(No Model.) 2 Sheets—Sheet 1.

B. PICKERING.

WATER MOTOR.

No. 588,470. Patented Aug. 17, 1897.

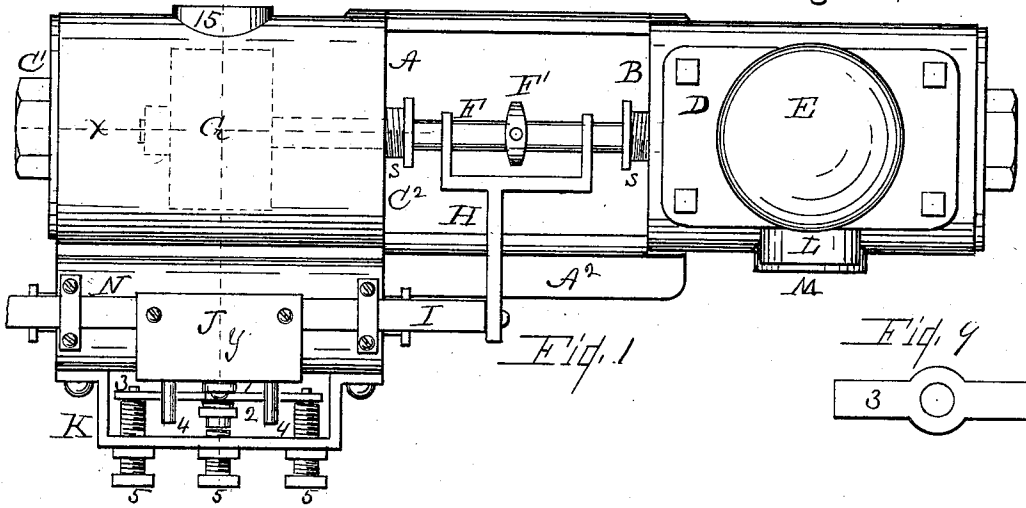


Fig. 1

Fig. 9

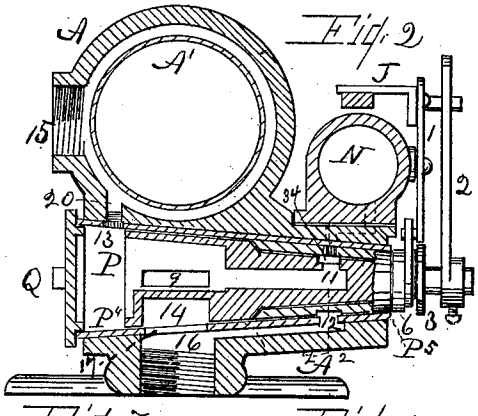


Fig. 2

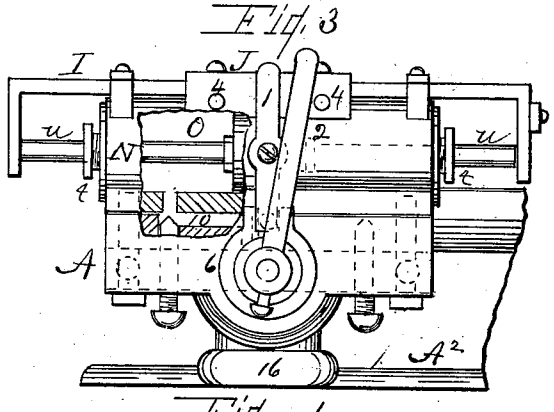


Fig. 3

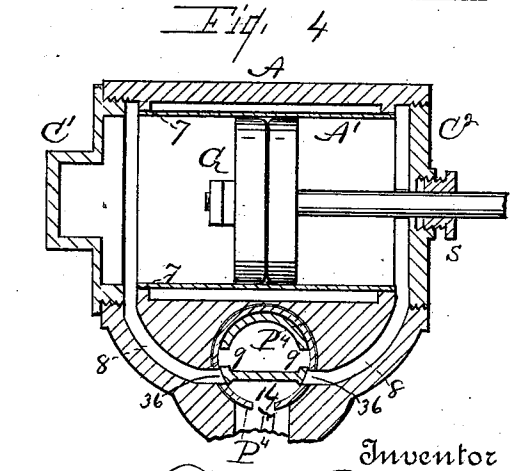


Fig. 4

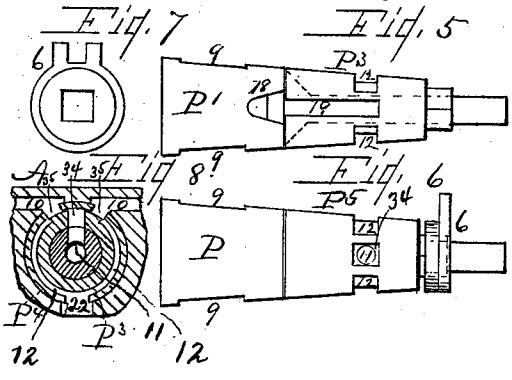


Fig. 7

Fig. 8

Fig. 5

Fig. 6

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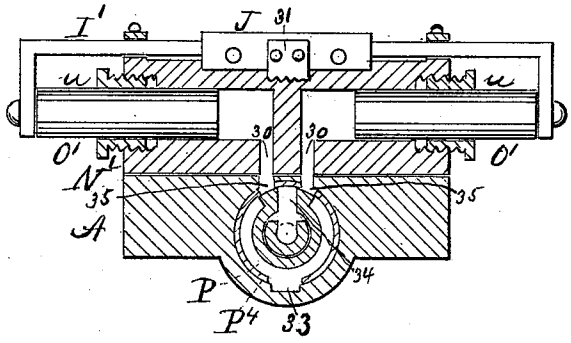
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Fig. 10



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UNITED STATES PATENT OFFICE.

BARTON PICKERING, OF DAYTON, OHIO.

WATER-MOTOR.

SPECIFICATION forming part of Letters Patent No. 588,470, dated August 17, 1897.

Application filed February 10, 1892. Serial No. 420,941. (No model.)

To all whom it may concern:

Be it known that I, BARTON PICKERING, a citizen of the United States, residing at Dayton, in the county of Montgomery and State of Ohio, have invented certain new and useful Improvements in Water-Motors; and I do hereby declare that the following is a full, clear, and exact description of the invention, which will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the letters and numerals of reference marked thereon, which form a part of this specification.

My invention relates to improvements in water-motors, the several features of which will be fully hereinafter described and claimed.

The object of my invention is to automatically operate a motor under any variation of pressure, the only essential condition being that the pressure shall be sufficient to produce a movement. The pump part of the motor is not involved in the invention, as the motor will operate independently and may be applied to any mechanism requiring a reciprocating motion.

The mechanism is illustrated in the accompanying drawings, in which—

Figure 1 is a plan of the motor as attached to a pump. Fig. 2 is a transverse vertical section of the motor on line *y*, Fig. 1, (two sheets.) Fig. 3 is a front view of the motor. Fig. 4 is a longitudinal vertical section of the motor on line *x*, Fig. 1. Fig. 5 is a top view of the principal valve and the supplementary valve. Fig. 6 is a top view of a variable form of the valves. Fig. 7 is a front view of the supplementary-valve arm. Fig. 8 is a transverse section of the supplementary valve and adjacent parts, the exterior being broken. Fig. 9 is a view of the adjusting-plate. Fig. 10 is a view, chiefly in longitudinal vertical section, of a variation of the piston-cylinder which gives motion to the supplementary valve.

Like letters and numerals designate like parts throughout the several views.

A is the motor-cylinder, and B the pump-cylinder, and these are rigidly attached to the base A^2. The pump is not an essential part of the invention, but is an addition to said cylinder and comprises a leather-packed piston identical with that of G, Fig. 4, and shown by dotted lines, Fig. 1, the valve-chamber D, induction-pipe M, eduction-pipe L, and air-chamber E. The pistons of the motor and pump are identical and are connected by the piston-rod F, to the center of which is rigidly attached the collar F′. To prevent leakage where the piston-rod passes through the cylinder-heads, the stuffing-boxes *s s* are provided.

C′ C^2 are the cylinder-heads of the motor, and the orifice 15 is for the induction-pipe and 16 for the eduction-pipe of the valve P.

A′ is the brass lining of the motor, the ends being closed within and against the outer surfaces of the circular ribs and within which the piston moves.

In an integral part of the motor-cylinder and transversely to said cylinder is a tapering orifice for the reception of the bush valve-seat P^4. (Shown in Figs. 2, 4, and 8.) This bush has an induction-orifice 13 corresponding to orifice 20 and an outlet-orifice 17 on the opposite side for the exhaust. These two orifices are for the principal valve P. This bush is further provided with three orifices for the supplementary valve, the orifices 10 10 at the top and the orifice 22 at the bottom, the former serving as inlet and outlet orifices and the latter the exhaust. The bush-opening, as adapted to two pistons, is shown in Fig. 10, the inlet-ports 35 35, the exhaust-port 33, and the supplementary-valve port 34. The rear end of said bush is closed by the plate Q, held by screws, and the central portion and right end is filled by the compound valve. The plate, with its screws, serves to both close the end of said bush and hold it snugly within its seat. The bush serves as a convenient seat for the valve, and its orifices correspond to the port and exhaust-orifices of the motor-casting.

The auxiliary device for completing the motion of the principal valve has two forms of supplementary valve performing like functions, but modified in the requisite adaptation to either a single or double piston or plunger.

At Fig. 4 is shown the valve P with its inlet side orifices 9 9 and inlet end orifices, the ports 88 in the casing communicating with the ends of the motor-cylinder, the exhaust-cavity 14 in said valve, and the exhaust-opening

17 in the bush P^4. When the valve is rotated slightly to the left, the water under pressure would carry the piston G to the right, and vice versa. The stem of the valve extends externally, and to the end is attached the arm 2.

Within guides on the cylinder N is supported the bar I, the ends of which are bent down at a right angle to engage the ends of the piston-rods *u u*, on which is attached the piston O. (Shown at Fig. 3.) To the right end of this bar is attached the forked arm H, the same extending over the piston-rod F, and thereby engages the collar F′ just before the piston makes its full movement in either direction. In this manner the requisite movement is given to the valve to drive the pistons of the motor and the pump, but without the resultant motion of the supplementary valve an automatic movement would not result.

To the top of the bar I is attached the angular plate J, and in the face of which are attached the pins 4 4, which engage the upper end of the valve-arm. The principal valves P and P′ are substantially the same. The only variation is that the former has a central orifice 11 to carry the water to the supplementary valve and the latter has the orifice 18 opening externally and communicating with the lengthened groove 19 of the supplementary valve P^3, (shown in Fig. 5,) which is the entry-port for the water, and 34 is the issue-port of the supplementary valve P^5.

I show two forms of supplementary valve, each form being respectively constructed with reference to one of the two forms of principal valve above described. The supplementary valve P^5 (shown in Fig. 6) has a transverse port 15, corresponding with the port 11 in the principal valve P. The supplementary valve P^3 (shown in Fig. 5) has a longitudinal groove 19, as shown, for conducting the fluid from the orifice 18 in the principal valve P′ to either side of the auxiliary piston O in the cylinder N. Either of these two forms of main and corresponding supplementary valve may be used at will. The bush P^4 is adapted for use as well with one form as with the other. The supplementary valve is provided with the arm 6, Fig. 7, whose square orifice embraces the neck of such supplementary valve and which is further provided with a slot to receive the pin of the pivotal lever 1 (shown in Fig. 3) or of the like connection on the rigid arm shown in Fig. 10. The former is used when the single piston O is used and the latter when the two pistons O′ O′ are used.

In the variation of the cylinder N′ shown in Fig. 10 the same is adapted to the use of two pistons and is provided with inlet-orifices 30 30 and the exhaust-orifice 33. The arm 31, rigidly attached to the bar I′, engages the notch of the arm 6, Fig. 3, the same as the oscillating arm, (shown in Fig. 1,) and thereby cause the supplementary valve P^3 to oscillate. The rigid arm or pivotal lever moves the supplementary valve and thereby opens the issue-port, causing the piston or pistons to move, and thereby completing the movement of the principal valve by causing the reciprocating bar I to move, which carries the principal valve until its opposite port is fully opened, and consequently a reverse movement results. The operation is thus: The water flows through the center of the valve and, entering through the side port of the principal valve, carries the pistons until the forked operating-arm engages the collar on the piston-rod, which carries said valve until its port is closed, but previously the valve-arm of the supplementary valve is engaged by the reciprocating bar and the water flows into the independent cylinder, causing a movement of the piston and thereby carrying said reciprocating bar sufficiently to fully open the opposite port of said principal valve and thereby reverse the action of the motor. The same action takes place at the end of each stroke, and the motor continues to move so long as the force is applied.

Steam or gas may be used as the propelling agency in the motor, as the valves are adapted to steam-pumps or any mechanism requiring an automatic reciprocating motion.

Both valves are held to their seat by the pressure of the water, and to prevent this force pressing the valves too tightly into their seat the plate 3, which bears against the arm 6, which embraces the square end of the supplementary valve, is used to hold back said valve by means of the outer screws 5 5, which are made to press against the ends of said plate. The stem of the principal valve abuts the middle screw, and by which a like adjustment is effected. Lock-nuts are used on all of these screws to bind them fully when the adjustment of the valves is made. The screws are all held in the arm K, fastened to the cylinder N.

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

1. The combination of the valve P provided with lateral ports and exhaust-cavity, the cylinder A having corresponding ports, the supplementary valve P^5 held on the stem of said principal valve and provided with issue-port 34 and exhaust-cavity 12, the cylinder N, with its piston O, and connecting mechanisms, by which the valve-arms are connected respectively with the pistons of the two cylinders, substantially as set forth.

2. The combination of the cylinder A with its piston G, the principal valve P provided with the operating-arm 2, and with issue-ports 9, 9, and exhaust-cavity 14, the cylinder N with its piston O, the supplementary valve P^5 provided with operating-arm 6 and with issue-port 34 and exhaust-cavity 12; the latter held on the stem by the former valve, substantially as set forth.

3. The bush or valve-seat P^4 provided with lateral openings 36 36 and exhaust-opening 17 for the principal valve; the inlet-ports 35, 35 and exhaust-opening 22 for the auxiliary

valve, in combination with the principal and auxiliary valves, the two parallel cylinders with pistons and rods, said valves arranged transversely to said cylinders, and with mechanism to effect their operation, substantially as described.

4. The combination of the compound valve, each part provided with distinct operating-arms, the principal valve having two issue-ports and an exhaust-cavity, the principal cylinder with corresponding ports, the piston and rod of said principal cylinder, the auxiliary valve having an issue-port and exhaust-cavity, and adapted to oscillate on the stem of the former valve, the auxiliary cylinder arranged parallel with the principal cylinder, the piston and rod of said auxiliary cylinder, and with suitable mechanism to give the initial movement to said principal valve, and to complete the motion of said principal valve by the agency of the auxiliary piston, substantially as described.

5. In a water-motor, the combination of two cylinders arranged parallel to each other, the larger of said cylinders containing the main piston and piston-rod, and the smaller the supplementary piston and its rod, the latter adapted to shift the main and supplementary valves, the bushing or valve-seat located in a bore of the cylinder-casting transverse to the axial line of the cylinders said bushing having suitable passages and ports for pressure and exhaust of the actuating fluid, the main and supplementary valves located within said bushing, each having suitable issue-ports and exhaust-cavities as described, and the supplementary valve being arranged to inclose and operate on the main valve, the arm of said supplementary valve, the reciprocating bar adapted to engage the ends of the piston-rod of the supplementary piston, said bar having two stops connected therewith, the pivoted lever having one of its ends located between the stops and the other end connected with the arm of the supplementary valve, whereby the latter is operated, an arm having one end rigidly connected with the main valve and its other end extending between the aforesaid stops on the bar, and suitable connections between the main motor piston-rod and the reciprocating bar, all substantially as set forth.

In testimony that I claim the foregoing as my own I affix my signature in presence of two witnesses.

BARTON PICKERING.

Witnesses:
CHARLES W. DALL,
B. F. HERSHEY.