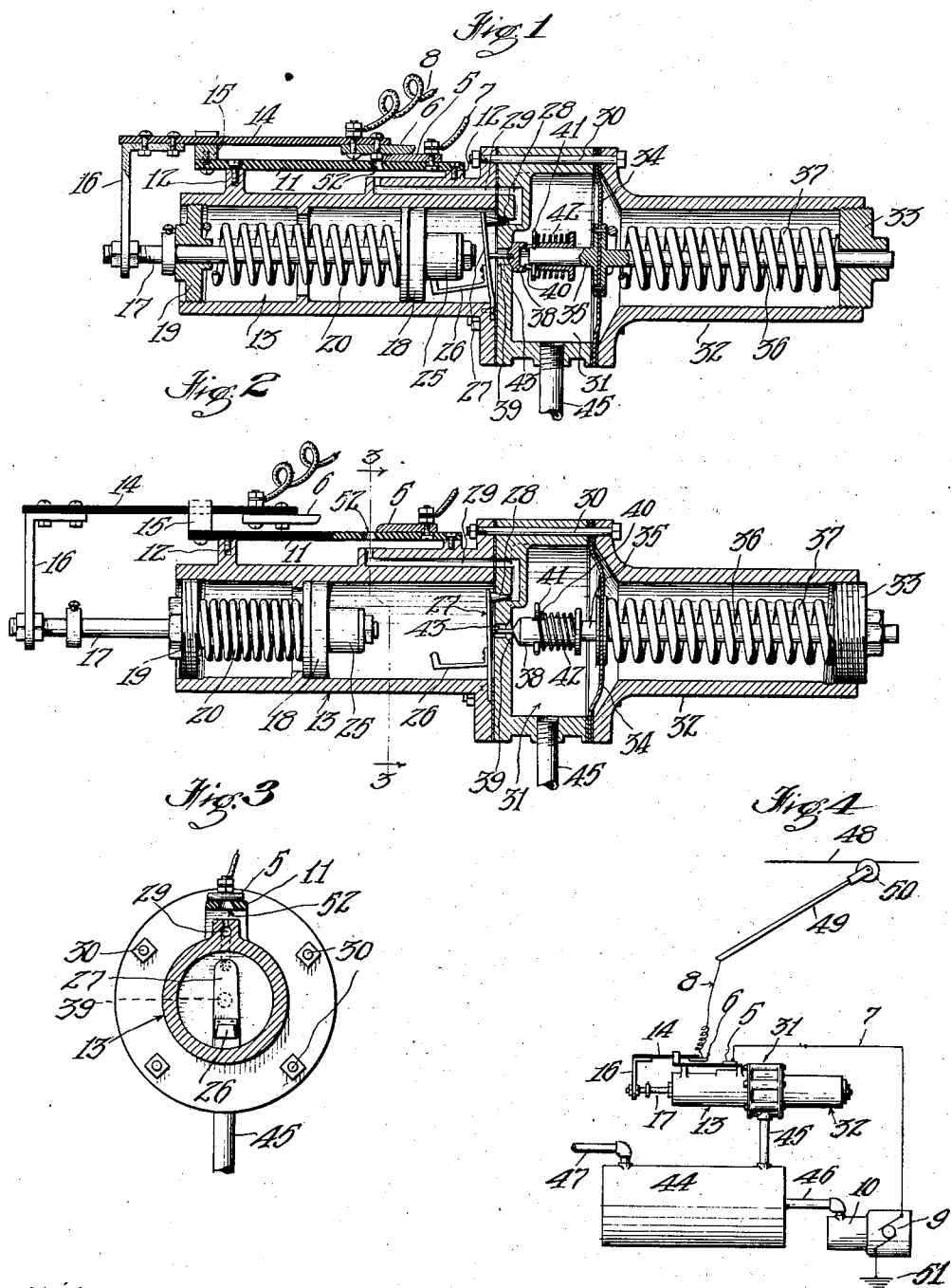


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 AUTOMATIC GOVERNOR FOR AIR COMPRESSORS.
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CLARENCE NORLAND, OF LOS ANGELES, CALIFORNIA.

AUTOMATIC GOVERNOR FOR AIR-COMPRESSORS.

No. 908,692.

Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, CLARENCE NORLAND, a citizen of the United States, residing at Los Angeles, in the county of Los Angeles and State of California, have invented new and useful Improvements in Automatic Governors for Air-Compressors, of which the following is a specification.

My invention aims to provide certain improvements in automatic governors for air compressors, such as electrically operated fluid pumps, which maintain a fluid pressure in a reservoir from which the pressure is drawn as needed—such, for example, as the pumping systems for compressed air for railroad brakes. My invention provides such a governor in which a cylinder and piston are used to operate the electric switch which controls the electric motor that operates the fluid pressure pump.

Another object is to provide a governor in which the arc created by opening the electric switch is extinguished by pneumatic means.

A further object is to provide a governor which is simple in construction and highly efficient in operation.

I accomplish these objects by means of the device described herein and illustrated in the accompanying drawings, in which:—

Figure 1.—is a central longitudinal section through my improved governor showing it in its operative position. Fig. 2.—is a central longitudinal section through my improved governor showing it in its inoperative position. Fig. 3.—is a transverse section taken on line 3—3 of Fig. 2, looking in the direction of the arrows. Fig. 4.—is a diagrammatic view of the governor showing it in its operative relation to the pump and receiving reservoir and its electrical circuit.

Referring to the drawings, the switch comprises a stationary member 5 and a movable member 6, to the terminals of which, lines 7 and 8 are secured. These lines form a part of the circuit of the electric motor 9 that operates the air compressor 10. Member 5 is rigidly secured to an insulating base 11 which is rigidly secured to lugs 12 projecting from the exterior of switch controlling cylinder 13. Member 6 is carried by a slidable arm 14 which reciprocates in a guideway 15 secured to the insulating base 11. The outer end of this slidable arm 14 is rigidly secured to an arm 16, which arm is connected at right angles to the outer end of piston rod 17. Piston

rod 17 is provided with the usual piston 18 which is adapted to reciprocate in cylinder 13 which is provided with a screw threaded closure 19, by means of which the tension of the coil spring 20, which is mounted on piston rod 17, is regulated. Piston 18 is provided with a contact lug 25 which is adapted to contact with an arm 26 rigidly secured to the spring arm 27, said arm being rigidly secured to cylinder 13 in a suitable manner. On the outer end of arm 27 is secured a valve stopper 28 which is adapted to seat with an exhaust port 29 at certain intervals during the operation of the governor, as will be more particularly described hereinafter.

Rigidly secured by means of bolts 30 to one end of cylinder 13 is a valve controlling cylinder 31 closed on the end that contacts with cylinder 13. Secured to the open end of controlling cylinder 31 by means of bolts 30 is the cylindrical casing 32 which is provided on its outer end with a screw threaded closure 33. Interposed between cylinder 31 and casing 32 is the flexible diaphragm 34 to which is secured in the center thereof and at right angles thereto, guide rods 35 and 36. Mounted on rod 36 and interposed between the diaphragm 34 and the closure 33 is a coiled tension spring 37, by means of which valve stopper 38 mounted on rod 35 is brought into or out of engagement with the port 39 in the closed end of cylinder 31. Valve stopper 38 is slidably mounted on rod 35, and is provided with a longitudinal slot 40 through which a pin 41 transversely secured to the end of the rod 35 passes. Interposed between pin 41 and the flanged outer end of valve stopper 38 is a coiled tension spring 42, the purpose of which is to instantly withdraw the stopper 38 from engagement with the port 39. Secured to the end of the stopper 38 is a pin 43, the purpose of which is to hold the stopper 28 out of engagement with exhaust port 29 so that the remaining air in cylinder 13 will be exhausted, thus allowing the lug 25 on piston 18 to contact with arm 26, this operation only occurring when the air in the reservoir 44 reaches the maximum amount. Reservoir 44 is connected to chamber 31 by pipe connection 45, and to pump 10 by pipe connection 46, an outlet pipe 47 connecting the braking mechanism (not shown). Line 8 leads to the trolley wire 48 through the medium of the trolley pole 49 and the wheel

50. Line 7 leads from member 5 through the electric motor connected to the pump 10 to a suitable ground 51.

The operation of the device is as follows:—

- 5 To successfully operate the brakes of an electrically propelled vehicle such as I have described my device as being applied to, it should have at least a pressure ranging from 60 to 80 pounds in the receiving reservoir 44.
- 10 When the pressure falls below the minimum the motorman is often unable to control the braking mechanism. When the pressure in the receiving reservoir has fallen below the minimum the governor is then in the position as illustrated in Fig. 1 of the drawings with the switch in its closed position and the fluid pressure pump 10 operating. As the
- 15 pressure in the reservoir 44 increases, the diaphragm 34 is forced outwardly against the tension of the coiled spring 37, the air in the controlling cylinder 31 retaining the valve stopper 38 in its seated position until pin 41 on rod 36 has receded to the rear of slot 40 in the valve stopper 38. Coil spring 42
- 20 which surrounds valve stopper 38 has at this time accumulated sufficient tension to instantly unseat the valve stopper, allowing the air to rush through the port 39 into cylinder 13 which forces the piston rearwardly
- 30 against the tension of spring 20 until the movable member 6 of the switch is out of engagement with the stationary member 5. Before contact lug 25 on piston 18 can leave arm 26, movable member 6 has just left the
- 35 stationary member 5, and the arc created by the opening of the switch will be extinguished by the air rushing through exhaust 29 and through aperture 52 in the insulating base 11. After the arc has been extinguished valve
- 40 stopper 28 on the further movement of the piston 18 seats itself, thus closing the exhaust. As the air is withdrawn from reservoir 44 diaphragm 34 begins to recede until the valve stopper 38 seats itself the pin 39
- 45 on the end of the stopper contacting with spring arm 27 until the lug 25 on the piston 18 contacts with the arm 26, thus allowing all the remaining air in cylinder 13 to be exhausted after the stopper 38 has seated itself,
- 50 thereby insuring a perfect contact of the members of the switch.

It will thus be seen from the foregoing description that I have produced a highly efficient device by means of which a continuous supply of air is forced to the receiving reservoir, doing away with the uncertainty that usually attends the operation of governors of this character.

Having described my invention what I claim is:—

- 60 1. In a device of the kind described, the combination of a switch; a cylinder provided with an exhaust port and having a piston operatively connected to said switch; a controlling chamber directly and constantly

open to reservoir pressure secured to one end of said cylinder and adapted to communicate therewith; means in said chamber for controlling the communication between the chamber and the cylinder, and means for opening the exhaust port in said cylinder when communication between cylinder and chamber is closed, said exhaust being directed against the contact point of said switch.

2. In a device of the kind described, the combination of a switch; a cylinder provided with an exhaust port and having a piston operatively connected to said switch; a controlling chamber directly and constantly open to reservoir pressure secured to one end of said cylinder and adapted to communicate therewith; means in said chamber for controlling the communication between the chamber and the cylinder, means in said chamber for opening said exhaust as communication between cylinder and chamber is closed, and additional means in said cylinder for maintaining said exhaust in open condition while communication between cylinder and chamber is opened.

3. In an automatic governor for air compressors, the combination of a switch composed of a movable pole and a stationary pole; a cylinder having a spring operated piston operatively connected to a pole of said switch; an exhaust port in said cylinder having a spring pressed valve stopper adapted to be operated by the piston, said exhaust port terminating outside of said cylinder adjacent the stationary pole of said switch; a valve controlling chamber secured to one end of said cylinder and communicating therewith; means to supply said controlling chamber with fluid pressure; a flexible diaphragm secured to the open end of the valve controlling chamber, said diaphragm having lugs secured thereto in the center thereof, one on either side of said diaphragm; a spring operated valve stopper slidingly mounted on one of said lugs; and a coil spring mounted on the other lug secured to said diaphragm adapted to force said diaphragm inwardly when the air in the valve controlling chamber falls below a predetermined pressure.

4. In a device of the kind described, the combination of a switch; a cylinder having a piston operatively connected to said switch, and provided with an exhaust port; a controlling chamber constantly open to reservoir pressure adapted to communicate with said cylinder when the pressure in the controlling chamber reaches a predetermined maximum; the valve in said chamber for opening said communication when a predetermined pressure is reached; a valve in said cylinder spring-pressed to close said exhaust, and means adapted to be operated by said piston to open said valve.

5. In a device of the kind described, the

combination of a switch; a cylinder having a piston operatively connected to said switch, and provided with an exhaust port; a controlling chamber constantly open to reservoir pressure adapted to communicate with said cylinder when the pressure in the controlling chamber reaches a predetermined maximum; the valve in said chamber for opening said communication when a predetermined pressure is reached; a valve in said cylinder spring-pressed to close said exhaust, means adapted to be operated by said piston to open said valve, and additional means upon the valve in the controlling chamber adapted to open said valve in the cylinder.

6. In a device of the kind described, the combination of a switch; a cylinder having a piston operatively connected to said switch and provided with an exhaust port; a controlling chamber constantly open to reservoir pressure, and having a port opening into said cylinder; a spring-pressed diaphragm in said controlling chamber; a stopper valve slidably mounted in said operating chamber and adapted to be actuated by said diaphragm to close said port; means for unseating said stopper valve when the fluid pressure in the controlling chamber reaches a maximum; a pin upon the seating end of said stopper valve adapted to extend into said port between the cylinder and controlling chamber; and a spring-pressed valve in the cylinder for controlling the exhaust port thereof, and adapted to be actuated by contact with said pin on the stopper valve.

7. In a device of the character described, the combination of a switch, a cylinder having a piston operatively connected to said switch, a controlling chamber constantly open to reservoir pressure and adapted to communicate with said cylinder when the fluid pressure has reached its maximum, an exhaust port in said cylinder directed against the contacts of said switch, means located in said cylinder for holding said port to ex-

haust until the piston in said cylinder has receded, and means located in said controlling chamber to simultaneously open the exhaust port in said cylinder and to close communication between said controlling chamber and said cylinder when the fluid pressure has reached the minimum.

8. In a device of the class described, the combination of a switch, a cylinder having a piston operatively connected to said switch, a controlling chamber connected to reservoir pressure and adapted to communicate with said cylinder when the fluid pressure rises above the normal, means to simultaneously direct the reservoir pressure against the contacts of said switch, and means located in said cylinder whereby said fluid pressure directing means is maintained in an operative position until the piston in said cylinder has receded.

9. In a device of the class described, the combination of a switch, a cylinder having a piston operatively connected to said switch, a controlling chamber connected to reservoir pressure and adapted to communicate with said cylinder when the fluid pressure has reached the maximum, a blast port in said cylinder directed against the contacts of said switch, means located in said cylinder for maintaining an unimpeded passage through said port until the piston has partially receded, and means located in said controlling chamber to simultaneously open the blast port in said cylinder and to close the communication between said controlling chamber and said cylinder when the fluid pressure has reached the minimum.

In witness that I claim the foregoing I have hereunto subscribed my name this 14th day of December, 1906.

CLARENCE NORLAND.

Witnesses:-

EDMUND A. STRAUSE,
G. E. HARPHAM.