(No Model.)

4 Sheets—Sheet 1.

J. H. VON SCHMIDT.

HYDRAULIC DREDGING MACHINE.

No. 407,044. Patented July 16, 1889.

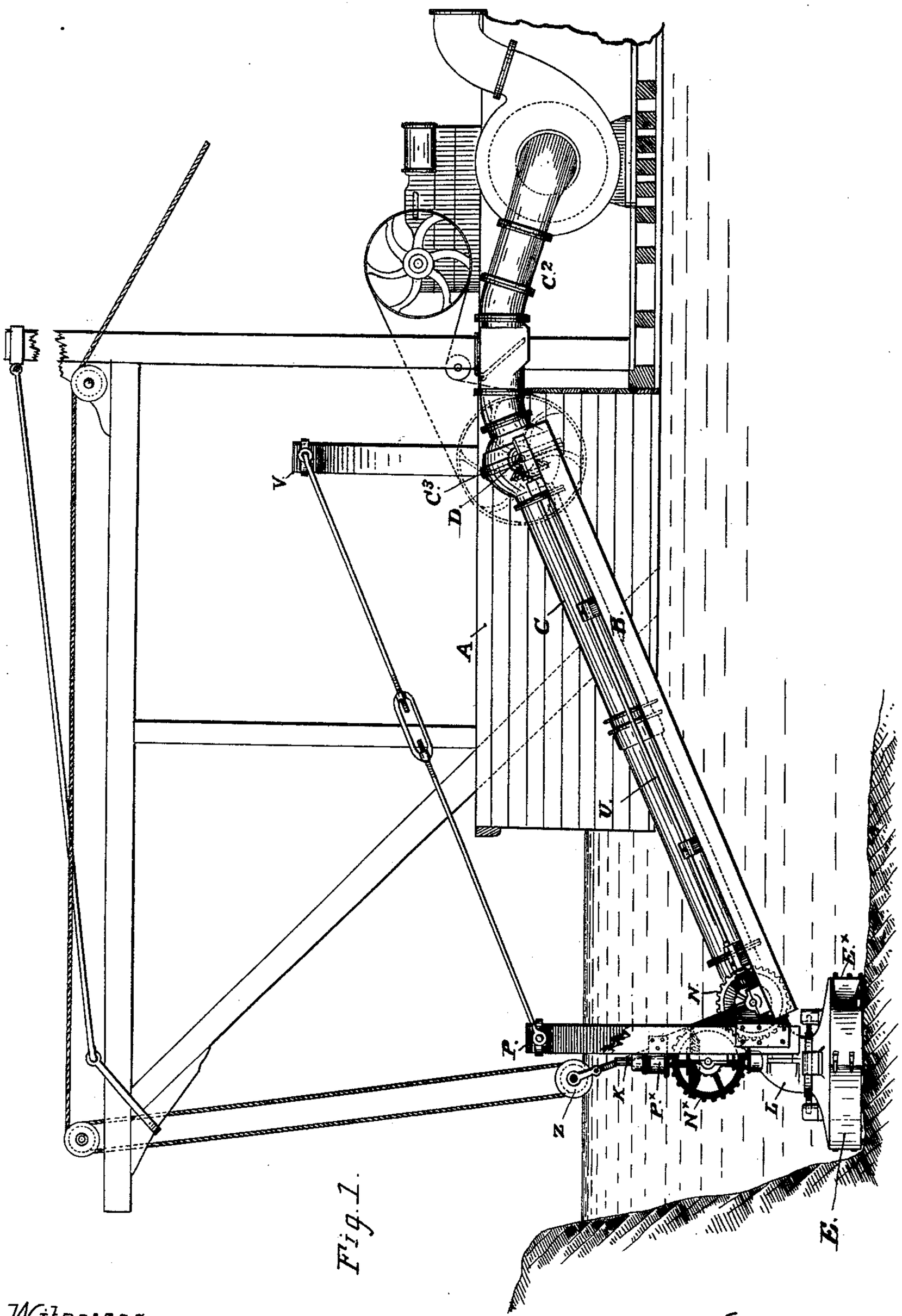

Fig. 1.

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(No Model.) 4 Sheets—Sheet 2.

J. H. VON SCHMIDT.

HYDRAULIC DREDGING MACHINE.

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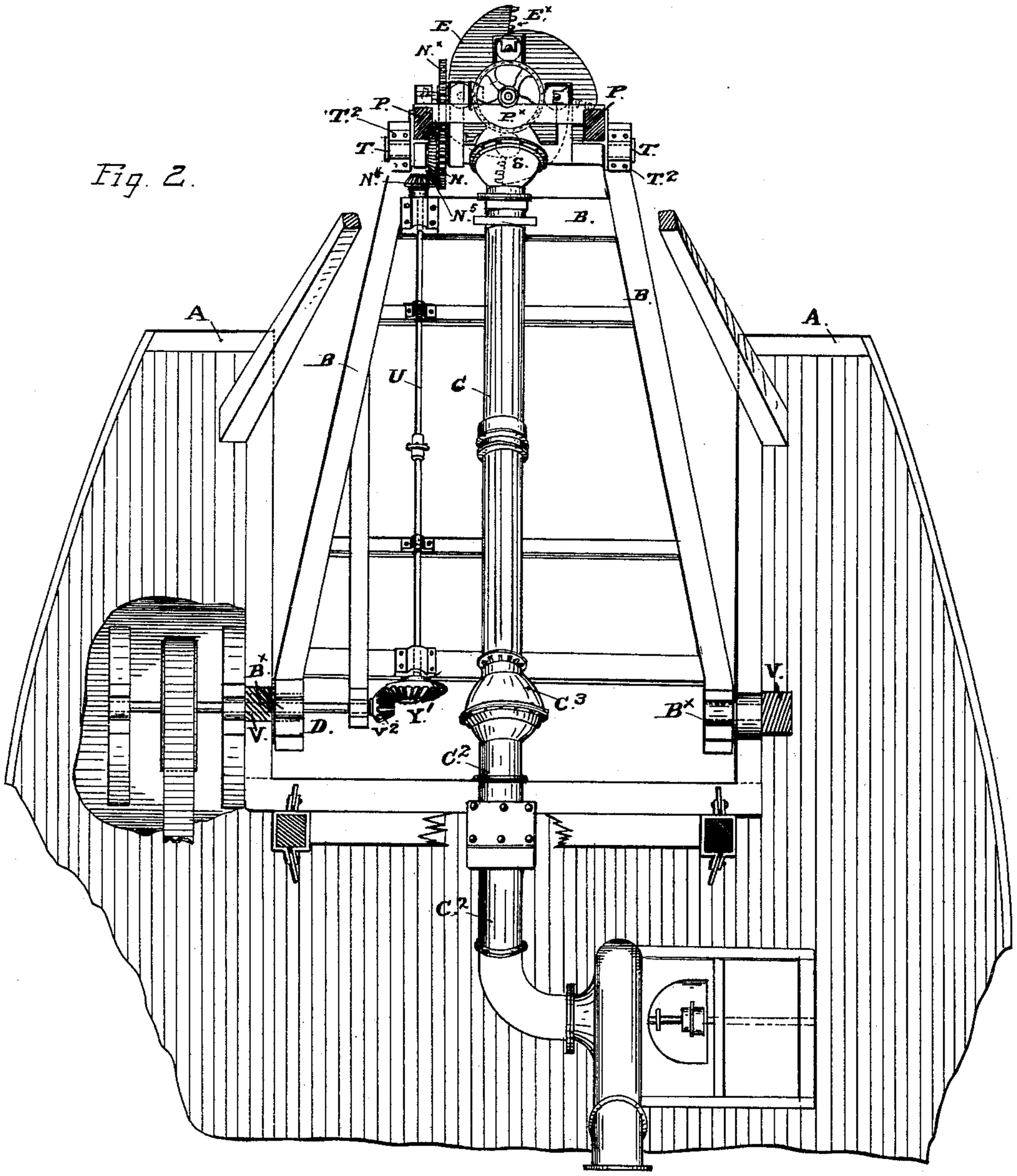
Fig. 2.



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(No Model.) 4 Sheets—Sheet 3.

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HYDRAULIC DREDGING MACHINE.

No. 407,044. Patented July 16, 1889.

Fig. 3.

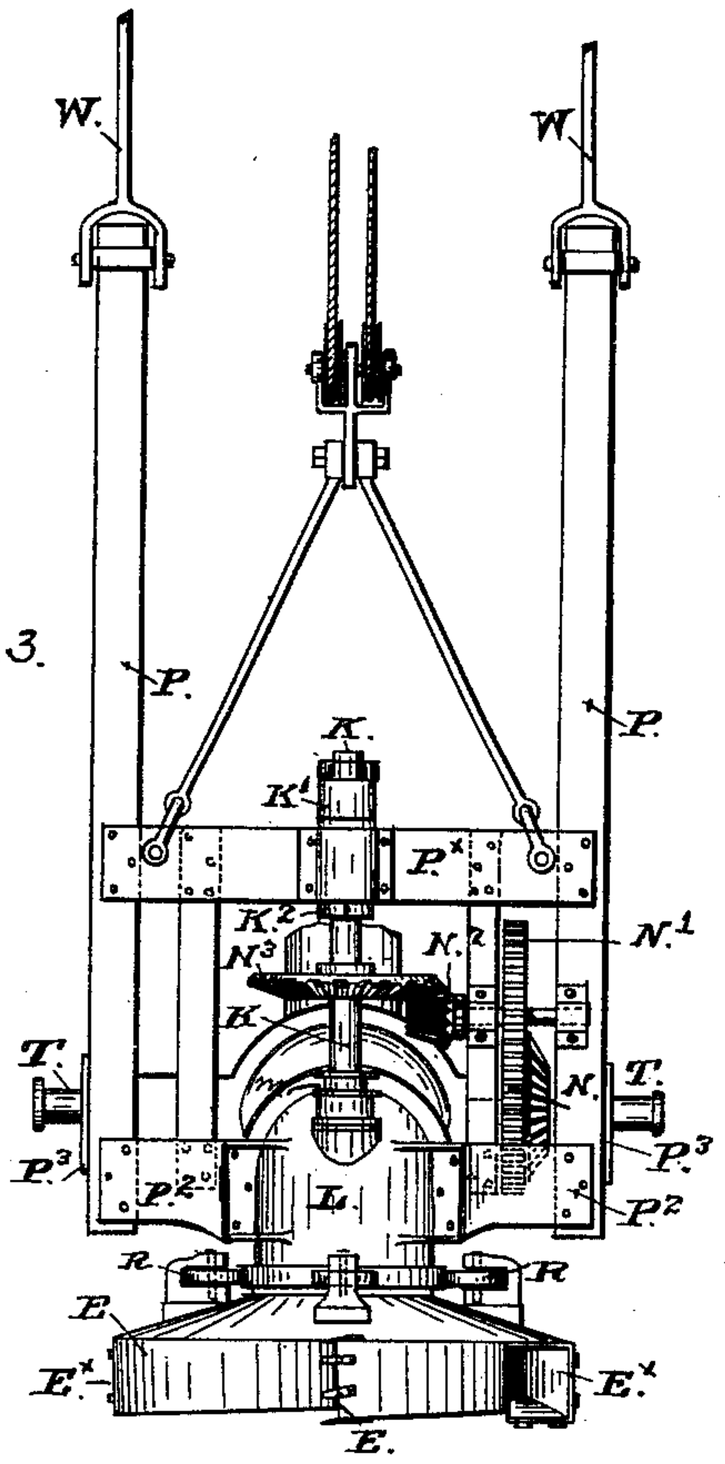


Fig. 4.

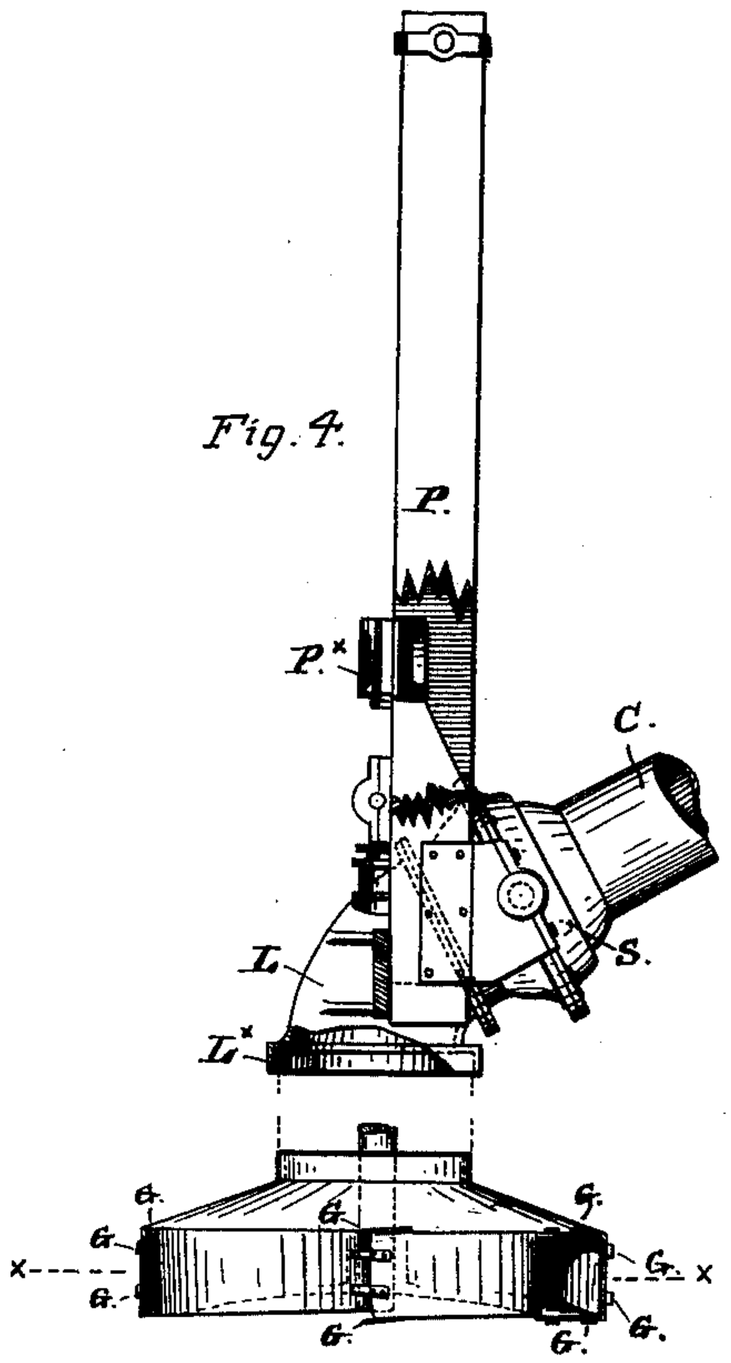


Fig. 5.

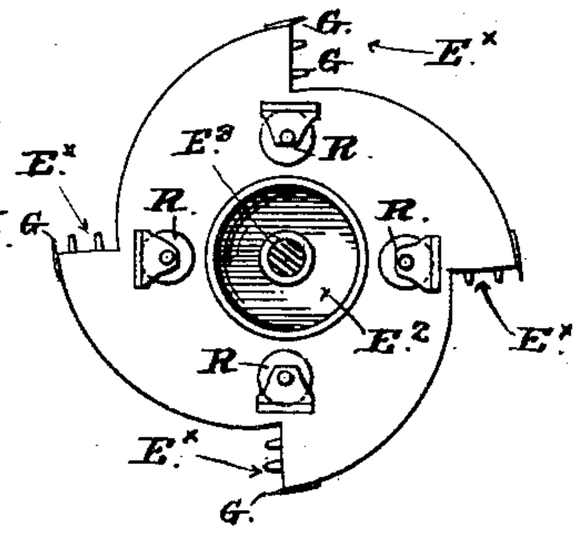
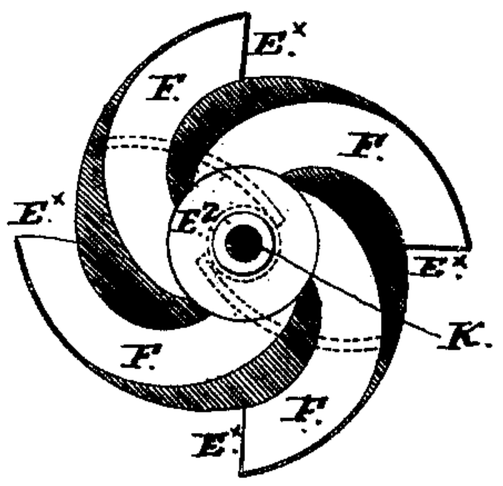


Fig. 6.



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(No Model.) 4 Sheets—Sheet 4.

J. H. VON SCHMIDT.

HYDRAULIC DREDGING MACHINE.

No. 407,044. Patented July 16, 1889.

Fig. 8.

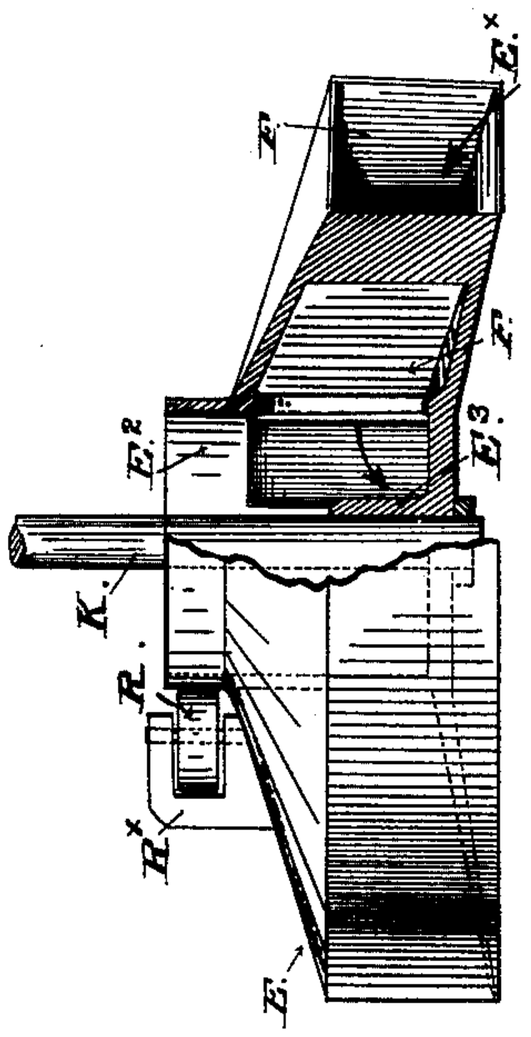
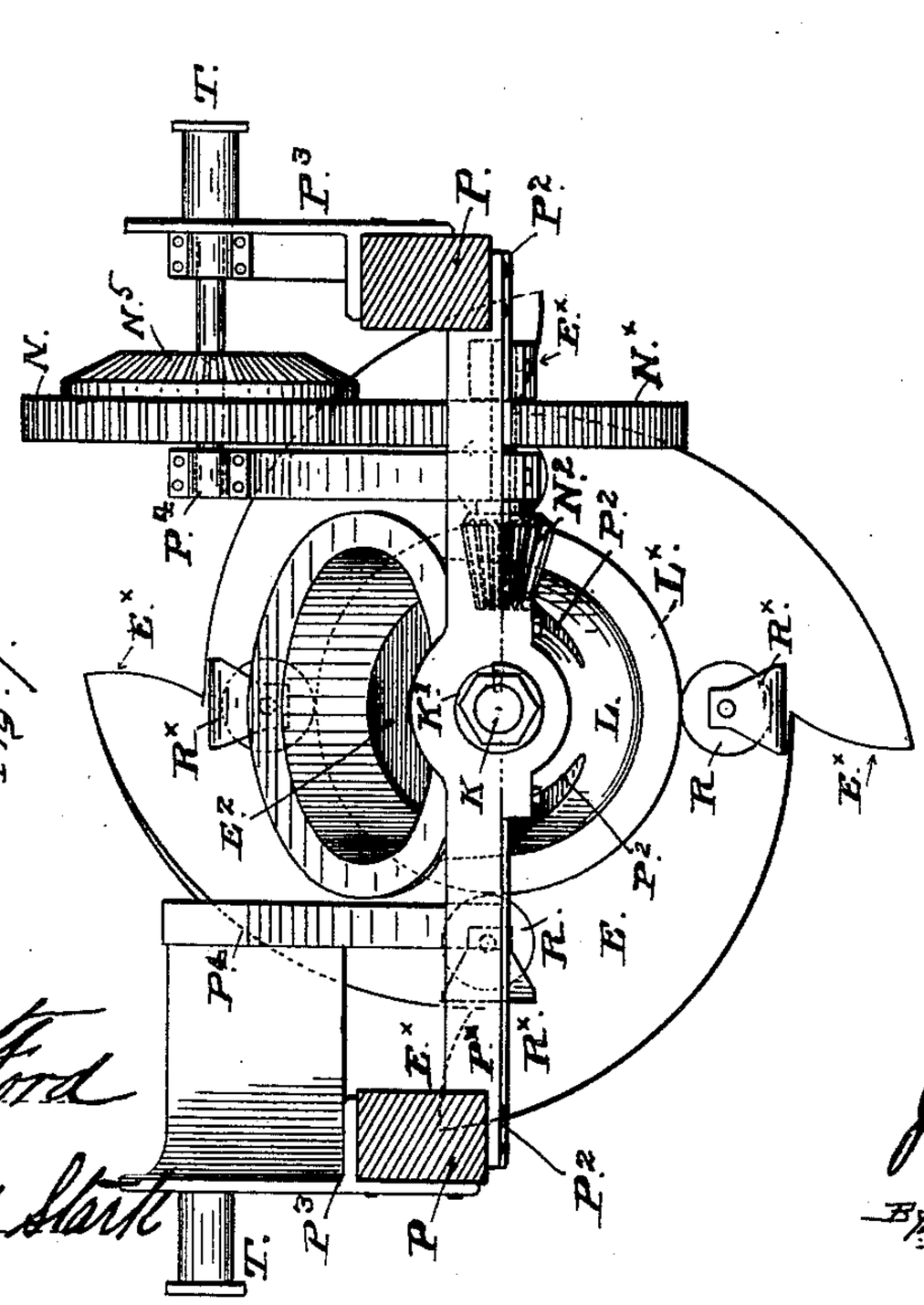


Fig. 7.



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UNITED STATES PATENT OFFICE.

JULIUS H. VON SCHMIDT, OF SAN FRANCISCO, CALIFORNIA.

HYDRAULIC DREDGING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 407,044, dated July 16, 1889.

Application filed January 22, 1889. Serial No. 297,183. (No model.)

To all whom it may concern:

Be it known that I, JULIUS H. VON SCHMIDT, a citizen of the United States, residing in the city and county of San Francisco, in the State of California, have invented certain new and useful Improvements in Hydraulic Dredging-Machines, of which the following is a specification.

My invention relates to dredging-machines of the kind known as "hydraulic" or "suction" dredgers; and it embraces certain improvements in that part of the apparatus which is termed the "cutter" or "excavator," that operates at the end of the suction-pipe under water to cut away the bank or bottom and deliver it into the suction-pipe. My present improvements in such implements and apparatus include a novel rotary excavator of peculiar construction with inlet-apertures at the periphery surrounded by cutting-edges and internal passages of helical form running from the openings to the center, where they terminate in a common suction-chamber having connection with the suction-pipe. This implement is mounted for rotation at the lower end of an inclined suction-pipe about a perpendicular axis under all conditions of submergence and different degrees of inclination of the pipe, and the cutting or excavating is done by the peripheral cutters at the mouths of the helical passages. In connection with this implement I provide for maintaining it in proper horizontal or working position to cut at the periphery always tangent to a vertical plane, at whatever depth it may be submerged, and in combination also I provide mechanism for driving it from power located on the dredge-boat.

The following description fully explains the nature of my said improvements and the manner in which I construct, arrange, and mount the same for operation on the end of a dredge-boat, the accompanying drawings that form part of this specification being referred to by figures and letters.

Figure 1 of the drawings represents in side elevation an excavator constructed according to my invention and arranged for operation at the end of a suction-pipe on a swinging boom or ladder projecting from the bow of the boat, the ladder and boat being shown partly in section. Fig. 2 is a top view or plan of the same. Fig. 3 is a front elevation of the excavator and the swinging frame in which it is supported on the end of the ladder. Fig. 4 is a top view of the excavator removed from the suction-pipe. Fig. 5 is a plan view of the excavator and of the end of the suction-pipe to which it is applied. Fig. 6 is a horizontal section at the line x x, Fig. 4. Fig. 7 is a top view of the excavator and parts of the frame in which it is suspended. Fig. 8 is an elevation of the excavator, partly in section. These figures are given on a larger scale than the views that are seen in Figs. 4 and 5.

A is the bow portion of a dredge-boat; B, the frame or ladder to carry the suction-pipe and excavator; C, the suction-pipe; D, the main driving-shaft on the boat, and E the rotary excavator at the end of the swinging ladder that is driven by the shaft D. In this arrangement the excavator is raised and lowered in a vertical arc by the movements of the ladder on its pivots $B^{\times}$ $B^{\times}$, while its adjustment laterally or from side to side is obtained by swinging the bow of the boat in a horizontal arc. By making suitable provision for the double movement in the joint of the suction-pipe and in the driving-shaft connection at the center of movement of the ladder it will be seen that this excavator could be mounted for operation on a hinged ladder having movements in both horizontal and vertical arcs from the bow, so that considerable amount of cutting and excavating could be done without changing the position of the boat.

$E^{\times}$ $E^{\times}$ are the openings at the rim of the excavator, through which the mud is taken in, and F F are helical passages extending inwardly to the center, where they open into a cylindrical chamber E^2, that is closed at the bottom, but is open at the top. The edges of the inlets $E^{\times}$ are suitably shaped to form cutters, and in most cases are furnished with projecting cutters or knives G G, particularly where the material to be cut is of such stiff or hard character to require them. The cutters G are separate blades of suitable shape to present sharp points in advance of the cutting-edges on the mouth of the inlet, and they are fixed by bolts or other fastenings that permit them

to be taken off for repairs. The simplest form of these openings and helical passages would be rectangular in cross-section, as I have represented in the several figures of the drawings; but the walls of the passages and the mouths at the periphery may be curved or circular in cross-section by forming the shell or body of the implement accordingly, so that the walls of the passages would be curved or somewhat cylindrical in cross-section. These passages should slightly increase in area as they approach the center chamber, in order to prevent the material sticking or becoming lodged in them. The bottom of the excavator is raised at the center, and from this point the floors or bottoms of the helical passages run obliquely with a regular slant downward to the mouths. The top also follows the same slant from the rim of the center chamber down to the periphery, at which point the cutting-edges of each mouth stand out beyond the wall or outer face of the helical passage next in advance and present in the direction of rotation a cutting-edge in a vertical plane, or parallel to the axis, and a cutting-edge at top and bottom, respectively, substantially at right angle to the axis. These edges or cutters are straight, as seen in Figs. 1, 2, 4, and 5, or are curved, as represented in Fig. 7, and as the passages F are of uniform length it will be seen that the inlet-mouths and their cutters are equally spaced around the circumference, and the corresponding cutters of all the openings lie in the same plane. Fixed beneath the bottom of the excavator are spiral scrapers H H, having suitable projection from the bottom and curved from the center outward to the circumference of the body, but in the reverse direction to the run of the passages above, in order to throw out the material from beneath the excavator and bring it in the path of the cutters and openings at the periphery. These parts H can be separate blades fixed to the bottom, or may be cast or made in one piece with that part.

The standing rim around the top of the center chamber is fitted to turn smoothly within the end of the elbow or curved section of pipe L that connects the suction-pipe to the excavator, and the shaft K, on which the excavator is fixed by the socket E^3 at the bottom of the chamber E^2, is carried out through the stuffing-box *m* at the bend of the elbow. Above this point the shaft extends sufficiently to take the driving-gears and be supported in bearings on the cross-beam $P^\times$, that is part of the frame in which the excavator is supported at the outer end of the swinging frame or ladder by which the implement is raised and lowered. This frame P P also carries the part L of the suction-pipe. A collar K′ is keyed on the end of the shaft above the beam to hold the shaft from slipping through the bearing during the vertical movement of the pivoted ladder, while the upward thrust is resisted by a collar K^2 under the beam, the gear N^3 on the shaft being thus kept in working contact with the pinion of the driving mechanism. Guide-wheels R R on upright axles in brackets $R^\times$ are fixed in position on the top of the excavator around the elbow L to bear against the periphery of the flange $L^\times$, which is made of suitable width to form a track for the wheels. The lateral pressure and forces that tend during operation to throw the shaft out of line are sufficiently resisted by these wheels, and the excavator is kept from binding in the end of the elbow or otherwise producing excessive friction in that joint.

The cross-beam $P^\times$ is part of an upright frame in which the excavator and its driving mechanism are so supported at the end of the pivoted ladder that the excavator maintains a substantially horizontal position under all changes of the ladder from one angle or degree of submergence to another during work, the other parts of the frame being composed of two upright posts P P, the flanged bottom plates P^2, which are bolted to the sides of the elbow, and the triangular-shaped plates P^3 P^3, which are fastened at top and bottom to the two cross beams or plates and extend rearwardly upon either side of the elbow to the center line of the ball-and-socket joint S, where the elbow connects with the suction-pipe leading backward to the pump. These angle-plates support the socket end of the elbow-pipe, and from their outer sides extend journals T T, coinciding with the axis of the joint S. The right-hand angle-plate, looking toward the front of the excavator, also furnishes boxes for the shafts of two spur-wheels N $N^\times$, that transmit motion to the driving-pinion from a long shaft U on the ladder, the connection between shaft and the spur-wheel N being made by the bevel-gears N^4 N^5.

Journal-boxes T^2 are fixed on the side bars of the ladder at the outer end to receive the journals T T, and on these points the carrying-frame P P swings and is wholly supported; but the upright bars P of the frame are connected to fixed points V V on the boat, directly above the center of movement of the ladder, by a stay rod or rods W, which with the uprights and the ladder form a parallelogram, and consequently preserve the perpendicularity of the frame P under all movements of the ladder on its pivot, because the fixed points V V are the same distance above the center of movement at the inner end as the points of attachment of the stay-rods are placed above the journals T T, and the rods and ladder are of equal length between these centers of movement.

The suction-pipe on the ladder is connected in the usual way with the stationary section C^2 on the boat at the pivot by a ball-and-socket joint C^3, and the engine-driven shaft D is mounted on this end of the ladder at the axis of the joint C^3, so that the connection with the long counter-shaft U, that runs down to the excavator, can be made directly by means

of simple gearing Y' Y². Power is applied to the shaft D from the engine by belt and pulleys or any other suitable medium.

To raise and lower the ladder for bringing the excavator into and out of position, the ordinary arrangement of a fixed overhead boom and tackle may be employed, as represented in Fig. 1 of the drawings, in which the traveling pulley-block is attached to the cross-beam of the swinging frame P P by the slings Z. By means of this kind the excavator is set it any position on the bottom or is supported at any point below the surface, as where a perpendicular bank is to be cut into or the bottom has considerable degree of inclination; and the excavator is also raised up above the surface for cleaning or repairs. The peculiar form and manner of mounting this implement enables access to be readily had from beneath it and the working parts reached without difficulty. Such parts as are subject to great strain and otherwise exposed to wear or injury can be easily replaced when necessary without dismounting the excavator.

From the above description and the accompanying drawings any one acquainted with the class of machines or apparatus to which my invention relates can construct and arrange for operation a rotary excavator of this kind.

Having thus fully described my invention, what I claim, and desire to secure by Letters Patent, is—

1. A rotary excavator for dredging-machines, having a central receiving-chamber, helical passages extending therefrom outward to the periphery, at which point the ends of the passages terminate in cutting mouths or buckets with cutting-edges setting in radial planes, in combination with a suction-pipe having an end section that is connected with the main pipe by a ball-and-socket joint, and is curved at the outer end to take the rim of the open end of the suction-chamber, and driving mechanism adapted to rotate the excavator about a perpendicular axis, substantially as described.

2. A rotary excavator having peripheral openings with cutting-edges, separate passages of helical form leading inwardly and delivering into a common suction-chamber at the center, and a bottom without openings having helical scraping blades or ribs extending from center to periphery in the opposite direction to the turns of the internal passages, said excavator being mounted for rotation about a perpendicular axis, substantially as described.

3. In a rotary excavator, the combination of a body provided with peripheral openings having cutting-edges, a common central chamber E², whose walls revolve with the excavator and lie immediately under the end of suction-pipe, and helical passages leading from the peripheral openings to the central chamber, where each passage has a separate discharge always open into the central chamber, as set forth.

4. A rotary excavator for dredging-machines, consisting of a body having peripheral openings, a common central receiving-chamber formed and revolving with the excavator, and helical passages leading from the peripheral openings to the common central chamber and discharging therein at all points of revolution, as set forth.

In testimony that I claim the foregoing I have hereunto set my hand and seal.

JULIUS H. VON SCHMIDT. [L. S.]

Witnesses:

C. W. M. SMITH,

CHAS. E. KELLY.