No. 834,344. PATENTED OCT. 30, 1906.

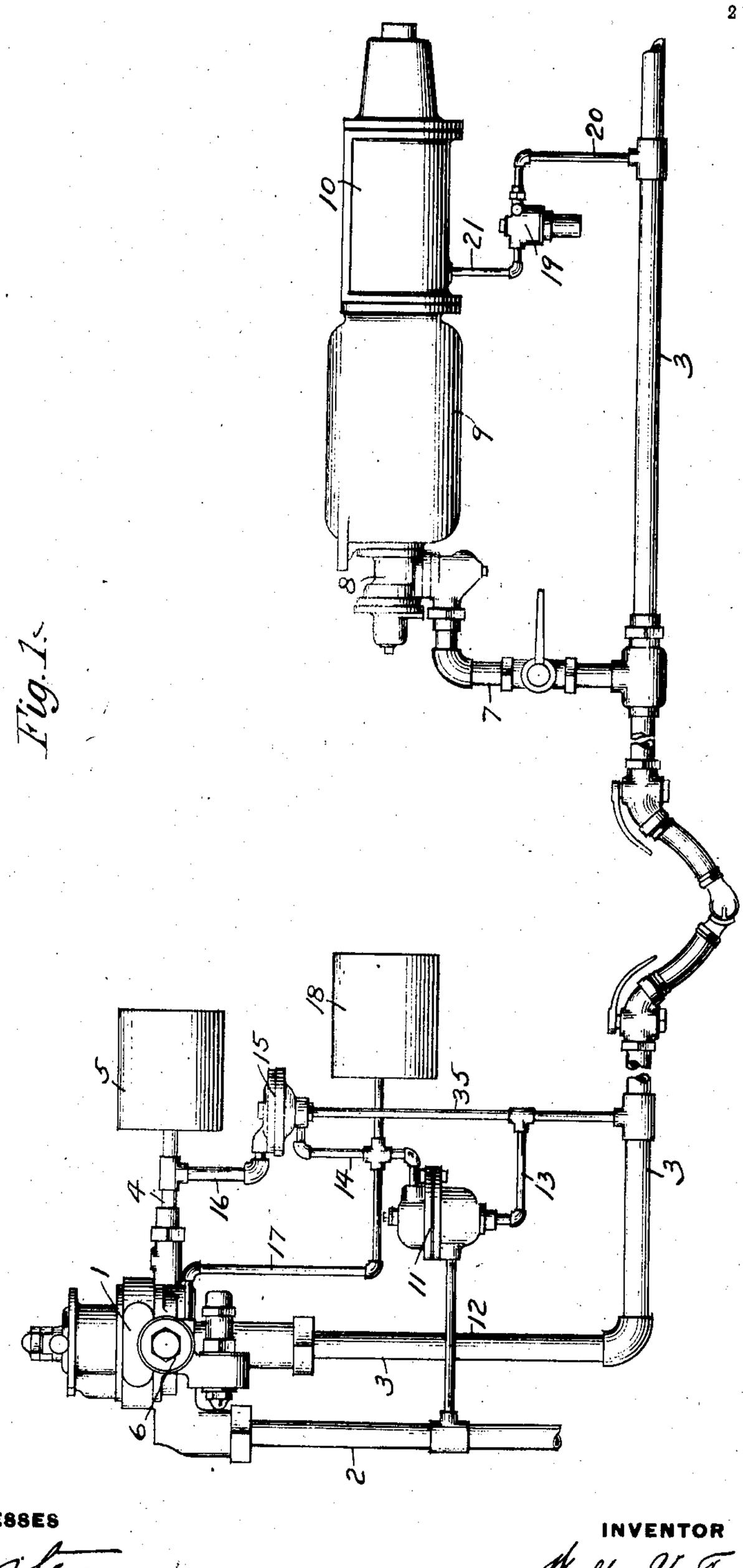
W. V. TURNER.

FLUID PRESSURE BRAKE.

APPLICATION FILED AUG. 22, 1903. RENEWED MAR. 15, 1906.

2 SHEETS—SHEET 1.

Fig. 1.



WITNESSES

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2 SHEETS—SHEET 2.

Fig. 3.

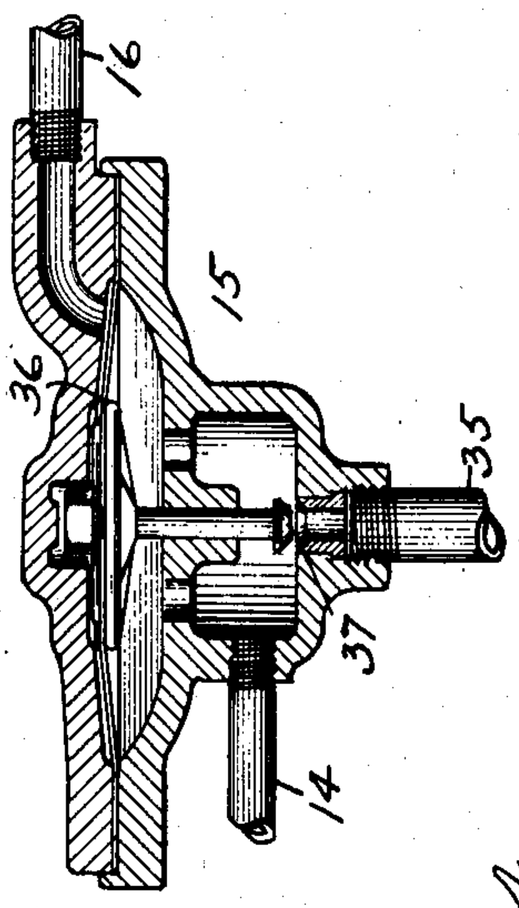


Fig. 4.

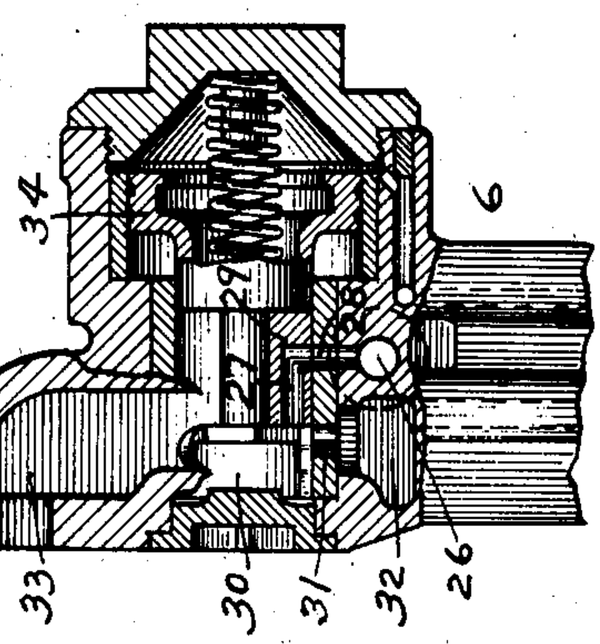


Fig. 2.

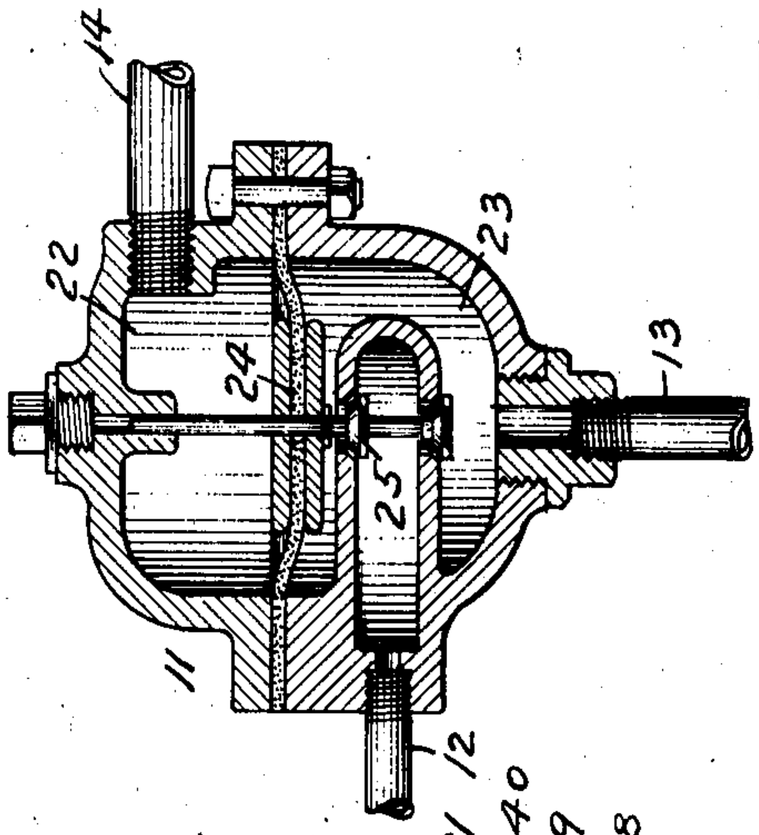
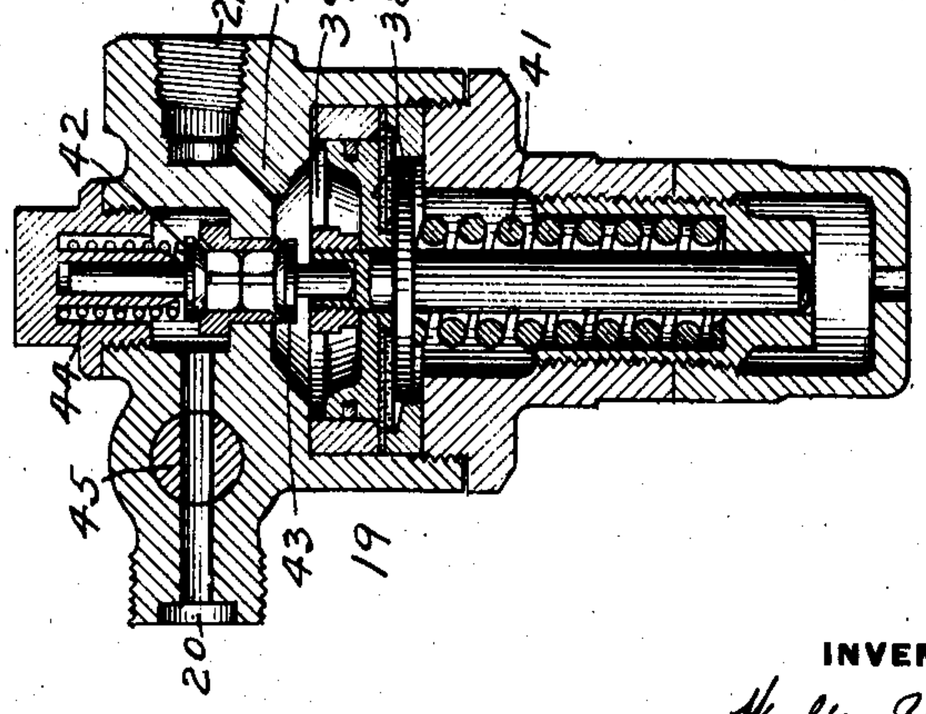


Fig. 5.



WITNESSES

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UNITED STATES PATENT OFFICE.

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

FLUID-PRESSURE BRAKE.

No. 834,344. Specification of Letters Patent. Patented Oct. 30, 1906.

Application filed August 22, 1903. Renewed March 15, 1906. Serial No. 306,260.

To all whom it may concern:

Be it known that I, WALTER V. TURNER, a citizen of the United States, residing at Wilkinsburg, in the county of Allegheny and State of Pennsylvania, have invented a certain new and useful Improvement in Fluid-Pressure Brakes, of which improvement the following is a specification.

This invention relates to fluid-pressure brakes, and more particularly to devices for maintaining the train-line pressure in an automatic air-brake system while the brakes remain applied and also for maintaining a certain pressure in the brake-cylinder.

With the present standard automatic air-brake apparatus when a certain reduction in train-line pressure is made for the purpose of applying the brakes with a given force and the brake-valve is set in lap position with all ports closed there is no means for supplying the train-pipe with air under pressure in order to compensate for the train-pipe leakage. Consequently it often happens that where the brakes are held on for a considerable time, as in descending a long grade, the further reduction in train-pipe pressure, due to leakage, causes further graduations of the triple valves and a corresponding increase in brake-cylinder pressure, which thus becomes greater than was intended or desired and usually necessitates a release and reapplication of the brakes several times during the descent of the grade. This results in a great waste of air, as well as in danger of losing control of the train through depleted auxiliary-reservoir pressure; and one of the objects of my invention is to provide means whereby the train-pipe pressure is automatically maintained at any desired degree of reduction while the brake-valve is in lap position and the brakes remain applied.

Another object is to provide a device by which the brake-cylinder pressure may also be maintained and any reduction therein due to leakage be automatically supplied from the train-pipe.

In the accompanying drawings, Figure 1 is a diagrammatic view showing one form of my improvement applied to a standard automatic air-brake apparatus; Fig. 2, a central sectional view of the regulating-valve device; Fig. 3, a central sectional view of the equalizing-valve, which is connected to the regulating-chamber and to the brake-valve-equalizing reservoir; Fig. 4, a broken sectional view of a portion of a standard slide-valve feed-valve device, showing means for connecting my improvement thereto; and Fig. 5, a central sectional view of one form of my improved valve device for maintaining the pressure in the brake-cylinder.

Referring to Fig. 1 of the drawings, the standard Westinghouse air-brake apparatus is shown, comprising the engineer's brake-valve 1, having the usual connections with the main reservoir-pipe 2, the train-pipe 3, and the pipe 4, leading to and forming part of the equalizing-reservoir 5. The brake-valve is also provided with the standard feed-valve device 6, which in this instance is of the so-called "slide-valve" type and is shown bolted to the side of the brake-valve casing in the usual way.

The train-pipe 3 includes the usual hose, couplings, and angle-cocks between the cars and on each car is provided with the branch pipe 7, leading to the triple-valve device 8, auxiliary reservoir 9, and brake-cylinder 10, all of which is of the ordinary standard construction.

According to my improvements as applied to the locomotive this standard equipment is also provided with a regulating-valve device 11, having pipe connections 12 with the main reservoir-pipe, 13 with the train-pipe, and 14 with the equalizing-valve device 15, which is also connected by pipe 16 with the equalizing-reservoir of the brake-valve. The regulating-valve device, as shown in Fig. 2, comprises a casing having two chambers 22 and 23, separated by a diaphragm or movable abutment 24 for operating the valve 25 to control the supply of air from the main reservoir and pipe 12 to the train-pipe chamber 23 and pipe 13, leading to the train-pipe, according to the pressure in the regulating-chamber 22, which is connected to the equalizing-valve by pipe 14.

A drum or reservoir 18 is connected to the regulating-chamber 22 merely for the purpose of enlarging or increasing the capacity of said chamber, which is supplied with air under pressure through the pipe 17, leading from an additional port or passage 26 in

the slide-valve feed-valve device 6. (See Fig. 4.) As is well known by those familiar with the art, the passage 33 of this feed-valve device communicates, through passages and ports in the brake-valve, with the main reservoir connection when the rotary valve is in running position, so that fluid under pressure from the main reservoir is admitted to the slide-valve chamber 30, in which is located the slide-valve 29, operated by the piston 34 to control the port 31 leading to the passage 32, which is in open communication with the train-pipe, the leakage by the piston 34, being governed by the usual spring-pressed diaphragm-valve, which is set to close at the desired normal train-pipe pressure, thereby operating the slide-valve to close the main feed-port 31 to the train-pipe. According to this feature of my improvement an additional port 27 is made through the slide-valve 29 and is adapted to register with a port 28 in the seat leading to the passage 26 and pipe 17, whereby the regulating-chamber 22 will be supplied with fluid under pressure from the main reservoirs whenever the engineer's brake-valve is in running position and the port 31 is open for feeding up the train-line.

The pressure of the regulating-chamber 22 also acts upon the under side of the diaphragm or movable abutment 36 of the equalizing-valve device 15, (see Fig. 3), which diaphragm operates the valve 37, controlling the outlet-passage from the regulating-chamber to the train-pipe through pipe connection 35, the upper side of diaphragm 36 being exposed to the pressure of the equalizing-reservoir of the engineer's brake-valve through pipe 16. The operation of this portion of my improvement is as follows: When the system is being charged up with fluid under pressure from the main reservoir and the engineer's brake-valve is placed in running position, the main feed-port 31 of the feed-valve device is open, as are also the ports 27 and 28, so that both the train-pipe and the regulating-chamber are being supplied from the main reservoir. The regulating-chamber being of small capacity as compared with the train-pipe, it is obvious that the pressure in said regulating-reservoir or chamber would ordinarily rise more rapidly and to a higher degree than that of the train-pipe unless some provision was made for equalizing these pressures, and this is what is accomplished by the use of the equalizing-valve device 15, for as soon as the pressure of the regulating-chamber, which also acts upon the under side of the diaphragm 36 of the equalizing-valve, rises above that of the train-pipe, which is always equal with that of the equalizing-reservoir 5 in this position of the brake-valve, the diaphragm 36 will rise by the preponderance of pressure beneath it and open the valve 37, thereby allowing any excess pressure of the regulating-chamber to flow out through pipe 35 to the train-pipe and equalize with the pressure therein.

When the brake-valve is placed in service position for making a certain reduction in the pressure of the equalizing-reservoir for applying the brakes, the diaphragm 36 rises, due to the higher pressure of the regulating-chamber beneath it, and the valve 37 is thus held open during the period that the train-pipe-discharge valve of the engineer's brake-valve is open, so that when the train-pipe has ceased discharging the pressures in the train-pipe and in the regulating-chamber will be equalized at the desired amount of reduction. In the meantime the brake-valve has been placed in lap position, in which, as well as in service position, the passage leading to the feed-valve device is closed, so that there is no communication with the regulating-chamber through pipe 17.

All ports now being closed, with the brakes applied at the desired pressure, if there should be any leakage in the train-line, as there always is more or less, the pressure in the chamber 23 of the regulating-valve would correspondingly diminish, thus allowing the pressure of the regulating-chamber, which is now held tightly closed and containing the desired degree of pressure, to open the valve 25, whereby communication from the main reservoir to the train-pipe is established and the pressure in the train-pipe raised to that of the regulating-chamber, when the valve 25 again closes. By means of this construction it will now be seen that the brake-valve may be left in lap position with the brakes applied for an indefinite length of time and that all train-pipe leakage will be supplied from the main reservoir through the regulating-valve, thus holding the brakes applied at the same constant pressure and also maintaining the train-pipe pressure constant at the desired amount of reduction. The brakes may then be released at any time by moving the engineer's brake-valve to full release and running positions in the usual way. In emergency applications the pressure in the regulating-chamber is released to the train-pipe by the opening of the equalizing-valve 37, since the pressure in the equalizing-reservoir on the top of the diaphragm 36 is vented to the atmosphere. Therefore the regulating-valve 25 will remain closed and prevent the discharge of main-reservoir air into the train-pipe.

It will now be evident that as the train-pipe pressure is maintained constant against all leaks while the brakes are applied any leakage from the brake-cylinder may be supplied from the train-pipe without interfering with the auxiliary reservoir or triple valve, and as one means of accomplishing this result I have shown a valve device 19, connected by pipe 20 with the train-pipe and by pipe 21 with the brake-cylinder.

As shown in Fig. 5, this valve device comprises a casing containing a diaphragm-piston or movable abutment 38, having a chamber 39 on one side communicating with the brake-cylinder through port 40 and pipe 21, the other side of the diaphragm being subject to the pressure of the adjustable spring 41, which may be set for any desired amount. Two oppositely-arranged valves 42 and 43, having abutting stems or wings, are operated by the diaphragm for controlling the passage through the casing. The length of the abutting wings of the valves is slightly greater than the distance between the opposite valve-seats, so that when the diaphragm and valves are in their mid-position both valves will be off their seats, thereby opening communication through the casing from the train-pipe to the brake-cylinder. The valves are preferably loosely mounted, as shown, so as to readily close tightly upon their seats, and a light spring 44 may be provided for assisting the closure of the valve, which opens toward the train-pipe. A cock 45 may also be used for cutting off communication through the valve device when desired. The intention is to adjust the spring 41 to hold a certain brake-cylinder pressure at which a train may be safely handled—such, for instance, as about twenty pounds. Then it is apparent that if the brake-cylinder pressure leaks down to this point the diaphragm 38 will occupy its mid-position, as shown in Fig. 5, and air from the train-pipe will flow into the brake-cylinder, compensating for any further leakage and maintaining the brake-cylinder pressure at that point. This device does not interfere in any way with the usual operation of the standard equipment in applying and releasing the brakes. When an application of the brakes is made in which the brake-cylinder pressure is higher than that for which the spring 41 is adjusted, the diaphragm 38 is depressed below mid-position, thereby allowing the upper valve 42 to close upon its seat and be held tightly closed by the train-pipe pressure. If the brakes are now held applied for a long period of time and the brake-cylinder pressure should leak down to the point at which the spring is adjusted, the valves will then open and the brake-cylinder pressure be maintained from the train-pipe at that pressure which is sufficient for controlling the train. By this means the control of a train descending a long grade will never be lost, due to brake-cylinder leakage, as now often happens with the present equipment. When the brakes are released and the pressure escapes from the diaphragm-chamber 39, the spring 41 holds the lower valve 43 tightly closed upon its seat, thereby preventing escape of train-pipe fluid to the atmosphere through the brake-cylinder.

It will now be seen that by means of my improvements trains may be operated down long grades with perfect safety and with a very economical use of air-pressure, thereby relieving the drain upon the air-pump and avoiding all danger of losing control of the train.

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

1. In a fluid-pressure brake, the combination with a train-pipe and engineer's brake-valve, of a valve for controlling the supply of fluid to the train-pipe, a movable abutment subject to the opposing pressures of the train-pipe and a regulating-chamber for operating said valve, means for supplying fluid under pressure to said chamber, and a device separate from the brake-valve for reducing the pressure in said chamber with that of the train-pipe in service applications.

2. In a fluid-pressure brake, the combination with a train-pipe and engineer's brake-valve, of means operated by the opposing pressures of the train-pipe and a regulating-chamber for controlling the supply of fluid to the train-pipe, and a valve device separate from the brake-valve for reducing the pressure in said chamber with that of the train-pipe in service applications.

3. In a fluid-pressure brake, the combination with a train-pipe and engineer's brake-valve, of a valve for controlling the supply of fluid from the main reservoir to the train-pipe, a movable abutment subject to the opposing pressures of the train-pipe and a regulating-chamber for operating said valve, means for supplying said chamber with fluid under pressure, and a valve device separate from the brake-valve for reducing the pressure in said chamber with that of the train-pipe in service applications.

4. In a fluid-pressure brake, the combination with an engineer's brake-valve having main-reservoir, train-pipe and equalizing-reservoir connections, of means operated by the opposing pressures of the train-pipe and a regulating-chamber for controlling the supply of fluid from the main reservoir to the train-pipe, and a valve device controlled by the pressure of the equalizing-reservoir for reducing the pressure in said regulating-chamber with that of the train-pipe in service applications.

5. In a fluid-pressure brake, the combination with an engineer's brake-valve having main-reservoir, train-pipe and equalizing-reservoir connections, of means operated by the opposing pressures of the train-pipe and a regulating-chamber for controlling the supply of fluid from the main reservoir to the train-pipe, a valve for reducing the pressure in said regulating-chamber with that of the train-pipe in service applications, and a mov-

able abutment subject to the opposing pressures of the equalizing-reservoir and the regulating-chamber for operating said valve.

6. In a fluid-pressure brake, the combination with an engineer's brake-valve having main-reservoir, train-pipe, equalizing-reservoir and feed-valve connections, of means operated by the opposing pressures of the train-pipe and a regulating-chamber for controlling the supply of fluid from the main reservoir to the train-pipe while the brakes are applied, a port controlled by the feed-valve device for supplying fluid from the main reservoir to the regulating-chamber, and a valve device controlled by the pressure of the equalizing-reservoir for reducing the pressure of said regulating-chamber with that of the train-pipe in service applications.

7. In a fluid-pressure brake, the combination with an engineer's brake-valve having main-reservoir, train-pipe and equalizing-reservoir connections, of means operated by the opposing pressures of the train-pipe and a regulating-chamber for controlling the supply of fluid from the main reservoir to the train-pipe when the brakes are applied, a valve controlling communication from the regulating-chamber to the train-pipe, and a movable abutment or diaphragm subject to the opposing pressures of the regulating-chamber and the equalizing-reservoir for operating said valve.

8. In a fluid-pressure brake, the combination with an engineer's brake-valve and train-pipe, of means operated by the opposing pressures of the train-pipe and a regulating-chamber for controlling the supply of fluid under pressure to the train-pipe while the brakes are applied, a valve for reducing the pressure in said regulating-chamber with that of the train-pipe in service applications, a diaphragm for operating said valve, and means operated by the brake-valve for controlling the pressure on said diaphragm.

9. In a fluid-pressure brake, the combination with means for supplying fluid under pressure to the train-pipe while the brakes are applied, of a valve device subject to the brake-cylinder pressure for controlling communication between the train-pipe and brake-cylinder.

10. In a fluid-pressure brake, the combination with means for maintaining train-pipe pressure while the brakes remain applied, of a valve device operated by brake-cylinder pressure for controlling communication from the train-pipe to the brake-cylinder.

11. In a fluid-pressure brake, the combination with a train-pipe, auxiliary reservoir, triple valve and brake-cylinder, of a valve device operated by brake-cylinder pressure for controlling communication from the train-pipe to the brake-cylinder.

12. In a fluid-pressure brake, the combination with a train-pipe, auxiliary reservoir, triple valve and brake-cylinder, of a valve device independent of the triple valve for controlling communication from the train-pipe to the brake-cylinder while the brake is applied.

13. A valve device for fluid-pressure brakes, comprising a casing having an inlet-opening for connection with the train-pipe, an outlet-opening for communicating with the brake-cylinder, a valve for controlling the passage through the casing, a movable abutment subject to brake-cylinder pressure for operating said valve, and a spring opposing the fluid-pressure on the abutment.

14. A valve device for fluid-pressure brakes, comprising a casing having a passage adapted to be connected at one end to the train-pipe and at the other end with the brake-cylinder, two oppositely-seated valves controlling said passage, and a movable abutment or diaphragm exposed to brake-cylinder pressure for operating said valves.

15. A valve device for fluid-pressure brakes, comprising a casing having ports adapted to be connected to the train-pipe and brake-cylinder respectively, a valve for controlling the passage through the casing, and means operated by a certain brake-cylinder pressure to open said valve and by a pressure either higher or lower than said amount to close said valve.

In testimony whereof I have hereunto set my hand.

WALTER V. TURNER.

Witnesses:
R. F. EMERY,
JAS. B. MACDONALD.