G. E. W. LUEHRMANN.

MOTOR.

APPLICATION FILED DEC. 20, 1909.

966,757. Patented Aug. 9, 1910.

Fig. 1.

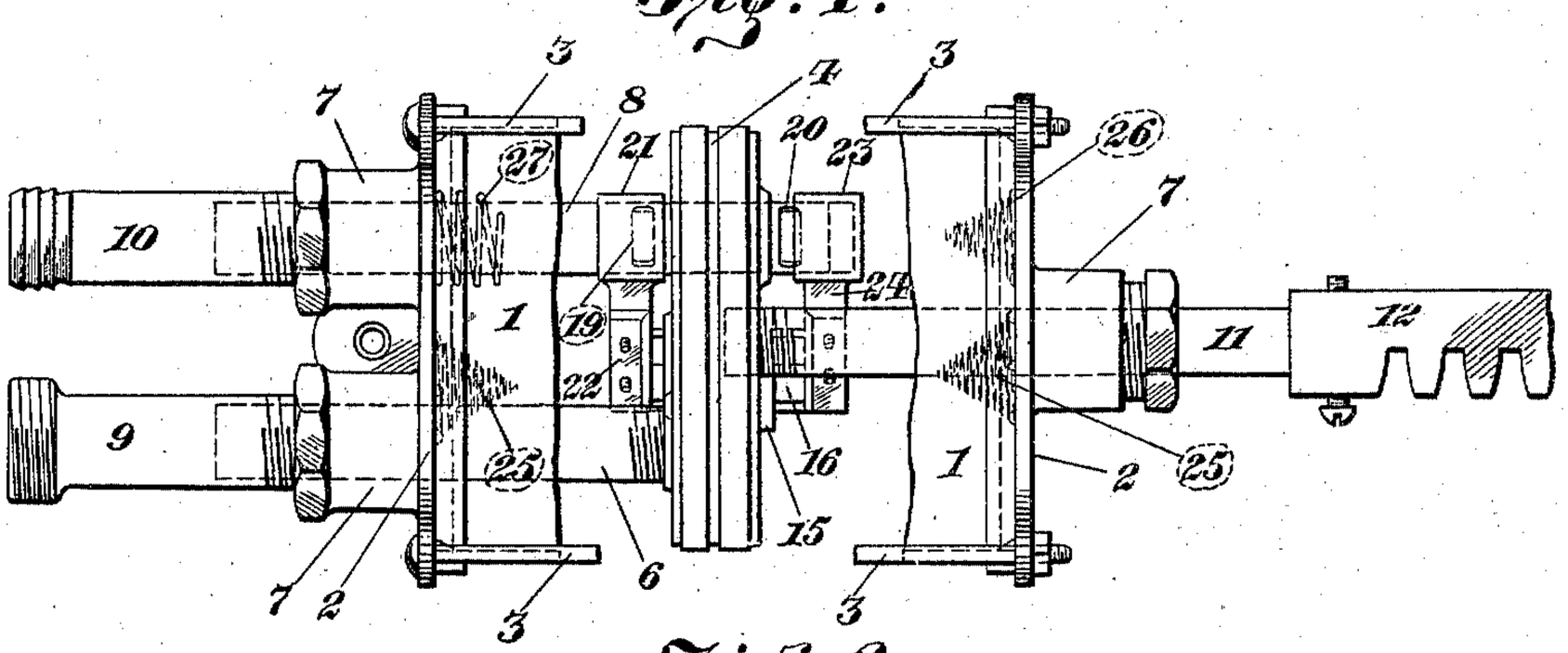


Fig. 2.

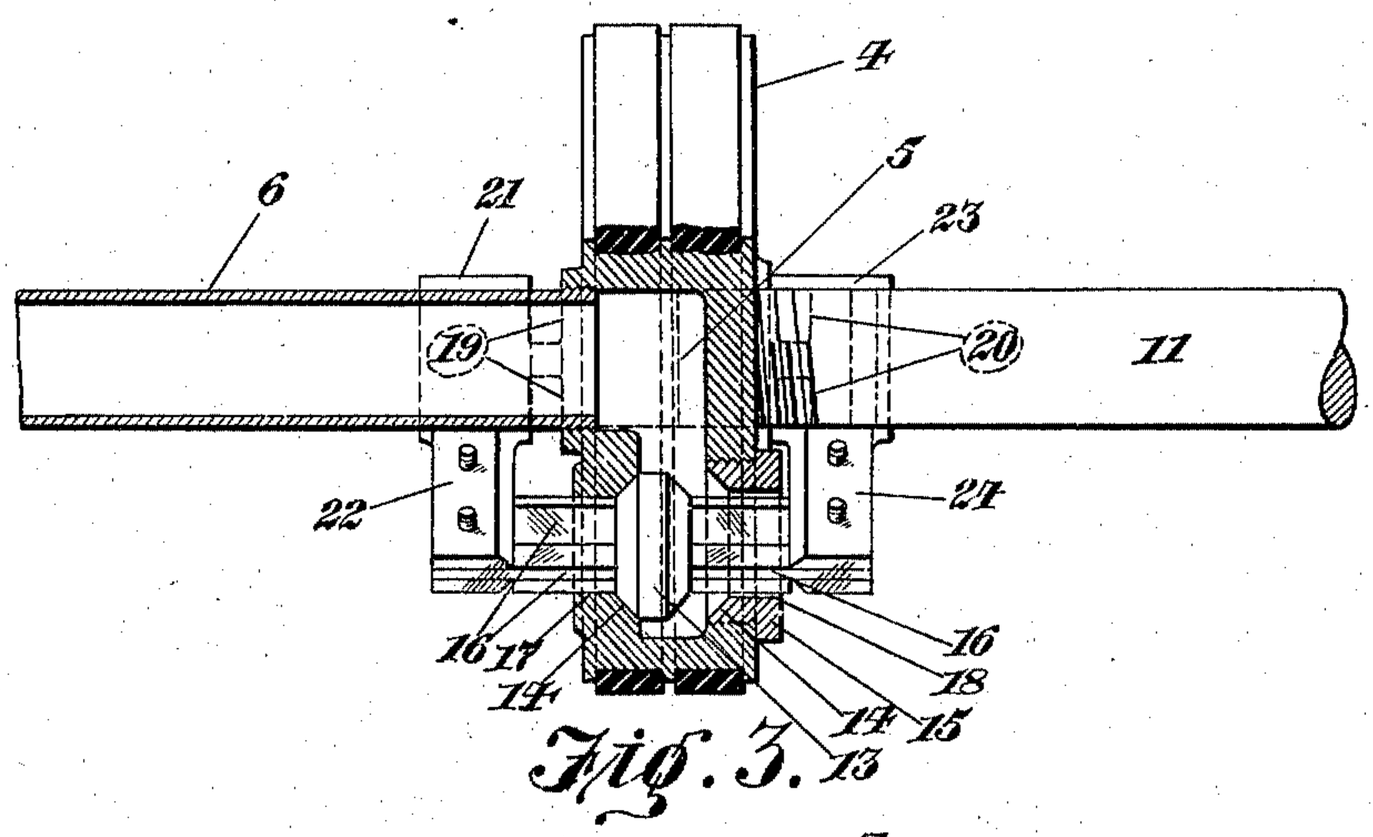
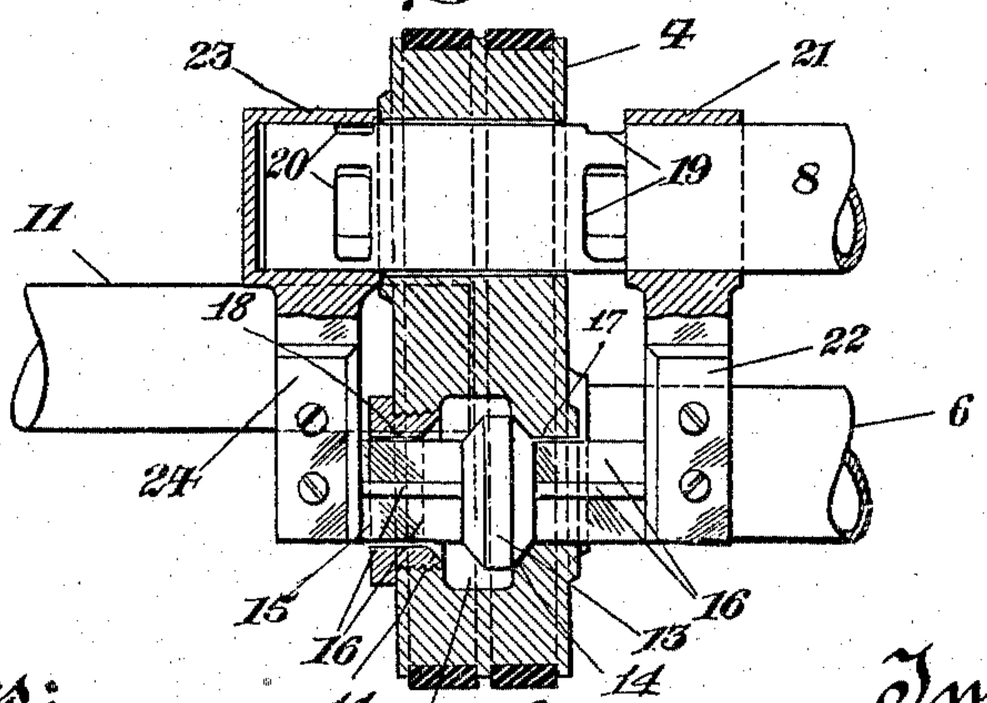


Fig. 3.



Witnesses:
Chas. A. Becker,
George G. Anderson.

Inventor:
George E. W. Luehrmann
By Hugh K. Wagner
His Attorney.

UNITED STATES PATENT OFFICE.

GEORGE E. W. LUEHRMANN, OF ST. LOUIS, MISSOURI, ASSIGNOR TO WAYNE MANUFACTURING COMPANY, OF ST. LOUIS, MISSOURI, A CORPORATION OF MISSOURI.

MOTOR.

966,757. Specification of Letters Patent. Patented Aug. 9, 1910.

Application filed December 20, 1909. Serial No. 534,156.

To all whom it may concern:

Be it known that I, GEORGE E. W. LUEHRMANN, a citizen of the United States, residing at the city of St. Louis, State of Missouri, have invented certain new and useful Improvements in Motors, of which the following is a specification, reference being had therein to the accompanying drawings.

This invention relates to improvements in motors, particularly such as are intended to be used to drive light machinery, like washing machines, etc., the motive power being preferably, but not necessarily, water, and has for its object the reduction of friction in operation and the consequent advantage of being operable with less fluid pressure and with greater ease and certainty. The present construction possesses the additional merit of being a simpler construction than such motors now in use.

In the drawings forming part of this specification, in which like numbers of reference denote like parts wherever they occur, Figure 1 is a plan view of the motor with a part of the cylinder broken away; Fig. 2 is a sectional view through the inlet valves; and Fig. 3 is a sectional view through the exhaust valves.

In the drawings 1 denotes the motor cylinder, each end of which is closed by a head 2, secured on an end of said cylinder by bolts 3. The piston 4 is slidably mounted in said cylinder and is provided with a single interior chamber 5. Inlet pipe 6, which is connected to one side of said piston, communicates with said inlet chamber and passes through a stuffing-box 7 in a cylinder head 2. Exhaust pipe 8, one end of which extends through piston 4, is fastened to said piston in any ordinary manner. Said exhaust pipe passes, also, through a stuffing-box 7, preferably in the same cylinder head 2 through which said inlet pipe passes. Pipe 9 and pipe 10 are connected to said stuffing-boxes, respectively, and each of said pipes is arranged to have a hose or pipe (not shown in the drawings) attached thereto. Piston rod 11 is connected to the other side of piston 4 and passes through a similar stuffing-box 7 in the other cylinder-head 2. A rack 12, or other suitable power-transmitting means, is attached to the outer end of said piston rod and, when piston 4 is set into operation in the manner hereinafter described, motion is imparted to said rack.

The inlet valve 13 is reciprocatively mounted in inlet chamber 5, and is adapted to engage alternately seats 14, one of which seats is located in a wall of piston 4 and the other of said seats is located in plug 15. One of the stems 16 of valve 13 extends through an aperture 17 in a wall of said piston and the other stem 16 extends through an aperture 18 in said plug. Each stem 16 is preferably grooved to allow the motive fluid which enters chamber 5 from inlet pipe 6 to pass into cylinder 1, *i. e.*, when valve 13 engages one of seats 14, the water in said inlet chamber is allowed to pass through aperture 17, thereby filling the space on one side of piston 4 within cylinder 1 and causing said piston to travel in one direction, but, when valve 13 engages the other seat 14, the water in said chamber is allowed to pass through aperture 18, thereby filling the space on the other side of piston 4 within cylinder 1 and causing said piston to travel in the opposite direction.

The exhaust pipe 8 is provided with apertures 19 adjacent one side of piston 4 and with apertures 20 adjacent the other side of said piston. A sleeve 21, which is mounted on said exhaust pipe, is connected by an arm 22 to one of said stems 16 and is adapted to slide upon said exhaust pipe and to open and close alternately apertures 19. A cup 23 is connected by an arm 24 to the other stem 16 and is held thereby in position to slide upon the end of said exhaust pipe and to open and close alternately the apertures 20.

When valve 13 engages one of said seats 14 in the manner hereinabove described, arm 22 holds sleeve 21 in position to close apertures 19, and arm 24 holds cup 23 in position to allow the water on one side of piston 4 within cylinder 1 to exhaust through apertures 20, but, when valve 13 engages the other seat 14, cup 23 covers apertures 20 and sleeve 21 occupies a position to allow the water on the other side of said piston to exhaust through apertures 19.

Each cylinder-head is provided with a spring 25 which is located in the path of movement of a valve stem 16. A spring 26 is attached to one of said cylinder-heads 2 and occupies a position to operate cup 23 when piston 4 moves said cup into engagement therewith. Spring 27, which is wound

around exhaust pipe 8, is adapted to operate sleeve 21, when piston 4 moves said c into position to compress said spring against a cylinder-head 2. Said spring 27 is preferably slidable upon exhaust pipe 8, but it should be understood that said spring can be secured either to a cylinder-head 2 or to sleeve 21. When piston 4 is caused to travel in one direction in the manner hereinabove described, stem 16 and cup 23 are moved into engagement with spring 25 and spring 26, respectively. Further travel of said piston in the same direction compresses said springs sufficiently to unseat valve 13 and to move same to the opposite seat 14 and, also, to cause cup 23 to close apertures 20 and sleeve 21 to open apertures 19, thereby reversing the direction of travel of said piston, and, when said piston nears the end of its reverse motion, the other spring 25 and spring 27 are compressed by the other valve stem 16 and sleeve 21, respectively, until said springs 25 and 27 unseat valve 13 and move same to the other seat 14 and, also, cause sleeve 21 to close apertures 19 and cup 23 to open apertures 20, thereby causing piston 4 to travel in the first direction until spring 25 and spring 26 again reverse its movement as hereinabove described.

Due to the fact that sleeve 21 and cup 23 are connected to valve stems 16 the valves are operated simultaneously, thereby making the reversal of piston 4 positive, and for this reason it should be understood that one of said cylinder-heads 2 may be provided with a spring, which is located in the path of movement of arm 22 and the other said cylinder-head 2 may be provided with a spring located in the path of movement of arm 24, thus obviating the necessity of two springs at each end of cylinder 1.

In a motor having the above-described kind of exhaust valves there is less friction to be overcome in operation of same, for the reason that, when said valves are operated, they are moved in a direction to cut the water instead of being moved against the pressure of the water, as is customary in similar motors.

The operation of the motor is as follows: Water or other fluid enters pipe 9 from a pipe or hose (not shown in the drawings) connected thereto and passes into inlet pipe 6 which conveys it to chamber 5, from which it flows through either aperture 17 or aperture 18. The fluid fills the space on one side of piston 4 within cylinder 1 and, exerting its pressure against a cylinder-head 2 and, also, against one side of piston 4, forces said piston in one direction. Referring to Fig. 1, if, for example, the water flows through aperture 17, pressure is exerted against the left-hand cylinder-head and, also, against the left side of piston 4, thereby causing said piston to move toward the right. Said piston moves toward the right until one of the springs 25 and spring 26, respectively, close aperture 17 and open apertures 19 and, also, simultaneously open aperture 18 and close apertures 20, whereby the water flows through aperture 18 and exerts its pressure against the right-hand cylinder-head 2 and against the right side of piston 4, thus causing said piston to travel toward the left. Said piston moves toward the left until the other spring 25 and spring 27, respectively, close aperture 18 and open apertures 20 and, also, simultaneously open aperture 17 and close apertures 19, thereby causing the water to exert its pressure against the left-hand cylinder-head 2 and against the left side of piston 4, and again forcing said piston toward the right. When piston 4 is moving toward the right, the water on the right of said piston exhausts through apertures 20 and passes through exhaust pipe 8 and then flows away through a hose or pipe (not shown in the drawings) attached to pipe 10, but when the piston is moving toward the left, the water on the left of said piston exhausts through apertures 19. The motor continues in operation until the water pressure is cut off, the direction of travel of piston 4 being reversed at the end of each stroke, in the manner hereinabove described.

I claim:

1. In a motor, the combination of a cylinder, a hollow piston, inlet valves communicating with the interior of said piston, an exhaust pipe leading from the interior of said cylinder and having openings therein located on both sides of said piston, and slide-valves mounted on said exhaust pipe and adapted alternately to close and unclose said openings.

2. In a motor, the combination of a cylinder, a hollow piston, inlet valves communicating with the interior of said piston, an exhaust pipe leading from the interior of said cylinder and having openings therein located on both sides of said piston, slide valves mounted on said exhaust pipe and adapted alternately to close and unclose said openings, and springs adapted to unseat the valves and impart to said valves their final movements after being unseated, thereby reversing the travel of the piston.

3. In a motor, the combination of a hollow member, an inlet pipe, an exhaust pipe, both of said pipes communicating with said hollow member, a piston having a chamber in communication with said inlet pipe, said exhaust pipe passing through said piston, and valves adapted to control exit of fluid from said chamber and exhaust valves located exterior to said chamber adapted to control the exhaust of fluid from said hollow member.

4. In a motor, the combination of a cylin-

der, a piston having a chamber, an inlet pipe communicating with said chamber, inlet valves communicating with said chamber, and an exhaust pipe connected to said piston and arranged to extend therethrough, slide exhaust valves mounted on said exhaust pipe, each end of said cylinder being provided with a pair of springs, each of said pairs of springs being adapted to unseat and to close an inlet valve and an exhaust valve, respectively, and simultaneously to seat and to open the other inlet valve and the other exhaust valve, thereby reversing the travel of said piston.

5. A motor, comprising, in combination, a cylinder, a chambered piston, an inlet pipe communicating with the interior of said piston, an exhaust pipe secured to said piston having exhaust ports exterior thereto, means extending through said piston for controlling the flow through said inlet pipe, and means yoked to said controlling means for controlling said exhaust ports.

6. A motor, comprising, in combination, a cylinder, a chambered piston movable in said cylinder, inlet and exhaust pipes movable with said piston and connected thereto, said inlet pipe being connected with the interior of said piston and said exhaust pipe having exhaust ports located exteriorly of said piston, and means extended through said piston to control the inlet and carrying means for controlling the exhaust.

7. In a motor, the combination of a hollow member, an inlet pipe, an exhaust pipe, both of said pipes communicating with the interior of said hollow member, a piston having a chamber in communication with said inlet pipe, said exhaust pipe passing through said piston, valves adapted to control the exit of fluid from said chamber, exhaust valves located exterior to said chamber adapted to control the exhaust of fluid from said hollow member, and means connecting said inlet valves with said exhaust valves.

8. In a motor, the combination of a hollow member, an inlet pipe, an exhaust pipe, both of said pipes communicating with the interior of said hollow member, a piston having a chamber in communication with said inlet pipe, said exhaust pipe passing through said piston, valves adapted to control the exit of fluid from said chamber, exhaust valves located exterior to said chamber adapted to control the exhaust of fluid from said hollow member, and arms connecting said inlet valves with said exhaust valves.

9. In a motor, the combination of a hollow member, an inlet pipe, an exhaust pipe, both of said pipes communicating with the interior of said hollow member, a piston having a chamber in communication with said inlet pipe, said exhaust pipe passing through said piston and having openings therein located on both sides of said piston, valves adapted to control the exit of fluid from said chamber, slide valves mounted on said exhaust pipe and adapted alternately to close and unclose said openings, and a frame connecting the sliding members of said exhaust valves.

10. In a motor, the combination of a hollow member, an inlet pipe, an exhaust pipe, both of said pipes communicating with the interior of said hollow member, a piston having a chamber in communication with said inlet pipe, said exhaust pipe passing through said piston and having openings therein located on both sides of said piston, valves adapted to control the exit of fluid from said chamber, a sleeve mounted on said exhaust pipe and adapted alternately to close and unclose the openings located on one side of said piston, and a cup mounted on said exhaust pipe and adapted alternately to close and unclose the openings located on the other side of said piston.

11. In a motor, the combination of a hollow member, an inlet pipe, an exhaust pipe, both of said pipes communicating with the interior of said hollow member, a piston having a chamber in communication with said inlet pipe, said exhaust pipe passing through said piston and having openings therein located on both sides of said piston, valves adapted to control the exit of fluid from said chamber, a sleeve mounted on said exhaust pipe and adapted alternately to close and unclose the openings located on one side of said piston, a cup mounted on said exhaust pipe and adapted alternately to close and unclose the openings located on the other side of said piston, and a frame connecting said sleeve with said cup.

12. In a motor, the combination of a hollow member, an inlet pipe, an exhaust pipe, both of said pipes communicating with the interior of said hollow member, a piston having a chamber in communication with said inlet pipe, said exhaust pipe passing through said piston and having openings therein located on both sides of said piston, valves adapted to control the exit of fluid from said chamber, a sleeve mounted on said exhaust pipe and adapted alternately to close and unclose the openings located on one side of said piston, a cup mounted on said exhaust pipe and adapted alternately to close and unclose the openings located on the other side of said piston, and arms connecting said sleeve and said cup with said valves.

In testimony whereof I have affixed my signature in presence of two witnesses.

GEORGE E. W. LUEHRMANN.

Witnesses:
OLINDA CRAMER,
GLADYS WALTON.