J. O. KAFADER.

HYDRAULIC MOTOR.

APPLICATION FILED JAN. 13, 1917. RENEWED JAN. 23, 1918.

1,257,875.

Patented Feb. 26, 1918.

2 SHEETS—SHEET 1.

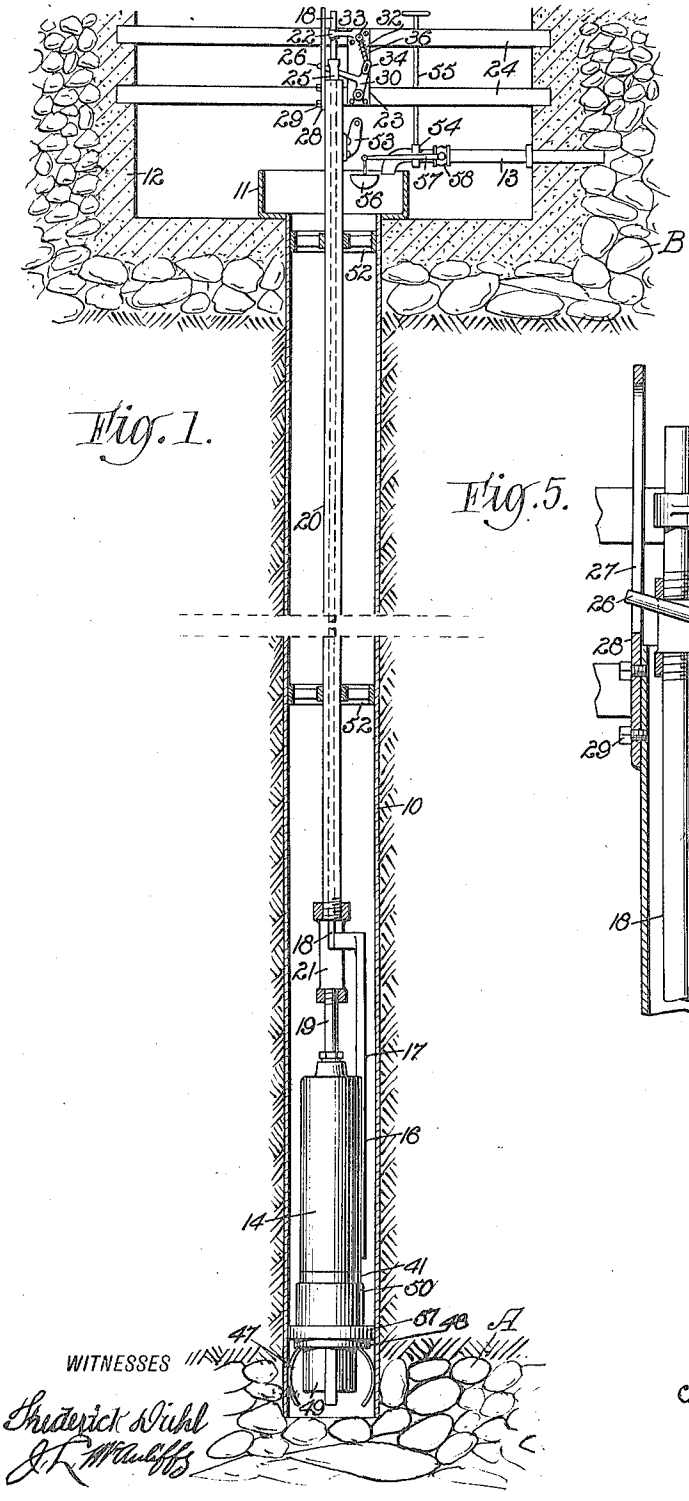


Fig. 1.

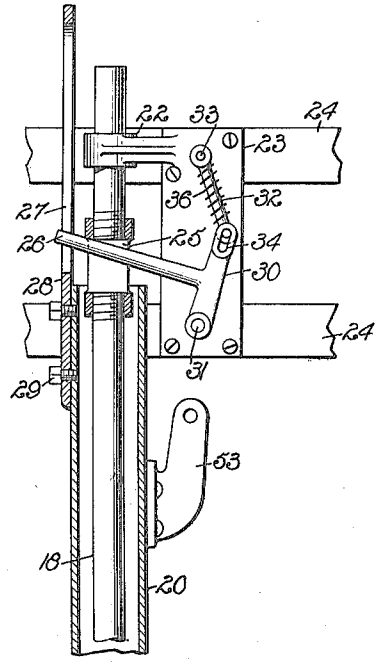


Fig. 5.

WITNESSES

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2 SHEETS—SHEET 2.

Fig. 2.

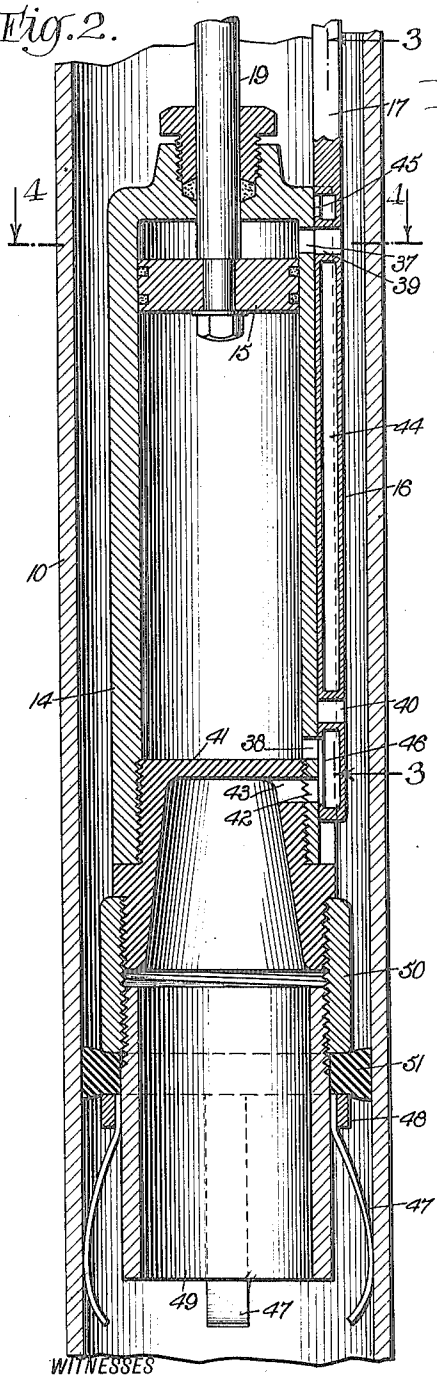


Fig. 3.

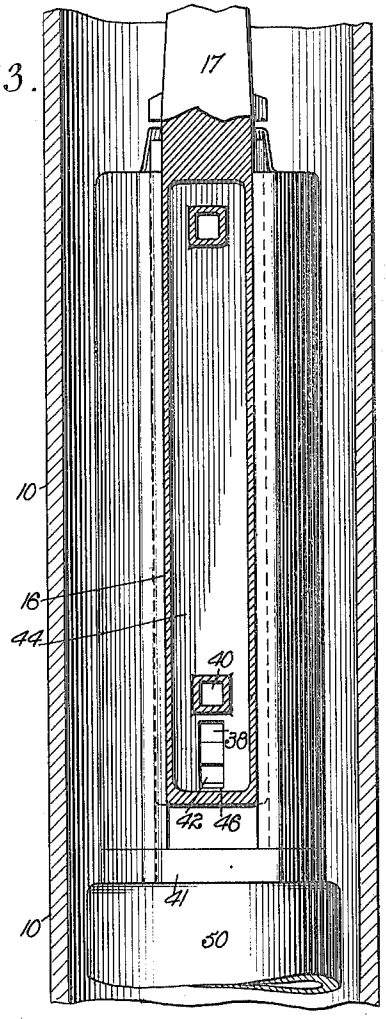
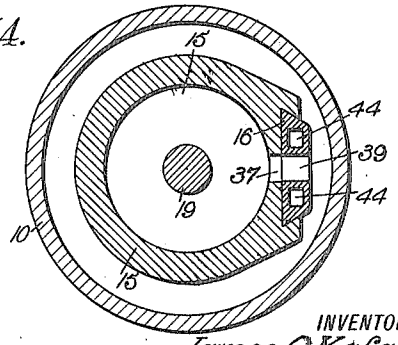


Fig. 4.



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HYDRAULIC MOTOR.

1,257,875. Specification of Letters Patent. Patented Feb. 26, 1918.

Application filed January 13, 1917, Serial No. 142,175. Renewed January 23, 1918. Serial No. 213,417.

To all whom it may concern:

Be it known that I, JAMES O. KAFADER, a citizen of the United States, and a resident of Fort Bidwell, in the county of Modoc and State of California, have invented a new and Improved Hydraulic Motor, of which the following is a full, clear, and exact description.

My invention relates to a hydraulic motor adapted to be operated under the pressure of a column of water representing the difference of levels of subterranean water strata.

In carrying out my invention use is made of a well casing extending from a lower to an upper stratum in which casing the motor is installed at the lower stratum, the motor comprising a cylinder and piston, and a valve controlling the admission and discharge of water to and from the cylinder, the valve rod being automatically controlled by the movements of a plunger rod operated by the piston.

The nature of the invention and its advantages will more clearly appear as the description proceeds.

Reference is to be had to the accompanying drawings forming a part of this specification in which similar reference characters indicate the corresponding parts in all the views.

Figure 1 is a sectional elevation of a motor and its appurtenances embodying my invention;

Fig. 2 is an enlarged, fragmentary, vertical section of my improved motor at the cylinder;

Fig. 3 is a vertical section on the line 3—3, Fig. 2;

Fig. 4 is a horizontal section on the line 4—4, Fig. 2;

Fig. 5 is a partly sectional front view of the valve controlling means.

In the illustrated example of my invention, letters A and B represent conventionally water strata at different levels. Extending between the respective strata is a well casing 10 which is of a capacity to maintain a constant column of water at the full height of the casing. The upper end of the casing preferably has a tank 11, said tank being constructed in a cement reservoir 12 at the upper water stratum, the water being delivered to the tank through the cement reservoir by any suitable conductor pipe 13.

In the casing 10 at the lower water stratum is a vertical cylinder 14 suitably sustained as by means hereinafter described. A piston 15 operates in the cylinder and a reciprocating valve 16 is provided to control the cylinder ports with the operation of the piston. The stem 17 of the valve is connected with a valve rod 18 which extends to the reservoir 12 or to the surface of the ground. The plunger 19 of the piston has the upper end 20 thereof made tubular and connected with the solid lower portion 19 by a suitable yoke or other coupling medium 21, and the valve rod 18 extends preferably through said tubular part of the plunger as shown.

The upper end of the valve rod 18 is guided in a bearing 22 which may be rigid with a plate 23 secured to the well timbers 24 at the reservoir 12 above the tank 11.

In order to cause the operation of the plunger to control the valve 16, the lever trip 26 extends through a coupling yoke 25 interposed in the rod 18 and extends through a vertical slot 27 in a trip arm 28 suitably secured as by screws 29 to the tubular part 20 of the plunger. Said lever trip 26 has a T-head 30, as best seen in Fig. 5, one end of said head being fulcrumed as at 31, to the plate 23 or other support, while the opposite end of said head 30 is articulated with a rockable bar 32. The bar 32 is pivoted at one end as at 33 to the plate 23 and its opposite end has a slot and pin connection with the head 30, there being shown a slot 34 in said head receiving a pin 35 on the bar 32. The spring 36 encircles the bar 32 and exerts its pressure against the adjacent end of the T-head 30 of the lever trip 26. The arrangement is such that whenever the pin 35 moves from a dead center with the pivots 31, 33, the spring 36 will rock the said lever to shift the valve by engaging the trip lever 26 with said rod as will appear.

The cylinder 14 has upper and lower ports 37, 38 above and below the piston 15 and the valve 16 has corresponding upper and lower inlet ports 39, 40. The cylinder is sufficiently smaller than the well casing 10 to maintain a constant volume of water to afford an ample supply to the cylinder ports through the said valve ports. The lower head 41 of the cylinder in the illustrated example consists of a screw plug and

below the lower cylinder port 38 I provide means to conduct the water from the cylinder to the lower water stratum. Said means includes registering openings 42, 43 in the cylinder and head 41 and connections establishing communication between the hollow interior of the head 41 and the casing 10 below the cylinder base. The valve has an oblong port 46 in constant register with the cylinder port 38 and the opening 42. At the upper end the valve has a discharge port 45 adapted to register with the adjacent cylinder port 37.

To sustain the cylinder 14 in the casing 10, the following devices are employed in the illustrated construction: Bowed springs 47 are secured to a ring 48 on a pipe section 49 which is connected by a coupling 50 to the lower end of the plug 41 and between said coupling 50 and the ring 48 a resilient packing ring 51 is clamped. The cylinder carrying the springs 47 which bear against the wall of the casing 10 is lowered in the casing to the desired position. The springs 47 prevent turning of the pipe section 49 so that the cylinder with the plug 41 may be screwed tightly into the coupling 50 to expand the packing ring 51 and thus give the cylinder a foundation in the casing.

The numeral 52 indicates spiders through which the tubular plunger 20 has guided movement. A bracket arm 53 or any equivalent means may be provided on the plunger at the upper end to be connected with any apparatus to be operated.

In operation the valve positioned as in Fig. 2 when the well casing 10 is filled with water, it will enter through the registering admission ports 39, 37, and move the piston 15 downwardly. As the piston approaches the limit of its stroke the downward movement of the plunger will cause the upper end of the arm 28 to trip the lever 26, thereby rocking said lever on its fulcrum 31 and throwing the head 30 thereof to the left carrying with it the bar 32. As soon as the pivot pin 35 is moved across the center of the pivots 31, 33, the spring 36 will rock the lever into engagement with the valve rod 18, thereby shifting the valve 16 to bring the admission port 40 of the valve in register with the lower port 38 of the cylinder, thus admitting water beneath the piston to lift the same and at the same time the upper discharge port 45 of the valve will be brought into register with the port 37 of the cylinder permitting the outflow of water from above the piston through the vertical passage 44 to the discharge port 46 of the valve and to the outlet openings 42, 43 from which the water passes through the plug 41 and pipe section 49 to the casing 10 below the packing ring 51 and thence to the lower water stratum A. Upon the piston approaching the limit of its upward stroke a reverse throw will be given to the lever trip 26 to lift the valve 16 and restore the same to the position in Fig. 2.

The inlet pipe 13 leading to the tank 11 is equipped in practice with any approved controlling means. I have shown conventionally a gate valve 54 adapted to cut off the water entirely when desired. The stem 55 of the valve rises to a proper height to be readily accessible. Also, I have shown conventionally a float-controlled means to regulate the flow of water, there being indicated a float 56 hung on the arm 57 of a valve 58.

I wish to state that although the illustrated example constitutes a practical embodiment of my invention, I do not limit myself strictly to the mechanical details herein illustrated, since manifestly the same can be considerably varied without departure from the spirit of the invention as defined in the appended claims.

Having thus described my invention I claim as new, and desire to secure by Letters Patent:

1. In a hydraulic motor, a casing adapted for communication at its top with a source of water supply to maintain a hydrostatic column therein, a cylinder in the casing at the bottom and formed with upper and lower ports to alternately communicate with the interior of the casing, a piston in said cylinder subject to the hydrostatic column, a valve controlling said ports, means to establish a water discharge from the casing below the cylinder, said valve being in constant communication with the said means to conduct water thereto after operation of the piston, and means to actuate the valve to control the admission and discharge of the water through the cylinder ports.

2. In a hydraulic motor, a casing adapted for communication with a water supply to maintain a hydrostatic head therein, a cylinder in the casing near the lower end and formed with ports near the ends thereof, the cylinder being of less diameter than the casing, to maintain a constant volume of water about the cylinder, a piston in said cylinder subject to the hydrostatic head, a valve operating over the cylinder ports, and having admission ports to establish communication between the cylinder ports and the casing, said valve further having an eduction passage and eduction ports at the ends in communication with the passage and means establishing a water discharge from the valve through the casing below the cylinder.

3. In a hydraulic motor, a vertical casing, a cylinder therein, means at the base of the cylinder for forming a closure of the casing, means to maintain a hydrostatic head in the casing, a piston in the cylinder subject to the hydrostatic head, valve means associated with the cylinder to control the

admission and eduction of water in the operation of the piston, and means to conduct the water from the valve through said closure to the casing below the cylinder.

4. The combination with a well casing connecting an upper subterranean water stratum with a lower one to produce a hydrostatic head, of a cylinder in the casing near the lower stratum, said cylinder having admission and eduction means, a piston in the cylinder subject to the hydrostatic head, and means to control the admission and eduction of water to and from the cylinder.

5. The combination with a well casing connecting an upper subterranean water stratum with a lower one to produce a hydrostatic head, a cylinder in the casing near the lower stratum, said cylinder having ports at the upper and lower ends, a piston in said cylinder subject to the hydrostatic head, a vertically reciprocating valve, having upper and lower ports to alternately communicate with the respective cylinder ports, said valve having a vertical eduction passage connecting the upper and lower valve ports, and means to conduct water below the cylinder from the said valve passage.

6. The combination with a casing and means to form a hydrostatic head therein, of a vertical cylinder in said casing near the lower end, said cylinder having ports at the upper and lower ends, a piston in said cylinder subject to the hydrostatic head, a vertically reciprocating valve having upper and lower ports to alternately communicate with the said cylinder ports, said valve having an eduction passage connecting the upper and lower valve ports, a plug forming the lower cylinder head, a pipe section in the casing below the said plug, coupling means expansible against the casing by the said coupling to constitute a foundation for the cylinder, said valve passage being in communication with the said pipe section.

JAMES OLIVER KAFADER.