

June 1, 1937.

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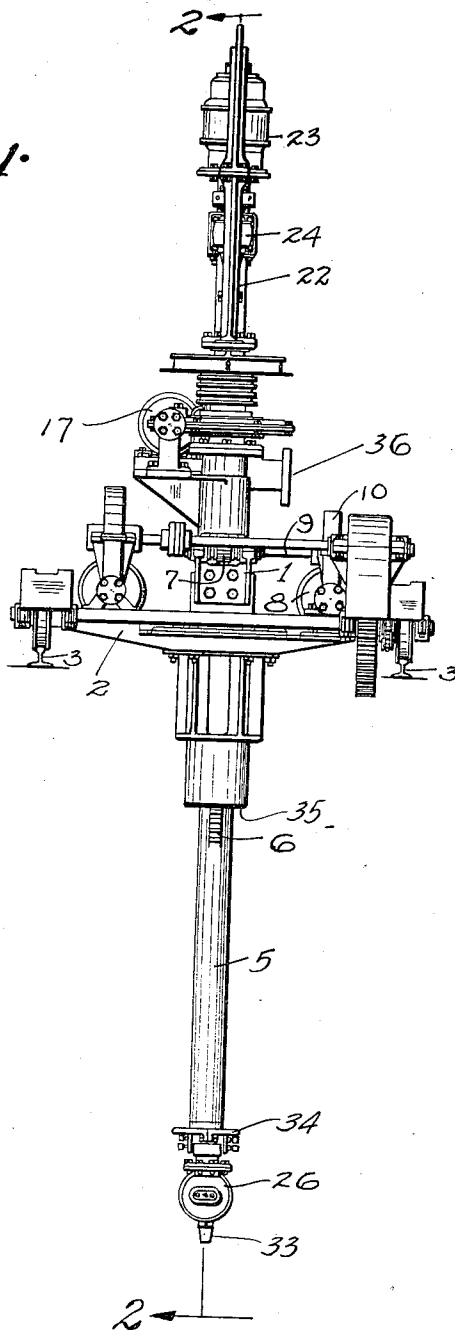
2,082,330

HYDRAULIC GUN

Filed April 18, 1928

4 Sheets-Sheet 1

Fig. 1.



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Fig. 2.

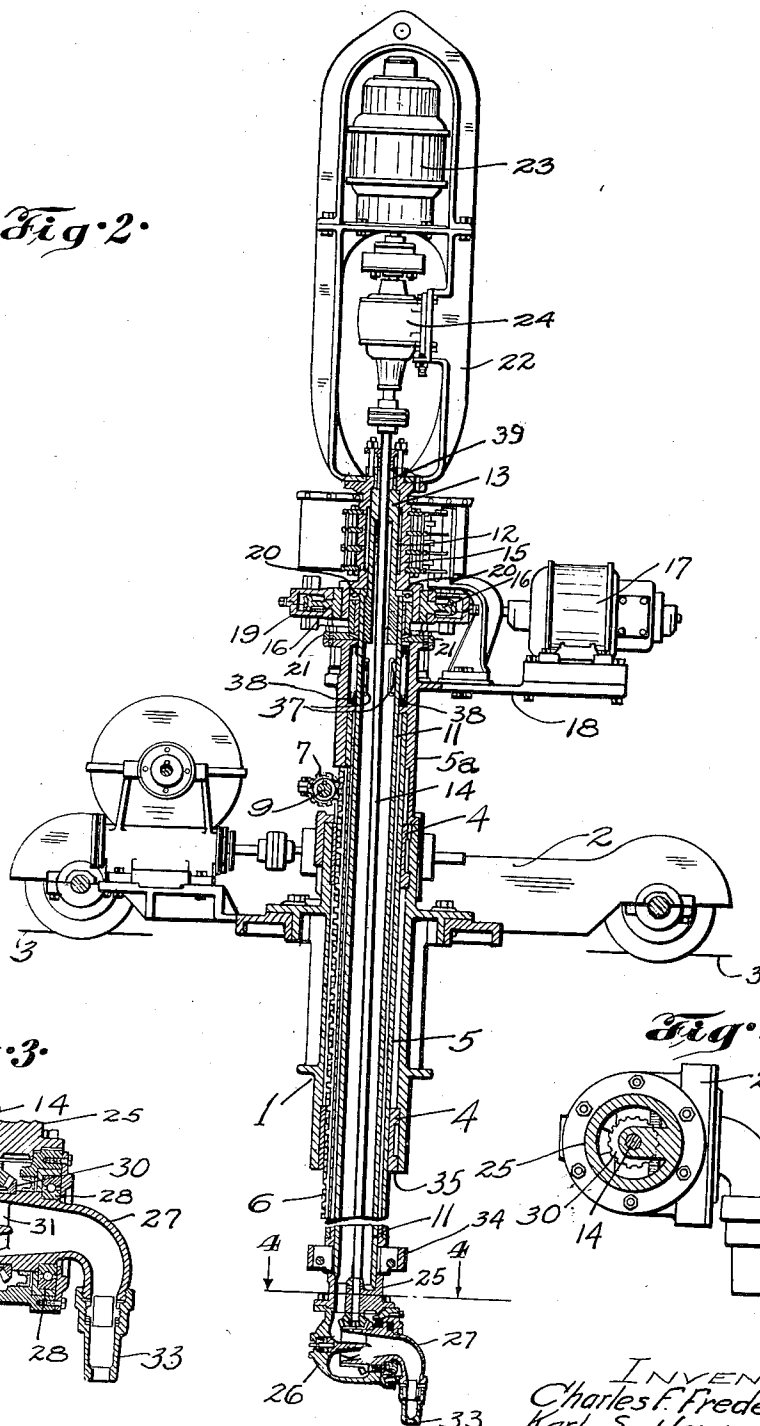


Fig. 3.

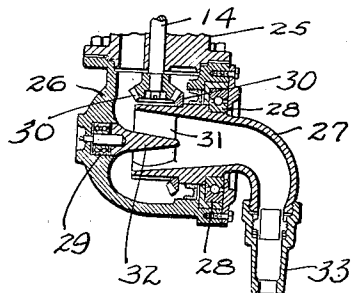
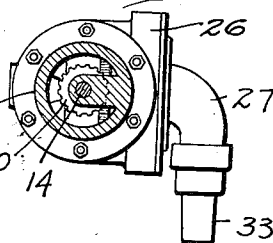


Fig. 4.



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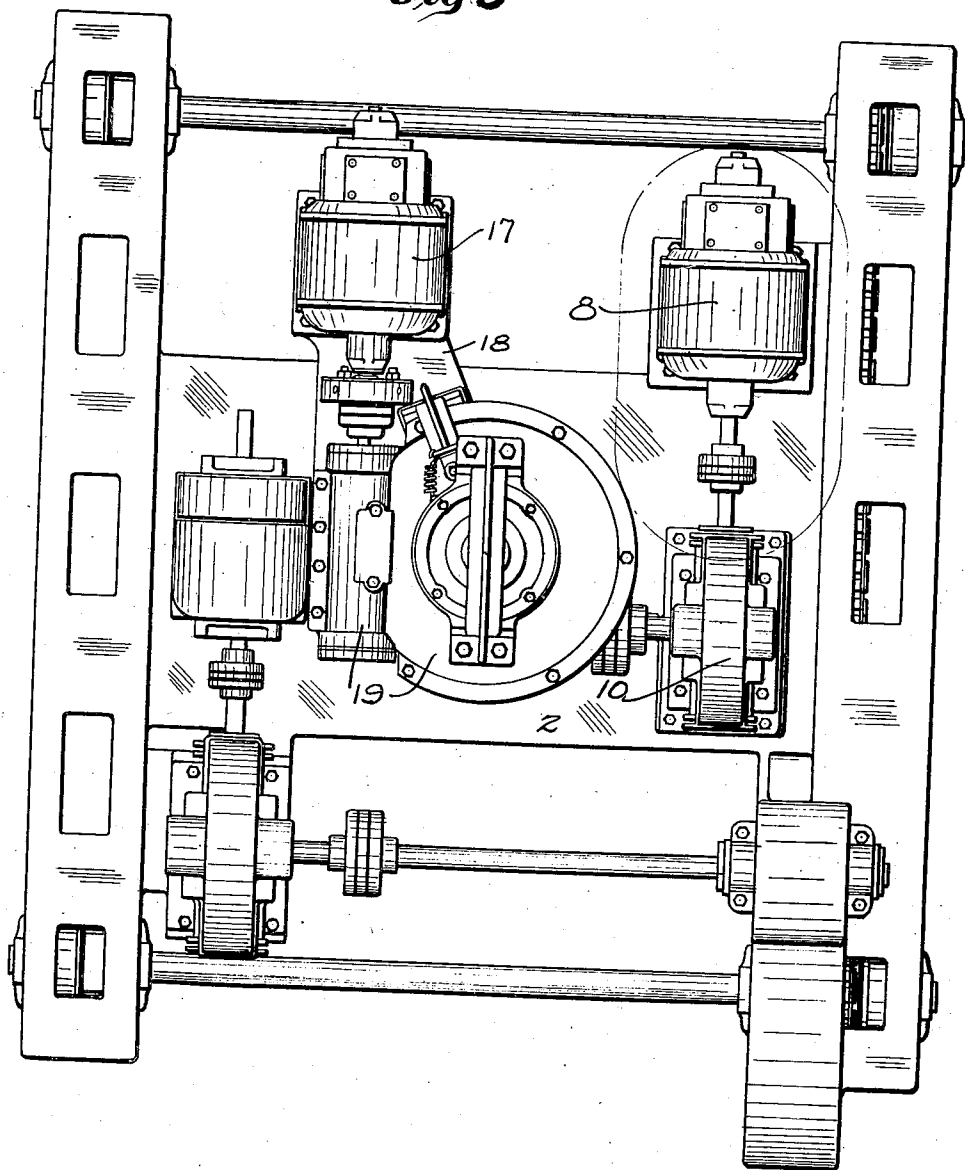
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Fig. 5.



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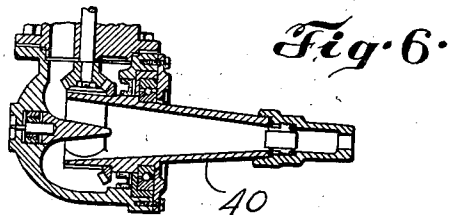


Fig. 8.

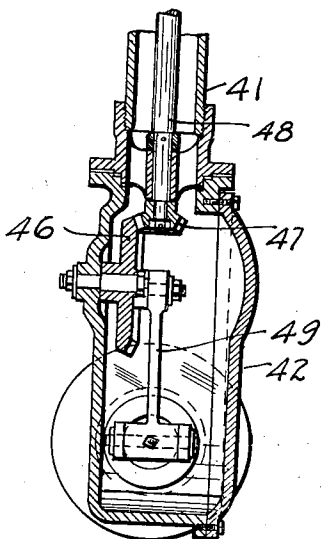


Fig. 7.

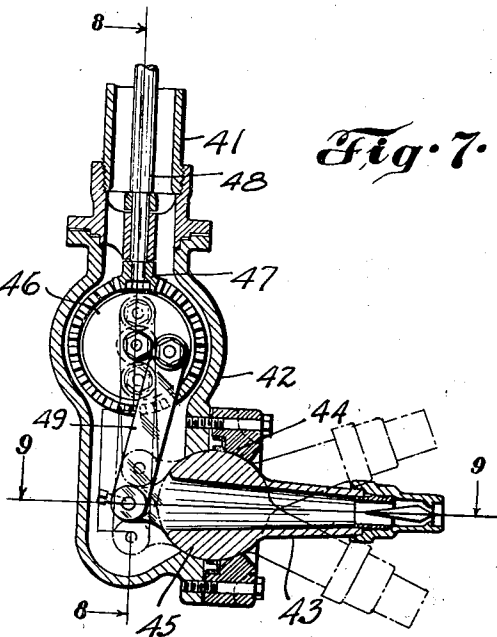
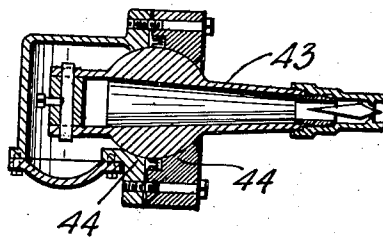


Fig. 9.



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UNITED STATES PATENT OFFICE

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HYDRAULIC GUN

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Application April 18, 1928, Serial No. 271,094

19 Claims. (Cl. 299—57)

Our invention relates to hydraulic guns and has been developed for use particularly in connection with the cleaning of cores and mold sand from large castings. It is to be understood that our invention is not limited to such use but may be used in fire fighting equipment, in hydraulic mining, and in various other industrial applications wherever it is desired to direct a stream of fluid at any desired angle from the discharge end of a nozzle and, particularly, when it is desired to control such a stream from a remote point.

In our copending application Serial No. 306,347 filed September 17, 1928 we illustrate and describe the application of our gun to the particular field referred to in connection with the cleaning of castings. In this particular application it is essential that a heavy volume of fluid under high pressure be forced into every recess of a complicated casting having pockets facing in all directions and it is necessary that this operation may be controlled by a person located at a remote point where he can be protected from the stream of water and from the flying sand, core rods, and other debris washed out by the gun.

In the accompanying drawings which illustrate a selected embodiment of our invention—

Figure 1 is a front elevation of our device applied to a travelling carriage.

Figure 2 is a vertical section taken on the line 2—2 of Figure 1.

Figure 3 is an enlarged detail of the nozzle shown in Figure 2.

Figure 4 is a horizontal section taken on line 4—4 of Figure 2 and showing the discharge tip of the nozzle rotated 90° in a vertical plane from the position shown in Figures 2 and 3.

Figure 5 is a top view of our gun mounted on a suitable carriage.

Figure 6 is a section corresponding to Figure 3 but illustrates a modified form of nozzle.

Figure 7 is a similar section illustrating another modification.

Figures 8 and 9 are sections taken approximately on lines 8—8 and 9—9 of Figure 7.

The body or frame of the gun is indicated at 1 and is shown as being mounted upon a travelling carriage 2 whereby the gun may be shifted along a track 3. Frame 1 is provided with bearings 4 in which an outer tube or barrel 5 is slidably mounted. Tube or barrel 5 is provided with a rack 6 on one side and a pinion 7 mounted on a shaft 9, journaled in frame 1, meshes with the rack 6 and may be rotated in

either direction to raise or lower barrel 5 in the frame. This rotation of pinion 7 is accomplished by means of a motor 8 which may be mounted on an extension of frame 1 but is shown as mounted on the travelling carriage 2 to which frame 1 is attached. Motor 8 is operatively connected to the shaft 9 of pinion 7 by means of a gear reducer 10.

The upper end of tube 5 carries a sleeve 5a which forms a bearing for an inner barrel 11 which extends beyond both ends of barrel 5 and at its upper end carries a bushing 12 provided with bearing 13 for journalling the upper end of an axially disposed shaft 14. Bushing 12 is keyed to a barrel head 15 which carries a worm wheel 16 which is driven by a worm, not shown, mounted on a shaft connected to motor 17 which is carried by a bracket 18 on sleeve 5a. The worm wheel 16 and its worm are enclosed in a suitable housing 19.

The upper end of head 15 carries a frame 22 in which is mounted a motor 23 and a speed reducer 24 by means of which shaft 14 may be rotated in either direction.

It will be understood that motors 8, 17, and 23, will be provided with individual cables leading to a remote control point where suitable switches and other electrical apparatus will be provided for selectively operating the motors as desired.

The weight of barrel 11, bushing 12, head 15 and the parts carried thereby, is rotatably mounted on sleeve 5a by an anti-friction device 20 through bracket 21 on the upper end of sleeve 5a.

The lower end of barrel 11 mounts a flange 25 which is provided with a bearing for the lower end of shaft 14 and also mounts a nozzle casing 26 forming an extension of the barrel. An L-shaped nozzle 27 is journaled in one side of casing 26, by means of roller bearings 28, and includes an integral spider 31 and central bearing element 32 which is journaled in the opposite side of casing 26 by means of a roller bearing 29. The inner end of nozzle 27 is geared to shaft 14 by means of miter gears 30. The outer end of nozzle 27 is provided with a renewable discharge tip 33.

The lower portion of tube 5 carries a bumper 34 adapted to abut against the lower face 35 of the frame 1 to arrest the upward movement of the barrels, and the downward movement of the tube and barrel is similarly arrested by engagement of the lower end of sleeve 5a with the upper end of frame 1.

Water is admitted to the gun through inlet connection 36 which projects outwardly from sleeve 5a. The water then passes from sleeve 5a (Figure 2) through the perforations 37 in upper end of barrel 11 and out of the nozzle at the lower end of the gun. Annular gaskets 38 of cup shaped cross section are provided between sleeve 5a and barrel 11 to prevent leakage through the joints of these elements. Leakage through the inner upper end of barrel 11 is prevented by the use of a stuffing box 39 in upper end of bushing 12.

Operation.—Frame 1, motor 8 and its speed reducer are stationary on carriage 2. Tube 5 and all of the remaining structure reciprocate vertically in frame 1. Barrel 11 and all of the parts carried thereby, including the nozzle casing 26 and the nozzle 27, may be rotated about the axis of tube 5 by means of the motor 17 mounted on the tube. Shaft 14 may be rotated on the same axis by means of the motor 23 and rotation of shaft 14 will rotate nozzle 27 about the horizontal axis of its inlet leg. Hence, it will be seen that nozzle 27 may be raised and lowered bodily, may be rotated in vertical planes, parallel with the axis of the tube and barrel, to various positions, one of which is indicated in Figure 4, and, by rotation of the inner barrel, may be rotated in a horizontal plane, irrespective of the angle of inclination of the discharge leg. Hence fluid may be discharged from the nozzle in any direction.

In Figure 6, we illustrate a modified construction in which the main portion of the discharge nozzle 40 extends laterally from the lower end of the inner barrel and is provided with a removable tip projecting axially of the main portion of the nozzle. This tip may be removed and an angular one substituted therefor. When an angular tip is placed upon the end of portion 40 the nozzle may be rotated to function the same as the nozzle 27 in the barrel 26 of the structure shown in Figure 2. At times it may be unnecessary to utilize the extreme range of direction of discharge and it may be desirable to obtain the greater force of a stream that may be had through a straight nozzle. This form of our invention will make it possible to use either arrangement according to the most desirable function.

In Figures 7, 8, and 9, we illustrate another modification in which the lower end of the barrel 41 mounts a member 42 for supporting the nozzle 43, the bearings 44 for the latter forming a socket joint for receiving the ball-shaped portion 45 of the nozzle. This provides for universal movement of the nozzle. A gear 46 is journaled on the side of member 42 and is driven by a pinion 47 on shaft 48. A crank 49 is connected to pinion 46 and the inner end of nozzle 43 and provides for directing the outer end of the nozzle upwardly or downwardly as may be desired.

This arrangement avoids the use of a nozzle with a right angle bend and enables the operator to direct a stream in almost as many directions as provided by the preferred structure.

Various other changes in the structure may be made without departing from the spirit of our invention, and we contemplate the exclusive use of such modifications as are included in the scope of our claims.

We claim:

1. In a hydraulic gun, a frame, an outer tube, means on said frame for reciprocating said tube lengthwise, an inner barrel within said tube and

communicating therewith, means on said tube for rotating said barrel, a discharge nozzle with angularly disposed legs with its inlet leg extending transversely of the axis of said barrel and journaled therein, means in said barrel for rotating said inlet leg, and a fluid inlet to said tube.

2. In a hydraulic gun, a frame, an outer tube slidable in said frame, a rack extending longitudinally of said tube, a motor and pinion assembled with said frame and driving said rack, an inner barrel rotatable in said tube and communicating therewith and extending beyond the ends thereof, a motor assembled with said tube and geared to said barrel for rotating the latter in said tube, a discharge nozzle with angularly disposed legs, with its inlet leg extending transversely of said barrel and rotatable therein, and a motor assembled with said barrel and operatively connected to said nozzle to rotate the latter in said barrel, and a fluid inlet to said tube.

3. In a hydraulic gun, a frame, a barrel rotatably mounted thereon to reciprocate axially and having inlet and outlet openings, a nozzle having a leg disposed at an angle to said barrel and journaled in said outlet opening and having a leg disposed at an angle to said first-mentioned leg, mechanism on said frame for reciprocating said barrel, and mechanism on said barrel for rotating said nozzle, each of said mechanisms being remotely controlled and operating independently of the other.

4. In a hydraulic gun, a frame, a tube mounted thereon to reciprocate axially, a barrel rotatably mounted in said tube and projecting at each end beyond said tube, a fluid inlet in said barrel adjacent one end, a nozzle having a leg disposed at an angle to said barrel and journaled in the same at the other end and having a leg disposed at an angle to said first-mentioned leg, a bracket on said barrel at the inlet end, a motor on said bracket, and mechanism inside said barrel for rotating said nozzle from said motor independently of the movement of said tube and said barrel.

5. In a hydraulic gun, a frame, a tube mounted on said frame to reciprocate axially, a barrel rotatably mounted in said tube and having fluid inlet and outlet openings, a nozzle having a leg disposed at an angle to said barrel and journaled in said outlet opening and having a leg disposed at an angle to said first-mentioned leg, means on said frame for reciprocating said tube, means on said tube for rotating said barrel, and means on said barrel for rotating said nozzle, each of the said means operating independently of the others and being remotely controlled.

6. A hydraulic machine comprising a pipe, means for admitting water into said pipe, a nozzle for conducting water from said pipe, means for supporting said nozzle for turning movements about an axis at an angle with respect to the axis of said pipe, a shaft supported in said pipe, mechanism for rotating said shaft, gearing for rotating said nozzle by said shaft, and mechanism for rotating said pipe irrespective of whether said shaft is being rotated or not.

7. A hydraulic machine comprising a longitudinally movable support, a water pipe mounted in said support, means for admitting water to said pipe, an angular nozzle supported for turning movements in connection with said pipe, gearing enclosed in said pipe for rotating said nozzle, mechanism supported by said support for operating said gearing, and mechanism for moving said support longitudinally.

8. A hydraulic machine comprising a longitudinally

dinally movable support, a water pipe mounted in said support, means for admitting water to said pipe, an angular nozzle supported for turning movements in connection with said pipe, gearing enclosed in said pipe for rotating said nozzle, mechanism supported by said support for operating said gearing, mechanism for moving said support longitudinally, and mechanism for rotating said pipe.

9. A hydraulic machine comprising a support, gearing for moving said support longitudinally, mechanism for operating said gearing, a water pipe mounted in and operated by said support, an angular discharge nozzle in connection with said pipe, a shaft extending axially in said pipe, gearing for rotating said nozzle by said shaft, and a motor for rotating said shaft.

10. A hydraulic machine comprising a tubular member, mechanism for moving said member longitudinally in opposite directions, a water pipe mounted for rotation in said tubular member, mechanism for rotating said water pipe about its axis, a shaft extending longitudinally through said tubular member, mechanism for rotating said shaft, an angular nozzle opening laterally from said water pipe, and mechanism for rotating said nozzle by said shaft.

11. A hydraulic machine comprising a support, mechanism for moving said support longitudinally in opposite directions, a rotary pipe mounted in said support, mechanism for rotating said pipe about its axis whether said pipe be in longitudinal motion or stationary, an angular nozzle opening laterally from said pipe, a shaft enclosed in said pipe, mechanism for rotating said shaft, and mechanism for rotating said nozzle by said shaft.

12. A hydraulic machine comprising a longitudinally movable support, means for supporting and guiding said support in its longitudinal movements, a rack in connection with said support, a gear meshing with said rack, a motor for rotating said gear, a water pipe supported for rotation in said support, mechanism for rotating said water pipe about its axis, an angular discharge nozzle opening from said pipe, a shaft enclosed in said pipe, a motor, mechanism for rotating said shaft by said motor, and gearing for rotating said nozzle by said shaft.

13. A hydraulic machine comprising a longitudinally movable support, means for supporting and guiding said support in its longitudinal movements, a pipe mounted for rotation in said support and for longitudinal movements thereby, mechanism for moving said support longitudinally, a motor supported by and movable with said support, and gearing operated by said motor for rotating said pipe.

14. A hydraulic machine comprising a longitudinally movable support, mechanism for supporting and guiding said support in its longitudinal movements, a pipe supported for rotation in and longitudinal movements by said support,

an angular nozzle in connection with said pipe, gearing enclosed in said pipe for rotating said nozzle, and a motor supported by and movable with said support for rotating said nozzle.

15. A hydraulic machine comprising a member mounted for longitudinal sliding movements in opposite directions, a pipe supported by said member, an angular nozzle swiveled at one end of said pipe, gearing in said pipe for rotating said nozzle, and a motor supported by and movable with said member for operating said gearing.

16. A hydraulic machine comprising a member mounted for longitudinal sliding movements in opposite directions, a pipe supported by said member, an angular nozzle swiveled at one end of said pipe, gearing in said pipe for rotating said nozzle, a motor supported by and movable with said member for operating said gearing, and mechanism for rotating said pipe irrespective of whether said nozzle is in rotation or not.

17. A hydraulic machine comprising a support, a member mounted for longitudinal sliding movements in opposite directions in said support, mechanism mounted on said support for moving said member longitudinally in opposite directions in said support, a pipe mounted in and moved longitudinally by said support, an angular nozzle swiveled to said pipe, a shaft extending axially through said pipe, a motor mounted on said member for rotating said shaft, gearing in said pipe for rotating said nozzle by said shaft, and means for admitting water to said pipe between said motor and said nozzle.

18. A hydraulic machine comprising a support, a member mounted for longitudinal sliding movements in opposite directions in said support, mechanism mounted on said support for moving said member longitudinally in opposite directions in said support, a pipe mounted in and moved longitudinally by said support, an angular nozzle swiveled to said pipe, a shaft extending axially through said pipe, a motor mounted on said member for rotating said shaft, gearing in said pipe for rotating said nozzle by said shaft, means for admitting water to said pipe between said motor and said nozzle, and mechanism for rotating said pipe in any of the longitudinally positions thereof and irrespective of whether said nozzle is in rotation or not.

19. A hydraulic machine comprising a support, a member mounted for longitudinal sliding movements in opposite directions in said support, mechanism for moving said member longitudinally in opposite directions in said support, a pipe mounted for rotation in said member, mechanism supported by said member for rotating said pipe, an angular nozzle pivoted to said pipe below said member, and means mounted on said member beyond the opposite end of said pipe from said nozzle for rotating said nozzle.

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