P. T. COFFIELD.

WATER MOTOR.

APPLICATION FILED JUNE 12, 1911.

1,008,954.

Patented Nov. 14, 1911

2 SHEETS—SHEET 1.

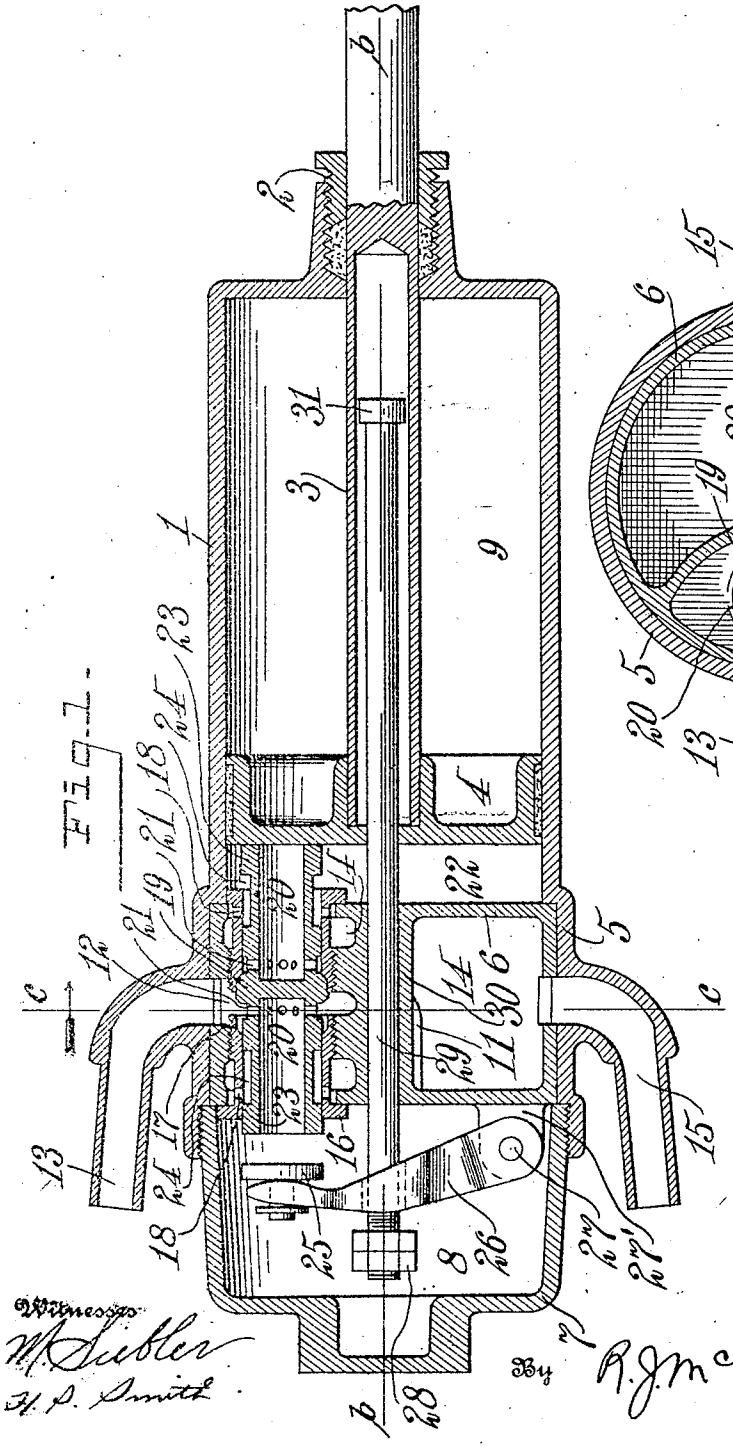

Fig. 1.

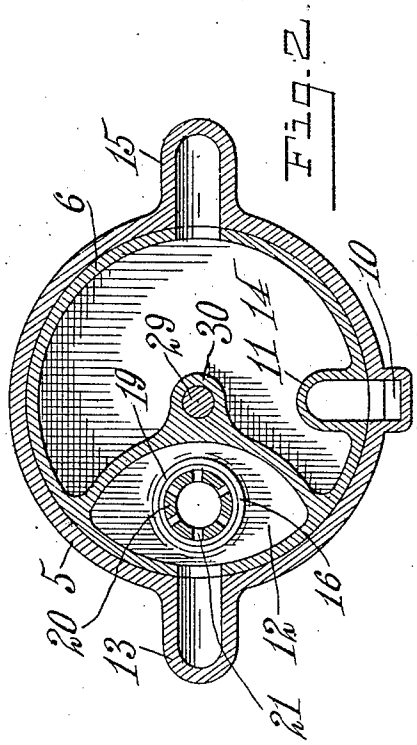

Fig. 2.

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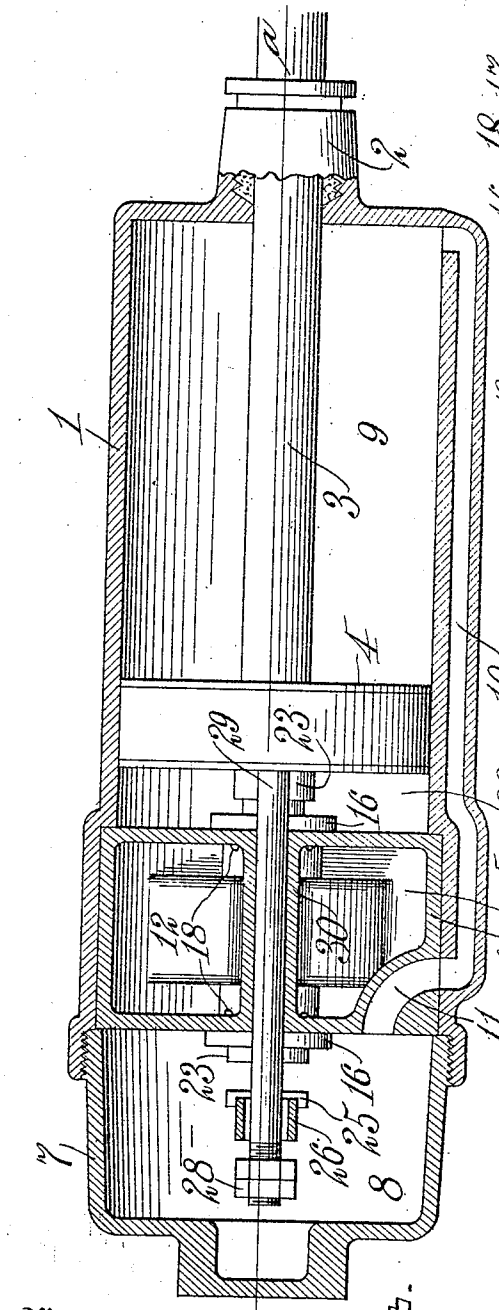

Fig. 3.

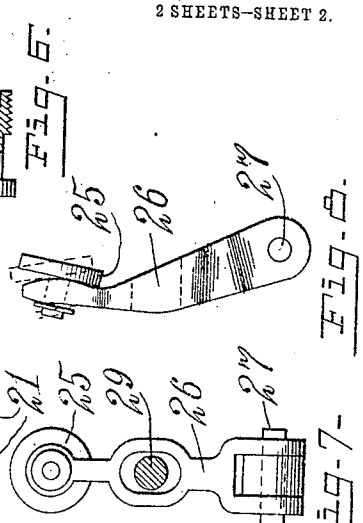

Fig. 5.

Fig. 6.

Fig. 7.

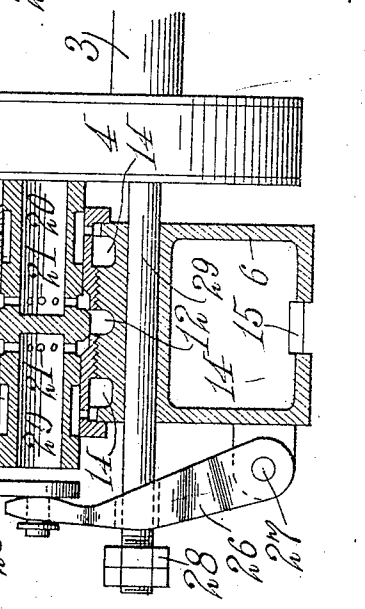

Fig. 4.

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UNITED STATES PATENT OFFICE.

PETER T. COFFIELD, OF DAYTON, OHIO, ASSIGNOR TO THE COFFIELD MOTOR WASHER COMPANY, OF DAYTON, OHIO.

WATER-MOTOR.

1,008,954. Specification of Letters Patent. Patented Nov. 14, 1911.

Application filed June 12, 1911. Serial No. 632,592.

To all whom it may concern:

Be it known that I, PETER T. COFFIELD, 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 declare the following to be a full, clear, and exact description of the invention, such as 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 figures of reference marked thereon, which form a part of this specification.

This invention relates to certain improvements in water motors, and has for its object to provide for the shifting of the valve without any attending noise such as water hammering. And further, the invention relates to certain improvements in the actuator for the valve both as to the manner of its mounting and operation as well as the manner of its engagement with the valve. And ready access to the valve or interior of the motor which enables repairs to be easily made should they be required, is a further object accomplished.

The mechanical means and arrangements will be fully set forth in the following description and pointed out in the claims.

Referring to the annexed drawings, Figure 1 is a longitudinal horizontal sectional view of the motor on the line *a*—*a* of Fig. 3; Fig. 2 is a section on the line *c*—*c* of Fig. 1; Fig. 3 is a vertical longitudinal sectional elevation on the line *b*—*b* of Fig. 1; Fig. 4 is a view of the valve similar to Fig. 1, showing the valve in a partially shifted position; Fig. 5 is a view of the valve; Fig. 6 is a partial sectional view of one of the valve bushings; and Figs. 7 and 8 are views of the actuator for initially shifting the valve in one direction.

Referring more particularly to the drawings, 1 designates the motor cylinder provided at one end with a stuffing box 2 through which a piston rod 3 passes. This piston rod connects with a piston 4 and forms the medium through which the power generated by the motor is transmitted to the machine to be driven. The said piston rod is essentially hollow as it extends from the piston, for a purpose to be presently set forth. The end of the cylinder opposite the stuffing box 2 is somewhat increased in diameter to provide a pocket 5, and extending therefrom are inlet and outlet pipes 13 and 15 respectively, to be again mentioned. This enlarged end of the cylinder receives a valve housing 6 which is held in position by a cap 7 which forms a detachable end of the motor cylinder beyond the valve housing. The said detachable cap may be screwed into the enlarged end of the cylinder, and when thus united it forms a chamber 8 which communicates with the chamber 9 formed in the cylinder on the other side of the piston 4. This communication between said chambers 8 and 9, which chambers, it will be observed, lie on opposite sides of the housing 6, is through a passage 10 formed in the wall of the cylinder, and a passage 11 in the valve housing 6. The valve housing 6 is provided with an inlet chamber 12 which communicates with the inlet pipe 13, and an exhaust chamber 14 which communicates with the exhaust pipe 15. Inclosed within said housing are right and left bushings 16 which receive a combination valve through which the inlet and exhaust are controlled. The said bushings form oppositely disposed seats 17 for the portion of said valve which controls the inlet of water, and said seats lie adjacent to the inlet chamber 12.

It will be seen from Fig. 6, that the seats 17 lie in from the ends of the bushings, and that the internal diameter of the inner ends of said bushings are made large enough to receive the inlet portion 19 of the valve member. Thus the inner ends of the bushings cooperate with the valve portion 19 in forming a piston valve before said valve portion becomes seated. It will therefore be seen that the further movement necessary to bring the valve 19 on either of the seats 17 to fully open the exhaust on one side and the inlet on the other will be accomplished by the fluid pressure. At suitable points away from the valve seat ends of the said bushings, they are provided with ports 18 which communicate with the exhaust chamber 14. The middle portion 19 of the valve lies between the seats or ends 17 of the bushings and within the inlet chamber 12. Extending from the said inlet valve portion 19 are tubular members 20 which are supported in said bushings. These tubular parts 20 of said valve are provided with ports 21 which enable a communication to be formed between the inlet chamber 12 and the interior of said tubular members. The outer

end of the left tubular member, looking at Fig. 1, communicates with chamber 8 and with chamber 9 through the passages 10 and 11, while the outer end of the right tubular portion 20 communicates with chamber 22 on the side of the piston opposite chamber 9. The outer ends 23 of the tubular portions 20 coöperate with the outer ends of the valve bushings 16 and constitute exhaust valves. The outer circumference of said tubular portions are reduced to provide chambers 24 around said tubular portions constituting passages from which the exhaust fluid enters the ports 18 when one or the other of the exhaust valve portions 23 is opened.

The piston 4 near the end of its stroke, moving to the left, Fig. 1, engages the adjacent tubular portion of the valve and initially shifts said valve, moving the inlet portion 19 from its seat. The other tubular end of said valve is likewise initially shifted in the opposite direction by an actuator 26 pivoted at 27 to a suitable part of the valve housing, such as an apertured ear 27′ which projects from near the periphery of said housing, the end of said actuator being suitably shaped to straddle said ear. The middle portion of said actuator has an opening of suitable size to permit a pull rod 29 to pass therethrough. The free end of the said actuator carries a valve-engaging piece 25 which has a freedom of movement relatively thereto in order that it may properly engage the end of the valve member when brought in contact therewith, and will impart a longitudinal movement to said valve member without exerting any torsional strain thereon. The freedom of movement of the valve 25 is shown to some extent in Fig. 8, which depends upon a desired looseness of connection which will permit the said piece to properly engage the end of the valve member. The extreme end of the pull rod 29 which passes through the actuator, is enlarged by suitable nuts 28 or otherwise. The said pull rod 29 passes through an axial opening 30 in the valve housing which forms a guide therefor, and through an opening in the axis of the piston 4, and into the hollow portion of the piston rod. The end of said rod lying within said tubular piston rod has a head 31 which is engaged by the piston when the latter moves a sufficient distance away from the valve. This action of the piston causes the head 28 of said pull rod 29 to engage the actuator 26 and carry the flexible valve piece 25 against the end of the valve and to thus unseat the inlet portion 19 in a manner similar to the action of the piston directly on the other end of said valve. In each case the ends of the tubular portions 20 are sealed when the piston 4 or piece 25 engages said ends.

Operation: The operation of the device is as follows: With the parts in the position shown in Fig. 1, the right hand exhaust valve 23 is open and the exhaust fluid within the chamber 22, to the left of the piston, is discharging through the right recessed valve portion 24, the right hand ports 18, the exhaust chamber, and out through the exhaust passageway 15. The live fluid is entering through the passageway 13 into the inlet chamber 12 past the inlet valve 19 through the left ports 21, into the left tubular member 20 and into the chamber 8, thence through the port 11 and the passageway 10 to the chamber 9, where it exerts itself against the right hand side of the piston. The piston is therefore moving to the left. In the position in which it is shown in Fig. 1, it has reached a point near the end of its left stroke, has sealed the end of the right tubular member 20 of the valve, and is beginning to shift said valve. The continued movement of said piston moves the valve to the position shown in Fig. 4. The exhaust valve 23 is then about to open on the left, and the right exhaust valve is closed. When in this position the inlet valve 19 is initially closed on its left by coming in alinement with the inner end of the left valve bushing 16. When the piston has moved the valve to the position shown in Fig. 4, the supply of live fluid to the chamber 9 is shut off, and the piston stops. As the inlet valve 19 is opened on its right, and the flow of the live fluid to the chamber 22 is prevented by the piston 4 acting as an abutment, the live water, under pressure, will react within the right tubular member 20 and, in seeking an outlet past the end of said tubular member, will shift the valve to the left, thereby opening the left exhaust valve 23 and allowing the live fluid to enter the chamber 22 and to move the piston to the right. When the valve is thus completely shifted by the live fluid, the inlet valve 19 will be moved to its left seat 17 and the left exhaust valve 23 will be completely opened. When the piston 4 is moving to the right, the fluid in the chamber 9 will exhaust through the passageway 10, the port 11, the chamber 8, past the left exhaust valve 23, left ports 18 into the exhaust chamber 14, and out through the exhaust passageway 15. When the piston 4 reaches a point near the end of its right stroke, the said piston will engage the enlargement 31 and will move the abutment or piece 25 in engagement with the end of the left tubular member 20, will seal the end thereof and initially move the valve to the right. The extended movement of the valve to the right is imparted by the live fluid reacting on the actuator piece 25 in the same manner as when the live fluid reacted on the piston when the valve was moved to the left. As the abutment or piece 25 has much freedom of movement, it will readily seat itself on

tne end of the left tubular member 20, thereby effectually sealing the tubular member until the valve is initially shifted. The inlet valve is initially closed before it is finally seated, therefore the said valve is prevented from pounding owing to the water which was trapped within the pocket formed by the recesses in front of the valve seats escaping therefrom.

It will be noted that the motor as constructed is of simple construction, and that by merely removing the cap 7 access may be had to the valve, valve bushings and actuator.

It will also be noted that a valve actuator with a flexible sealing portion as thus constructed, may be used on an oscillating type of motor, as well as on a reciprocating type, as herein shown and described.

I do not herein claim a compound valve the periphery of which is annularly depressed on either side of the inlet portion of said valve, and the ends of which constitute exhaust valves, as such forms the subject matter of certain claims in my co-pending application, Serial Number 598,068, filed December 19, 1910.

I claim:

1. In a water motor having a cylinder, a piston and inlet and exhaust chambers, a compound valve member controlling the inlet and exhaust and constructed and arranged to be finally moved by the fluid pressure, and an actuator for moving said valve member, in combination with a valve flexibly mounted on said actuator and adapted to close the end of the valve member until said valve member is in a position to be finally moved by the fluid pressure.

2. In a water motor having a cylinder, a piston, inlet and exhaust chambers, a single valve member controlling the inlet and exhaust, said valve member being constructed and arranged to be finally moved by water pressure, means for initially moving said valve member, bushings in which said valve member reciprocates, the inner diameter of said bushings being of larger diameter at their inner ends to coöperate with the inlet portion of said valve member to permit the final movement of said valve member by the water pressure, to fully open the exhaust passage for the outward flow of the water.

3. In a water motor having a cylinder, a piston and inlet and exhaust chambers, a compound valve member constructed and arranged to be finally moved by water pressure movable in one direction by the piston, in combination with a hinged valve shifter influenced by the piston to initially move the valve member in the other direction.

4. In a motor of the type specified, the combination with a motor cylinder, of a housing mounted at one end of said cylinder with inlet and exhaust chambers therein, and valve seats which lie in recesses on each side of the entrance to the inlet chamber, a compound valve a part of which is movable through said recesses and adapted to engage said seats alternately in controlling the inlet, and other parts of which are adapted to control the exhaust, a piston movable in contact with one end of said valve member to initially move it from one of said seats, an actuator movable against the other end of said valve to initially move it from the other of said seats, means under the control of the piston adapted to give such movement to said actuator, and a flexibly mounted valve-engaging piece carried on said actuator.

5. In a motor of the type specified, the combination with a cylinder enlarged at one end, of a valve housing mounted in said enlarged end provided with inlet and exhaust chambers, and an axial opening, a cap engaging said enlarged end of said cylinder and forming a chamber on one side of said housing, a compound valve mounted in said housing and controlling the inlet and exhaust chambers, a piston in said cylinder dividing it into two chambers which receive the motive fluid and exhaust it from opposite sides respectively of the housing, said piston initially acting on one end of said valve to shift it, an actuator pivoted to the side of said housing within the chamber formed by said cap, and a pull rod projected through the axes of the housing and piston and adapted to be engaged by said piston to operate said actuator, substantially as described.

6. In a motor of the type specified, the combination with a cylinder, of a valve housing arranged at one end of said cylinder and having inlet and exhaust chambers and an axial opening, a compound valve mounted in the valve housing on one side of the axial opening in said housing, and controlling the inlet and exhaust, a piston on one side of said housing dividing the cylinder into two chambers, and acting on one end of said valve to initially open it, a valve actuator pivoted to said housing eccentrically to its axial opening, a pull rod projected through the piston and the axial opening of the housing, and engaging said actuator to impart initial movement to said valve, said pull rod being under the control of the piston, substantially as specified.

In testimony whereof I affix my signature, in presence of two witnesses.

PETER T. COFFIELD.

Witnesses:
R. J. McCarty,
Matthew Siebler.