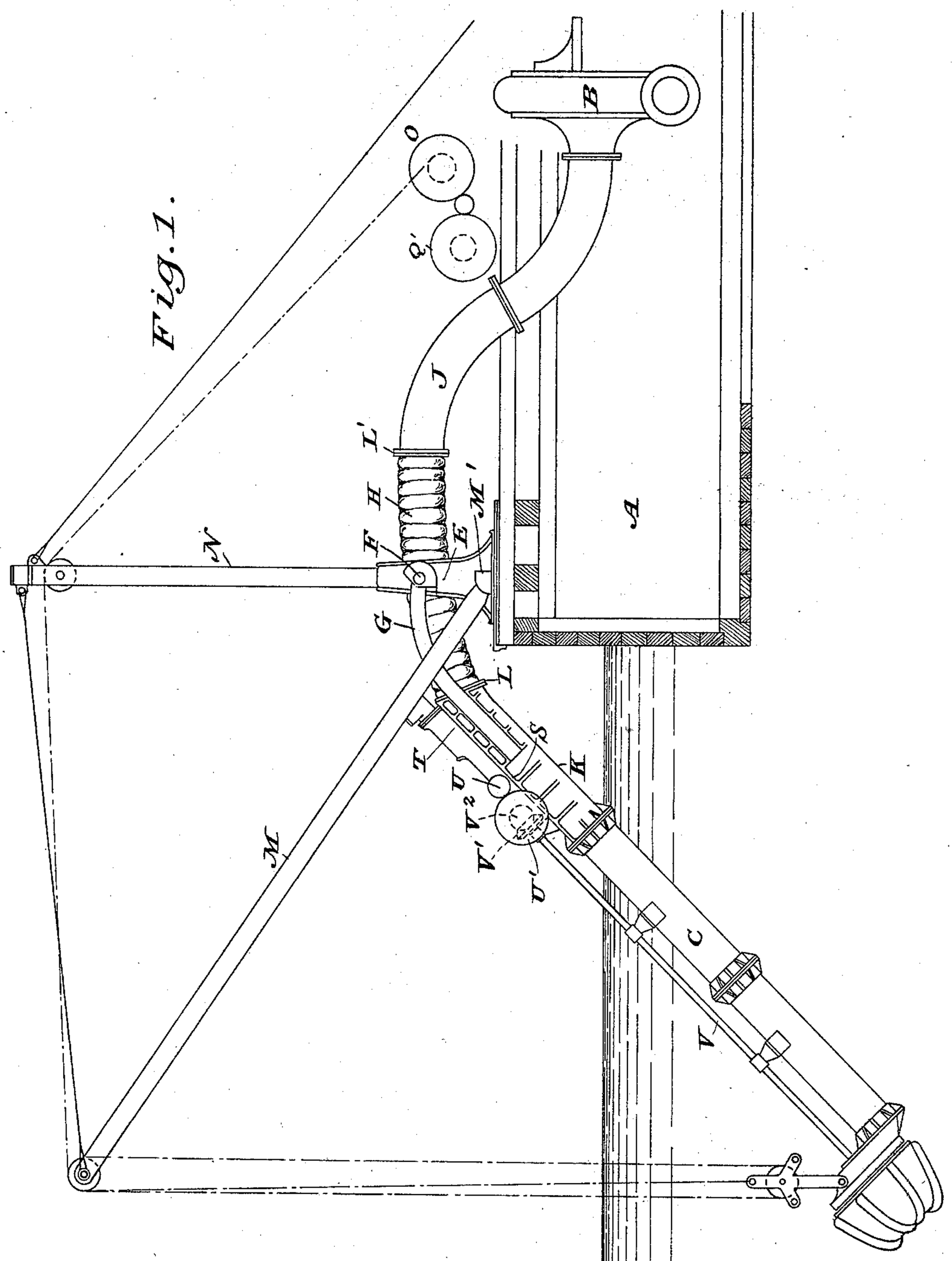
(No Model.) 3 Sheets—Sheet 1.

A. W. ROBINSON.

HYDRAULIC DREDGING APPARATUS.

No. 566,473. Patented Aug. 25, 1896.

Fig. 1.



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By his Attorney
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(No Model.)

3 Sheets—Sheet 2.

A. W. ROBINSON.

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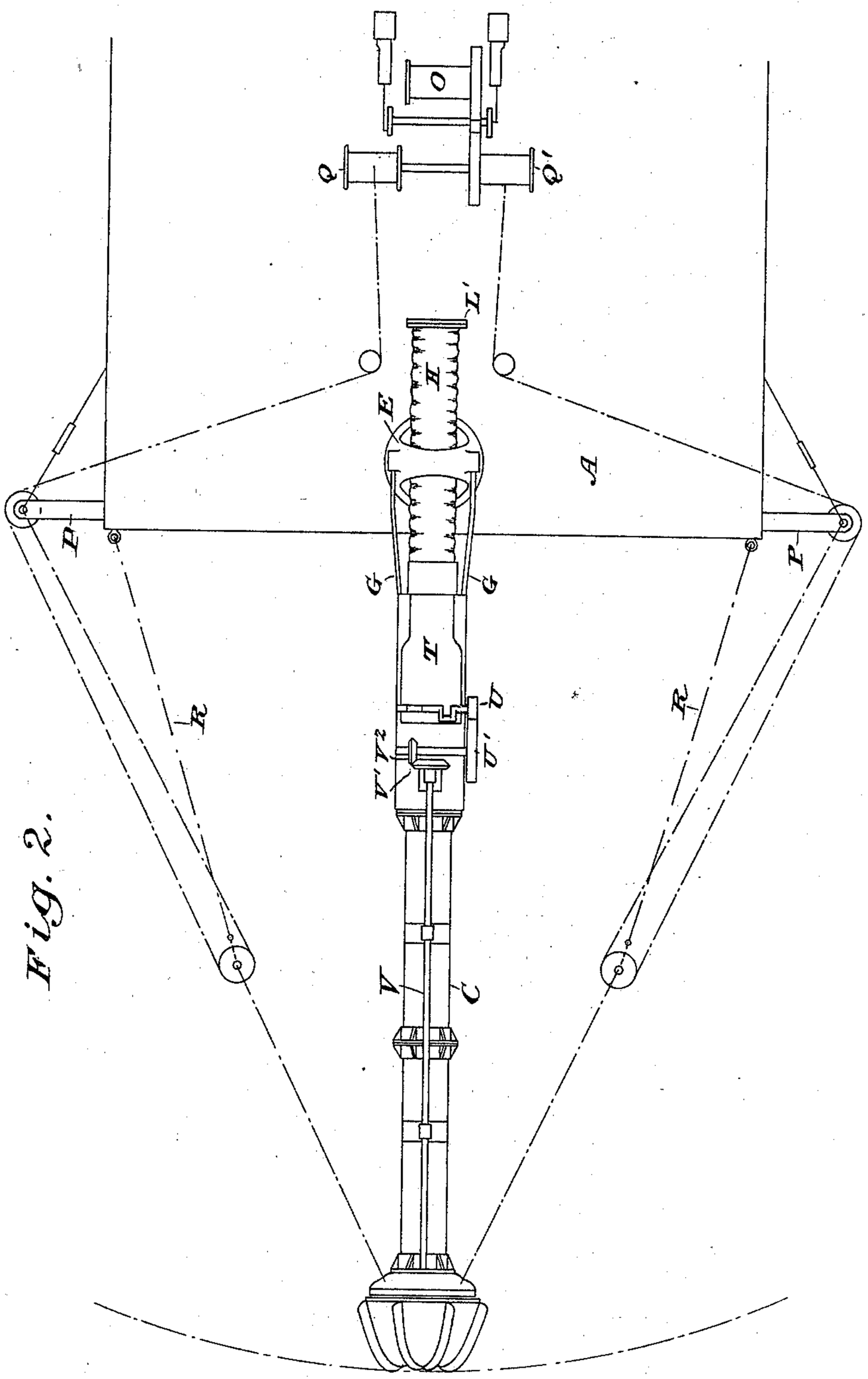

Fig. 2.

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HYDRAULIC DREDGING APPARATUS.

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Fig. 3.

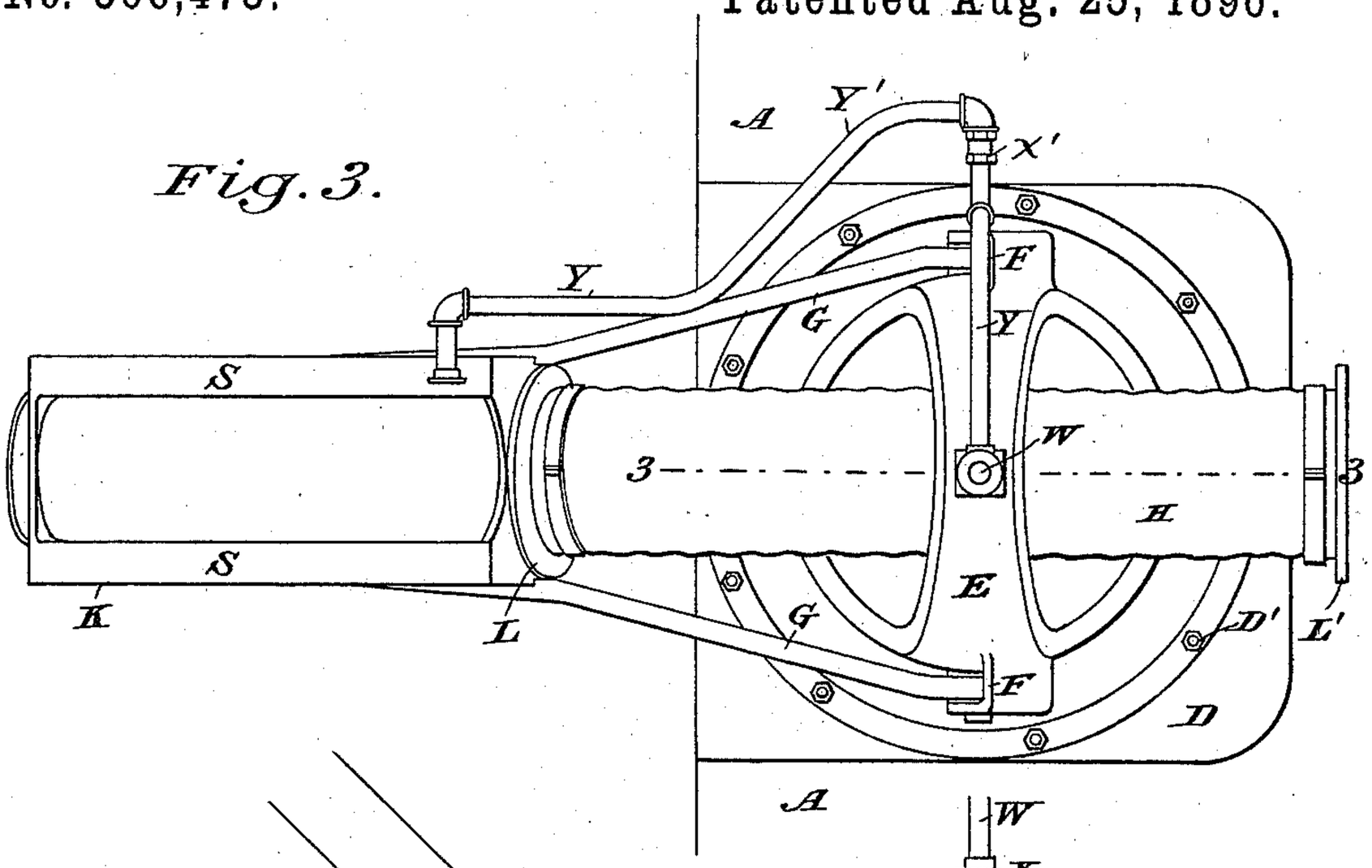
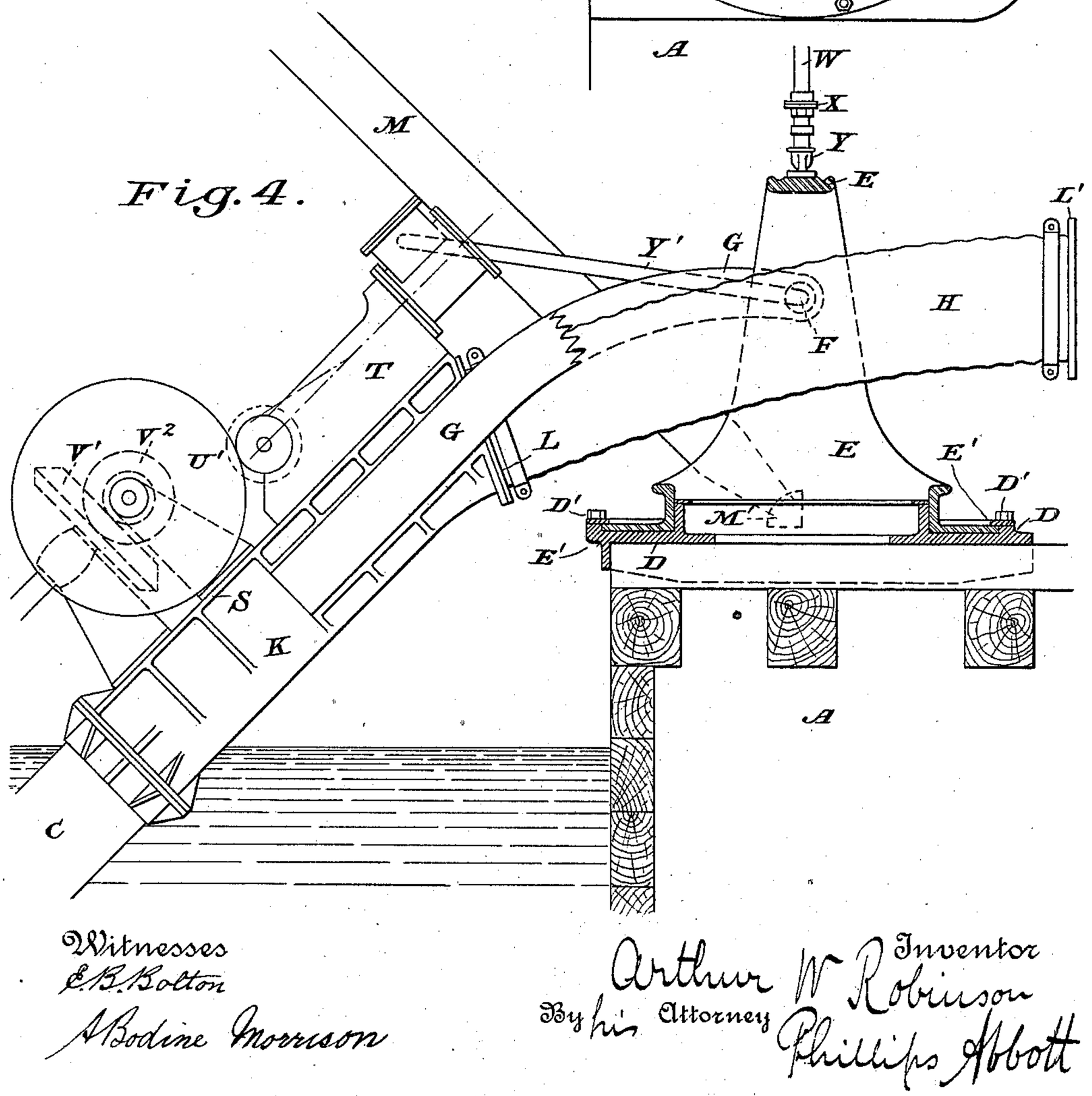


Fig. 4.



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UNITED STATES PATENT OFFICE.

ARTHUR W. ROBINSON, OF MILWAUKEE, WISCONSIN.

HYDRAULIC DREDGING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 566,473, dated August 25, 1896.

Application filed March 18, 1896. Serial No. 583,652. (No model.)

To all whom it may concern:

Be it known that I, ARTHUR W. ROBINSON, a citizen of the United States, and a resident of Milwaukee, in the county of Milwaukee and State of Wisconsin, have invented certain new and useful Improved Hydraulic Dredging Apparatus, of which the following is a specification.

My invention relates to that class of hydraulic dredging-machines in which a suction-pipe extends over the bow of the boat, and which may be fitted with a cutter-head or other excavating appliances, as desired.

The object of my invention is to provide a universal swing motion to the suction-pipe, so as to enable it to be raised and lowered to the required depth, and also to swing laterally on the hull, so that the end of the suction-pipe may make a cut of considerable width without swinging the hull, and also to provide a suction-pipe which will have a smooth and continuous interior, without sharp curves, while the above-mentioned motions are being performed, and otherwise to simplify and improve the apparatus. To accomplish this, my improvements involve certain novel and useful peculiarities of construction, relative arrangements or combination of parts and principles of operation, all of which will be herein first fully described, and then pointed out in the claims.

In the accompanying drawings, forming a part of this specification, Figure 1 is a longitudinal section of the front end of the dredging-boat or hull to which the devices may be applied, showing the suction-pipe and its connections in side elevation. Fig. 2 is a plan view of the same, the mast and boom being omitted. Fig. 3 is a plan view of the universal joint in detail. Fig. 4 is a side elevation of the same, showing the base-plate, arch-casting, and the universal joint in section on the line 3 3 of Fig. 3.

In all the figures like letters of reference indicate the same parts.

Referring to Fig. 1, A represents part of the hull or float upon which the machinery is mounted.

B represents a centrifugal pump or equivalent suction apparatus, operated by power, and which is connected with the suction-pipe C by means of a universal joint, as set forth below.

D is a base-plate (shown more clearly in Figs. 3 and 4) secured upon the hull, and having a turn-seat upon which an arch-casting E may revolve. The arch-casting E is confined to its seat upon the base-plate by a flange-ring D′, secured thereto by bolts, as shown, this flange-ring extending over the edge E′ of the flange of the arch-casting. This arch-casting E is provided with hinge-sockets F F on each side, to which the suction-pipe is pivoted by means of two side arms G G. The side arms are secured to and form an integral part of the suction-pipe, and by means of which it is supported or carried by the arch-casting E, and permitted to rise and fall thereon through the medium of the hinge-joints F F. It will be seen that, owing to the fact that the arch-casting E can revolve upon the base D, this combination constitutes a universal swing-joint.

H is a length of flexible suction-pipe, formed of hose or other suitable material, and serves to connect the adjacent ends of the fixed suction-pipe J and the upper end of the swinging suction-pipe K. The hose H is connected to the adjacent suction-pipes by flanges L and L′ and suitable bolts or equivalent devices. It is disposed in such manner that the middle of its length is about opposite the middle of the arch-casting E, and so that the center line of the suction-pipe, produced perpendicularly to the flanges L and L′, in any position, will intersect in the plane of the hinge-pins F F. It will be seen by reference to Fig. 4 that the flange L at the upper end of suction-pipe K is placed at an angle with the body of the pipe, being connected thereto by a slight curve. The reason of this will be presently explained.

In Fig. 4 the suction-pipe K is represented in its lowest position, and it is seen that the hose H is deflected to a moderate degree out of a straight line, and that it forms a gradual and continuous curve with the suction-pipe. As the suction-pipe is raised to a point halfway between its maximum and minimum depths the hose H will assume a straight line, and when the suction-pipe K is raised out of the water to a horizontal position the con-

necting-hose will assume an upward curve to a degree equivalent to its maximum downward curve. (Shown in Fig. 4.) In this manner the degree of flexure of the hose is reduced to a minimum and distributed uniformly throughout all conditions of work, and in this manner a smooth and continuous suction-pipe is provided, with the avoidance of sharp bends and irregularities or pockets in its interior, as is the case when ball-joints or other equivalent devices are employed. Turning now to the manner in which the suction-pipe is supported and the movements performed, it will be seen that it is suspended from the end of a boom M. This boom is made double, so that the suction-pipe passes up between its two members, and its lower ends are stepped in two sockets M′ (seen in Fig. 1) and formed on the sides of the arch-casting E, so that the boom and arch-casting revolve together about the axis of the latter. The arch-casting E is provided with sufficient space or clearance about the hose to enable the latter to have freedom of movement when the suction-pipe is swinging from side to side. The boom M is supported from an A-frame or mast N, which is a fixture on the boat and may be of any preferred construction, so long as the support for and swinging movement of the boom M is suitably provided for. The suction-pipe C is raised and lowered by a hoisting-tackle carried to a drum O, operated by suitable power, and provided-with appliances for holding, lifting, and lowering, as desired.

The lateral swinging movement of the suction-pipe is accomplished by side lines attached to its lower end, as shown in Fig. 2. These lines are carried up to the sides of the boat, and their point of attachment is spread apart as far as possible, and may even be spread to a greater distance than the width of the boat, by means of outriggers, as shown by P P, Fig. 2. This, however, is not essential. The swing-lines of these side tackles are carried to two drums Q and Q′, which are operated by suitable power on the boat. They are independent of each other, and by revolving the drum Q the suction-pipe is swung in one direction, and vice versa. Check-lines R R may be provided to fix a limit to the swinging motion of the suction-pipe, or the swing may be limited by the swing-lines themselves.

In the particular application of the suction-pipe illustrated it is shown with a cutter-head or excavator at the lower end, by means of which the material is excavated and fed into the mouth of the suction-pipe. I do not here broadly claim the use of a cutter-head or excavating apparatus in this connection, as such is not new; but the particular means of driving the same forms part of the improvements herein embodied, in further description of which, and referring to Fig. 3, it will be seen that the upper section K of the suction-pipe is formed with two flanges S S upon its top. These flanges are for the purpose of forming a seat upon which a pair of engines with the necessary gearing may be mounted for the purpose of driving the cutter-head. T (see Fig. 4) are the engines, which are preferably of the inside-crank type, having a pinion U at the outer end of the crank-shaft. This pinion drives a spur-gear U′ on the cross-shaft, which cross-shaft is connected to the line-shaft of the suction-pipe by a pair of bevel-gears V′ and V². These shafts are carried in suitable brackets attached to the flanges S, as shown. A single engine may be employed if preferred. Steam is transmitted to the cylinders of the engines through a pipe having two swivel-joints placed on the vertical and horizontal axes of swing, respectively. In this way a satisfactory and suitable steam connection is furnished, without the employment of hose, the use of which is objectionable.

W (see Fig. 4) is the fixed steam-supply pipe.

X is a swivel-joint placed upon the top of the arch-frame E, having its lower portion attached thereto.

Y is a section of steam-pipe forming a connection between the base of the swivel-joint X and another swivel-joint X′, (see Fig. 3,) which is on the axis of the hinge-joint F and suitably supported upon it. A pipe Y′ connects the swivel-joint X′ with the engines T, so that in this way a continuous steam-pipe is provided having perfect freedom of movement corresponding to the universal swing.

Among the advantages which are obtained by the use of my improvements may be mentioned the fact that all the apparatus is open and easily accessible and above deck; and, furthermore, the necessity of cutting away the front end of the boat to form a well or recess, as in some other appliances, is done away with, and the whole of the apparatus is arranged in a convenient and simple form, which is not liable to get out of order.

I claim—

1. In a dredging apparatus, a rigid suction-pipe, the upper end whereof is at all times above water-level, a flexible section connecting with the upper end of said rigid pipe, the pipe as a whole having vertical and lateral swing, a rotary excavator on the forward end of the pipe, a steam-engine for driving the excavator located upon the upper end of the rigid pipe, and steam-supply pipes for the engine, having the same centers of motion for vertical and horizontal swing that the pipe itself has, for the purposes set forth.

2. In a dredging apparatus, a rigid suction-pipe the upper end whereof is at all times above water-level, a flexible section connecting with the upper end of said rigid pipe, the pipe, as a whole having vertical and lateral swing, a rotary excavator on the forward end of the pipe, a steam-engine for driving the

excavator, located upon the upper end of the rigid pipe, steam-supply pipes for the engine having the same centers of motion for vertical and horizontal swing that the pipe itself has, and swing ropes or chains attached at or near the forward end of the rigid pipe, for the purposes set forth.

3. In a dredging apparatus, a suction-pipe supported upon arms pivoted by horizontal axes to a turn-table having a vertical axis, a steam-engine for driving the cutter located upon the pipe itself, and steam-supply pipes for the engine having joints in the same planes as the horizontal and vertical axes above referred to, for the purposes set forth.

4. In a dredging apparatus, a rigid suction-pipe, an excavator on the end thereof, a steam-engine for driving the excavator mounted on the pipe at or near its upper end, supports for the pipe attached thereto, adjacent to the engine and connected at their other ends by horizontal axes to a turn-table on the boat having a vertical axis, said turn-table itself, and steam-supply pipes for the engine having joints in the same plane as the said vertical and horizontal axes, for the purposes set forth.

5. In a dredging apparatus, a casting for the support of a suction-pipe, embodying an annular base upon which it may be turned, and sockets adapted to pivotally hold the supports for the pipe, for the purposes set forth.

6. In a dredging apparatus, a casting for the support of a suction-pipe, having an annular base upon which it may be turned, a bridge-shaped upper part, adapted to support the steam-supply device for the driving-engine, and laterally-located sockets adapted to pivotally hold the supports for the pipe, and sockets near its base, for the support of a boom, for the purposes set forth.

Signed at Milwaukee, in the county of Milwaukee and State of Wisconsin, this 6th day of March, A. D. 1896.

ARTHUR W. ROBINSON.

Witnesses:
CARNEY HARTLEY,
JOHN C. WILLIAMS.