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TRIPLE VALVE FOR AIR BRAKES.

APPLICATION FILED OCT. 20, 1910.

1,012,694. Patented Dec. 26, 1911.

Fig. 1.

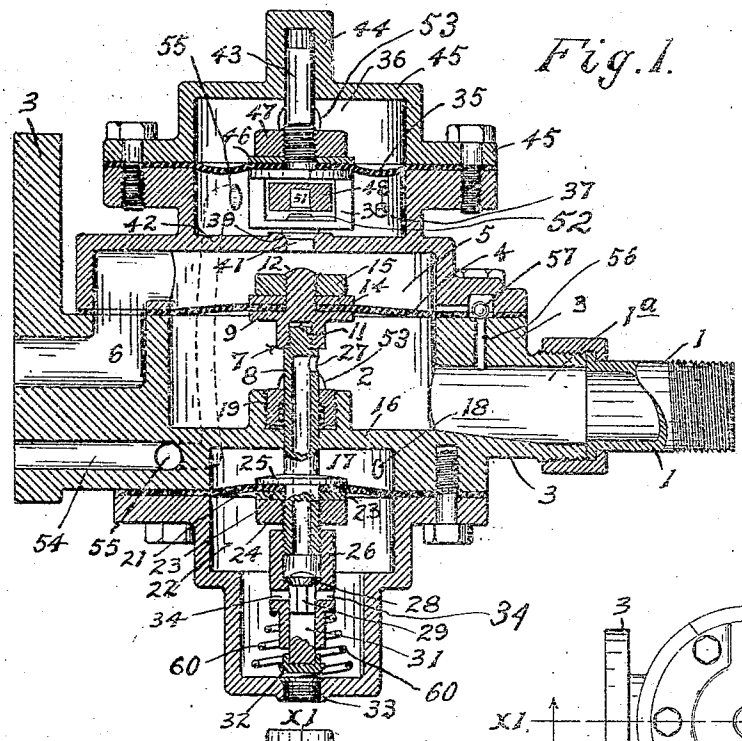


Fig. 3.

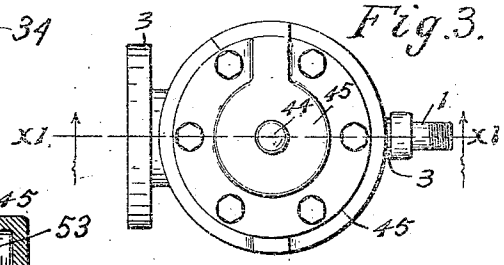
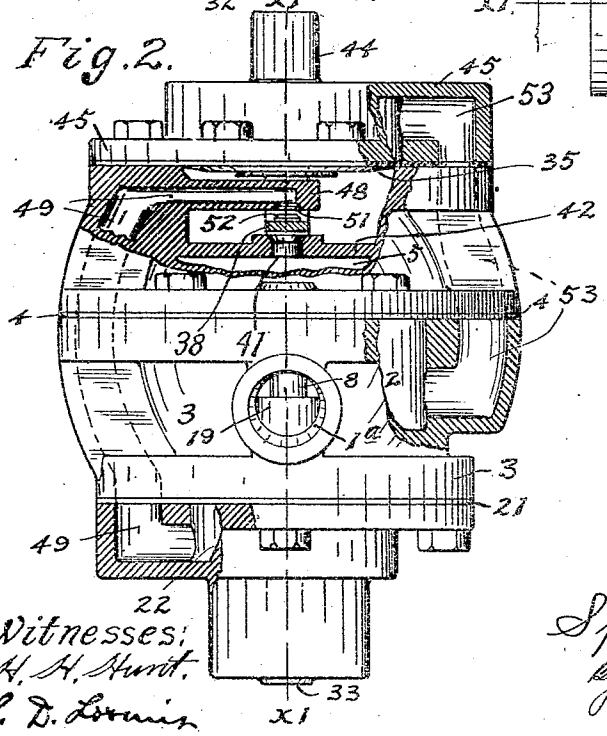


Fig. 2.



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UNITED STATES PATENT OFFICE.

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TRIPLE VALVE FOR AIR-BRAKES.

1,012,694. Specification of Letters Patent. Patented Dec. 26, 1911.

Application filed October 20, 1910. Serial No. 588,211.

To all whom it may concern:

Be it known that I, SPENCER G. NEAL, a citizen of the United States, residing at Los Angeles, 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 valve 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.

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 mid-section on line X^1 of Figs. 2 and 3. Fig. 2 is a side elevation partly broken. Fig. 3 is a top plan on a reduced scale.

Referring in detail to the drawings, the train pipe 1 leads into the 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 the 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 a 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, 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.

Referring now more particularly to the means for effecting an 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 upperside 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 the 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.

Constant communication is maintained between the main train pipe chamber 2 and the emergency train pipe chamber 36 by means of a passage 53 (see Fig. 2). Constant com-

munication is maintained between the brake cylinder passage 54 and the emergency brake cylinder chamber 37 by means of passage 55 lettered at its ends in Fig. 1.

In order to provide for charging the auxiliary reservoir, from the main inlet 1ª leads a charging passage 56 to the auxiliary chamber 5, said passage being controlled by a check valve 57 which prevents air from 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. 1. As soon as the increase of train pipe pressure stops, the pressure in auxiliary chamber 5 will equalize with the train pipe pressure by way of charging passage 56, but the valve operating parts connected with the main diaphragm 4 will remain in the uppermost position shown in Fig. 1 until the train pipe pressure in chamber 2 is reduced below the sealed pressure above main diaphragm 4 enough to compress a helical spring 60 which operates between the bottom of chamber 22 and valve cage 26. The main object of spring 60 is to offset the difference in area between the top and bottom of main diaphragm 4 due to rod 8.

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 line pressure is increased thus forcing air through the restricted charging passage 56 past the check valve 57 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. 1, in which position the valve 28 is closed shutting off communication between chambers 2 and 22 and opening the vent 33 at the lower end of chamber 22. Air may thus be admitted to the train pipe, auxiliary chamber 5, auxiliary reservoir, and main train pipe chamber 2 until the air pressure in all these places, is say 80 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 57) upon the upper side of diaphragm 4 will overcome the pressure of 70 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 train pipe chamber 2 through port 27 and hollow rod 8 past valve 28 into equalizing chamber 22, and thence through passage 49 (see Fig. 2), arm 48 and port 51 into an emergency brake cylinder chamber 37. Air thus admitted to chamber 37 will escape therefrom through passage 55 (see Fig. 1) to the passage 54 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 20 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 80 to 70 pounds and a pressure of 20 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 10 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 continued pressures underneath the main diaphragms 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 may be therefore applied gradually, the valve automatically bringing itself to lap position quickly or more slowly according to the amount of the reduction made by the engineer in the train pipe.

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 53 of Fig. 2) 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 55 and 54. 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 the 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 depresses diaphragm 35, 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 54, passage 55 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. 1 (full release position) and the charging operation may again be performed as has already been described.

I claim:

1. In braking apparatus, a train pipe, a main train pipe chamber in communication therewith, an auxiliary chamber in communication with the auxiliary reservoir, a brake cylinder, a main abutment between said auxiliary chamber and main train pipe chamber, an equalizing chamber having an exhaust port leading to the outer atmosphere, an equalizing abutment closing one side of said equalizing chamber, the other side of said equalizing abutment being exposed to atmospheric pressure, valve operating means operatively connecting said main abutment and said equalizing abutment, a valve to admit air from the train pipe through said main train pipe chamber to said equalizing chamber, an exhaust valve for said equalizing chamber, said valves being operatively connected with said valve operating means, an emergency train pipe chamber in communication with the train pipe through said main train pipe chamber, an emergency abutment exposed on one side to the pressure in said emergency train pipe chamber, an emergency brake cylinder chamber to which the other side of said emergency abutment is exposed, said emergency brake cylinder chamber having passages communicating with the brake cylinder and with said equalizing chamber and with said auxiliary chamber, and valvular means operatively connected with said emergency abutment to put said emergency brake cylinder chamber into communication with said equalizing chamber and into communication with said auxiliary chamber to supply air therefrom to the brake cylinder.

2. In braking apparatus, a train pipe chamber in communication with the train pipe, an emergency brake cylinder chamber, provided with passages to conduct air therethrough from the auxiliary reservoir to the brake cylinder, an equalizing chamber having communication with the brake cylinder through said emergency brake cylinder chamber, and means controlled by variation of train pipe pressure affording communication between said train pipe chamber and equalizing chamber.

3. In braking apparatus, a main abutment exposed to train pipe pressure on one side and to auxiliary reservoir pressure on the other side, an equalizing chamber having communication with the brake cylinder, a

valve to admit air under train pipe pressure to said chamber, an exhaust valve for said chamber, and means operatively connecting both of said valves with said abutment, the reduction of the train pipe pressure upon said abutment operating said means first to close said exhaust valve and then to open the valve which admits air from the train pipe to said chamber.

4. In braking apparatus, a main abutment exposed to train pipe pressure in a train pipe chamber on one side and to auxiliary reservoir pressure on the other side, an equalizing chamber having communication with the brake cylinder, a hollow rod connected with said main diaphragm and extending into said equalizing chamber to establish communication between said chambers, a valve to control the passage of air through said rod to said equalizing chamber, and means carried by said rod to automatically open said valve.

5. In braking apparatus, a main abutment exposed to train pipe pressure on one side and to auxiliary reservoir pressure on the other side, an equalizing chamber having communication with the brake cylinder, a valve to admit air under train pipe pressure to said equalizing chamber, and an exhaust valve for said equalizing chamber, said valves being secured together to move as one part and being connected with said hollow rod and having a limited movement with relation thereto causing the movement of said rod in one direction to close said exhaust valve and then open the other valve and also causing a reverse opening of said valves to take place when said rod is moved to the limit of its travel in the other direction.

6. In braking apparatus, a main abutment exposed to train pipe pressure on one side and to auxiliary reservoir pressure on the other side, an equalizing chamber, an emergency brake cylinder chamber, means for automatically putting said equalizing chamber into communication through said emergency brake cylinder chamber with the brakes for service applications, a hollow rod operatively connected with said abutment and leading therefrom into said equalizing chamber to conduct air under train pipe pressure into said equalizing chamber, a valve cage carried by said rod within said equalizing chamber, a part mounted in said valve cage and having a limited movement with relation thereto, and two valves carried by said part, one of said valves controlling entrance of air into said equalizing chamber through said rod and to the other of said valves controlling escape of air through an exhaust port with which said equalizing chamber is provided.

7. 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, an equalizing chamber in communication with the brake cylinder through said chamber containing brake cylinder pressure, and means operated by said abutment to open said inlet, said means immediately thereafter closing communication between said equalizing chamber and chamber containing brake cylinder pressure.

8. In braking apparatus, a valve to control the supply of air from the train pipe to the brakes during service braking, an equalizing chamber the pressure in which closes said valve, an emergency brake cylinder chamber continuously in communication with the brake cylinder, an abutment exposed on one side to the pressure in said emergency brake cylinder chamber and on the other side to train pipe pressure, means operated by said abutment to admit auxiliary air to said emergency brake cylinder chamber and to close communication between said emergency brake cylinder chamber and said equalizing chamber when the brake cylinder pressure exceeds the maximum for service braking.

9. In braking apparatus, a main train pipe chamer, an equalizing chamber in communication with the brake cylinder during service braking, a movable hollow rod adapted to establish and cut off communication between said chambers, means operated by a reduction of train pipe pressure during service braking to move said rod to open communication between said chambers through said rod, and means operated by brake cylinder pressure to close communication through said rod.

10. In braking apparatus, a main train pipe chamber, an equalizing chamber in communication with the brake cylinder during service braking, a movable hollow rod adapted to establish and cut off communication between said chambers, and means operated by reduction of train pipe pressure during service braking to move said rod to open communication through said rod, said means being opposed by brake cylinder pressure.

11. A triple valve comprising a chamber in communication with the auxiliary reservoir, an emergency brake cylinder chamber in communication with the brake cylinder, a wall separating said chambers, there being a port through said wall, an equalizing chamber, there being a passage leading from said emergency brake cylinder chamber to said equalizing chamber, means for admitting train pipe air to said equalizing chamber for service braking, a diaphragm exposed on one side to the air in said emer-

gency brake cylinder chamber, a chamber in communication with the train pipe to which the other side of said diaphragm is exposed, a valve movable in one direction to open said port and close said passage and movable in the other direction to close said port and open said passage, and means operatively connecting said valve with said diaphragm.

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 fifteenth day of October, 1910.

SPENCER G. NEAL.

Witnesses:

ALBERT H. MERRILL,

J. BOYD.