J. S. WARD.

FLUID ACTUATED MOTOR.

APPLICATION FILED NOV. 22, 1909.

977,574.

Patented Dec. 6, 1910.

2 SHEETS—SHEET 1.

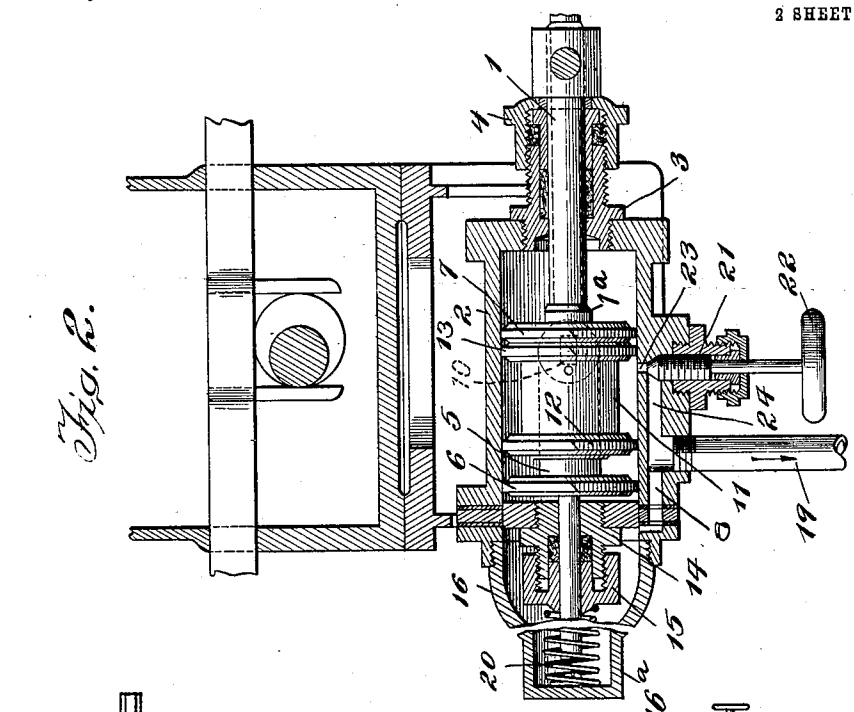

Fig. 2.

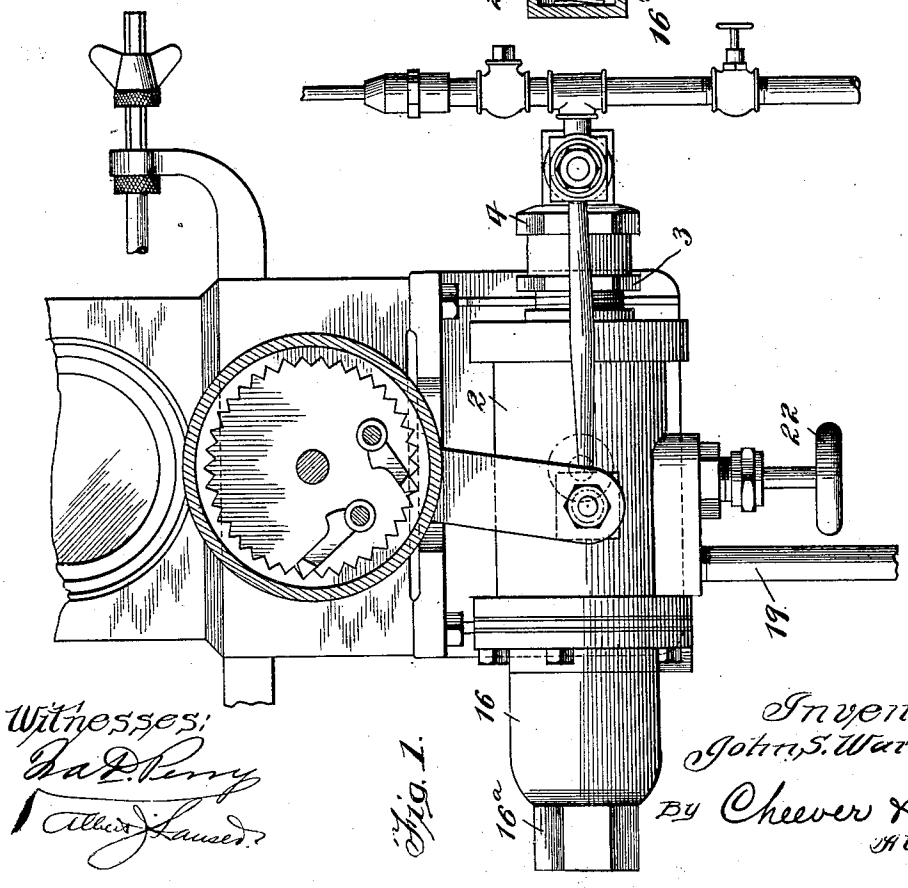

Fig. 1.

Witnesses:

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2 SHEETS—SHEET 2.

Fig. 3.

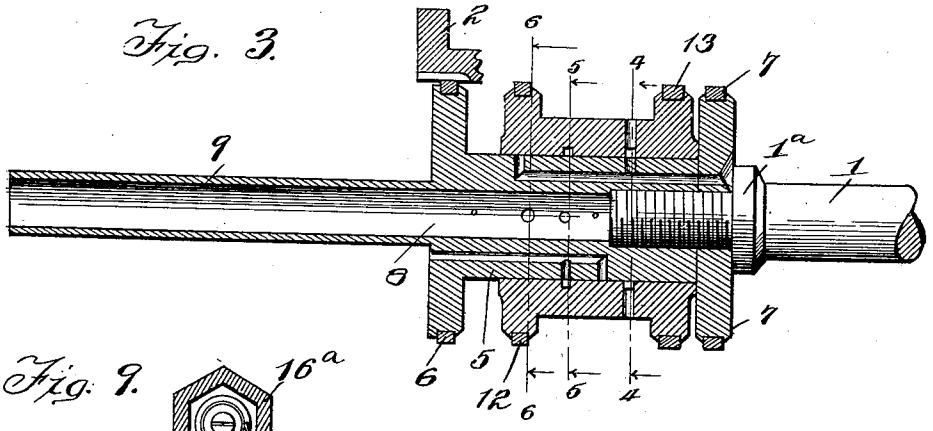


Fig. 9.

Fig. 4.

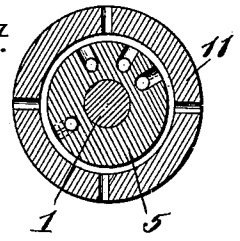


Fig. 7.

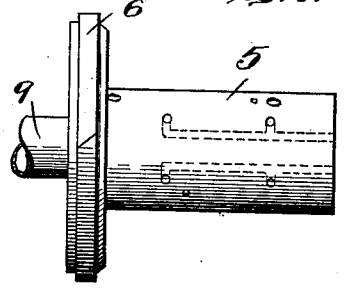


Fig. 5.

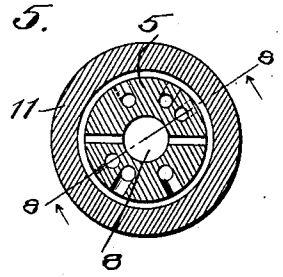


Fig. 6.

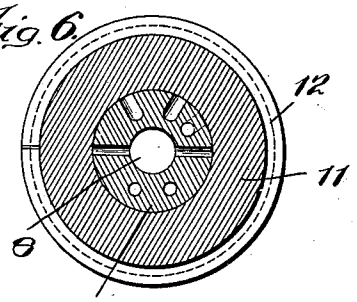
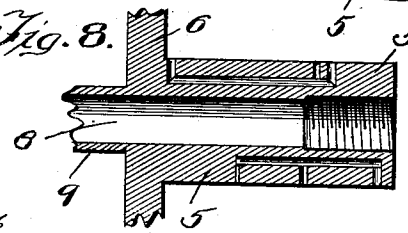


Fig. 8.



Witnesses:

Inventor:

John S. Ward

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Atty's.

UNITED STATES PATENT OFFICE.

JOHN S. WARD, OF CHICAGO, ILLINOIS.

FLUID-ACTUATED MOTOR.

977,574. Specification of Letters Patent. Patented Dec. 6, 1910.

Application filed November 22, 1909. Serial No. 529,465.

To all whom it may concern:

Be it known that I, JOHN S. WARD, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a certain new and useful Improvement in Fluid-Actuated Motors, of which the following is a specification.

My invention relates to fluid actuated motors, and as my type of motor is especially advantageous in connection with a lubricating pump, I have illustrated it in connection therewith.

The ratchet mechanism and connected parts which serve to link the piston of the motor with the slide bars of the pump, form the subject of a divisional application filed March 7, 1910, Serial No. 547,732.

The objects of my invention are:—First, to provide means for regulating and controlling the operation of the motor. Second, to provide means for preventing the loosening of the nut of the stuffing box of the motor, and third, to provide certain details of construction hereinafter more fully set forth.

I accomplish my objects by the mechanism illustrated in accompanying drawings, in which—

Figure 1 is a side elevation of the motor showing the same connected to a lubricating pump. In this figure the casing of the ratchet device, which connects the motor to the pump, is shown in section. Fig. 2 is a vertical sectional view of the parts shown in Fig. 1. Fig. 3 is a longitudinal sectional view through the piston and valve. Figs. 4, 5 and 6 are sectional views taken respectively on the lines 4—4, 5—5 and 6—6 of Fig. 3. Fig. 7 is a side view of one of the parts of the motor piston. Fig. 8 is a longitudinal sectional view of the parts shown in Fig. 7, the plane of section being taken on line 8—8 of Fig. 5. Fig. 9 is a transverse sectional view of the outer end of the bonnet at the end of the main cylinder.

Similar reference characters denote similar parts throughout the several views.

The pump and ratchet mechanism form no part of my present invention and therefore need not be described except to say that the ratchet and its connections form the subject of a separate application, Serial No. 547,732, filed March 7, 1910. In some respects also the ratchet mechanism is similar to the one shown in my previous Patent No. 893,118 issued July 14, 1908.

Referring to the parts more directly concerned with my present invention, the piston rod 1 extends into the cylinder 2 of the motor through a stuffing box 3, and nut 4, and at its inner end screws into the piston body 5 as shown in Figs. 2 to 8. At the inner end of the piston body is a disk 6 preferably integral therewith. This disk is provided with packing at its periphery for making steam tight or air tight fit with the cylinder. A similar disk 7 is located at the opposite end of the piston body and is held in place by means of the flange 1^a of the rod 1.

The piston body is hollow, having a longitudinal passage 8 which communicates with the exhaust tube 9, formed on the piston body at the end opposite to the rod 1. Cylinder 2 has an inlet port 10 at the middle of the far side when viewed as in Fig. 2, this inlet being indicated in dotted lines. The normal exhaust is out through the tube 9. The steam, compressed air or other actuating fluid entering through the admission port 10 is controlled by means of a piston valve 11 fitting over the piston body 5, and having disks 12 and 13 at its ends which fit slidingly in said cylinder. The piston body and piston valve have suitable admission and exhaust ports for causing reciprocation of the piston and motor cylinder but these need not be minutely described as the construction is well known, and I do not claim to be the inventor of them. It is sufficient to say that the steam or other operating fluid has access at all times to the space surrounding the piston valve between the ends thereof. The pressure at this part of the cylinder therefore always remains approximately maximum unless the by-pass, which will be hereinafter described and which constitutes one of the elements of my invention, is open to a greater or less extent.

At the end of the motor cylinder, opposite to the stuffing-box 3 is a stuffing-box 14 having a nut 15, these two parts preventing leakage around the exhaust tube 9. Tube 9 discharges into a bonnet or head 16 which is long enough to accommodate the movement of the exhaust tube and forms a chamber into which the exhaust actuating fluid escapes. Said bonnet screws on to the end

of the cylinder and is preferably of polygonal cross-section at its outer end 16ª to be operated by a wrench. The bonnet is therefore readily removable, and at the same time is provided with means for making an air tight or steam tight joint. The exhaust steam is led out from the bonnet through a passage 18 formed in the side of the cylinder and connecting with the exhaust pipe 19.

My device is particularly adapted for use with lubricators used upon railway locomotives where the shock and jar due to the vibration of the locomotive, in addition to the movement of tube 9, tends to loosen the nut 15. In my device I have prevented this by interposing a spring 20 between said nut and the end of the bonnet 16. By preference this spring is rigidly fastened to the bonnet and consequently the parts may be readily assembled, the spring naturally finding its position around the tube 9 and against the top of the nut 15.

An aperture 23 is formed in the side of the cylinder 2, near the center thereof, where it will at all times be between the two ends 12 and 13 of the piston valve 11. Said aperture is closed by means of a valve 21 operated by a hand-wheel 22. When said valve is open steam or other actuating fluid escapes from the inside of the cylinder through the aperture 23 past the valve 21 to a duct 24 leading to the exhaust pipe 19. The aperture 23 and duct 24 constitute a by-pass through which the actuating fluid may escape direct to exhaust without causing the reciprocation of the piston.

In operation when steam is admitted to the cylinder 2, if the by-pass is closed the piston 5 will be caused to reciprocate according to the law of operation well known in connection with this type of engine. For railway locomotives and other machinery exposed to varying degrees of temperature it is desirable that the steam used as the actuating fluid should never be shut off from the cylinder 2. I have found that if the steam is shut off not only will the parts become chilled in cold weather and cause condensation, but the oil with which the parts are lubricated will also become chilled and thickened and prevent the moving parts from responding as certainly as they should when steam is turned on. With my construction when it is desired to slow down the movement of the piston 5, instead of throttling the stem inlet, I open the valve 21. If I desire merely to partially slow down the motor I open valve 21 only a slight amount but by increasing the opening of the valve sufficiently I can so reduce the pressure in the cylinder 2 between the disks 12 and 13 as to cause the motor to stop entirely. Under these conditions the steam will blow through the motor and keep all the parts thereof warm so that they will respond immediately when called upon and yet it will be unnecessary at any time to touch the valve which controls the supply of steam to the inlet of the cylinder. The ducts 23 and 24 constitute a by-pass, and by controlling the amount of opening of said by-pass through the agency of the valve 21, I can regulate the motor to a nicety from full speed to no speed. It will be understood, of course, that motors of the size required for the ordinary lubricating apparatus require almost inappreciable amounts of steam, and therefore, the waste of steam blowing through the parts when the valve 21 is wide open will be negligible.

I claim as my invention.

1. A motor comprising a cylinder, a piston therein, a piston valve slidable on said piston, and having a space between its ends open to the pressure of the operating fluid, a bypass leading from said cylinder at a point between the ends of said piston valve, and means for regulating the opening through said bypass.

2. A motor comprising a cylinder, a hollow piston movable therein, an exhaust tube communicating with the inside of said piston, a piston valve slidably mounted on said piston and having a space between its ends in communication with the source of operating fluid, an exhaust pipe, two ducts leading to said exhaust pipe, one duct leading from the exhaust tube, and the other duct leading from the inside of the cylinder from a point between the ends of the piston valve, and means for controlling the amount of opening through said last mentioned duct.

3. In a fluid actuated motor, the combination of a cylinder, a bonnet secured to one end thereof, a piston sliding in said cylinder, a piston valve sliding upon said piston, said piston being hollow and having admission and exhaust ports controlled by said valve, an exhaust tube communicating with the inside of said piston and extending through the end of said cylinder into said bonnet, a stuffing box nut surrounding said tube at the end of the cylinder within the bonnet and a coiled spring interposed between said nut and bonnet for preventing the nut from becoming unscrewed.

4. In a fluid actuated motor the combination of a cylinder, a hollow piston working therein, a piston valve slidable on said piston, an exhaust tube communicating with the inside of said piston and extending through one end of the cylinder, a stuffing box and nut on the end of the cylinder around said tube, a coiled spring adapted to abut against said nut for preventing the unscrewing thereof and a bonnet adapted to screw onto the end of the cylinder and inclose said tube and nut and also to form an abutment for the outer end of said spring.

5. The combination, with the motor cylin-

der, hollow piston therein, piston valve, and exhaust tube extending from the piston through the end of the cylinder, of a stuffing nut at the end of the cylinder through which said tube passes, a bonnet screwing onto the end of the cylinder, and a coiled spring fastened to and carried by said bonnet and adapted to abut said stuffing nut for holding it.

6. The combination, with the motor cylinder, hollow piston therein, piston valve, and exhaust tube extending from the piston through the end of the cylinder, of a stuffing nut at the end of the cylinder through which said tube passes, a coiled spring for abutting against said nut and a bonnet screwing onto the end of the cylinder over said nut and exhaust tube and adapted to abut said spring, said bonnet having a polygonal end for taking a wrench.

7. In combination, a cylinder, a reciprocating piston therefor, a stuffing box and nut at one end of said cylinder, a member secured to said piston and extending through said stuffing box and nut, a bonnet secured to the end of the cylinder and inclosing said nut, and a coiled spring interposed between said bonnet and nut.

In witness whereof, I have hereunto subscribed my name in the presence of two witnesses.

JOHN S. WARD.

Witnesses:
HOWARD M. COX,
MARGARET D. ROBB.