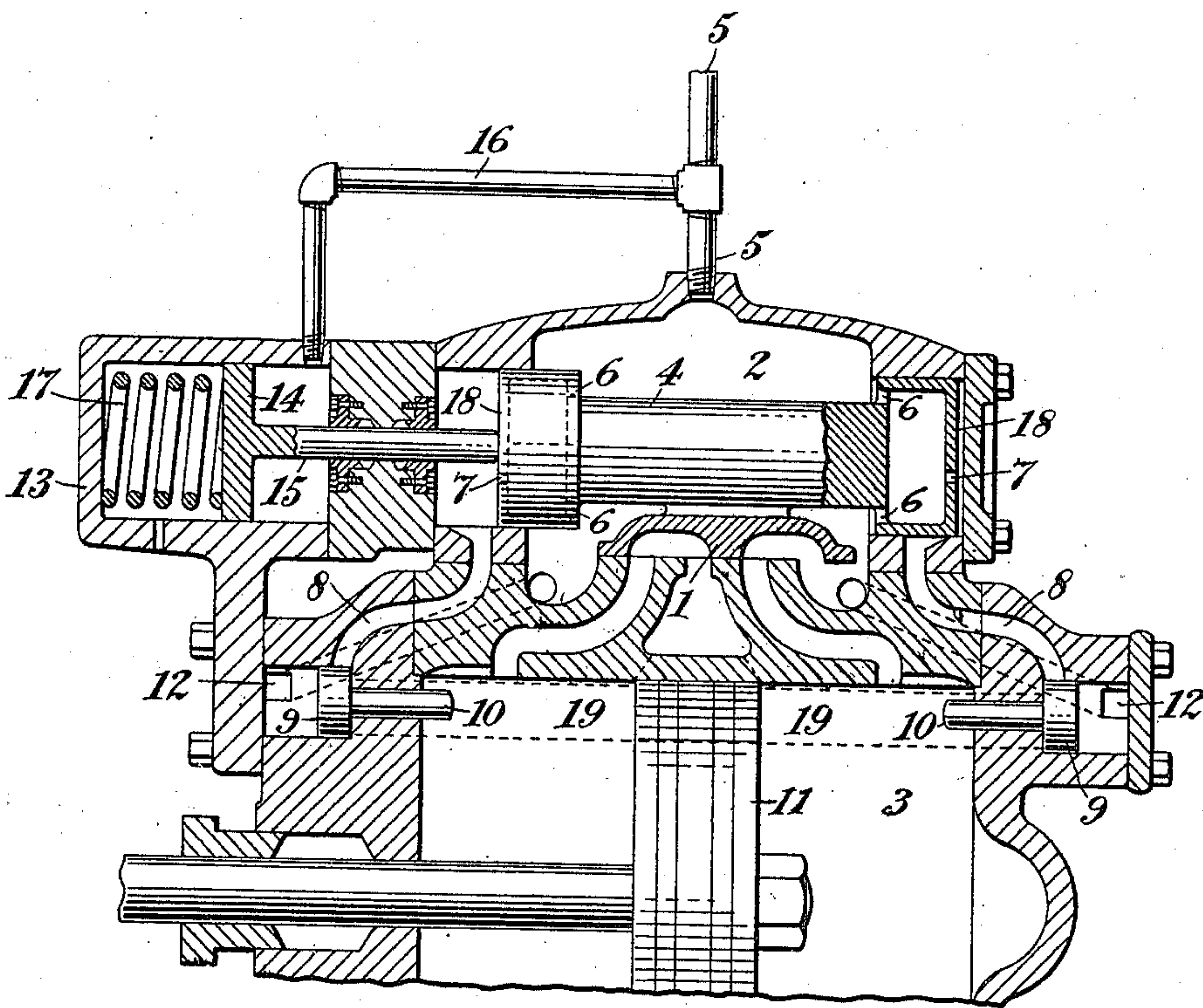


J. FOURNIA.  
 FLUID PRESSURE VALVE.  
 APPLICATION FILED JAN. 22, 1910.

974,872.

Patented Nov. 8, 1910.



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# UNITED STATES PATENT OFFICE.

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## FLUID-PRESSURE VALVE.

974,872.

Specification of Letters Patent.

Patented Nov. 8, 1910.

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*To all whom it may concern:*

Be it known that I, JOHN FOURNIA, a citizen of the United States, residing at Albany, in the county of Albany and State of New York, have invented a certain new and useful Improvement in Fluid-Pressure Valves, of which the following is a specification, reference being had therein to the accompanying drawings, forming part thereof.

My invention relates to fluid-pressure valves and particularly to the valve mechanism of fluid-pressure motors.

My invention is particularly applicable to simplex steam engines or motors used on pumps, rock drills, and percussion and similar tools, though in its broad conception it is applicable to any fluid-pressure motor or engine. In such motors various well-known automatic devices are employed to throw the valve, that is, to move it back and forth so as to alternately connect the opposite ends of the cylinder with the pressure-fluid inlet and exhaust passages; and these automatic valve throws either extend exteriorly of the cylinder and are mechanically operated, as by eccentric rods or tappets, or are located wholly within the valve chest and are operated mechanically or by the pressure fluid. When the pressure-fluid is shut off and the motor stopped, the valve is apt to be stopped on center or at dead points, as it is called, that is, with the inlet and exhaust balanced on both sides of the piston, with the result that, when the pressure fluid is again turned on, there is no inequality of pressure to start the piston. This is particularly apt to occur in the case of motors in which the valve throw is located wholly within the valve chest and is fluid actuated, such as is used mainly on single direct acting pumps or other simplex devices which have no occasion to be reversed in operation.

One object of my invention is to prevent the valves on fluid-pressure motors from becoming so centered, or stopping at a dead point.

Other objects are reliability, durability and simplicity of construction and operation.

Other objects and advantages of my invention will appear from the following description.

I shall now describe my invention with reference to the accompanying drawings

and shall thereafter point out my invention in claims.

The drawing shows a central vertical longitudinal section of a fluid-pressure engine or motor with my invention applied thereto.

I shall hereafter speak of the pressure fluid as steam, though other pressure fluids, as compressed air, will operate the mechanism equally as well.

In the illustrated steam engine, a valve-operating plunger, which is steam actuated, is employed as the valve throw. An ordinary slide-valve 1 in the valve-chest 2 is shifted back and forth to alternately connect opposite ends of the cylinder 3 with the live steam and exhaust passages in the usual way. The slide-valve 1 is shifted by the valve-operating plunger 4, which is steam actuated and to which the slide-valve is fixed. To cause the plunger 4 to be shifted by the steam, the ends are made enlarged and hollow, and the steam, entering the valve-chest 2 through the pipe 5, envelops the plunger 4, and passes into the cylinder 3 through the inlet passage, which is open, and also rushes into the enlarged hollow ends of the plunger 4 through openings 6 shown as formed in the inner shoulders of the hollow ends. The steam issues from the hollow ends through small openings 7 leading into the cylindrical spaces 18 between the ends of the plunger and heads of the steam chest, into which spaces the plunger works with a tight fit. Since the pressure is normally equal at each end, the plunger 4 under ordinary conditions is balanced and motionless. To produce an inequality of pressure on the plunger, passages 8 are provided communicating between the spaces 18 and the respective ends of the cylinder 3, which passages are closed by reversing tapped valves 9 which have stems 10 extending into the cylinder 3. When the main piston 11 reaches one end of its stroke, it strikes the stem 10 of the reversing valve 9 at that end of the cylinder and opens the passage 8, thereby permitting the steam to exhaust from the space 18 at that end of the plunger 4 through the passage 8 and a passage 19 (shown in dotted lines) to the exhaust of the valve chest, and unbalancing the pressure upon the two ends of the plunger 4, with the result that the plunger 4 and slide-valve 1 are shifted over and the motor reversed. Live steam, which issues



from ports 12 behind the reversing valves 9 through the passages shown in dotted lines, produces pressure to hold the valves 9 in closing position and to return them to such position as soon as the piston 11 is moved away. As usual, in its movement the plunger 4 closes the passages 8 just before it reaches the end of its stroke and traps sufficient steam to cushion the stroke.

10 The construction, so far as above described, is substantially the same as heretofore known and used and may be taken as an illustration of a complete valve organism adapted to be combined with the valve-controlling means devised by me.

15 The slide-valve 1 and plunger 4 are shown in the drawing as occupying a position at the limit of their movement with one side of the cylinder 3 open to the live steam and closed to the exhaust, and the other side closed to the live steam and open to the exhaust. When the steam is turned off, the plunger and slide-valve may stop midway in their movement with both sides of the cylinder 3 open to the inlet and closed to the exhaust. In this event, when steam is again turned on, there is no inequality of pressure in the cylinder 3 to start the piston 11 either way, and the plunger 4 remains balanced and motionless, since there is no way to open the reversing valves 9 and the engine is incapable of starting itself. To start the engine in such contingency, manually operated means are usually provided, whereby the attendant is enabled to move the valve one way or the other, but my invention broadly comprehends automatic means auxiliary to the valve throw and coöperating therewith, which become operative to move the valve to starting position when the steam is turned off, and are moved out of operative relation with the valve throw when the steam is turned on.

45 In the embodiment of my invention shown in the drawing, I employ an auxiliary cylinder 13, secured to the steam engine in any suitable way in line with the valve-chest 2, and a piston 14 therein provided with a stem 15 projecting into the valve-chest through stuffing boxes and arranged to abut against the end of the plunger 4, when not restrained and held back out of abutting position. A pipe 16 forms a communicating conduit between the steam inlet pipe 5 and the cylinder 13 so as to admit steam in front of the piston 14; and a thrust-spring 17, in the rear of the piston, bears at one end against the end of the cylinder 13, and at the other against the piston 14, and tends to push the piston toward the plunger 4, and when the piston 14 is so thrust forward by the spring, the stem 15 on the piston, abutting against the plunger 4, pushes the plunger and the valve 1 over to the farthest extent of their move-

ment, as shown in the drawing. To counteract the thrust of the spring 17 on the piston, and withdraw the stem 15 from its abutment against the plunger 4 and thus leave the plunger free to perform its regular operation 70 when the steam is turned on, the connecting pipe 16 admits steam to the cylinder 13 in front of the piston 14 at the same time that steam enters the valve-chest 2, and the piston 14 and its stem 15 are pushed back by the steam pressure exerted in opposition to the thrust of the spring 17, so that the stem 15 is withdrawn from the path of the plunger 4, leaving the plunger free to perform its usual operations. 80 When the steam is shut off, the steam pressure immediately falls in the cylinder 13, and the spring 17, being unopposed, again pushes the piston 14 and stem 15 forward, and the plunger 4 and valve 1 are carried 85 over to starting position.

It is obvious that various modifications may be made in the construction shown and above particularly described within the principle and scope of my invention. 90

I claim:

1. In combination with the valve mechanism of a fluid-pressure motor, means coöperative with the valve mechanism tending to place the mechanism in starting position, 95 and means controlled by the pressure fluid for rendering the coöperative means inoperative.

2. In combination with a slide-valve of a fluid-pressure motor, means coöperative 100 with the valve tending to place the valve in starting position, and means controlled by the pressure fluid for rendering the coöperative means inoperative.

3. In combination with the valve mechanism of a fluid-pressure motor and a valve-operating plunger, means coöperating with the plunger and tending to place the valve in starting position, and means controlled by the pressure fluid for rendering the co- 110 operative means inoperative.

4. In combination with the valve mechanism of a fluid-pressure motor, resilient means coöperative with the valve mechanism tending to place the mechanism in starting 115 position, and means controlled by the pressure fluid for rendering the resilient means inoperative.

5. In combination with a fluid-pressure slide-valve and a valve-operating plunger, 120 an auxiliary piston controlled by the pressure fluid and adapted to coöperate with the plunger to place the valve in starting position when the pressure fluid is shut off, and to be moved out of operative relation with 125 the plunger when the pressure fluid is admitted.

6. In combination with the valve mechanism of a fluid-pressure motor, an auxiliary cylinder, a piston in the auxiliary cylinder 130



adapted to cooperate with the valve mechanism to place the mechanism in starting position, and means for admitting pressure fluid to the auxiliary cylinder to withdraw the piston from cooperation with the valve mechanism.

7. In combination with the valve mechanism of a fluid-pressure motor, a valve-operating member, an auxiliary cylinder and a piston therein adapted to cooperate with the valve-operating member to move the valve mechanism to starting position, resilient means cooperative with the piston and tending to move it into cooperative relation with the valve-operating member, and means for admitting pressure fluid to the auxiliary cylinder in opposition to the resilient means to move the piston out of operative relation with the valve-operating member.

8. In combination with a slide-valve mechanism of a fluid-pressure motor and a plunger for operating the slide-valve, an auxiliary cylinder and a piston therein, a thrust member operated by the piston and adapted to abut against the valve-operating plunger, resilient means cooperative with the piston and tending to move the valve to starting position, and means for admitting pressure fluid to the auxiliary cylinder in opposition to the resilient means.

9. In combination with a valve-chest and

valve mechanism of a fluid-pressure motor, an auxiliary cylinder and a piston therein, a thrust member operated by the piston and adapted in the absence of fluid pressure from the auxiliary cylinder to move the valve mechanism to starting position, and a conduit in communication with the valve-chest to admit the fluid pressure to the auxiliary cylinder to move the auxiliary piston out of operative connection with the valve mechanism.

10. In combination with a valve chest and a slide-valve mechanism of a fluid-pressure motor and a plunger for operating the slide-valve, an auxiliary cylinder and a piston therein, a thrust member operated by the piston and adapted to abut against the valve-operating plunger, resilient means cooperative with the piston tending to move the valve to starting position, and a communicating conduit between the valve-chest and the auxiliary cylinder arranged to admit pressure fluid in front of the auxiliary piston to move the auxiliary piston out of operative connection with the valve mechanism.

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

JOHN FOURNIA.

Witnesses:

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MARTIN BECK.