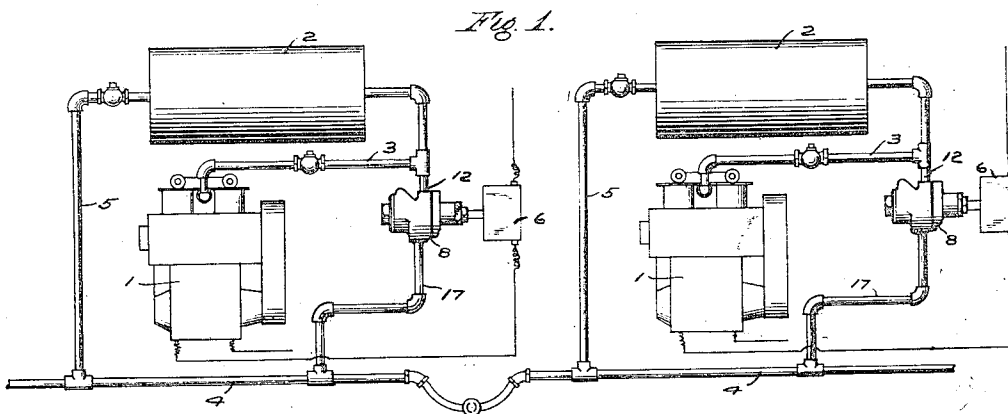
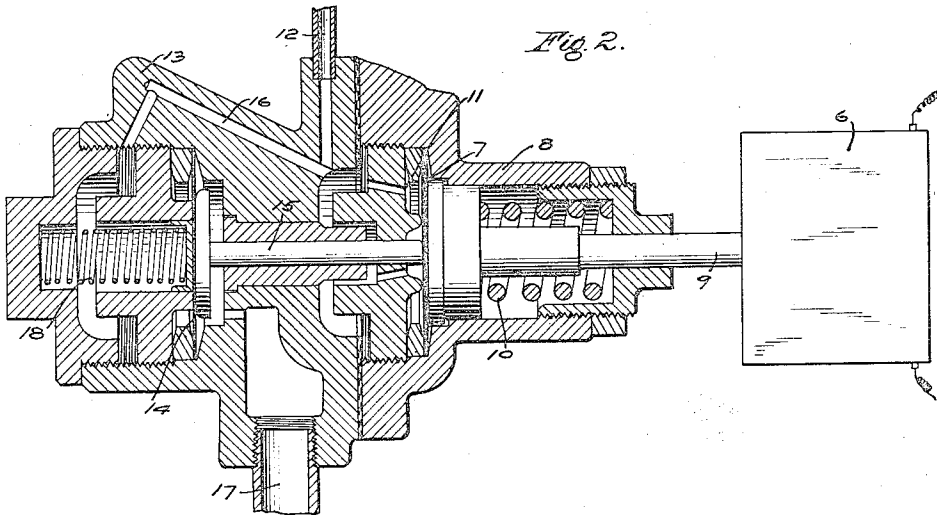


W. V. TURNER.
DIFFERENTIAL PRESSURE GOVERNOR FOR PUMPS.
APPLICATION FILED SEPT. 16, 1907.

1,060,650.

Patented May 6, 1913.
2 SHEETS—SHEET 1.



WITNESSES

J. Custer
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INVENTOR

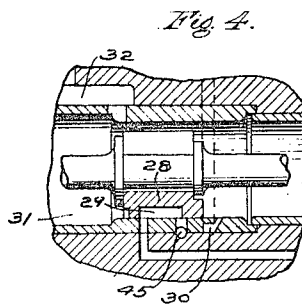
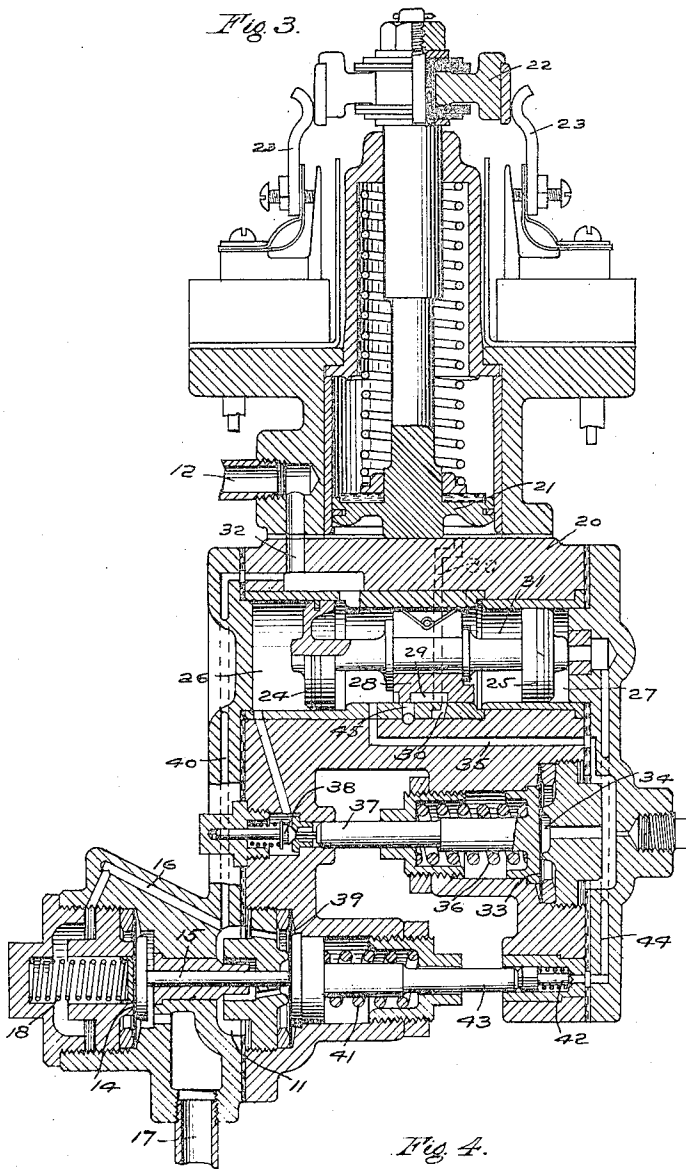
Walter V. Turner
by *E. H. Knight* Att'y.

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WITNESSES

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UNITED STATES PATENT OFFICE.

WALTER V. TURNER, OF EDGEWOOD, PENNSYLVANIA, ASSIGNOR TO THE WESTINGHOUSE AIR BRAKE COMPANY, OF PITTSBURGH, PENNSYLVANIA, A CORPORATION OF PENNSYLVANIA.

DIFFERENTIAL-PRESSURE GOVERNOR FOR PUMPS.

1,060,650.

Specification of Letters Patent.

Patented May 6, 1913.

Application filed September 16, 1907. Serial No. 393,020.

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 Differential-Pressure Governors for Pumps, of which the following is a specification.

My invention relates to pressure governors and particularly to differential pressure governors for pumps as employed where two or more pumps compress air or other fluid into a common receptacle such as, for example, a reservoir pipe line.

Owing to the difficulty of adjusting a plurality of governors with sufficient accuracy that all may operate to cut in at the same degree of pressure and at the same time, it usually happens that some one pump governor of the system causes the cutting in of the corresponding pump before the other governors act, and this pump raises the pressure in its reservoir, and in the reservoir pipe line. There being non-return check valves in the pipes connecting the reservoirs to the pipe line, a differential pressure then exists between the other reservoirs and said pipe line. It is this pressure which is employed in differential governors to effect a substantially simultaneous action of the several pump governors.

The principal object of my invention is to provide an improved differential pressure control apparatus of the above character, which may be readily and cheaply applied to existing forms of fluid pressure governors, and which will operate accurately upon a slight differential pressure to cause the governor to cut in the pump.

In the accompanying drawings, Figure 1 is a diagrammatic view of two electric pump equipments coupled together, with my improvements applied; Fig. 2 a central sectional view of one form of differential pressure governing mechanism applied in general to a pump controlling device; Fig. 3 a central sectional view showing my improvement applied to a preferred form of electric pump governor; and Fig. 4 a central sectional view of the main controlling valve of the construction shown in Fig. 3, with the valve in its cut out position.

The apparatus on a car may comprise, as shown in Fig. 1, an electric motor driven

pump 1, reservoir 2, into which air is compressed by the pump 1, through pipe 3, reservoir pipe line 4 or other common receptacle, connected to the reservoir 2 by pipe 5, and having the usual couplings at each end of the car. An electric pump governor 6 and differential control device 8 is connected to the reservoir pipe line 4, by pipe 17, and to the reservoir 2, by pipe 12.

According to the construction illustrated in Figs. 1 and 2, I provide a pressure governor comprising an electric switch or controlling device 6, of any desired construction, and a regulating mechanism for governing the action of said controlling device, which may consist of a diaphragm 7 contained in a chamber 11 of a casing 8 and having a stem 9 operatively connected to said controlling device.

The chamber 11 on one side of diaphragm 7 is connected by a pipe 12 to the main reservoir and the opposite side of the diaphragm is subject to the pressure of an adjustable spring 10, so that the regulating mechanism is operated according to variations in pump or main reservoir pressure in the usual manner.

As shown in Fig. 2, the differential governing device may comprise a casing 13, secured to the casing 8, and containing a diaphragm 14, adapted to actuate a stem 15, which extends into the diaphragm chamber 11 and contacts with the diaphragm 7.

The diaphragm 14 is open on one face to pump pressure by way of passage 16, which leads to pipe 12, and the opposite face is subject to the pressure from the other pumps of the system, being connected to the reservoir pipe line 4 by pipe 17.

The pressure of a spring 18 opposes the reservoir pipe line pressure on the diaphragm 14, so that when the pump pressure and the reservoir line pressure are substantially equal, the pressure of the spring 18 opposes the pressure of the spring 10, and consequently the regulating mechanism is subject to the opposing pressures of the pump and the differential pressure of the springs 10 and 18.

Should the adjustment of another governor be such that the corresponding pump is first cut in and compresses air into its reservoir and the pipe line 4, the rise in pressure thereby caused in the reservoir pipe

line 4 is communicated to the differential diaphragm 14 and tends to compress the spring 18, counteracting its effect on the diaphragm 7. The pump pressure acting on the face of the regulating diaphragm will then be overcome by the pressure of the spring 10, shifting the diaphragm 7 and the stem 9, thereby causing the governor mechanism to actuate the controlling device and close the pump motor circuit, cutting in the pump. In this manner, when one pump cuts in, all will cut in, and continue to operate until the governor adjusted to the lowest pressure cuts out its pump. The maximum range in the variations in the adjustment of different governors may readily be made not to exceed a few pounds, and as the difference between the cutting in and cutting out pressure of a governor is usually much more, say 10 to 15 pounds, there will be a pump pressure on the diaphragm of the regulating mechanism of the governor first to cut out its pump, within a few pounds of the highest cut out pressure, consequently the reservoir line pressure, acting on the differential diaphragm, may compress the differential spring 18, but this will not be sufficient to effect the movement of the diaphragm 7, which is subject to the high pump pressure. Consequently each pump will continue to pump until the corresponding governor cuts out the pump, according to the degree of pressure to which it is adjusted.

In Fig. 3 of the drawings is illustrated a particular design of pump governor, such as disclosed in prior application Serial No. 381,311, with my present improvements applied thereto, for the purpose of showing its adaptability to various forms of governors.

The operation of this pump governor is briefly as follows: A main supply valve 28, actuated by an abutment having heads 24 and 25, controls the admission and release of fluid under pressure to and from the actuating piston 21, connected to the movable part 22 of an electric switch, having stationary contacts 23. The piston heads 24 and 25 are adapted to permit equalization of pressure from the valve chamber 31 to the outer piston chambers 26 and 27. A release valve 38, governed by a diaphragm 33, controls the release of fluid from chamber 26, and a release valve 42, governed by a low tension diaphragm 39, controls the release of fluid from chamber 27. With no fluid pressure on diaphragm 39, the valve 42 is open, so that chamber 27 is at atmospheric pressure, and the valve 38 being closed, fluid pressure in chamber 26 shifts main valve 28 to position shown in Fig. 3, in which the face of the actuating piston is open to the atmosphere, through port 30, cavity 29 in the valve 28 and exhaust port 45. When the pump pressure has attained the degree for which the low tension diaphragm is set,

the valve 42 is closed, permitting the equalization of pressure into the chamber 27, when the pump pressure then increases to the degree at which the diaphragm 33 is set, the valve 38 is opened, and chamber 26 is vented to the atmosphere, causing the abutment to be quickly shifted by the fluid pressure in the chamber 27. The main slide valve 28 then uncovers port 30 to the valve chamber 31, so that fluid under pressure is admitted to actuating piston 21, which causes the piston to shift outwardly and open the electric switch, thereby cutting out the pump.

The differential governing device may be applied to the low tension diaphragm 39, the passage 16 may be connected to a passage 40, leading to pipe 12, so that the outer face of the diaphragm is subject to pump pressure and the opposite face is subject to pressure in the reservoir pipe line. The spring 41 is now adjusted so that the differential pressure of the springs 18 and 41 is equal to the desired low tension degree of pump pressure, and thus, with a single pump, wherein the reservoir line pressure does not of course, exceed the pump pressure, the combined effect of the springs 18 and 41 is equivalent to the single low tension spring.

If coupled to other pumps, the rise in pressure in the reservoir pipe line, caused by the first pump to cut in, is communicated to the inner face of the diaphragm 14, and as the spring 18 is compressed, the diaphragm 39 is correspondingly relieved of pressure, so that the spring 41 shifts the diaphragm and permits the release valve 42 to open, venting the chamber 27, and, as before described, thereby causing the governing device or switch to close and the pump to operate.

It will thus be apparent that my improvements may be readily applied to various existing forms of pump governors, thereby providing a very economical construction.

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

1. A pressure governor comprising a controlling device, a regulating mechanism, subject to opposing pressures of the pump and a spring, for governing the action of said controlling device, and an abutment, subject to the opposing pressures of different pumps and a spring, normally opposing said regulating mechanism spring, said abutment being actuated by an increase in pressure from one pump to counteract the effect of said differential spring.

2. A pressure governor comprising a controlling device, a regulating mechanism comprising an abutment, subject to the opposing pressures of the pump and an adjustable spring, for governing the action of said controlling device, a yielding resistance means

opposing said regulating spring, and means operated by the opposing pressures from different pumps for acting on said resistance means to cause said regulating means to operate.

3. In a pressure governing apparatus, the combination with an air pump, reservoir, and reservoir pipe line, of a movable abutment, subject to the opposing pressures of the reservoir and an adjustable spring, for controlling said pump and an abutment, subject on one face to the pressure of a spring adapted to oppose the pressure of said adjustable spring, the latter abutment being subject to reservoir line pressure in a direction tending to relieve the adjustable spring of the pressure of said opposing spring.

4. A pressure governing apparatus comprising a controlling device or switch, an abutment subject on one side to the pressure of an adjustable spring and on the opposite side to reservoir pressure and a yielding resistance means, and means subject on opposite sides to pressures from different pumps for opposing said yielding resistance means.

5. In a pressure governing apparatus, the combination with an air pump, reservoir and reservoir pipe line, of a movable abutment subject to the opposing pressures of an adjustable spring and said reservoir, for controlling said pump, and another movable abutment subject to the opposing pressures of the reservoir and pipe line, for varying the pressure on the first mentioned abutment.

6. A pressure governor comprising a controlling device, a regulating mechanism subject to the opposing pressures of the pump and an adjustable spring, for governing the action of said controlling device, and an abutment subject to the pressure of a spring

and the pressure from another pump for also controlling the action of said regulating mechanism.

7. A pressure governor comprising a controlling device, an abutment subject to the opposing pressures of an adjustable spring and the pump pressure for governing the action of said controlling device, a yielding resistance, and a diaphragm subject to the opposing pressures from different pumps and on one side to said yielding resistance and adapted to act on said abutment.

8. A pressure governor comprising a controlling device, a movable abutment subject to the opposing pressures of the pump and an adjustable spring for governing the action of said controlling device, a diaphragm subject to the opposing pressures from different pumps and adapted to act on said abutment, and a spring acting on one side of said diaphragm to normally oppose the movement of the abutment.

9. A pressure governor comprising a controlling device, a movable abutment subject to the opposing pressures of the pump and an adjustable spring for governing the action of said controlling device, a diaphragm subject to the opposing pressures from different pumps and adapted to act on said abutment, and a spring acting on one side of said diaphragm to normally oppose the movement of the abutment, said diaphragm being operated upon an increase in pump pressure on one side to relieve the abutment of the pressure of said spring.

In testimony whereof, I have hereunto set my hand.

WALTER V. TURNER.

Witnesses:

R. F. EMERY,
E. B. MACDONALD.