



# UNITED STATES PATENT OFFICE.

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## WATER-PUMPING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 715,871, dated December 16, 1902.

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*To all whom it may concern:*

Be it known that I, GEORGE J. ROBERTS, of Dayton, in the county of Montgomery, State of Ohio, have invented certain new and useful  
5 Improvements in Water-Pumping Apparatus; and I hereby declare the following to be a full, clear, and exact description of the same, reference being had to the accompanying drawings, forming a part of this specification, and  
10 to the letters of reference marked thereon.

This invention relates to improvements in hydraulic motors and pumps, and particularly to that class of combined hydraulic motor and pump designed for pumping water into a  
15 tank or other suitable receptacle or local system from a source of supply in proximity to the pump, while the motor is driven from a high-pressure system—such, for instance, as a city system. The particular utility of this  
20 class of apparatus is found in those situations where the water supplied through the city mains is hard or not well adapted for domestic or other use, and consequently a local supply of rain or soft water has to be provided,  
25 and the force or power from the city mains is utilized to distribute the local supply through the local system and usually by pumping the same into an elevated tank or into an air-tight tank located in any desired situation and from  
30 which it is distributed. The present invention is designed to provide a means whereby the supply from the city mains to the motor will be controlled by the pressure in the local system or the tank from which said system is supplied; and the invention consists in a device of this character so constructed that when  
35 the pressure in the local system or tank has reached a predetermined point or degree the motor-supply will be automatically interrupted and as a consequence the motor and pump  
40 brought to rest, the arrangement being such, however, that the motor-supply is not again established upon a reduction of the high pressure in the local system to a point where the  
45 cut-off of the motor-supply was effected, but the pressure in the local system is allowed to drop considerably below that point, whereby a certain proportion of the water in the local system or tank for the local system may be  
50 utilized or used before the motor again becomes effective, and as a consequence the

creeping of the motor or its slow operation when the pressure in the local system or tank is slowly or only slightly reduced is effectually prevented and the wear and strain on the  
55 parts incident thereto is entirely eliminated.

Referring to the accompanying drawings, Figure 1 is an elevation, partly in perspective, showing a combined motor and pump with the present improvements applied thereto. Fig. 60  
2 is a horizontal section through the governing-valve and its operating mechanism, with the valve shown in its open position. Fig. 3 is a similar view with the valve in its closed  
65 position.

Like letters of reference in the several figures indicate the same parts.

The pump and motor illustrated are of a well-known type and need only be described in general terms, inasmuch as it will be obvious  
70 that any ordinary or preferred type of pump and motor for operating the same may be substituted for that shown without in any way affecting the present invention.

The letter A indicates the motor end of the  
75 device; B, the pump end; C, the local or cistern supply-pipe for the pump, and C' the pipe leading from the pump to the local tank or domestic system.

D indicates the supply to the motor, and 80  
D' the discharge from the motor.

The controlling mechanism made the subject-matter of the present invention is interposed between the motor-supply D and the  
85 discharge from the pump or some portion of the system supplied by said discharge, whereby the pressure in said system or in the tank for supplying the same may be utilized as one of the controlling factors of a shut-off or valve in the supply-pipe D. As illustrated and as  
90 the most convenient embodiment of the invention, a valve-casing E is connected with the supply-pipe D and provided with a cylindrical extension E', which at the opposite end is provided with a pipe E<sup>2</sup>, communicating  
95 with the pump-discharge pipe C', whereby pressure may enter the cylinder E' from the discharge-pipe C'. The supply for the motor enters the valve-casing E through a transverse opening F, and a valve G, closing to-  
100 ward the motor or in the direction of the pressure in the high-pressure system, is mounted

in the valve-casing E in such position as to be held to its seat with the supply to the pump cut off by the pressure in the high-pressure or city system, as will be readily understood from an inspection of Figs. 2 and 3. The valve-stem *g*, upon which the valve G is mounted, works through a gland and packing *h*, preferably having its base threaded into the end of the valve-casing E, as shown at *h'*. At its outer end said valve-stem *g* is provided with a piston, preferably formed by suitable heads I on the stem, and a cup-leather *i*, held between said heads. The diameter of the piston and its cylindrical casing E' is preferably considerably greater than that of the valve, and the leather *i* is cupped in a direction to make the pressure in the pump system or tank available in a direction tending to close the valve G, such tendency, however, being counteracted or resisted by a spring K, preferably located between the piston and head of the valve-casing, as shown clearly in said Figs. 2 and 3, the chamber in which the spring is located or the portion of the extension in front of the piston I being vented, as at M. The spring K is preferably a spiral spring and surrounds the valve-stem G, together with its gland and packing, while the cylinder E', in which the piston works, constitutes a casing for all of the parts and may be conveniently and economically formed separate from the valve-casing and united thereto by a screw-threaded connection. By this construction the parts may be readily separated to facilitate repairs or cleaning, and in order to still further facilitate such operations the pipe E<sup>2</sup> is preferably connected with the casing E' by passing through a gland and packing L on the end of said casing, whereby the parts of said casing may be separated and slipped back along said pipe, exposing the working parts for renewal or repairs, as occasion may demand.

In operation it will be understood that the valve is not a balanced valve; but the preponderance of power is exerted in a direction to maintain the valve in either position to which it may be set until the lowering or raising of the pressure becomes sufficiently great to effect its movement. Thus, assuming that the motor and pump have raised the pressure in the local tank or system until it is sufficient to advance the valve and piston against the tension of the spring K and closes the valve G, in such position, we have the pressure of the water in the motor-supply pipe operating against the valve G and the pressure in the local tank or system operating against the piston I, tending to hold said valve closed, whereas the spring K alone is operating in the opposite direction. Under such conditions it is found that the pressure in the local system may be reduced very considerably before the spring K can assert itself or overcome the pressure against the valve G, augmented by the reduced pressure against the piston, and so open the valve, and it is obvi-

ous that by increasing the diameter of the valve G with its outlet-port or by varying the strength of the spring K or the diameter of the piston I the parts may be proportioned to effect a very wide variation between the opening and closing pressures in the local tank or system, and consequently it is possible to fill the local tank or system, stop the motor automatically, and allow the same to remain at rest until a large proportion of the water in the local tank or system has been utilized, when the motor will automatically resume its operation and the local tank or system again filled until a pressure is reached where the motor will be brought to a state of absolute rest.

Those familiar with devices of this character will readily appreciate the advantages incident to the use of the motor under full head for a short time only as compared with the constant slow or irregular slow but very frequent operation of the motor, and especially where there is a liability of the valves being cut or worn by grit or sand contained in the water-supplies and which materials are much more active when the motor is moving slowly than when it is working under full head.

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

1. In a hydraulic motor and pumping apparatus, the combination with the motor, the pump and supply and discharge pipes therefor, of a valve in the motor-supply closing toward the motor and held closed by the pressure in the motor-supply, a spring for opening the valve, a cylinder open to the pressure of the pump-discharge, a piston therein connected with the valve and under the influence of the pump-discharge tending to hold the valve closed, whereby the valve will be held closed until the combined pressure of the motor-supply and the pump-discharge is less than the power of the spring and will be held open until the pump-discharge alone is of sufficient pressure to overcome the spring; substantially as described.

2. In a hydraulic motor and pumping apparatus, the combination with the motor, the pump and independent supply and discharge pipes therefor, of a valve in the motor-supply closing toward the motor and held closed by the pressure in the motor-supply, a rod on which the valve is mounted, a piston on the rear end of the rod, a cylinder surrounding the piston and open to the pump-discharge in rear of the piston, a packing for the rod between the valve-chamber and cylinder, and a spring operating on the valve in opposition to the pressure in the motor-supply and pump-discharge; substantially as described.

3. In a hydraulic motor and pumping apparatus, the combination with the motor, the pump and independent supply and discharge pipes therefor, of a valve in the motor-supply closing toward the motor and held closed by the pressure in the motor-supply, a rod on

which the valve is mounted, a piston on the opposite end of said rod, a packing-gland through which the rod works, a cylinder surrounding said gland and piston and open to the pump-discharge pressure in rear of the piston, and a spring surrounding the gland and rod within the cylinder for opening the valve; substantially as described.

4. An automatic motor-controlling valve for a hydraulic motor and pump, embodying a valve-casing through which the motor-supply passes, a packing-gland in one end of said casing, a cylinder surrounding said gland and detachably connected with the valve-casing, a valve in the valve-casing, a piston in the cylinder, a valve-rod passing through the gland and connecting the valve and piston, a spring tending to open the valve and a pipe connection with the cylinder for the application of pump-pressure in a direction

tending to close the valve; substantially as described.

5. An automatic motor-controlling valve for a hydraulic motor and pump, embodying a valve-casing through which the motor-supply passes, a packing-gland projecting from the end of said casing, a cylinder surrounding the gland and detachably connected with the casing, a packed pipe connection with the cylinder whereby the cylinder may be detached from the casing and moved without detaching the pipe connection, for the inspection of the gland, a valve, a valve-rod, a piston and a spring for moving the valve and piston in one direction; substantially as described.

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Witnesses:

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