W. V. TURNER.

PRESSURE GOVERNING APPARATUS.

APPLICATION FILED NOV. 1, 1907.

929,055. Patented July 27, 1909.

Fig. 3.

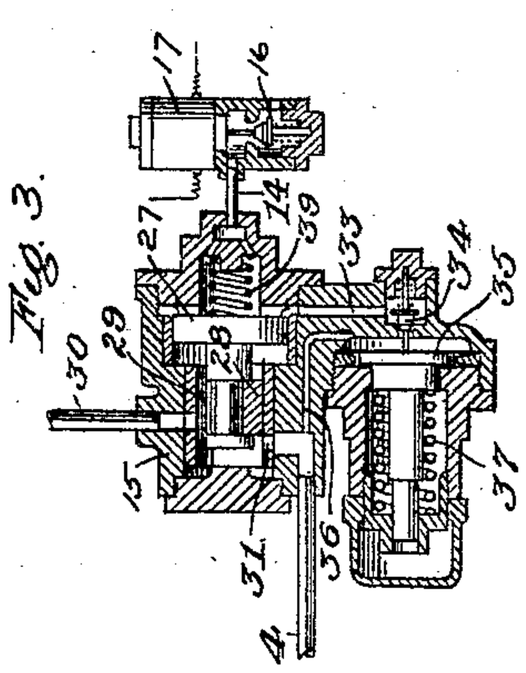


Fig. 1.

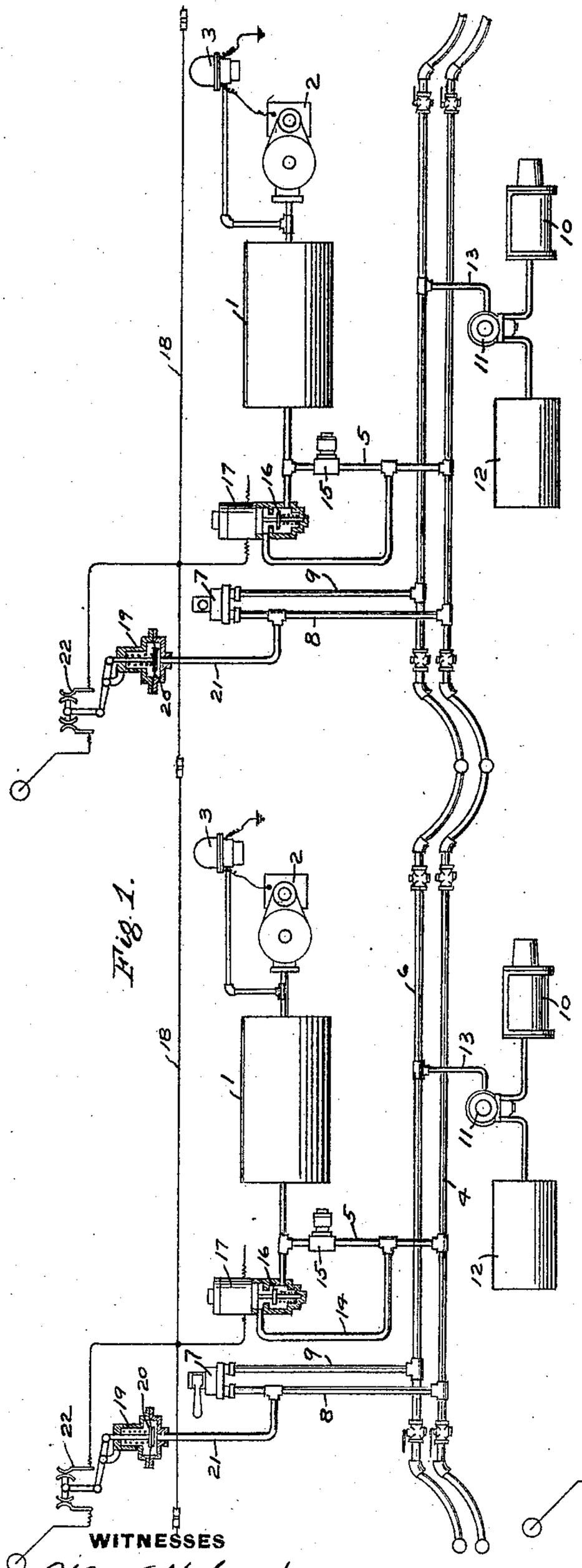
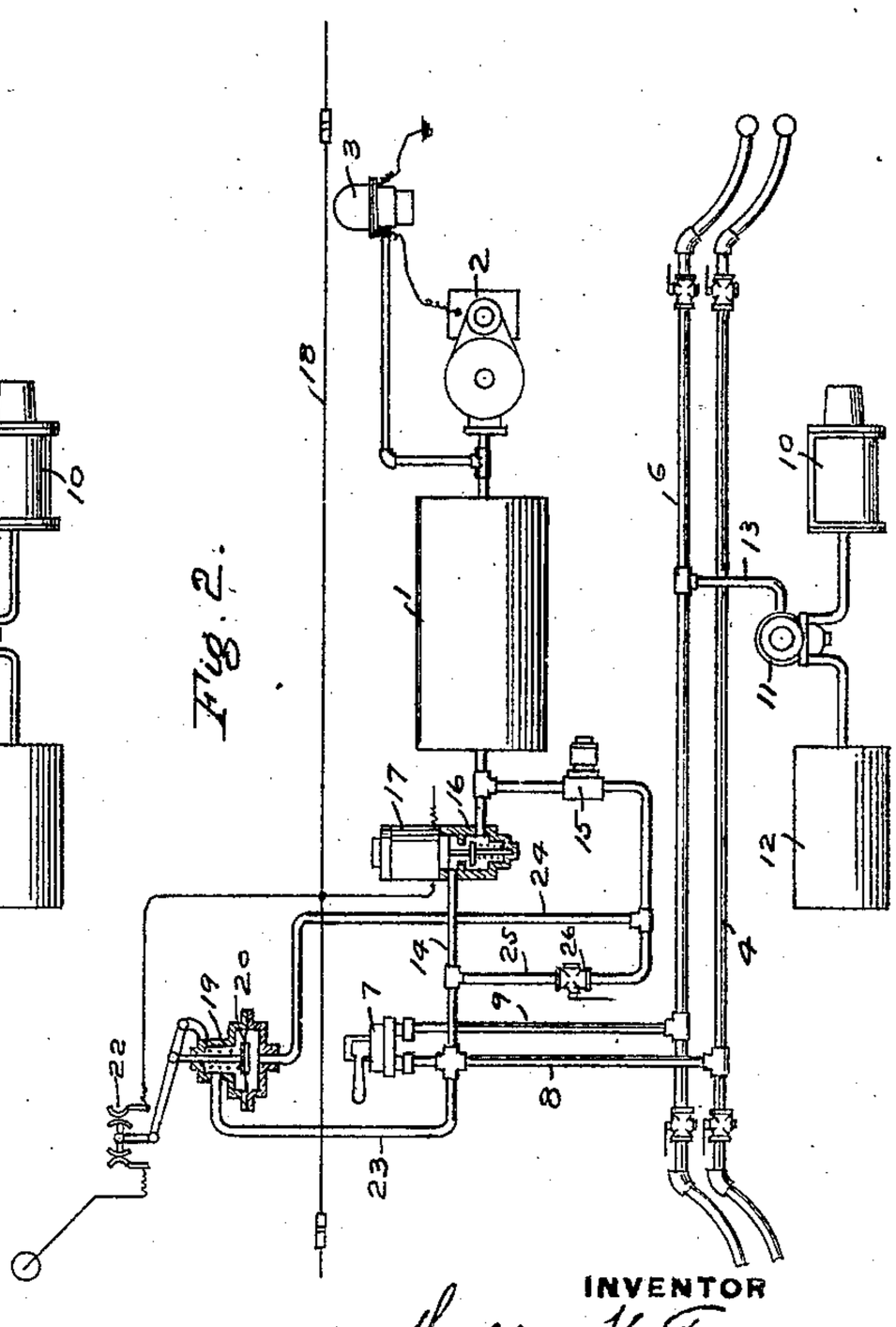


Fig. 2.



WITNESSES

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UNITED STATES PATENT OFFICE.

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PRESSURE-GOVERNING APPARATUS.

No. 929,055. Specification of Letters Patent. Patented July 27, 1909.

Application filed November 1, 1907. Serial No. 400,182.

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 Pressure-Governing Apparatus, of which the following is a specification.

This invention relates to fluid pressure brake systems for electrically propelled cars, and more particularly to pressure governing apparatus therefor. In this class of service, the motor cars or electric locomotives, are usually provided with motor driven air compressors, and reservoirs in which air is stored for operating the brakes. Where two or more cars so equipped are coupled in a train, it is desirable to utilize the fluid pressure from all of the storage reservoirs, to avoid overloading one pump while the other pumps are idle. In order to accomplish this purpose, it has been heretofore proposed to provide a common supply pipe, sometimes termed the control pipe, into which air is supplied from the several storage reservoirs, through feed or reducing valves, so that the supply or control line pressure is reduced to a degree less than the maximum main reservoir pressure. This type of apparatus operates very satisfactorily ordinarily, but on very long trains, of eight to ten cars or more, where air is supplied from the control line to the brake system through a brake valve at the head end of the train, there is liable to be a more rapid drop in pressure at the head end than at the rear end, and the consequence may be, that some feed valve near the head end may open before the other feed valves and supply air to the control line. The rise in pressure in the control line thus caused is liable to prevent the other feed valves from acting, so that a single pump or compressor and storage reservoir may furnish most of the air for the system. To some extent, also, the work of supplying air to the system may be thrown mostly on one pump, by reason of differences in adjustment of the feed valves, for if one valve is adjusted to open at a higher degree of pressure than the others, such feed valve opens first and supplies air to the control pipe line.

The principal object of my invention is, therefore, to provide improved means whereby air may be utilized from all the reservoirs and pumps in the system.

Another object of my invention is to provide means, governed by the pressure in a common receptacle, for controlling the supply of air from two or more sources of fluid pressure to said common receptacle.

In the accompanying drawings, Figure 1 is a diagrammatic view, illustrating a fluid pressure brake apparatus for two motor cars coupled together, and having one form of my improvements applied thereto; Fig. 2, a diagrammatic view of a fluid pressure brake apparatus for one motor car and embodying a modified form of my invention; and Fig. 3 a central sectional view of a feed or reducing valve device and a magnet valve for controlling its operation.

According to Fig. 1, the apparatus on each car comprises a main or storage reservoir 1, an electric motor driven pump 2, controlled by a pump governor 3, for compressing air into the reservoir 1, a supply pipe or control line 4, connected by branch pipe 5 to reservoir 1, train pipe 6, brake valve 7, connected by pipes 8 and 9 to the control pipe and train pipe respectively, and the brake cylinder 10, triple valve 11, and auxiliary reservoir 12 connected to the train pipe by branch pipe 13, all of which apparatus may be of the ordinary or usual construction.

According to one form of my invention, as shown in Fig. 1, I provide a by-pass pipe 14, around the feed valve 15, in which is interposed a valve 16, controlled by an electro-magnet 17, and governing the supply of air from the main reservoir to the supply pipe, through said by-pass 14. One terminal of the electro-magnet 17 is connected to an electric train wire 18, adapted to be coupled with the train wire of the other cars in the train, the other terminal being connected to a common return, so that when current flows through the completed circuit, the electro-magnets 17 throughout the train are energized and operate the valves 16 simultaneously. The train wire 18 is connected to a suitable source of current supply through an electric switch 22, the movable part of which is adapted to be actuated by a diaphragm or movable abutment 20, contained in a casing 19 of the regulating mechanism. The diaphragm 20 is subject on one face to supply or control line pres-

sure and on the opposite face to the pressure of a resistance spring, which is adjusted to the desired maximum degree at which the control line is to be maintained.

The operation will now be readily apparent, for, upon the reduction in pressure of the supply pipe line 4 to a point at or slightly less than that regulating spring which happens to be adjusted to the highest pressure, the diaphragm of this regulating device moves, and the corresponding switch 22 is thrown to the cut in position, thereby energizing the several electro-magnets 17 in the train and causing the several valves 16 to open and supply air from the respective main reservoirs to the supply pipe or control line. The several reservoirs continue to supply air to the supply pipe until all of the switches have cut out, the final one to cut out, breaking the circuit and permitting the valves 16 to close. Thus each reservoir supplies air to the supply pipe, and it follows, that each pump performs its share of duty in maintaining the corresponding reservoir up to the predetermined maximum degree of pressure.

Another construction of my invention is illustrated in Fig. 2 of the drawing, in which the car equipment may be similar to that shown in Fig. 1. In this case, the regulating diaphragm 20, for controlling the action of the electric switch 22, is subject on one face to the pressure admitted from the usual feed valve 15, through pipe 24, and on the other face to pressure from the supply pipe line admitted by way of pipe 23. A light spring is also employed for normally opening the switch when the fluid pressure acting on the opposite sides of the abutment are substantially equal. The operation of this form of apparatus is as follows: The reservoirs being charged to the predetermined desired pressure, by the action of the compressors, air is supplied to one side of the diaphragm 20, from the main reservoir through reducing valve 15 and pipe 24, at the reduced pressure according to the adjustment of the feed valve 15. The pressure of the light regulating spring is thus overcome by the opposing air pressure on the diaphragm, and the electric switch 22 is closed, thereby energizing the electro-magnets 17 so that the corresponding supply valves 16 on each car are opened and the supply pipe or control line 4 is charged to substantially the degree of pressure for which the feed valve 15 is adjusted. The control line pressure acting on one side of the regulating diaphragm 20, then balances the feed valve pressure on the opposite side of the diaphragm, so that the spring opens the switch 22. If one feed valve is adjusted to a higher closing pressure than the other feed valves, then the switch 22 on that car will be the last to open and thereby break the electric circuit through the magnets 17, so that all the supply valves 16 are closed. When the pressure becomes reduced in the control line, and as soon as some one of the regulating diaphragms is subjected to a control line pressure slightly less than the opposing feed valve pressure, that diaphragm moves and closes the corresponding switch 22, completing the circuit through all of the magnets 17, so that the valves 16 are opened to supply air to the control line. Upon the charging of the control line to the standard pressure, the valves are again closed in the manner already described.

In order to cut out the electric control mechanism from operation, when desired, and employ the feed valve 15 for supplying air to the supply pipe, I may provide a pipe 25, connecting the feed valve pipe 24 with the pipe 14, leading to pipe 8 and the supply pipe 4, interposed in which is a cut out cock 26.

When the electric regulating mechanism is used, the cock 26 is turned to its closed position. If it is desired to cut out the electric regulating mechanism, the cock 26 is opened. The fluid pressure on the opposite sides of the diaphragm 20 will then be the same, and the spring will maintain the switch 22 in its open position, the feed valve 15 then controls the supply of air to the supply pipe 4 in the usual manner, through pipe 25, opening to the control line.

In Fig. 3 of the drawings, I have illustrated a construction in which the electro-magnet control valve is employed for governing the operation of the usual feed valve. The feed valve shown is of the slide valve type and briefly described comprises a main piston 27 for operating a slide valve 28 contained in valve chamber 29. The valve chamber is in open communication with the main reservoir through pipe 30 and valve 28 controls a port 31 for supplying air to the supply pipe 4. Port 33 leads from the chamber at the outer face of piston 27 to control valve 34 which is adapted to be operated by a regulating diaphragm 35 subject on one side to the pressure in the supply line 4 through port 36 and on the opposite side to the pressure of an adjustable spring 37. When the pressure in the supply line falls to a degree less than the pressure of the spring 37, the diaphragm 35 is moved outwardly and the valve 34 is opened so that fluid is vented through the port 33 to the supply line 4 and the higher reservoir pressure on the inner face of piston 27 then shifts the piston and valve 28 thereupon opens port 31 to supply air to the supply pipe line 4. Upon the pressure in said supply line feeding up to a degree of pressure exceeding the pressure of spring 37, the diaphragm moves inwardly and permits valve 34 to close. The fluid pressure then quickly

equalizes around piston 27, so that the piston and valve 28 are returned by the spring 39 to close the supply port 31. According to my invention the electro-magnet valve device 17 is connected by the pipe 14 to the chamber at the outer face of piston 27 so that when the electric circuit is closed by one of the switches 22, valve 16 on each car is opened by the action of the respective electro-magnet and air is thereupon vented from the piston 27 to the atmosphere thus causing the outward movement of same and the opening of the valve 28 to admit air to the supply pipe line. All of the feed valves in the train are thereby opened simultaneously to supply air to the supply line.

It will be understood that my invention may be carried out in a variety of ways, and it is obvious that by means of my improvements each source of pressure supplies its quota of air to the supply pipe, and consequently, each pump contributes in maintaining the fluid pressure of the system.

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

1. In a fluid pressure control apparatus, the combination with two or more sources of fluid pressure, and a common receptacle, of means governed by the pressure in the common receptacle, for controlling the simultaneous supply of air from the several sources of fluid pressure to the common receptacle.

2. In a fluid pressure control apparatus, the combination with a supply pipe and two or more reservoirs for supplying air to said pipe, of an electric regulating mechanism governed by pressure in the supply pipe for controlling the supply of air from said reservoirs to the supply pipe.

3. In a fluid pressure control apparatus, the combination with a common supply pipe and a plurality of reservoirs, of an electrically operated valve means for controlling the supply of air from each reservoir to the common supply pipe and a regulating mechanism, governed by the pressure in the supply pipe, for controlling the electric circuit for actuating said valves.

4. In a fluid pressure control apparatus, the combination with a common supply pipe, of a plurality of fluid pressure supply mechanisms, comprising a storage reservoir, a valve for controlling the supply of air from the reservoir to said common supply pipe, and a regulating mechanism for governing the action of the valve, and means for causing the simultaneous action of all the valves by the operation of one regulating mechanism.

5. In a fluid pressure control apparatus, the combination with a common supply pipe, of a plurality of fluid pressure supply mechanisms, comprising a storage reservoir, a valve for controlling the supply of air from the reservoir to said common supply pipe, and a regulating mechanism governed by the pressure in the supply pipe, for controlling the action of the valve, and means for causing the simultaneous action of all the valves by the operation of one regulating mechanism.

6. In a fluid pressure control apparatus, the combination with a common supply pipe, of a plurality of fluid pressure supply mechanisms, each comprising a source of fluid pressure, a feed valve device for governing the flow of fluid from the source of pressure to the common supply pipe, a direct supply valve for supplying air from the source to said supply pipe, and a regulating device subject to the opposing pressures from the feed valve device and said supply pipe, for governing the action of said supply valve, and means for simultaneously actuating the supply valves of the system upon operation of one of the regulating devices.

7. In a fluid pressure control apparatus, the combination with a common supply pipe, two or more sources of fluid pressure, and a feed valve device for supplying air from each source of pressure to the supply pipe, of a regulating mechanism governed by the pressure in the supply pipe for controlling the action of said feed valve device, and means for causing the simultaneous action of all the feed valve devices upon operation of one of the regulating mechanisms.

8. In a fluid pressure control apparatus, the combination with a common supply pipe and a plurality of electrically controlled devices for governing the supply of fluid to said supply pipe, of means subject to the pressure in the supply pipe for causing the operation of said electrically controlled devices.

9. In a fluid pressure control apparatus, the combination with a common supply pipe, a plurality of reservoirs, and corresponding feed valves for supplying air from each reservoir to the supply pipe, of electrically controlled devices for also supplying air from each reservoir to the supply pipe and means subject to the opposing pressures from a feed valve and the supply pipe for governing the operation of said electrically controlled devices.

10. In a fluid pressure control apparatus, the combination with a common supply pipe and two or more sources of fluid pressure, of electrically governed means for controlling the supply of air from the several sources of fluid pressure to said supply pipe.

In testimony whereof I have hereunto set my hand.

WALTER V. TURNER.

Witnesses:
R. F. Emery,
Wm. M. Cady.