S. G. NEAL.

TRIPLE VALVE FOR AIR BRAKES.

APPLICATION FILED MAR. 6, 1911.

1,012,695. **Patented Dec. 26, 1911.**

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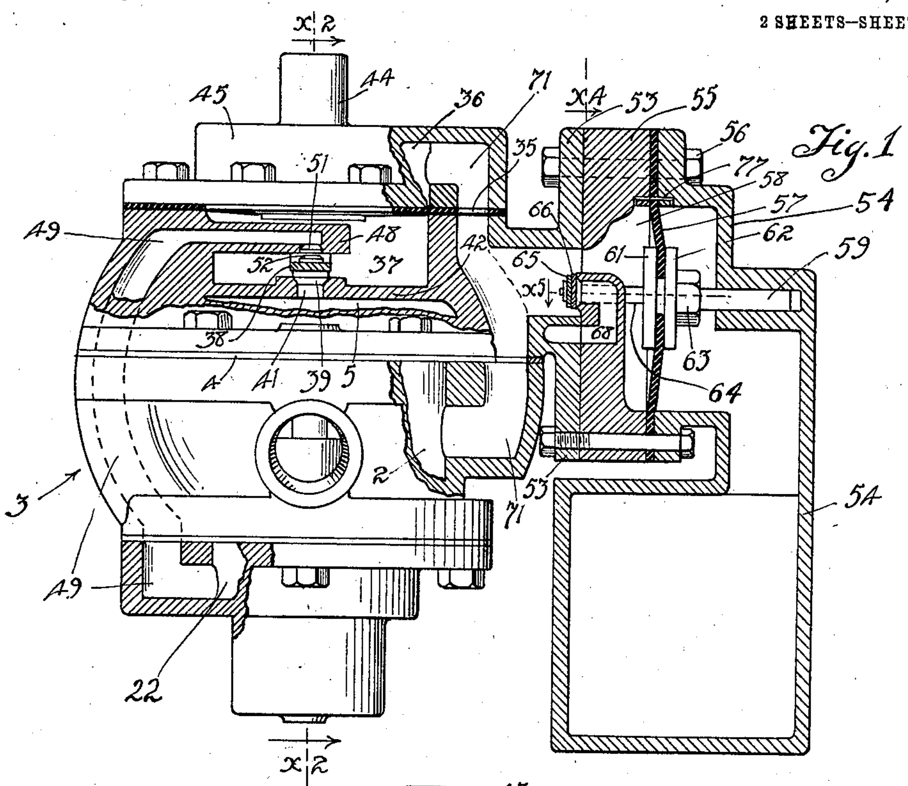

Fig. 1

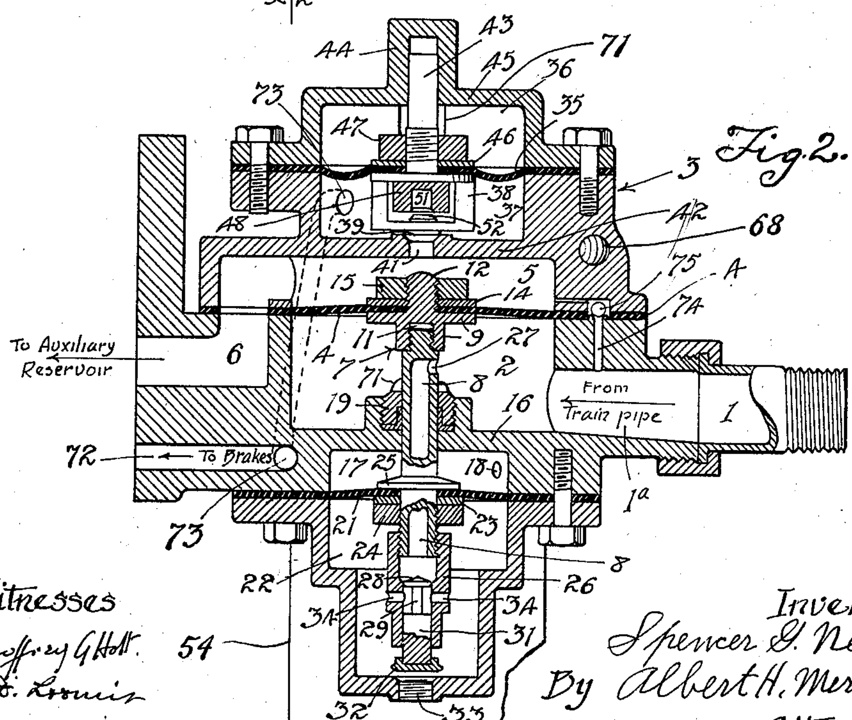

Fig. 2.

Witnesses

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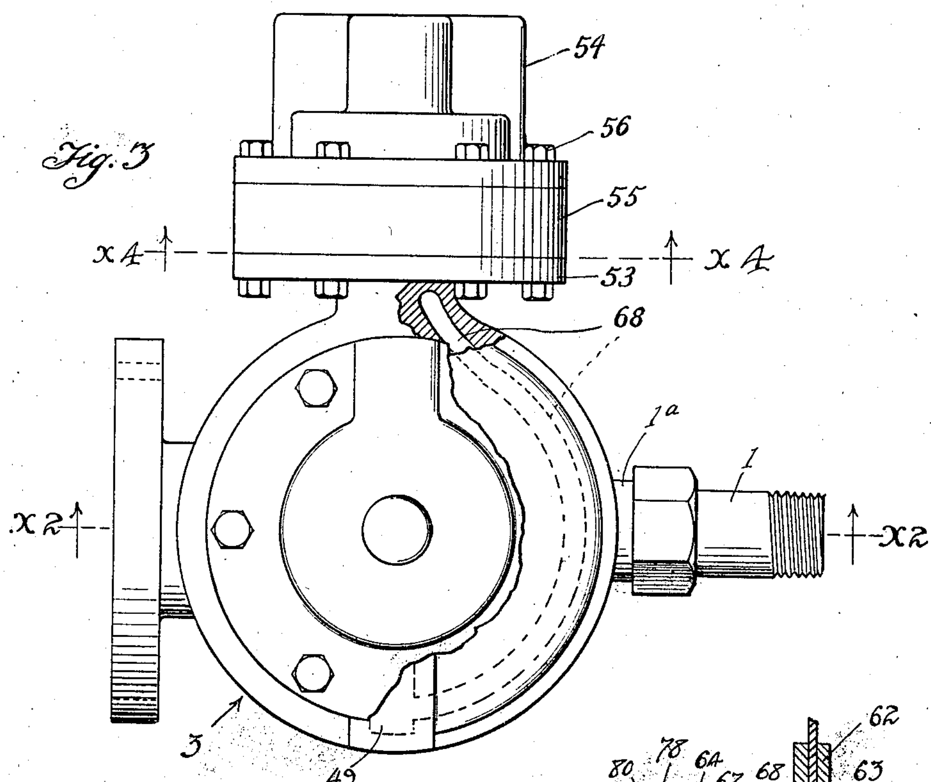
2 SHEETS—SHEET 2.

Fig. 3



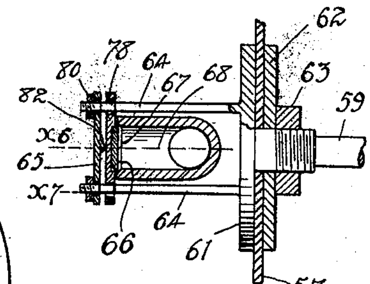
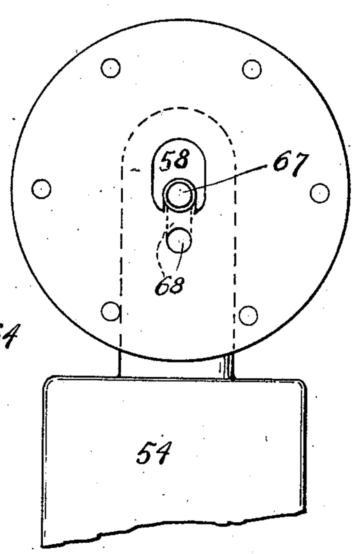


Fig. 5

Fig. 4



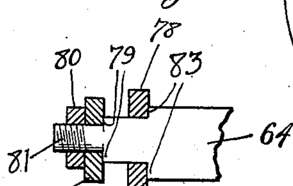


Fig. 7

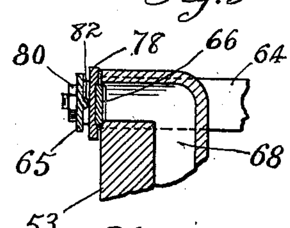


Fig 6

Witnesses,

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UNITED STATES PATENT OFFICE.

SPENCER G. NEAL, OF LOS ANGELES, CALIFORNIA, ASSIGNOR TO CALIFORNIA VALVE AND AIR BRAKE COMPANY, OF LOS ANGELES, CALIFORNIA, A CORPORATION OF CALIFORNIA.

TRIPLE VALVE FOR AIR-BRAKES.

1,012,695. Specification of Letters Patent. **Patented Dec. 26, 1911.**

Application filed March 6, 1911. Serial No. 612,655.

To all whom it may concern:

Be it known that I, SPENCER G. NEAL, a citizen of the United States, residing in the city of Los Angeles, State of California, have invented a new and useful Triple Valve for Air-Brakes, of which the following is a specification.

An object of the present invention is to simplify the air braking apparatus described and claimed in Patent No. 961,320, issued jointly to William H. Sheasby and myself, June 14, 1910.

This invention relates to triple valves for air brakes adapted to perform all the essential functions of the apparatus set forth in said patent by means of a much simpler and less expensive construction.

Another object of this invention is to provide means which will adapt the valve for satisfactory use, in both quick emergency and service braking, on a car connected up with other cars when the latter are equipped with brakes of the automatic type operating according to the principles of the Westinghouse and kindred braking systems.

In the braking apparatus patented to myself and W. H. Sheasby, above referred to, and also in my co-pending application, Sr. No. 565,616, filed June 7th, 1910, service braking may be satisfactorily performed in connection with cars controlled by other braking systems in general use, but in emergency braking the cars otherwise controlled apply the brakes quicker and cause what is termed "stretching" or "bunching" of the train. By the present invention an attachment is added to the valve which makes the quick emergency feature of my valve work in unison with that feature of otherwise equipped cars in the same train.

A further object of the present invention is to provide a triple valve still more sensitive to slight variations of air pressure, and having no slide valves or other parts liable to become inoperative by reason of sticking, lack of lubrication, or presence of dirt.

Referring to the accompanying drawings, which illustrate the invention, Figure 1 is a side elevation partly broken; Fig. 2 is a mid-section on line x^2 of Figs. 1 and 3; Fig. 3 is a broken top plan; Fig. 4 is a section on line x^4 of Figs. 1 and 3; Fig. 5 is an enlarged transverse section on line x^5 of Fig. 1. Fig. 6 is a section on line x^6 of Fig. 5; Fig. 7 is a sectional detail of Figs. 5 and 6 on a still larger scale.

Referring in detail to the drawings, the train pipe 1 leads into main train pipe chamber 2 through channel 1^a of the main casting 3. Above said chamber 2 and, separated therefrom by the main abutment or diaphragm 4, is an auxiliary chamber 5 in constant communication with the auxiliary reservoir (not shown) through the auxiliary passage 6. In order that said abutment 4 may operate valves hereinafter described, valve operating means 7 are secured to the central portion thereof. Said valve operating means preferably consist of a hollow piston rod 8, which is secured to said diaphragm by means of the flanged head 9, having a socket 11, into which the upper end of rod 8 screws, and a threaded extension 12 extending up through the diaphragm 4 and provided with follower 14 and nut 15.

Beneath the main train pipe chamber 2 and separated therefrom by cross wall 16, is a chamber 17 having a port 18 in constant communication with the outer atmosphere. Around the rod 8 is a stuffing box 19 to provide an air-tight fitting through wall 16. The equalizing abutment 21 extends across the lower side of chamber 17 to separate said chamber from the equalizing chamber 22. The hollow piston rod 8 extends through and is secured to abutment 21 by means of follower 23 and nut 24, which clamp said diaphragm against flange 25 with which said rod is provided.

Within the equalizing chamber 22 the lower end of hollow rod 8 is screwed into valve cage 26. Said valve cage and rod afford communication between said equalizing chamber and the train pipe chamber 2, the hollow rod for this purpose being provided with a lateral port 27, which opens out into the main train pipe chamber 2. The valve cage 26 forms a closed chamber, the outlet from which is controlled by a valve 28 having a downwardly extending stem 29 carrying a plunger 31, slidable within said valve cage, which in turn carries at its lower end an exhaust valve 32 that opens and closes a vent 33 with which the equalizing chamber 22 is provided. Below the valve 28 are lateral passages 34 to afford communication with the equalizing chamber when the valve 28 is open.

By this invention an emergency application of the brakes may be effected in a moderately quick manner or in a very sudden manner. In making the more moderate application of the brakes, a gradual reduction of the train pipe pressure is made beyond that required for service braking. The quick emergency application is made by the usual quick reduction of train pipe pressure, as applied by braking systems of the Westinghouse type. The last mentioned feature of this invention is what is relied upon to adapt the same for use in a train of cars part of which are equipped with brakes controlled according to the principles of other braking systems.

Referring now to the means for effecting the moderate emergency application of the brakes, an emergency abutment 35 separates the emergency train pipe chamber 36 from the emergency brake cylinder chamber 37. Said abutment 35 carries a depending yoke 38 to which is fastened a valve 39 that opens and closes a port 41 through wall 42 to control communication between said chamber 37 and the auxiliary chamber 5. From the upper side of said yoke extends a stem 43, the upper end of which may play in a guiding extension 44, formed in the cap 45. Said stem 43 is threaded above abutment 35, the follower 46 and nut 47 being provided to secure the yoke to the abutment.

Into the emergency brake cylinder chamber 37, extends a hollow arm 48, which is connected with a passage 49, that leads to the equalizing chamber 22. The passage in said hollow arm 48 opens downwardly into the chamber 37 through a port 51. The valve 39, already referred to, carried by yoke 38, is provided with an upper face 52, which closes said port 51 when the yoke ascends while the lower face of said valve opens port 41.

Referring more particularly to Fig. 1, the main casing 3 is provided with a flanged extension 53 to which is bolted a supplemental emergency chamber 54, a valve block 55 being interposed between the flanged extension 53 and said supplemental emergency chamber, said parts being clamped together by suitable bolts 56. A supplemental emergency abutment, preferably a diaphragm 57, is clamped between block 55 and the casing of the supplemental emergency chamber, said block being chambered out to form a space 58 on one side of said diaphragm, and the other side of said diaphragm being exposed to air within said supplemental emergency chamber. Through diaphragm 57 extends a stem 59, the said stem carrying a follower 61 made fast thereto (or formed in one piece therewith) which rests upon one side of said diaphragm. The follower 61 has fixed thereto, or formed in one piece therewith, a yoke 64 which carries at its outer end a cross piece 65 furnished with a valve 66 which opens and closes a port 67 at the mouth of the passage 68. Said passage leads from block 55 around through the main casing 3 (see Fig. 3) to passage 49, which leads from the equalizing chamber to the emergency brake cylinder chamber. A leakage passage 77 connects the supplemental emergency chamber 54 with the chamber 58 within block 55. The object of this small passage is to prevent moderate reduction of train pipe pressure from operating the supplemental emergency diaphragm 57, said passage 77 allowing an approximate equalization on each side of diaphragm 57 except when a sudden reduction is made in the train pipe pressure. Constant communication is maintained between the main train pipe chamber 2 and the emergency train pipe chamber 36 by means of a passage 71 (see Fig. 1). Constant communication is maintained between the brake cylinder passage 72 and the emergency brake cylinder chamber 37 by means of passage 73 lettered at its ends in Fig. 2.

In order to provide for charging the auxiliary reservoir, from the main inlet 1[a] leads a charging passage 74 to the auxiliary chamber 5, said passage being controlled by a check valve 75 which prevents air returning from the auxiliary chamber to the train pipe.

When the train pipe is charged, pressure in train pipe chamber 2 will be increased more rapidly than the pressure in the auxiliary chamber 5, therefore the greatest pressure will at such time be on the lower side of main diaphragm 4 and will put the parts in the position shown in Fig. 2. As soon as the increase of train pipe pressure stops, the pressure in chamber 5 will equalize with the train pipe pressure by way of charging passage 74, but the valve operating parts connected with the main diaphragm 4 will remain in the uppermost position shown in Fig. 2 until the train pipe pressure in chamber 2 is reduced slightly below the pressure above main diaphragm.

The weight of check valve 75 is sufficient to cause said valve to come to its seat slightly before equalization between train line pressure and auxiliary reservoir pressure, this difference being sufficient to offset the difference in area between the top and bottom of main diaphragm 4, due to the displacement of rod 8 where it passes through stuffing box 19.

In order to provide means for causing the valve 66 to seat truly upon the mouth of the passage 68, said valve is mounted upon a plate 78 which is fitted loosely upon the arms 64 of the yoke, there being a slight clearance between said arms and plate to allow valve 66 readily to adjust itself to its seat.

The cross piece 65 is clamped against shoulders 79 (see Fig. 7) with which each yoke-arm 64 is provided, by means of nuts 80 which screw onto a reduced threaded portion 81 with which the ends of the yoke-arms are provided. Said cross piece 65 is furnished with an internally projecting lug 82 which bears upon the center portion of the outer side of the plate 78, said lug being located axially in line with the passage 68 so that the pressure thereof upon the outer side of the plate 78 will always bring the valve 66 truly to its seat. In order to provide for positively opening said valve 66, each yoke-arm 64 is provided with a shoulder 83 which engages the inner side of the plate 78 and moves said plate to open the valve whenever the rod 59 is moved toward the left by the diaphragm 57 in the manner that has hereinbefore been described.

The operation is as follows: Assuming the air pressure to be zero in the train pipe, auxiliary reservoir, and various chambers of the triple valve, in order to charge the auxiliary reservoir and put the parts of the triple valve in full release position, the train pipe pressure is increased thus forcing air through the restricted charging passage 74 past the check valve 75 and into the auxiliary chamber 5 and thence through the auxiliary passage 6 to the auxiliary reservoir (not shown). While this operation is taking place the valve operating means 7 will be raised by the rapidly increasing air pressure under diaphragm 4 until the parts assume the position shown in Fig. 2, in which position the valve 28 is closed shutting off communication between chambers 2 and 22 and opening vent 33 at the lower end of chamber 22. Air may thus be admitted from the train pipe to auxiliary chamber 5, auxiliary reservoir (not shown), main train pipe chamber 2, emergency train pipe chamber 36 (by way of leakage passage 71) and through leakage passage 77 to supplemental reservoir 54 until the air pressure in all these places reaches say eighty pounds per square inch. To make a service application of the brakes under these conditions, a reduction may be made in train pipe pressure as in present braking systems of, for example, ten pounds per square inch, with the result that the pressure in the auxiliary chamber 5 (retained by check valve 75) upon the upper side of diaphragm 4 will overcome the pressure of seventy pounds remaining below said diaphragm in main train pipe chamber 2. Consequently the hollow rod 8 and parts connected therewith will descend until the valve 32 closes and the valve 28 opens. Air will now be fed from the train pipe chamber 2 through port 27 and hollow rod 8 past valve 28 out ports 34 into equalizing chamber 22, and thence through passage 49 (see Fig. 1), arm 48 and port 51 into an emergency brake cylinder chamber 37. Air thus admitted to chamber 37 will escape therefrom through passage 73 (see Fig. 2) to the passage 72 which leads to the brake cylinder (not shown). The feeding of air from the train pipe to the brake cylinder in the manner just described will continue until sufficient pressure is built up beneath the equalizing abutment 21 to aid the train pipe pressure beneath diaphragm 4 sufficiently to overcome the auxiliary reservoir pressure above said diaphragm 4 with the result that rod 8 will be raised closing the valve 28 thus preventing further admission of air to the brake cylinder until another reduction of pressure is made in the train pipe.

In the embodiment of the invention illustrated in the drawings, the main abutment 4 is about twice as large as the equalizing abutment 21, therefore the reduction of train pipe pressure ten pounds as just described will cause twenty pounds pressure to be built up in the brake cylinder and in the equalizing chamber 22 before there will be enough pressure beneath said equalizing abutment 21 to lift the rod 8 and close the valve 28. The reason for thus proportioning the diaphragms 4 and 21 is to adapt the appliance for use on a train some of the cars of which are equipped with automatic brakes such as are at present in general use, wherein the auxiliary reservoir contains from two to two and a half times the volume that is contained by the portion of the brake cylinder into which air is admitted during the ordinary service application of the brakes,—such a construction causing the reduction of train pipe pressure to build up a brake cylinder pressure of from two to two and a half times the amount of the train pipe reduction at each service application of the brakes.

Continuing again with the operation of my triple valve, it will be seen that after the train pipe pressure has been reduced from eighty to seventy pounds and a pressure of twenty pounds thus built up in the brake cylinder, as described, before the valve is brought to lap position, a further reduction of train pipe pressure of another ten pounds, will build the brake cylinder pressure up to forty pounds before the valve laps. Successive reductions may thus be made until the brake cylinder pressure is built up to an equality with the reduced train pipe pressure.

If, at any time before the brake cylinder pressure has been built up to a full equality with the train pipe pressure, it is desired to partially release the brakes, the train pipe pressure will be raised in train pipe chamber 2 to cause the combined pressures underneath the main diaphragm 4 and 21 to overcome the pressure above said main diaphragm 4 and raise the release valve 32 thereby exhausting the air from the equalizing chamber 22 and hence from the brake cylinder which is at this time in communication with said equalizing chamber. The escape of air from the brake cylinder thus permitted will continue only until the pressure beneath equalizing diaphragm 21 is sufficiently reduced to cause the valve operating means to descend thus closing the exhaust valve 32. The operation just described will be the reverse of the operation before described for service application of the brakes and therefore a graduated release, as well as graduated application, of the brakes may be obtained.

If it is borne in mind that constant communication is maintained between the emergency train pipe chamber 36 (beneath cap 45) and the main train pipe chamber 2 (see passage 71 of Fig. 1) it will be seen that when the brake cylinder pressure is built up to an equality with the reduced train pipe pressure, the brake cylinder pressure in chamber 37 beneath the emergency diaphragm 35 will overcome the train pipe pressure above said diaphragm thus lifting yoke 38 and opening port 41 to admit auxiliary reservoir pressure to the emergency brake cylinder chamber 37 and thence to the brake cylinder through passages 73 and 72, thus making a service emergency (not the quick emergency, hereinafter described) application of the brakes. The yoke 38, immediately after opening the port 41 lifts the valve face 52 and cuts off escape of air from the emergency brake cylinder chamber 37 back to the equalizing chamber 22, thus guarding against the lower port 33 being opened by reason of excessive brake cylinder pressure below diaphragm 21, and consequent premature escape of brake cylinder air to the outer atmosphere. From what has just been said it will be seen that when the brake cylinders are filled with air from this service emergency application, the valve operating means 7 will have descended and the lower port 33 will be closed. Now, to release the brakes the train pipe pressure will be raised until the same in the upper chamber 36 exceeds the brake cylinder pressure, depresses diaphragm 35, and opens port 51 and immediately thereafter closes port 41. The effect of this operation will be to permit brake cylinder air to escape through the brake cylinder passage 72, passage 73, chamber 37 and thence by way of passage 49 to the lower chamber 22 and outer atmosphere through the open port 33, said port 33 being opened as soon as the released brake cylinder pressure under diaphragm 21 raises the valve operating means. At the same time with the escape of the air from the brake cylinder as just described, the parts are brought to the position shown in full lines in Fig. 2 (full release position) and the charging operation may again be performed as has already been described.

Reference will now be made to the operation of the supplemental emergency attachment (best shown at the right side of Fig. 1): During all service application of the brakes, the moderate reductions made in the train pipe pressure do not operate supplemental emergency diaphragm 57, because the leakage passage 77 maintains approximate equalization of pressure on each side of said diaphragm. But when a very sudden reduction is made in train pipe pressure, the pressure on the inner side of diaphragm 57 becomes so much less than that in the supplemental emergency chamber on the other side of said diaphragm, that said diaphragm operates and moves the rod inwardly, thus opening valve 66 against the train line pressure and allowing train line air to enter passage 68 and thus be led (see Fig. 3) around to channel 49, (see Fig. 1) to the emergency brake cylinder chamber 37, thence to be conducted by passages 73 and 72 (see Fig. 2) to the brake cylinder (not shown). The effect of this additional volume of train pipe air being conducted to the brake cylinder is to suddenly bring the brake cylinder pressure up, and at the same time quickly bring the train line pressure down, thus causing an equalization of train line and brake cylinder pressure, which puts the auxiliary reservoir pressure into connection with the brake cylinder hereinbefore described.

I claim:

1. In braking apparatus, a movable emergency abutment exposed on one side to a chamber containing train pipe pressure and on the other side to a chamber containing brake cylinder pressure, there being an inlet to admit auxiliary reservoir pressure to said chamber containing brake cylinder pressure, means operated by said abutment to open and close said inlet, a supplemental emergency passage to supply additional train line air for the brake cylinder, a valve to control the flow of air through said passage, a supplemental emergency abutment and means operatively connecting said valve and abutment, said abutment remaining inoperative during reductions of train pipe pressure for service applications of the brakes and operating said valve during more sudden reductions of the train pipe pressure.

2. In braking apparatus, a movable emergency abutment exposed on one side to a chamber containing train pipe pressure and on the other side to a chamber containing brake cylinder pressure, there being an inlet to admit auxiliary reservoir pressure to said chamber containing brake cylinder pressure,

means operated by said abutment to open and close said inlet, a supplemental emergency passage to supply additional train line air for the brake cylinder, a valve to control the flow of air through said passage, a supplemental emergency abutment, means operatively connecting said valve and abutment, one side of said abutment being exposed to train pipe pressure, and a closed chamber on the other side of said abutment, there being a leakage passage affording communication between air under train pipe pressure and the air in said closed chamber.

3. In braking apparatus, an abutment moved in one direction by train pipe pressure to close communication between the auxiliary reservoir and brake cylinder, and moved in the other direction by brake cylinder pressure to open communication between the auxiliary reservoir and brake cylinder upon either a moderate or rapid reduction of train pipe pressure below brake cylinder pressure, and supplemental emergency means to supply additional volume of train pipe air to the brake cylinder upon the more rapid reduction of train pipe pressure.

4. In braking apparatus, means actuated by train pipe and brake cylinder pressure to open communication between the auxiliary reservoir and brake cylinder, upon either a moderate or rapid reduction of train pipe pressure below brake cylinder pressure, and supplemental emergency means to supply additional volume of train pipe air to the brake cylinder upon the more rapid reduction of train pipe pressure.

5. In braking apparatus, means operated by a reduction of train pipe pressure to open communication between the train pipe and brake cylinder while the pressure in the train pipe exceeds that in the brake cylinder, said means automatically placing the auxiliary reservoir in communication with the brake cylinder when the pressure in the train pipe falls below that in the brake cylinder at a moderately rapid rate, and supplemental emergency means to supply additional volume of train pipe air to the brake cylinder upon the more rapid reduction of train pipe pressure.

6. In braking apparatus, a valve to control communication between the train pipe and brake cylinder, an abutment operatively connected with said valve, said abutment being exposed to auxiliary reservoir pressure which opens said valve, an abutment exposed to brake cylinder pressure to close said valve in opposition to the auxiliary reservoir pressure, means to open communication between the auxiliary reservoir and brake cylinder upon either a moderate or rapid reduction of train pipe pressure below brake cylinder pressure, and supplemental emergency means to supply an additional volume of train pipe air to the brake cylinder upon the more rapid reduction of train pipe pressure.

In testimony whereof I have hereunto signed my name in the presence of two subscribing witnesses at Los Angeles, in the county of Los Angeles and State of California, this 28th day of February 1911.

SPENCER G. NEAL.

Witnesses:
L. D. LOOMIS,
ALBERT H. MERRILL.