W. E. DOBSON.

PRESSURE CONTROL VALVE.

APPLICATION FILED NOV. 22, 1919.

1,409,933.

Patented Mar. 21, 1922.

3 SHEETS—SHEET 1.

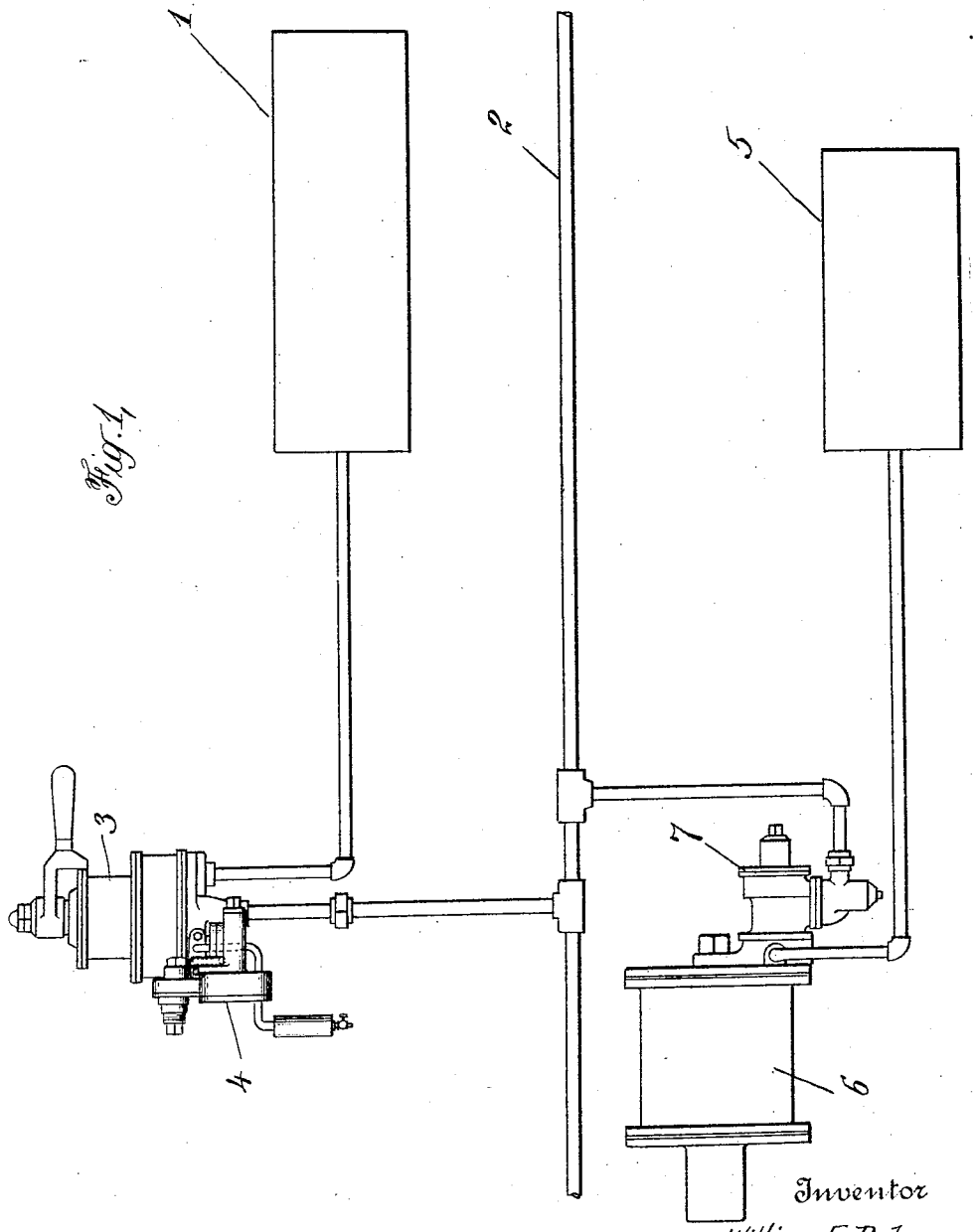

Fig. 1.

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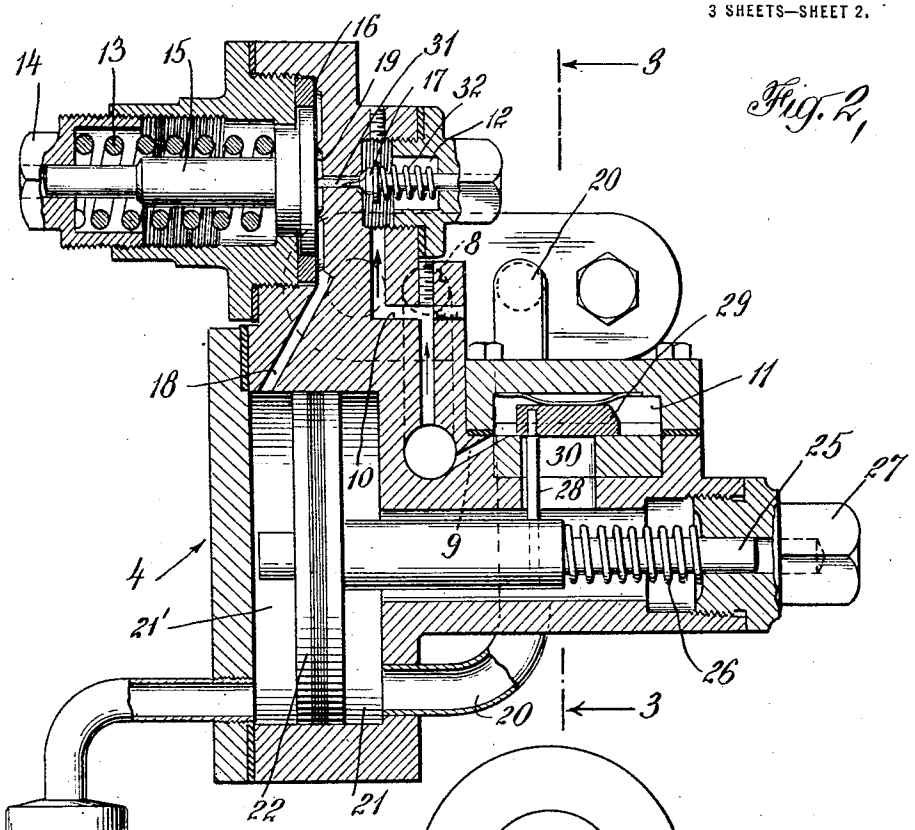
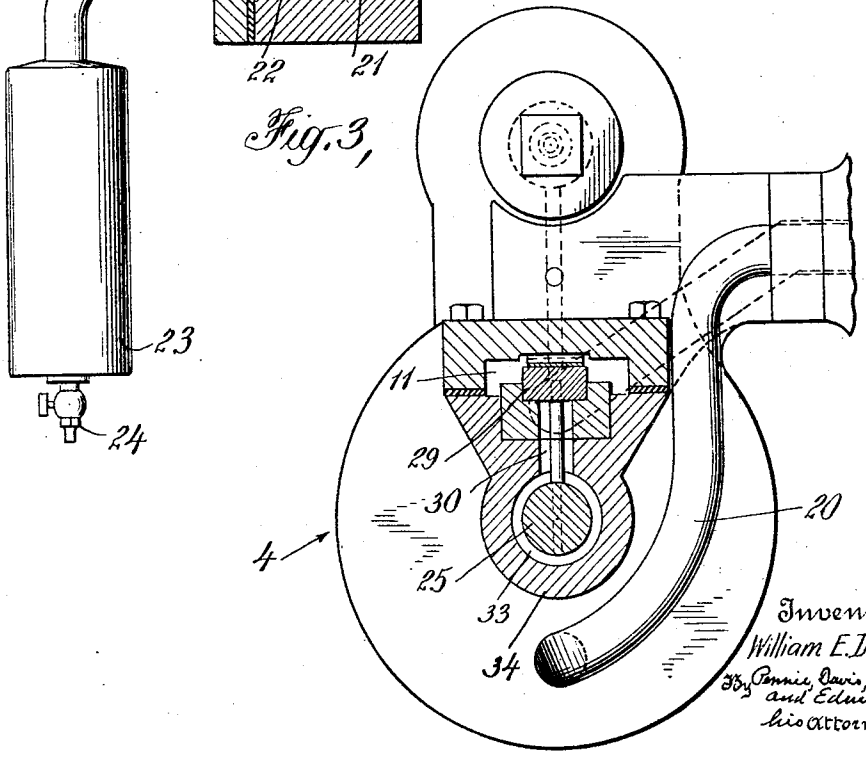


Fig. 2,

Fig. 3,



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3 SHEETS—SHEET 3.

Fig. 4,

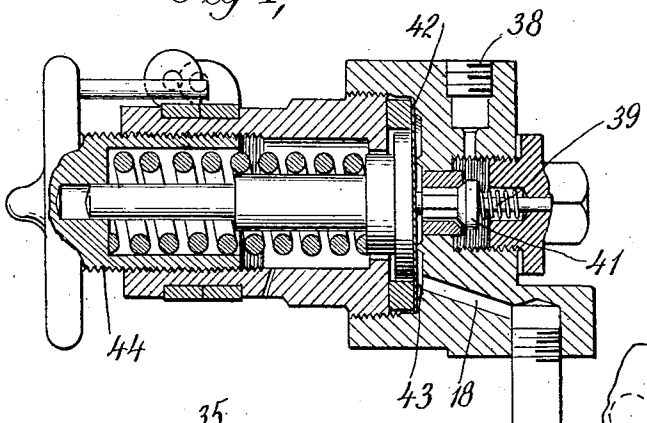
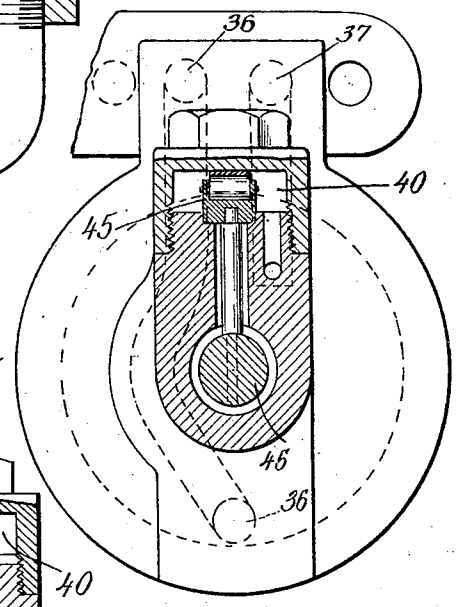
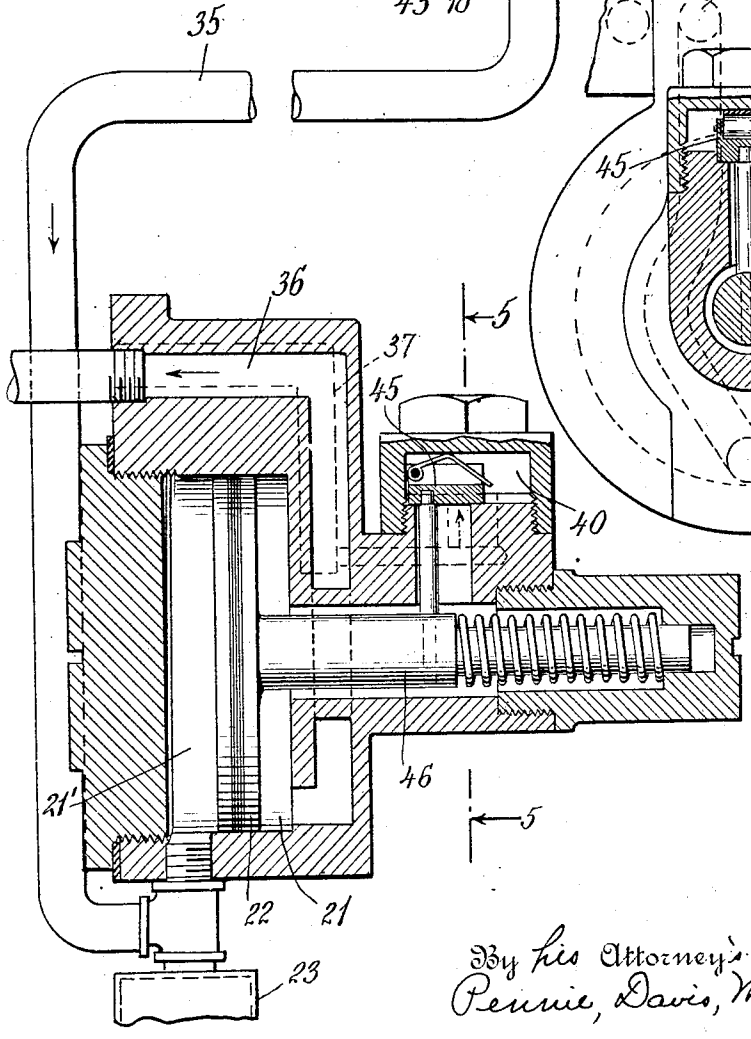


Fig. 5,





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UNITED STATES PATENT OFFICE.

WILLIAM E. DOBSON, OF PHILADELPHIA, PENNSYLVANIA.

PRESSURE-CONTROL VALVE.

1,409,933. Specification of Letters Patent. Patented Mar. 21, 1922.

Application filed November 22, 1919. Serial No. 339,863.

To all whom it may concern:

Be it known that I, WILLIAM E. DOBSON, a citizen of the United States, residing at Philadelphia, in the county of Philadelphia, State of Pennsylvania, have invented certain new and useful Improvements in Pressure-Control Valves; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

The primary object of this invention is to provide an improved and more reliable feed valve for use in connection with standard air brake equipment, to supply and maintain a uniform air pressure in the train line. It will, however, be understood that the improved feed valve may be utilized in connection with other fluid pressure systems where it is desired to maintain a substantially unvarying predetermined value of fluid pressure in a pipe system which is to be supplied from a source maintained at a considerably higher pressure.

Feed valves constructed up to the present time have been found unreliable, principally due to the fact that their construction has been such that foreign substances (such as oil, rust, carbon, etc.,) which enter and collect within the feed valve casing, can easily interfere with the intended operation of the valve parts. Unless such feed valves are cleaned at frequent intervals the air pressure in the train line fluctuates, particularly in long trains, to such an extent that the brakes of the train are unintentionally applied, which frequently causes burnt wheels, broken wheels, flat wheels and stalling of trains. Various practices have been inaugurated in railroad operation to provide for the frequent cleaning of feed valves and careful supervision of their repair in order to obviate the operating difficulties arising from the unreliable action of such valves, but in spite of these precautions annoyances such as those outlined above are of frequent occurrence.

This invention is directed to the provision of a valve which overcomes these defects, which is so constructed that the air pressure in the train line is maintained within a few pounds, for example, two pounds of its predetermined value and which at the same time does not require inspection or cleaning except at long intervals of time. To this end the sliding feed valve which controls the flow from the high-pressure source—through the engineer's valve at running position in the ordinary air brake system—is actuated by a simple piston fully exposed on one side to the train line pressure and on the other side to a pressure equal to the desired train line pressure and which is constantly maintained at the desired value from the high pressure source through a simple automatic (and preferably adjustable) regulating valve. There is also provided in the construction of the valve means for drifting out into the train line foreign substances which may have found their way into the train line side of the piston chamber, and, in connection with the other side of the piston chamber, a dirt collector or auxiliary chamber, in which foreign material collects and from which it may be drained or drifted out through a drain cock which may be opened at frequent intervals, for example, when the air-brakes of the train are being tested at the start of a run.

The invention will be more clearly understood from a consideration of the accompanying drawings, which illustrate an embodiment in which a feed valve embodying the invention is applied to the air-brake system of a railway train.

In these drawings:

Fig. 1 is a diagrammatic view of a portion of a railway air-brake system;

Fig. 2 is a vertical cross sectional view of the improved valve;

Fig. 3 is a cross sectional view on line 3—3 of Fig. 2;

Fig. 4 illustrates a modified form of the improved valve in which the automatic regulating valve chamber is separated from the remaining portion of the valve;

Fig. 5 is a cross sectional view on line 5—5 of Fig. 4.

Referring to Fig. 1, the usual main pressure reservoir 1 and train pipe line 2 are shown in combination with the engineer's valve 3 and pressure reducing or feed valve 4. The feed valve 4, the auxiliary reservoir 5, the brake cylinder 6, the triple valve 7, and the train line 2, coact in the usual manner.

The general practice in railway operation is to maintain the main air reservoir 1 at a pressure of ninety pounds per square inch and the train line 2 is usually maintained at a pressure of approximately seventy pounds per square inch, the reduction in pressure being accomplished by the use of a

feed valve 4 which is intended to maintain automatically the pressure of the train line at seventy pounds.

In Fig. 2 the duct 8 is open to the main reservoir pressure, and branches into two auxiliary ducts 9 and 10 which lead respectively to the feed valve chamber 11 and the regulating valve chamber 12. The spring 13 may be adjusted by the adjusting nut 14 so that the diaphragm stem 15 acting through the diaphragm 16 will unseat the regulating valve 17 whenever the pressure on the left-hand side of the feed-valve actuating piston 22 and in the duct 18 and diaphragm chamber 19 falls below a predetermined value. In railway practice the spring 13 may be adjusted to unseat the valve 17 when this pressure, for example, falls below seventy pounds per square inch.

The duct 20 and the chamber 21 on the right hand side of piston 22 are continuously open to the train line air pressure. Piston 22 closely fits the walls of the cylindrical piston chamber as shown and prevents the passage of air from one side of the piston to the other. Communicating with chamber 21′ on the left hand side of the piston is provided an auxiliary chamber 23 constituting a drainage and volume reservoir, and a drain cock 24. It will be observed that the drainage and volume reservoir 23 will collect oil, dirt or any other foreign substance which has found its way into the chamber 21′ through the duct 18. It also provides convenient means for receiving the volume of air compressed by the piston 22 when the piston is moved to the left.

The piston 22 is provided with a stem 25 around which is placed a lap spring 26 which abuts against the lap spring abutment 27. The spring is adapted when under compression to exert a force which will overcome inertia and frictional forces. A feed valve pin 28 inserted in the piston stem 25 serves to actuate the feed valve 29 which in turn opens the port 30 when the piston 22 is moved to the right. High pressure air is then admitted from the main reservoir through duct 8 and port 30 to chamber 21 and thence to the train line through the duct 20, which is preferably at the bottom of chamber 21 so that the current of air flowing from port 30 will drift out all foreign substances from chamber 21 to the train line.

In operation, high pressure air from the main reservoir 1, say at ninety pounds pressure, enters the feed valve casing through the duct 8 and flows through branch duct 10 to chamber 12. Whenever the pressure in chamber 21′ falls below the predetermined intended train line pressure, spring 13 and diaphragm 16 will unseat the valve 17 and air will flow through duct 18 into chamber 21′, thereby restoring the intended pressure while forcing back the diaphragm and permit spring 32 to close the valve 17. In this way the pressure in chamber 21 is always maintained at the intended value.

Whenever the train line pressure is reduced below normal by leakage through the couplings between the railway cars, or by leakage at any other point, then the air pressure existing in chamber 21′ will move the piston 22 to the right against the lap spring 26 and open the port 30 thereby permitting air at main reservoir pressure to pass directly into the train line and build it up to its predetermined value. When this intended train line pressure is restored it will, by direct action on piston 22, move it to the left, closing the feed valve 29. This operation, of course, does not occur instantly but, as it has been pointed out, the spring 26 is compressed to a point at which it serves to overcome the frictional and inertia forces of the piston so that a very slight excess pressure will serve to operate the piston 22 and move it to the left, the volume of air on the opposite side of the piston being compressed into the drainage and volume reservoir 23.

The total volume of air contained within chamber 21′ is small in comparison with the entire volume of air to the left of piston 22, and included for the most part within reservoir 23. For this reason movement of piston 22 changes the entire volume of air but slightly, and, hence, has practically no effect upon its pressure. This same effect cannot be produced by means of a spring of a size small enough to be feasible. Expansion of such a spring to permit the opening of feed valve 29 would reduce its pressure below the required minimum of 70 lbs. so that piston 22 would be moved to the left and constrict the opening through port 30 before pressure in the train line could rise to 70 lbs. It is thus possible to maintain constant and uniform pressure to the left of piston 22 by the use of a comparatively large volume of compressed gas.

In Fig. 3 the character of the seat of feed valve 29 is shown as well as the path travelled by the air admitted through the port 30 which reaches the piston chamber 21 through an ample annular passageway 33 formed about the stem 25 in the casing 34 of the feed valve.

In Fig. 4 a modification is shown, in which the regulating valve and the feed valve are in separate valve casings. The valve casings may be located apart from each other at convenient points. The pipe 35 connects the duct 18 with the piston chamber 21′, and the duct 36 leading to the train line corresponds to the duct 20 as shown in Fig. 2. The ducts 37 and 38 are connected directly to the high pressure air source or main reservoir and in this way, as in the case of the construction shown in Fig. 2, the regulating

valve chamber 39 and the feed valve chamber 40 are each independently open to the high pressure air of the main reservoir.

The regulating valve 41 is adapted to be seated or unseated depending upon the position of the diaphragm 42 in accordance with the pressure in the diaphragm chamber 43 and duct 18. The adjusting nut 44 will in any case determine the pressure at which the valve 41 will be unseated, as fully explained in connection with the regulating valve 17 of Fig. 2. The method of operation of the feed valve 45 and piston 22 is identical with the action of the valve 29 and piston 22, described in connection with Fig. 2. The auxiliary chamber 23 also performs a similar function to the chamber 23, shown in Fig. 2.

The cross sectional view of the supply valve casing of Fig. 4, as shown in Fig. 5, discloses a similar arrangement of the feed valve 45 and stem 46, as described in connection with the valve 29 and stem 25 of Fig. 3.

By means of the arrangement shown in Figs. 4 and 5, the two valve mechanisms may conveniently be located at any distance from one another and in such places as may be desirable from the point of view of economy in space at or from other considerations.

It should be distinctly understood that the specific construction described and shown herein is capable of modification and that other arrangements differing in structure may be made without departing from the spirit and scope of this invention. Particularly, when the actuating piston is mentioned in the appended claims it is intended to include equivalent structures such as a flexibly supported diaphragm or other partition in chamber 21, 21′ capable of sufficient movement to actuate the feed valve in the manner described.

I claim—

1. Means for maintaining uniform pressure in a fluid distribution system supplied from a high pressure source, comprising a piston actuated feed valve controlling the flow from the high pressure source to the distribution system, the piston chamber of the valve being open on one side to the pressure of the distribution system and on the other side to a constant predetermined fluid pressure.

2. Means for maintaining uniform pressure in a fluid distribution system supplied from a high pressure source, comprising a piston actuated feed valve controlling the flow from the high pressure source to the distribution system, the piston chamber of the valve being open on one side to the pressure of the distribution system and on the other side to a constant predetermined pressure, and means for maintaining the said constant predetermined pressure comprising a connection to the high pressure source and an automatic regulating valve set to the desired predetermined pressure and controlling said connection.

3. Means for maintaining uniform pressure in a fluid distribution system supplied from a high pressure source, comprising a piston actuated feed valve controlling the flow from the high pressure source to the distribution system, the piston chamber of the valve being open on one side to the pressure of the distribution system and on the other side to a constant predetermined pressure, and means for maintaining the said constant predetermined pressure comprising a connection to the high pressure source and an adjustable automatic regulating valve capable of being set to the desired predetermined pressure and controlling said connection.

4. In a fluid pressure system, the combination with a source of fluid pressure and a lower pressure distribution system, of a regulating valve and a chamber therefor, a feed valve and a chamber therefor, each of said chambers being open to the said source, a cylinder and a piston within the cylinder adapted to close said feed valve when maintained in its normal position by a predetermined pressure acting on each side of the piston, and to open said supply valve when the pressure in the distribution system falls below the said predetermined value, said feed valve when opened being adapted to permit the building up of the distribution system pressure directly from the source, said regulating valve adapted to be opened when the pressure behind the piston falls below the said predetermined value and to be closed when the pressure behind the piston is built up to the said predetermined value.

5. In a brake system, the combination with the main pressure reservoir and a train pipe line, of a regulating valve and a chamber therefor, a feed valve and a chamber therefor, each of said chambers being open to the main reservoir, a cylinder and a piston within the cylinder, an auxiliary chamber connected to one end of the cylinder, and a port at the other end of the cylinder connected to said train line, an operating connection between the feed valve and the said piston, said feed valve being adapted when opened to permit the train line pressure to be built up directly from the main reservoir, a duct leading from said regulating valve to the auxiliary chamber side of said piston, said regulating valve being adapted to open said side of the piston cylinder to the source when the pressure on that side of the piston falls below the predetermined train line pressure, and to close when the said pressure is built up to the predetermined train line pressure.

6. An air brake system feed valve comprising a piston, a piston chamber open on one side of the piston to the train line and

on the other side to a uniform predetermined pressure maintained from the main reservoir through an automatic regulating valve, and a valve actuated by the piston to control the flow from the main reservoir to the train line.

7. In a brake system, the combination with the main pressure reservoir and a train line, of a regulating valve and a chamber therefor, a feed valve and a chamber therefor, each of said chambers being open to the main reservoir, a cylinder and a piston therein, an auxiliary chamber connected to the lower part of the cylinder behind the piston and a duct connecting the cylinder in front of the piston to the train line, a duct leading from the regulating valve to the auxiliary chamber end of the cylinder and a duct leading from the feed valve to the other end of the cylinder, said auxiliary chamber being adapted to drain or drift out foreign matter from the rear of the piston.

8. In a brake system, the combination with the main pressure reservoir and a train line, of a regulating valve and a chamber therefor, a feed valve and a chamber therefor, each of said chambers being open to the main reservoir, a cylinder and a piston therein, an auxiliary chamber connected to the lower part of the cylinder behind the piston and a duct connecting the lower part of the cylinder in front of the piston to the train line, a duct leading from the regulating valve to the auxiliary chamber end of the cylinder and a duct leading from the feed valve to the other end of the cylinder, said auxiliary chamber being adapted to drain or drift out foreign matter from the rear of the piston and the duct leading to the train line being adapted to drift out foreign matter from in front of the piston into the train line.

9. Means for maintaining uniform pressure in the train line of a brake system supplied from a main high pressure reservoir, comprising a piston actuated feed valve controlling the flow from the main high pressure reservoir to the train line, the piston chamber of the valve being open on one side to the pressure of the train line and on the other side to a constant predetermined fluid pressure.

10. Means for maintaining uniform pressure in the train line of a brake system supplied from a high pressure reservoir comprising a feed valve controlling the flow from the high pressure reservoir to the train line and actuated by a single piston, said piston being acted upon on one side by the pressure of the train line and on the other side by a constant predetermined fluid pressure.

11. Means for maintaining uniform pressure in the train line of a brake system supplied from a main high pressure reservoir, comprising a piston actuated feed valve controlling the flow from the main high pressure reservoir to the train line, the piston chamber of the valve being open on one side to the pressure of the train line and on the other side to a constant predetermined fluid pressure, a duct leading from the bottom of the predetermined pressure side of the piston chamber to an auxiliary chamber, and a duct leading from the bottom of the train line side of the piston chamber into the train line.

12. Means for maintaining uniform pressure in the train line of a brake system supplied from a main high pressure reservoir, comprising a piston actuated feed valve controlling the flow from the main high pressure reservoir to the train line, the piston chamber of the valve being open on one side to the pressure of the train line and on the other side to a constant predetermined fluid pressure, and a duct near the bottom of the piston chamber through which foreign matter can be drifted therefrom.

In testimony whereof I affix my signature.

WILLIAM E. DOBSON.