W. V. TURNER.

ELECTRIC PUMP GOVERNOR.

APPLICATION FILED JUNE 22, 1909.

1,018,594.

Patented Feb. 27, 1912.

2 SHEETS—SHEET 1.

Fig. 2.

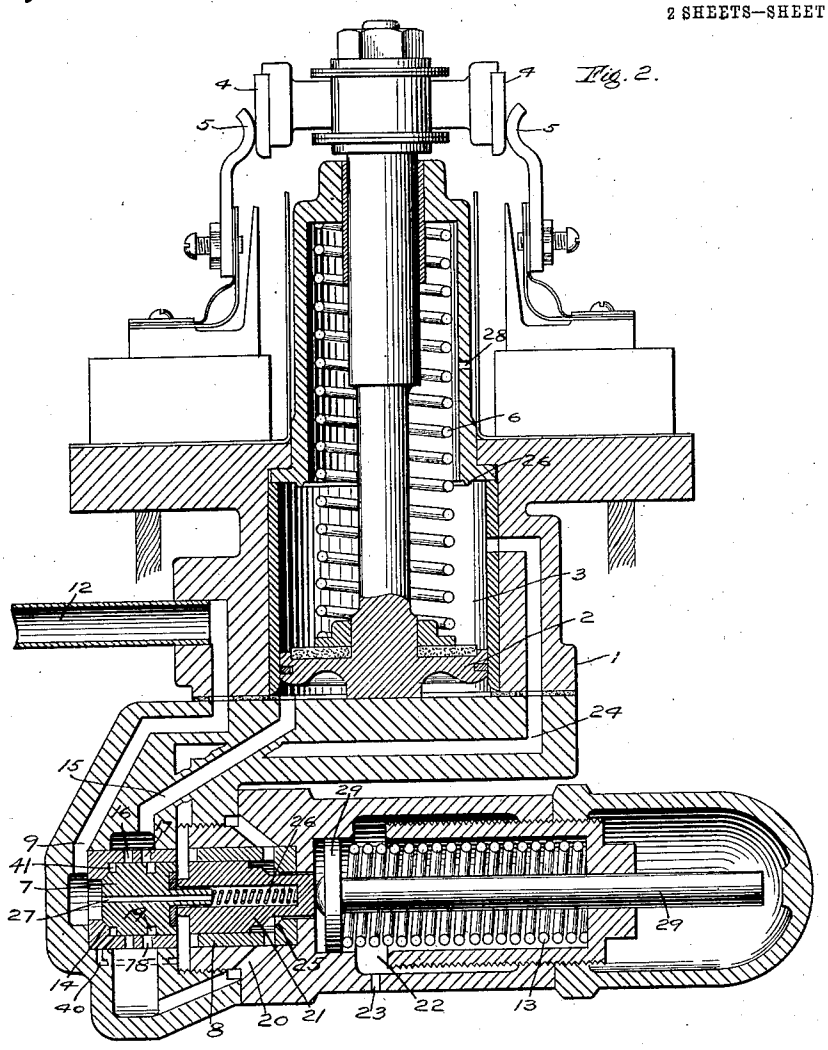
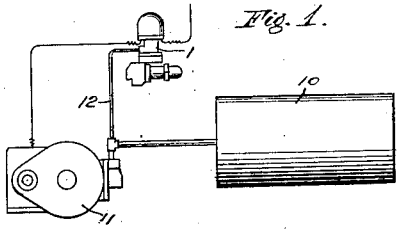


Fig. 1.



WITNESSES

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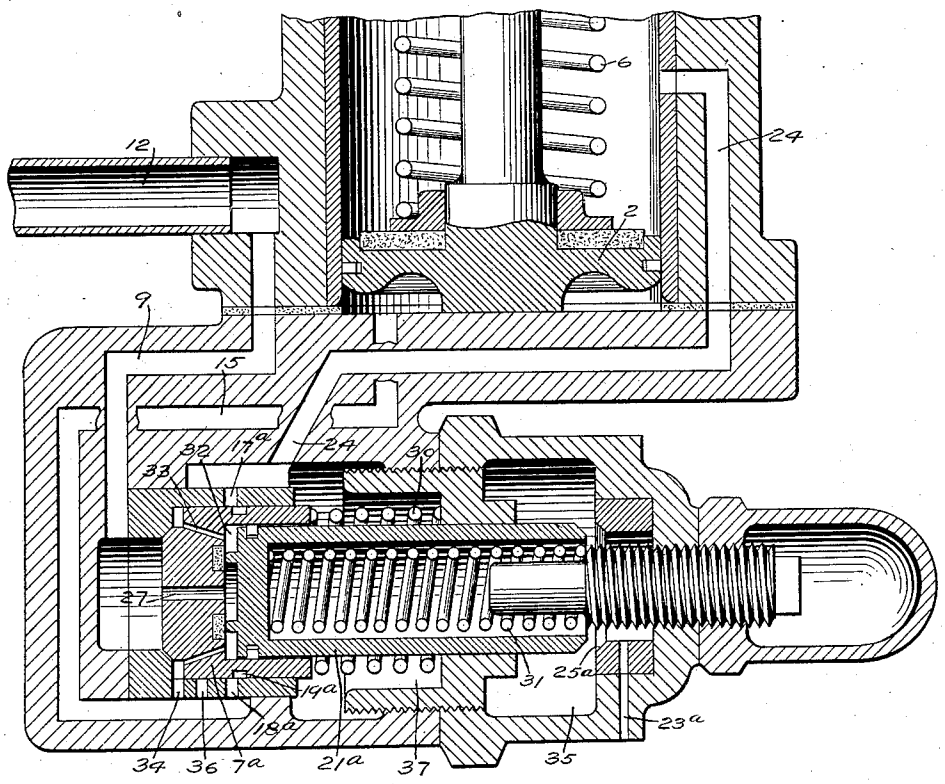
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2 SHEETS—SHEET 2.

Fig. 3.



WITNESSES

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UNITED STATES PATENT OFFICE.

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ELECTRIC-PUMP GOVERNOR.

1,018,594. Specification of Letters Patent. **Patented Feb. 27, 1912.**

Application filed June 22, 1909. Serial No. 503,628.

To all whom it may concern:

Be it known that I, WALTER V. TURNER, a citizen of the United States, residing at Edgewood, in the county of Allegheny and State of Pennsylvania, have invented new and useful Improvements in Electric-Pump Governors, of which the following is a specification.

This invention relates to pump governors, and more particularly to governors for electric motor driven pumps.

The main object of my invention is to simplify the operating mechanism of the type of pressure governor having a main piston for actuating a pump controlling device or electric switch, the operating mechanism being governed by pump pressure for supplying and releasing air to and from said main piston.

Another object is to provide a pump governor having means for effecting the free escape of fluid leaking around the operating mechanism thereof, so as to insure the prompt and positive action of the governor.

Another object is to provide a simple form of pump governor of few parts in which the range between the cutting-in and cutting-out pressures may be adjusted at will.

Other objects and advantages will be referred to in the more detailed description of the invention in connection with the drawings.

In the accompanying drawings; Figure 1 is a diagrammatic view of an electric motor driven pump apparatus with my improved pressure governor applied thereto; Fig. 2 a vertical sectional view of a pressure governor embodying my improvement, and Fig. 3 a similar view, with the electric switch portion of the governor broken away, showing a modified form of pressure governor embodying my invention.

As shown in Fig. 2 of the drawings the pump governor may comprise a casing 1 having a piston chamber 3 containing an actuating piston 2, the piston being provided with movable contacts 4 of a pump controlling switch having fixed contacts 5, a spring 6 normally holding said piston at its inner position. The governing mechanism for controlling the admission and release of fluid to and from the actuating piston comprises, according to my invention, a valve piston mechanism preferably formed of two valve pistons 7 and 21 mounted to operate in a bushing 8 and subject in one position on only a small area of the valve piston 7 to pump pressure admitted thereto through a passage 9. In the opposite direction the valve piston mechanism is subject to the resistance of an adjustable spring 13 acting on the valve piston 21 through a guiding spring stem 29, said spring tending to hold the valve piston 7 to its seat 14. Valve piston 7 is provided with an annular groove or port 19 which, when the valve piston is on its seat 14, establishes communication from port 17 in bushing 8 leading to passage 15 to port 18 which communicates with passage 20. The valve piston 21 controls communication from the passage 20 to chamber 22 having a small or restricted port 23 leading to the atmosphere.

The parts being connected as shown in Fig. 1 of the drawings with the passage 9 communicating with a pipe 12 opening into main reservoir 10 of the motor driven pump 11, and the electric switch of the governor being in its closed position, as shown in Fig. 2, the pump compresses air into the reservoir 10, and at the same time the pressure rises on the small exposed area of the valve piston 7 until sufficient to overcome the resistance of the adjustable spring 13. The valve piston is then moved from its seat 14, at once opening up the full area of said piston to the action of the pump pressure. Valve piston 7 is thereupon rapidly shifted outwardly, uncovering port 16 so as to admit fluid under pressure from the supply passage 9 to passage 15. Fluid under pressure is then admitted to the actuating piston 2 in large volume so as to cause the same to move out rapidly and open the electric switch. The second valve piston 21 is also shifted by the outward movement of the valve piston 7 to engage its seat 25, cutting off communication from passage 20 to the spring chamber 22 and exhaust port 23.

In the movement of the piston 2 to the cut-out position, a passage 24 leading to the space between the valve pistons 7 and 21 is passed over so that the same is opened to

the chamber at the inner face of piston 2 and fluid at pump pressure flows through the passage to the inner face of valve piston 21. This pressure then holds the valve piston to its seat 25, a portion of the area of same being exposed to the atmospheric pressure in spring chamber 22. The valve piston 7 is now subject to pump pressure on opposite sides, so that the pressure of a light spring 26 inserted between the valve pistons 7 and 21 is sufficient to shift the valve piston 7 to its seat 14. This movement closes the port 16 which admits air through passage 15 to piston 2, but a passage 27 is provided through valve piston 7, so that pump pressure on piston 2 is now maintained through passage 24, which communicates with the space between the valve pistons 7 and 21 and consequently with the passage 27.

With the fall in pump pressure, the pressure reduces on the inner face of valve piston 21, until the pressure of the spring 13 is sufficient to slightly move the valve piston 21 from its seat 25, thus opening communication from the passage 20 to chamber 22. As port 23 is quite small, fluid under pressure flows to chamber 22 from passage 20 faster than it can escape through the port 23, so that a certain degree of pressure accumulates in chamber 22 and is exerted on the outer face of valve piston 21 in addition to the pressure of spring 13 and thereby insures the prompt and positive movement of the valve piston to its inner position.

By opening the passage 20 to the atmosphere exhaust port 23 fluid is vented from the actuating piston 2 through ports 15, 17, 19, and 18, thus causing said piston to move inwardly and close the electric switch to cut in the pump.

It will be noted that the prompt and positive movement of the parts depends upon the difference in pressures acting on the opposite sides of the valve piston mechanism, and since the atmospheric port 23, opening to the chamber 22 must be quite small so that a prompt cutting-in movement may be obtained, it will be apparent that should leakage of air past the seat 14 of valve piston 7 be greater than the capacity of the port 23, the fluid pressure on the spring side of the valve piston mechanism will build up and thus tend to prevent the desired rapid movement of the parts. An important feature of my invention consists in disposing of any such leakage of air past the valve mechanism and preferably a port 40 is provided connecting the valve piston chamber 41 adjacent the seat 14 with the chamber between the valve pistons 7 and 21. As the latter chamber is open to passage 24, any air leaking past the seat 14 will then flow through passages 40 and 24 and out to the atmosphere through the port 28. Although the port 40 is preferred, the valve piston 7 being made a loose fit in the bushing 8, will in some cases be sufficient to permit the escape of air as it leaks.

In the construction shown in Fig. 3 of the drawings, means are provided whereby the so-called range or difference between the cutting-in and cutting-out pressures may be adjusted to any desired amount. For this purpose two adjustable springs 30 and 31 are employed, the spring 30 acting on the valve piston 7^a, and spring 31 on valve piston 21^a. The valve piston 21^a operates in a piston chamber 32 of the valve piston 7^a and is adapted to normally seat on the valve piston 7^a.

In the cut-in position, as shown in Fig. 3, port 15 leading to the piston 2 is connected by port 18^a, groove 19^a, and port 17^a with passage 24, so that the chamber at the inner side of the piston is open to the atmosphere.

Passages 33 in the valve piston 7^a form communication from the portion of the piston chamber 32 at the inner face of the valve piston 21^a to the space at the inner face of valve piston 7^a and a port 34 connects this latter space with passage 15. As passage 15 is open in the cut-in position of the parts through ports 18^a, 19^a, and 17^a to the passage 24, it will be seen that any leakage of fluid into these chambers will readily escape to the atmosphere and thus prevent possible building up of pressure therein.

The adjustable springs 30 and 31 being adjusted so that the total resistance is equal to the maximum pressure at which it is desired to have the pump cut out, when the pump pressure acting on the small exposed area of the valve piston 7^a is high enough to overcome the spring resistance, the same is moved from its seat, and exposing the full area thereof to fluid pressure, the valve parts are quickly shifted to their extreme outer position, the valve piston 21^a engaging the seat 25^a and cutting off communication from the spring chamber 35 to the exhaust port 23^a. Fluid under pressure is then supplied from the passage 9, through port 36 to the passage 15 which leads to the chamber at the inner face of the main piston 2. Said piston is thereupon rapidly shifted to its cut-out position, opening the electric switch contacts with a quick snap-like movement and thereby stopping the pump. As the passage 24 opens to the portion of the main piston chamber which is at the inner face of the piston 2 in the cut-out position of the parts, it will be seen that fluid under pressure enters the chamber 37 at the outer face of valve piston 7^a, thus balancing the fluid pressures on opposite sides of said valve piston, so that the pressure of spring 30 at once returns the same to its inner position. The valve piston 21^a, however, remains in its outer seated position until the pump pres-

sure acting on the inner face of the valve piston has reduced sufficiently to permit the spring 31 to start same from its seat 25ª. Having once lifted from its seat, the valve piston 21ª quickly moves over to its inner position. The chamber at the inner face of the main piston 2 is now open to the atmosphere through the exhaust port 23ª by way of passage 15, ports 18ª, 19ª, and 17ª to chamber 37 and thence around the loose fitting valve piston 21ª to chamber 35, and fluid is vented from the piston 2 causing the spring 6 to move the same inwardly, and passing over passage 24, the piston opens said passage to the atmosphere, thus providing an additional vent for the release of fluid from the piston 2. Piston 2 thereupon quickly moves to its inner position, closing the pump motor switch, and causing the pump to start.

It will be noted that while the valve parts operate against the resistance of the two springs 30 and 31 in the movement to cut out, the cutting-in is governed only by the spring 31. This affords the means by which the range between the maximum and minimum cutting-out and cutting-in pressures may be varied as desired, it being only necessary to adjust the spring 31 at the desired cutting-in pressure and the spring 30 so that the sum of both spring resistances will correspond with the desired cutting-out pressure, as will be clear.

The two valve pistons 7 and 21 may be combined in one piece in some cases, but it is considered preferable to construct same as shown in the drawings, for the reason that it is difficult to secure accurate seating at opposite positions of a unitary two seated valve piston and it is also more difficult to assemble the parts.

Having now described my invention, what I claim as new and desire to secure by Letters Patent, is:—

1. A pump governor comprising a pump controlling device, a piston for actuating same, a valve piston subject on one side to pump pressure for supplying air to said piston, a second valve piston operated upon a predetermined induction in pump pressure for controlling the release of air from said piston independently of the other valve piston, and a spring for opposing the movement of said valve pistons.

2. A pump governor comprising a pump controlling device, a piston for actuating same, a valve piston having a seated position and subject on one side to pump pressure for supplying air to said piston, a second valve piston subject on one side to pump pressure for controlling the release of air from said actuating piston, a spring for opposing the pump pressure on said valve pistons, means operating upon supplying air to said actuating piston for balancing the fluid pressures on the first valve piston, and a spring for returning same to its seated position.

3. A pump governor comprising a pump controlling device, a piston for actuating same, a valve piston having a seated position and subject on one side to pump pressure for supplying air to said piston, a second valve piston subject on one side to pump pressure for controlling the release of air from said actuating piston, a spring for opposing the pump pressure on said valve pistons, said actuating piston being adapted, when air is supplied thereto, to supply air to the first mentioned valve piston for balancing the fluid pressures thereon, and a spring for returning said valve piston to its seated position.

4. A pump governor comprising a pump controlling device, a piston for actuating same, a valve piston having one area exposed in a seated position to pump pressure for supplying air to operate said actuating piston, a second valve piston having a seated position exposing a different area to pump pressure and moving independently of said other valve piston for releasing air from said actuating piston, and a spring for opposing the pump pressure on said valve pistons.

5. A pump governor comprising a pump controlling device, a piston for actuating same, a valve piston having one area exposed in a seated position to pump pressure and a larger area on the opposite side to atmospheric pressure for supplying air to operate said actuating piston, a second valve piston having a seated position exposing a larger area to pump pressure and a smaller area to atmospheric pressure than the first valve piston and movable independently of said first valve piston for releasing air from said actuating piston, and a spring for opposing the pump pressure on said valve pistons.

6. A pump governor comprising a pump controlling device, a piston for actuating same, a valve piston mechanism for controlling the supply and release of fluid to and from said actuating piston and having a seat in one direction exposing a small area to pump pressure and a seat in the opposite direction exposing a portion of the area thereof to atmospheric pressure, two adjustable springs for opposing the movement of said valve piston mechanism from the first mentioned seat, and means for eliminating the pressure of one of said springs on the valve piston mechanism when the same occupies its second seat.

7. A pump governor comprising a pump controlling device, a piston and cylinder for actuating same, a valve mechanism for controlling the fluid pressure on said actuating piston comprising two valve pistons

subject in one direction to pump pressure, an adjustable spring acting on each valve piston to oppose the pump pressure, said valve mechanism having opposite seats, the movement from one of which is opposed by both springs, and means for effecting the initial movement of one valve piston from the opposite position, whereby the movement of the other valve piston from said position is governed by only one spring.

In testimony whereof I have hereunto set my hand.

WALTER V. TURNER.

Witnesses:
WM. M. CADY,
A. M. CLEMENTS.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."