T. JARDINE.

HYDRAULIC DREDGE.

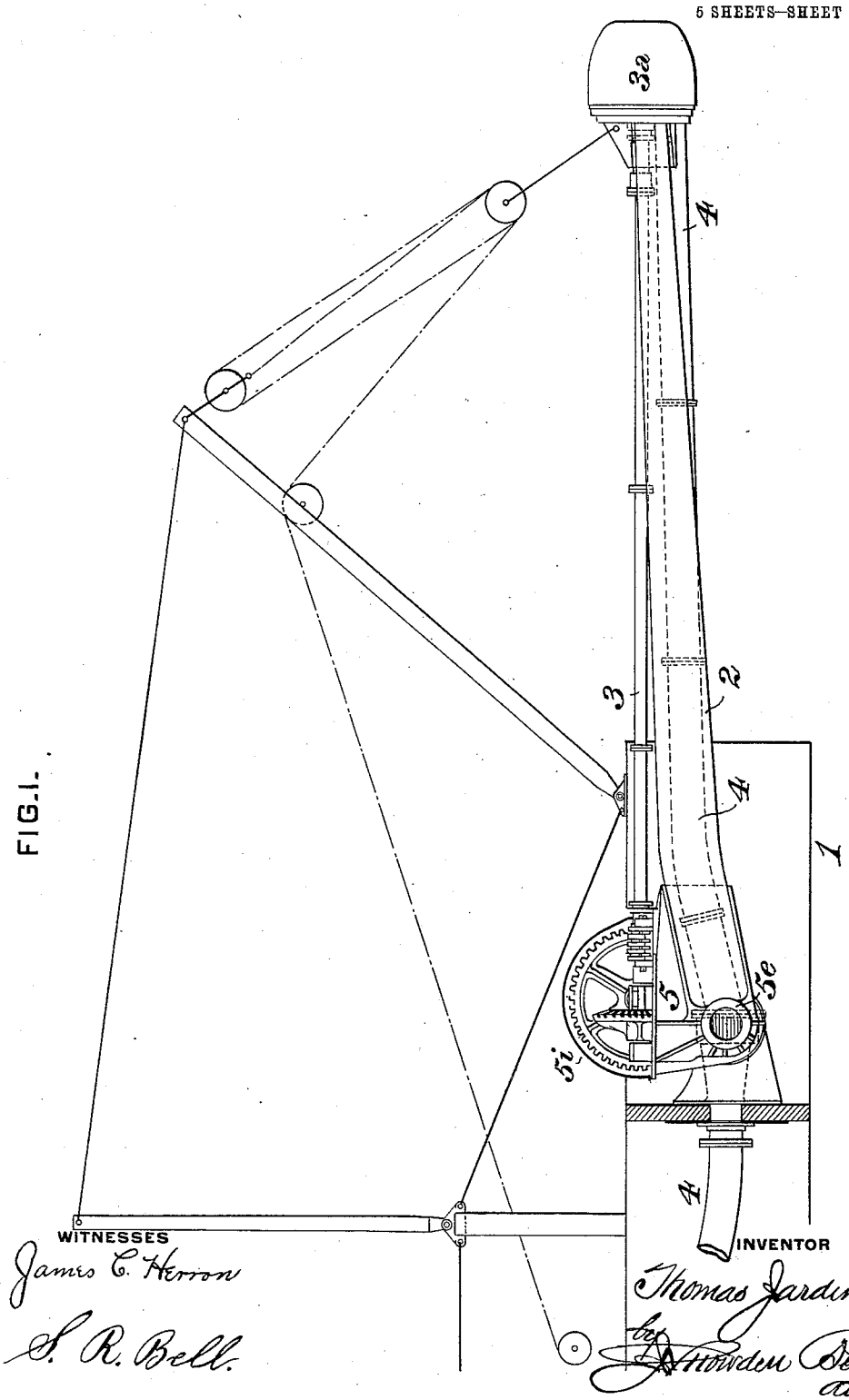
APPLICATION FILED JUNE 14, 1910.

1,052,148.

Patented Feb. 4, 1913.

5 SHEETS—SHEET 1.

FIG. 1.



WITNESSES

James C. Herron

S. R. Bell.

INVENTOR

Thomas Jardine,

by Howden Bell

atty.

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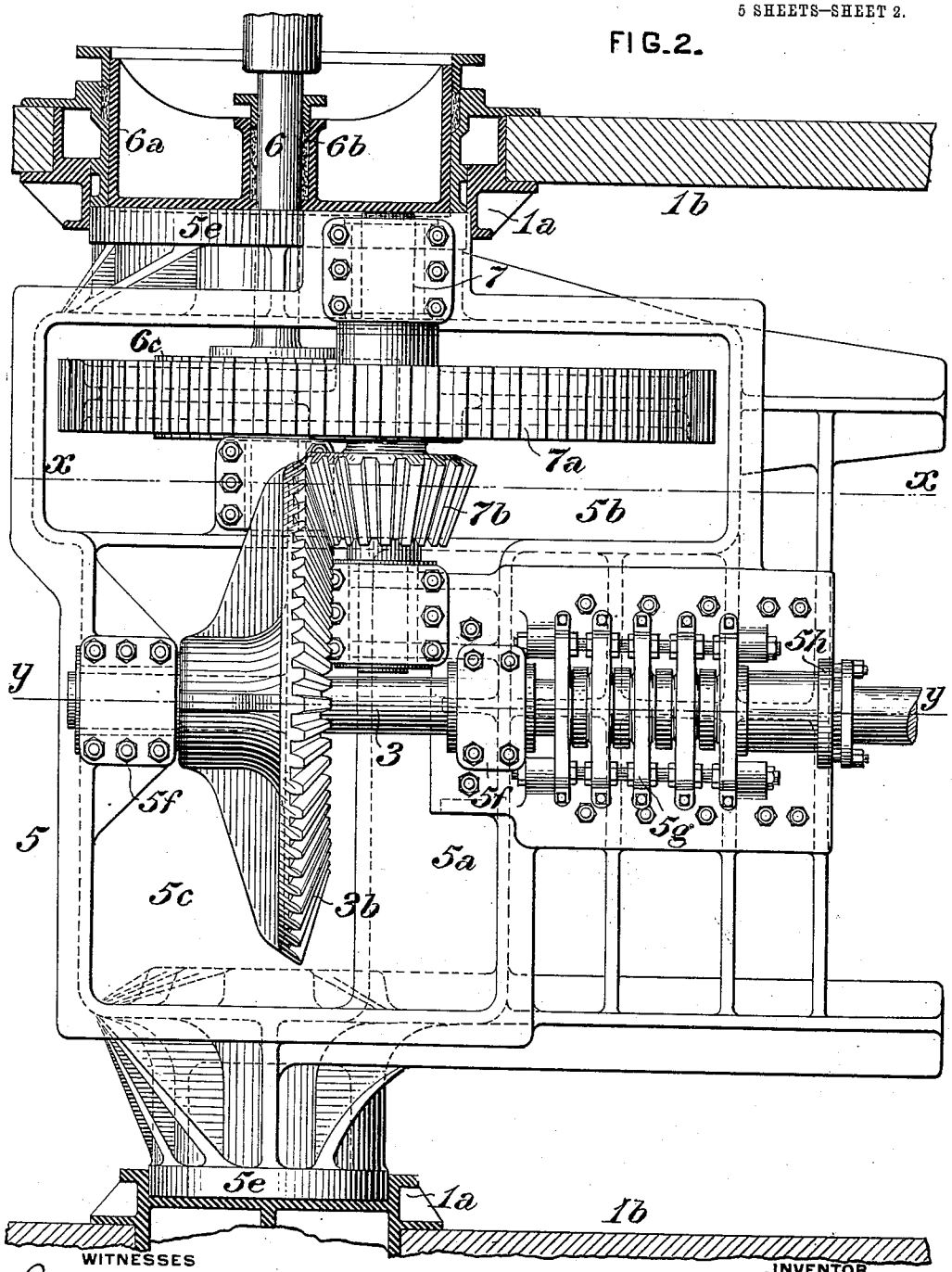
5 SHEETS—SHEET 2.

FIG. 2.



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James C. Herron

S. R. Bell.

INVENTOR

Thomas Jardine,

by J. Howden Sett.

Atty.

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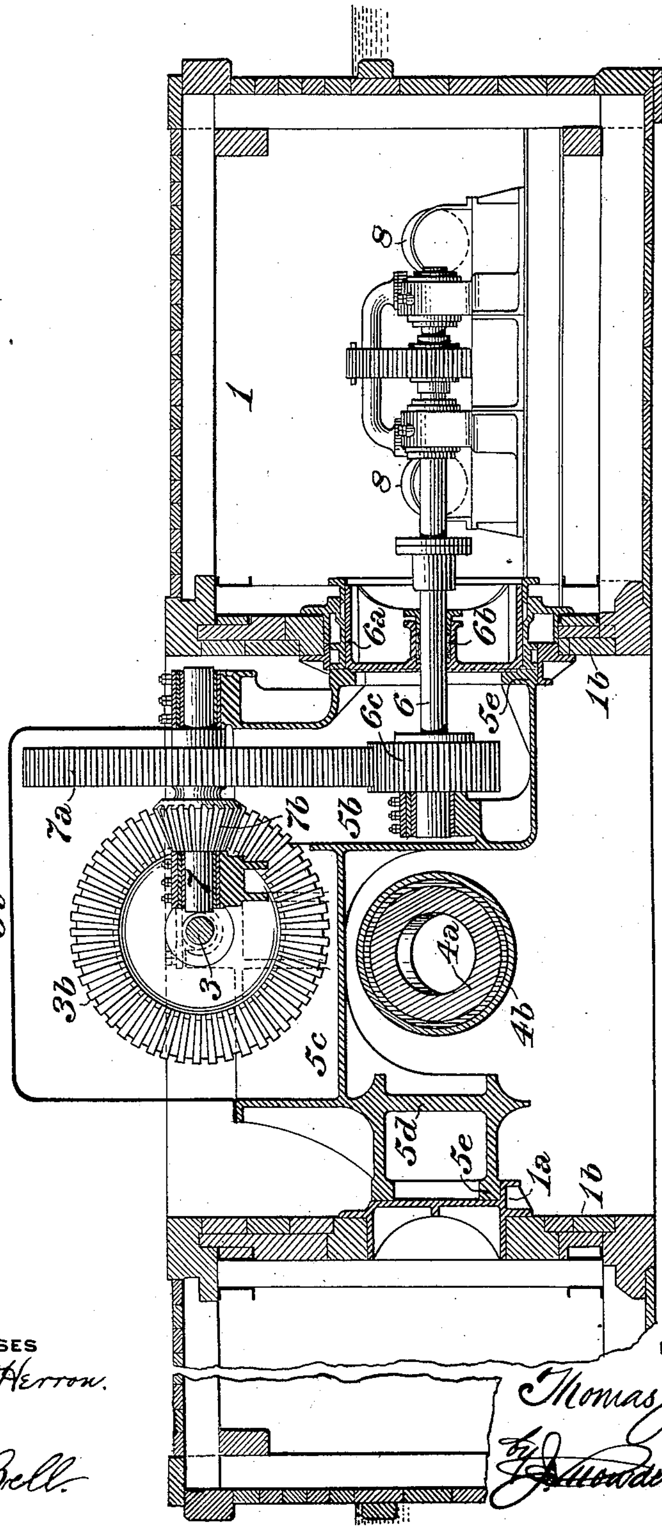
5 SHEETS—SHEET 3.

FIG. 3.



WITNESSES

James C. Herron.

S. R. Bell.

INVENTOR

Thomas Jardine,

by Snowden Bell

Atty.

T. JARDINE.

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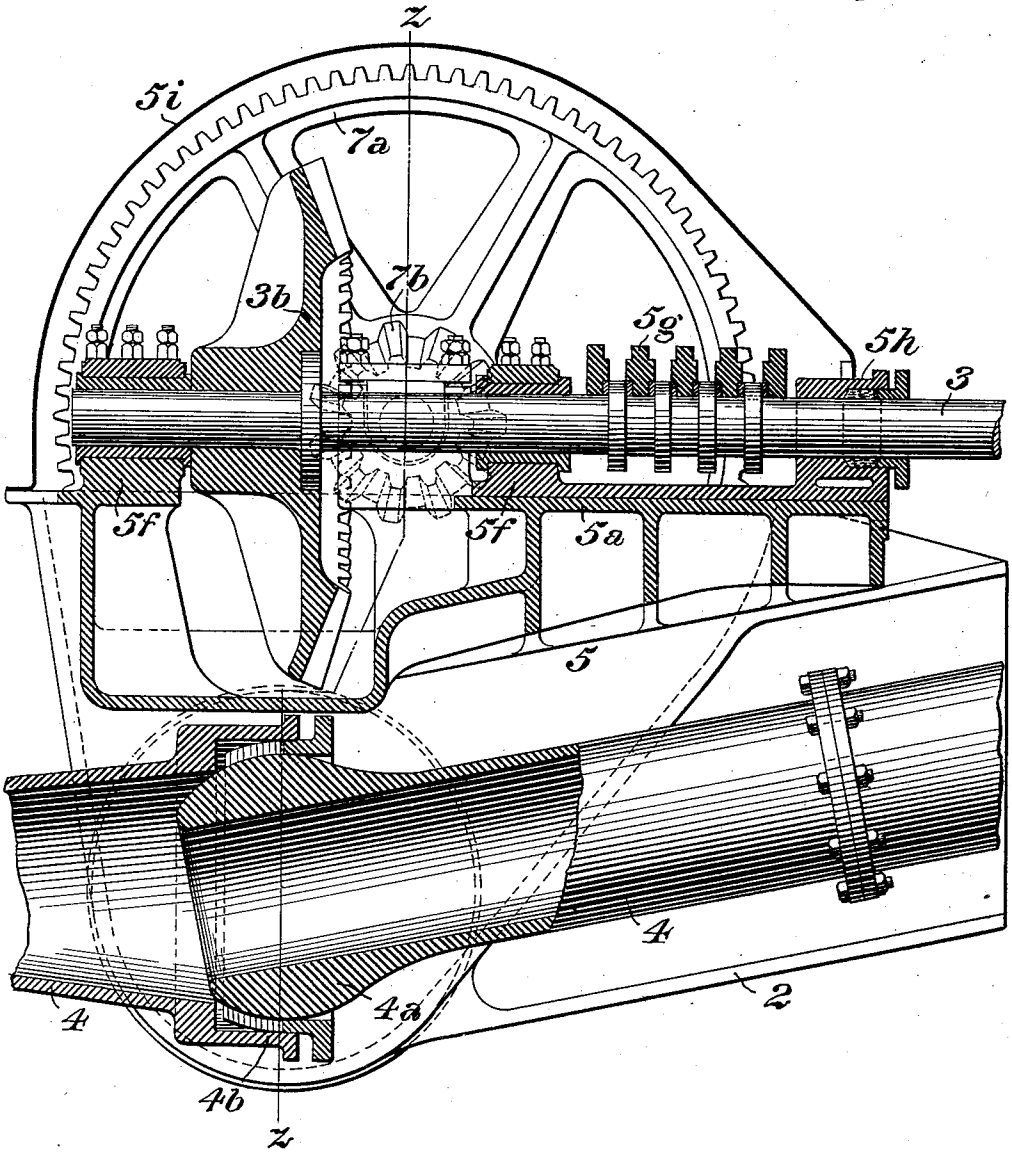
5 SHEETS—SHEET 4.

FIG. 4.



WITNESSES

James C. Herron

S. R. Bell.

INVENTOR

Thomas Jardine.

by Fitzgerald Dell.

atty.

COLUMBIA PLANOGRAPH CO., WASHINGTON, D. C.

T. JARDINE.

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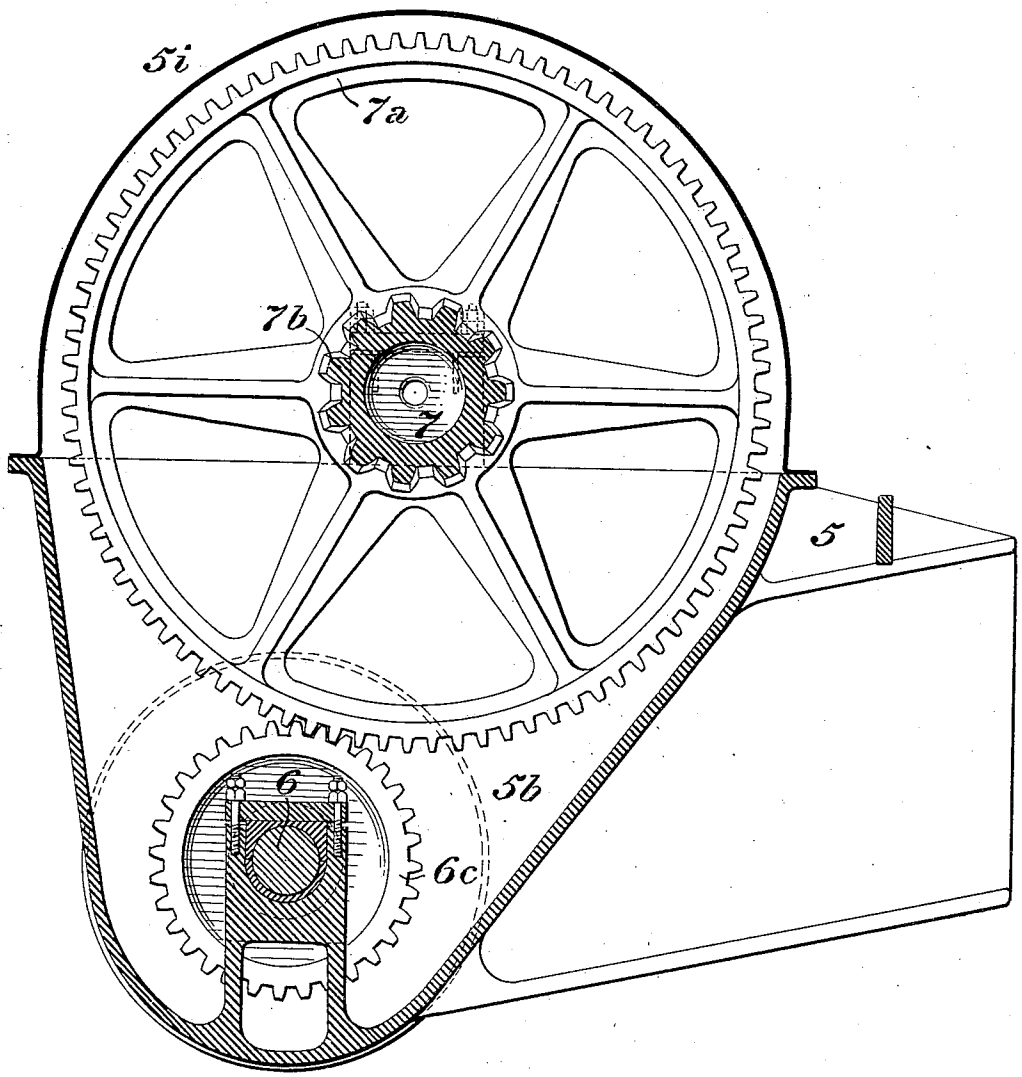
5 SHEETS—SHEET 5.

FIG. 5.



WITNESSES

James C. Herron.

S. R. Bell.

INVENTOR

Thomas Jardine.

by J. Howden Dott

Atty.

COLUMBIA PLANOGRAPH CO., WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

THOMAS JARDINE, OF PATERSON, NEW JERSEY.

HYDRAULIC DREDGE.

1,052,148. Specification of Letters Patent. Patented Feb. 4, 1913.

Application filed June 14, 1910. Serial No. 566,758.

To all whom it may concern:

Be it known that I, THOMAS JARDINE, of Paterson, in the county of Passaic and State of New Jersey, have invented a certain new and useful Improvement in Hydraulic Dredges, of which improvement the following is a specification.

The object of my invention is to provide a unitary structure by which the supporting frame or ladder of the suction pipe of a hydraulic dredge, the sections of the suction pipe carried thereon, and the cutter shaft, may be connected to the hull of the dredge, with the capacity of swinging or vibratory movement in a vertical plane relatively thereto, and below the water line thereof; which will constitute a support and inclosure for the driving gearing and thrust bearing of the cutter shaft, in which said gearing can be run in oil and protected from the access of water and grit; which will maintain the ball joint of the suction pipe continuously immersed in water, so as to prevent leakage of air thereinto; and which will provide for the location of the shaft which transmits power from the cutter engine to the cutter shaft, in the axial line of the movements of the ladder and cutter shaft relatively to the hull, without permitting the ingress of water to the hull.

The improvement claimed is hereinafter fully set forth.

In the accompanying drawings: Figure 1 is a side view, partly in section, of the forward portion of a hydraulic dredge, illustrating an application of my invention; Fig. 2, a plan view, partly in section, and on an enlarged scale, of the trunnion head and the gearing therein; Fig. 3, a transverse section, on the line *z*—*z* of Fig. 4, and Figs. 4 and 5, vertical longitudinal sections, on the lines *y y* and *x x*, respectively, of Fig. 2.

My invention is herein exemplified as applied in a hydraulic dredge, to the forward portion of the hull, 1, of which, there is connected a frame or ladder, 2, which supports the outer end of a cutter shaft, 3, on which is secured a cutter, 3^a, of any suitable known form, and the outer sections of a suction pipe, 4, through which spoil is conveyed from the cutter by the operation of a centrifugal pump mounted on the hull and not shown in the drawings, in the ordinary manner. As is familiar to those skilled in the art, the ladder is required to be swung in a vertical plane, in order to maintain the cutter in proper operative relation to the material to be dredged out as the work progresses, and must therefore be so connected to the hull of the dredge as to admit of such swinging movement thereon.

In the practice of my invention, I provide, for the purpose of articulating the ladder, 2, to the hull, 1, of the dredge, and supporting and inclosing the driving gearing and thrust bearing of the cutter shaft, 3, a connecting member which I term a "trunnion head", which, as an entirety, is U-shaped in form and is designated in the drawings by the reference symbol, 5, and which, except as to a separable sheet metal cover or top casing, is preferably, as shown, a unitary structure of cast metal. The trunnion head comprises a horizontal bed plate, 5^a; an oil reservoir, 5^b, extending downwardly therefrom on one side; another oil reservoir, 5^c, extending downwardly at the rear; a vertical plate, 5^d, on the side of the bed plate opposite that on which the oil reservoir, 5^b, is located; and two outwardly projecting journals or trunnions, 5^e, fixed to the plate, 5^d, and the oil reservoir, 5^b, respectively. The trunnions, 5^e, are located entirely below the water line of the dredge, and are fitted to move about a common axial line, in bearings, 1^a, secured to the side walls, 1^b, of a well or open space in the hull, into which the ladder, 2, extends, and through which the suction pipe, 4, passes. The side members of the ladder, 2, are secured, at and adjoining their inner ends, to the vertical plate, 5^d, and to an extension of the oil reservoir, 5^b, respectively, and the ladder and cutter shaft and outer suction pipe sections supported thereon, are consequently adapted to be swung, with the trunnion head, about the axial line of the trunnions, 5^e.

The cutter shaft, 3, is journaled in bearings, 5^f, which are supported on the bed plate, 5^a, of the trunnion head, and the end thrust of the cutter shaft is taken up by a thrust bearing, 5^g, of any suitable construction, fixed to the bed plate. The cutter shaft passes through a stuffing box, 5^h, at the rear of the trunnion head, which is provided to prevent leakage of oil. Rotation is imparted to the cutter shaft from a driving shaft, 6, actuated by an engine, 8, in the hull of the dredge, the driving shaft passing through one of the trunnions, 5^e, in the axial line thereof, and through a cylindrical casing, 6^a, in the adjacent side wall, the casing

being provided with a properly packed stuffing box, 6^b, to prevent leakage of water into the hull. The driving shaft carries a spur pinion, 6^c, which engages a corresponding gear, 7^a, fixed upon a transverse shaft, 7, journaled in bearings on the trunnion head, and the shaft, 7, carries a bevel pinion, 7^b, which engages a corresponding gear, 3^b, on the inner end of the cutter shaft, 3. The pinion, 6^c, rotates in the oil reservoir, 5^b, and the gear, 7^a, projects downwardly into said reservoir. The bevel gear, 3^b, projects downwardly into the oil reservoir, 5^c, and all the gearing described is completely inclosed by said oil reservoirs, and by a sheet metal cover on top casing, 5^f, secured to the trunnion head. It will thus be seen that the gearing can be run in oil and is completely protected from the access of water and gritty material held in suspension adjacent to the dredge.

The innermost of the sections of the suction pipe, 4, which are supported on the ladder, is coupled to the outermost of the sections of said pipe which are supported on the hull of the dredge, by a ball joint, the center of which is located in the axial line of the trunnions, 5^e, and which is shown as comprising a ball portion 4^a, on the outer section, and a socket portion, 4^o, on the adjoining inner section. It will be seen that this location of the ball joint enables the outer sections of the suction pipe to be moved in correspondence with the ladder, and that the joint being continuously submerged, there can be no leakage of air into the suction pipe.

My improvement, which is of ready applicability in hydraulic dredges of the type which has been approved in practical service, provides a simple, compact, and reliable means for articulating a supporting ladder and suction pipe to a dredge hull, with an inclosure of the gearing and relative disposition of the cutter driving shaft and suction pipe ball joint, the advantages of which will be apparent to those skilled in the operation of dredging apparatus of the character to which my invention relates.

I claim as my invention and desire to secure by Letters Patent:

1. The combination with the hull of a hydraulic dredge, and separated and independent bearings on the hull below the water level, of a U-shaped trunnion head journaled in said bearings and below the water line, a cutter supporting frame or ladder supported by and fixed to and movable with said trunnion head about the bearings, a suction pipe carried on said ladder and having one end in the U-shaped trunnion and between the bearings, and a suction pipe supported on the hull and jointed to the suction pipe of the ladder in line axially with the journals of the trunnion head.

2. The combination with the hull of a hydraulic dredge, and separated and independent bearings on the hull below the water level, of a U-shaped trunnion head journaled in said bearings and below the water line, a cutter supporting frame or ladder supported by and fixed to and movable with said trunnion head about the bearings, a suction pipe carried on said ladder and having one end in the U-shaped trunnion and between the bearings, and a suction pipe supported on the hull and jointed to the suction pipe of the ladder in line axially with the journals of the trunnion head, a cutter shaft carried on said ladder, a driving shaft rotated by a motor in the hull and extending axially into the trunnion head through one of the journals thereof, gearing rotating in the trunnion head and connecting said driving shaft with the cutter shaft, and means for preventing access of water to the hull around the driving shaft.

3. The combination with the hull of a hydraulic dredge, and separated and independent bearings on the hull below the water level, of a U-shaped trunnion head journaled in said bearings and below the water line, a cutter supporting frame or ladder supported by and fixed to and movable with said trunnion head about the bearings, a suction pipe carried on said ladder and having one end in the U-shaped trunnion and between the bearings, and a suction pipe supported on the hull and jointed to the suction pipe of the ladder in line axially with the journals of the trunnion head, a cutter shaft carried on said ladder, a driving shaft rotated by a motor in the hull and extending axially into the trunnion head through one of the journals thereof, gearing inclosed in the trunnion head between oil reservoirs therein and a cover or casing, and connecting said driving shaft with the cutter shaft, and means for preventing access of water to the hull around the driving shaft.

4. The combination with the hull of a hydraulic dredge, and separated and independent bearings on the hull below the water level, of a U-shaped trunnion head journaled in said bearings on the hull below the water line, a cutter supporting frame or ladder supported by and fixed to and movable with said trunnion head about the bearings, a suction pipe carried on said ladder having one end in the U-shaped trunnion and between the bearings, a suction pipe supported on the hull and extending outwardly between the journals of the trunnion head, and a ball joint connecting said pipe with the suction pipe of the ladder and having its center in the axial line of the journals of the trunnion head.

5. A trunnion head for hydraulic dredges, comprising, in a unitary structure, a bed plate to receive separated shaft bearings, downwardly depending oil reservoirs made

integral with said bearings for the reception of gearing, vertical plate surfaces for connection to a supporting frame or ladder, and lateral journals or trunnions adapted to be mounted in bearings on the hull of a hydraulic dredge.

6. A trunnion head for hydraulic dredges, comprising, in a unitary structure, a bed plate to receive shaft bearings, an oil reservoir extending downwardly from one side of the bed plate, a vertical plate extending downwardly from the opposite side of the bed plate, an oil reservoir extending downwardly from the rear of the bed plate and being of less depth than the side oil reservoir and vertical plate, so as to provide space for the passage of a suction pipe, and lateral journals or trunnions on the side oil reservoir and vertical plate, respectively, the trunnion on the reservoir being made hollow for the passage of a driving shaft.

THOMAS JARDINE.

Witnesses:
HERBERT YOUNG,
THOMAS P. HILTON.