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M. CORRINGTON.

AUTOMATIC FLUID PRESSURE BRAKE MECHANISM.

APPLICATION FILED JULY 12, 1902.

NO MODEL.

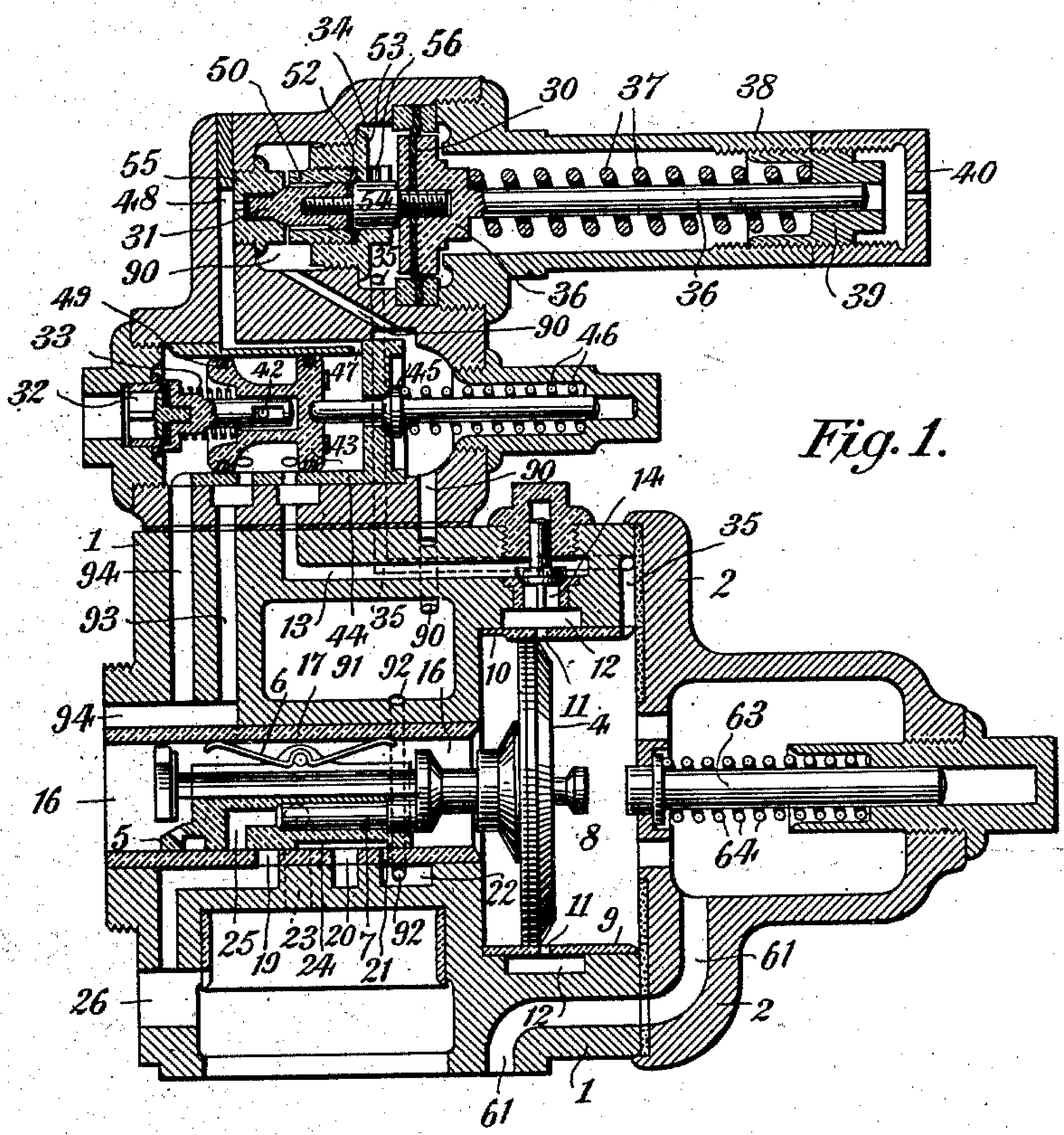


Fig. 1.

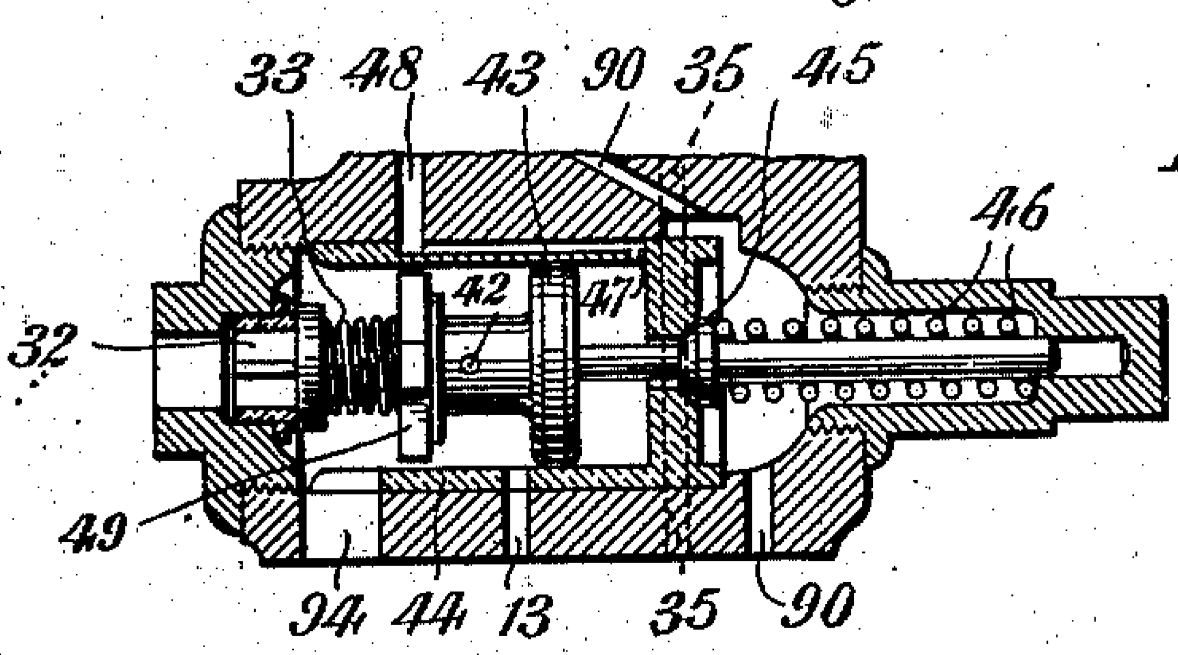


Fig. 2.

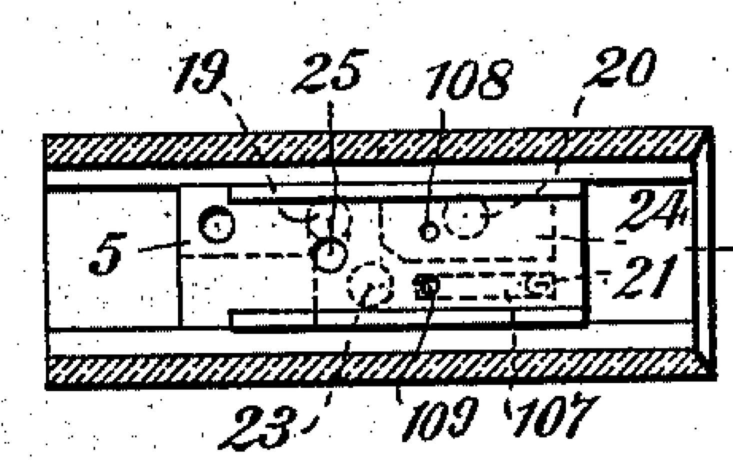
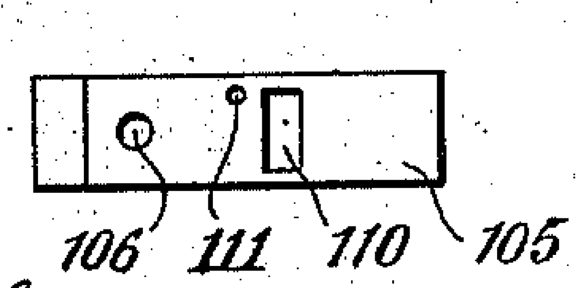


Fig. 3.

Fig. 4.



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UNITED STATES PATENT OFFICE.

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AUTOMATIC FLUID-PRESSURE BRAKE MECHANISM.

SPECIFICATION forming part of Letters Patent No. 749,263, dated January 12, 1904.

Application filed July 12, 1902. Serial No. 115,317. (No model.)

To all whom it may concern:

Be it known that I, MURRAY CORRINGTON, a citizen of the United States, residing at New York city, in the county and State of New York, have invented certain new and useful Improvements in Automatic Fluid-Pressure Brake Apparatus, of which the following is a specification.

My invention relates to improvements in the air-brake art, and has more particularly to do with a means for enabling me to recharge the auxiliary reservoir on the car of an automatic fluid-pressure brake system while the brakes are applied, whereby I may keep the brakes continuously applied as long as desired, and finally to release the brakes with certainty.

Referring to the drawings, Figure 1 is a vertical section of a well-known form of quick-acting triple valve and its casing, showing also in section one form of valve device embodying my improvements which is adapted to be fastened appropriately to the triple-valve casing. Fig. 2 is a vertical section of a portion of the new apparatus, showing a modification. Fig. 3 is a plan or top view of a modified form of the main valve of the triple valve upon its seat. Fig. 4 is a plan of the valve-face of a modified form of graduating valve.

Going first to Fig. 1, there is seen a main casing 1 of the triple valve and a cap section or casing 2. Within the casing 1 the triple valve operates, embracing the piston 4, the main slide-valve 5, with its spring 6, and the graduating-valve 7, these being the usual parts of the triple valve. The piston 4 operates within a chamber 8, having a bush 9, with a charging groove or passage 10 at the upper left-hand corner of the chamber, which is opened by the piston 4 when in its extreme left-hand or normal release position. The bush 9 has one or more small ports 11 communicating with a cavity 12, preferably cored in the casing around the bush. The valve 5 operates within a chamber 16, normally open to the auxiliary reservoir and having a bushing 17. This latter bush has on its under side and controlled by the valve 5 a port 19, leading to the brake-cylinder through passage 26, a port 20, leading to the atmosphere or exhaust, and a port 21, which leads into the cavity 22. While this device is a quick-acting triple valve, as will be readily recognized by those skilled in the art, the quick-acting mechanism is not shown, since it is deemed entirely unnecessary. Likewise the usual nozzle by which the triple-valve casing is connected to the branch train-pipe is omitted, because it is deemed unnecessary to illustrate it. It is sufficient to say that the passage 61 is normally open to the train-pipe, and therefore the train-pipe air is always present through said passage in the chamber 8 at the right-hand side of the piston 4. The emergency mechanism operates in the chamber below the slide-valve chamber and is actuated by air admitted from the auxiliary reservoir through the dotted-line passage 23, Figs. 1 and 3, when the triple valve moves through its full traverse to the right. The stop 63 and spring 64 in the casing 2 are the well-known graduating spring and stop for limiting the movement of the triple valve to the appropriate position for the service operation. All these matters are well understood in the art and require no further illustration.

Attached to the casing 1 in an appropriate manner is a casing inclosing a diaphragm 30, exposed on its right-hand side to atmospheric pressure and on its left-hand side to air under pressure in chamber 34, admitted thereto through the passage 35, (shown partly in dotted lines,) which is preferably normally open to the train-pipe. The diaphragm 30 is backed up by a disk 36, which carries a load, such as the spring 37, that may be adjusted to the desired tension by the nut 39, which in turn may be covered and locked by the cap-nut 40. These parts are inclosed in a suitable box or case 38. A second small diaphragm 52, held in position in the box or holder 53 by the nut 50, serves the purpose of a frictionless stuffing-box to prevent any air from passing between passages or cavities 34 and 90. A valve 31, operating upon a seat 55, is connected to the disk 36 by the coupling-rod 54, which, having a pin 56 operating in a suitable slot in the box 53, is held in position while the disk 36 is screwed onto its outer end.

Another chamber in the casing has a bushing 44, in which operate the two pistons 43 and 49, these two pistons forming a double piston, but being given separate reference-numerals for easy description. A valve 32 is coupled to the two pistons just mentioned by a pin 42 and is held normally to its seat by the light spring 33. Another valve, 45, is held normally on its seat by the spring 46, which likewise holds the pistons 43 49 in the normal position, as indicated. A passage 48 leads from the chamber of the piston 43 through the port 47 to the valve 31. Another passage, 90, leads from the opposite side of valve 31 to the chamber 91 and thence continues by the passage 92 to the cavity 22. The passage 13 enters the piston-chamber through one or more ports in the bush 44, located at the left of piston 43, and a passage 93, leading from the auxiliary reservoir through passage 94, likewise enters the same chamber through one or more ports located at the right of piston 49. A second passage 94 may likewise lead from the auxiliary reservoir to the valve 32, as illustrated.

The operation of the mechanism is as follows: Air entering the train-pipe flows through the usual connections to the passage 61 and thence to the chamber 8. If the triple valve is in its normal or release position, in which the port 10 is uncovered, the air flows through charging-port 10 in the usual manner to the auxiliary reservoir. Supposing the recharging means are also employed and the valve 14 is free to operate as a check-valve, air also goes through the ports 11 into cavity 12, thence past valve 14 and through passage 13 to the inner side of bush 44, thence to the left and through the ports connected with passage 93 and the passage itself to the auxiliary reservoir. The pressure admitted to the chamber 8 also finds its way through passage 35 into chamber 34 at the left of diaphragm 30, where its force tends to move the diaphragm to the right and open the valve 31. Supposing the system is operating at the normal pressure of seventy pounds per square inch in train-pipe and auxiliary reservoir, this being the usual normal pressure at which the brake systems in general use are operated, the spring 37 is preferably adjusted to balance a pressure of about sixty-seven or sixty-eight pounds at the left of diaphragm 30. With the full normal pressure of seventy pounds in chamber 34, therefore, the diaphragm 30 is moved to the right and the valve 31 is normally open. Supposing the triple valve is in normal or release position, the port 21 in the bush 17 is open to the triple-valve chamber, and the pressure admitted thereto goes through ports 21 and 22, 92, 91, and 90, past the valve 31, that valve being open by the full normal pressure, as just explained, thence by the passage 48 and port 47 to the chamber at the right-hand side of piston 43. There is also a slight leak past the piston 43, so that in any event with the system normally charged to its full pressure the piston 43 is balanced, and likewise the piston 49.

Supposing all parts of the system are normally charged at the full normal pressure, to set the brakes the train-pipe pressure is gradually reduced about six or eight pounds, the usual amount for a service action. The check-valve 14 prevents any backward flow of air through passage 13. This reduction being felt in the chamber 34, the spring 37 moves the disk 36 and all the parts connected therewith to the left and closes valve 31, thus stopping all communication between passages 48 and 90. The same reduction of pressure being felt at the right of piston 4, the reservoir-pressure on its other side moves the piston to the right, first opening graduating-valve 7 and then drawing the valve 5 to the position so that port 25 registers with port 19. This admits reservoir-pressure to the brake-cylinder until the declining pressure at the left of piston 4 permits the train-pipe pressure to close the graduating-valve. In these movements of the piston 4 it occupies a position at the right-hand side of ports 11. To recharge without releasing, air is gradually admitted to the train-line, which, entering the chamber 8 in the usual manner, moves the triple valve a short distance to the left, so that the packing-ring of piston 4 passes just across the ports 11, while the graduating-port 25 of the slide-valve passes to the left of port 19, leading to the brake-cylinder, as seen in Fig. 1. This absolutely assures us that any air entering the reservoir through the recharging-ports 11 cannot get to the brake-cylinder until the train-pipe pressure is reduced. The air entering the ports 11 goes by the passage 13 through the bush 44 and thence by the passage 93 to the reservoir, as already explained. In Fig. 1 the triple valve is shown in the proper position for recharging the reservoir. To admit more pressure into the brake-cylinder, it is only necessary to reduce the train-pipe pressure after recharging the reservoir and cause the triple valve to move to the right against the graduating-stop, when port 25 again registers with the brake-cylinder passage 19. These operations of recharging the reservoir may be repeated as often as desired and the brakes kept continuously applied, care being taken not to raise the pressure in chamber 34 high enough to move the diaphragm 30 to the right and open valve 31. When it is desired to release, the parts being in the position shown in Fig. 1 and the cavity 24 connecting port 21, and therefore the chambers or passages 90, 91, and 92 and 22 with exhaust-port 20, the pressure is increased in the train-pipe in the usual manner, which goes through the ports 11, 13, and 93 to the reservoir, recharging the reservoir as rapidly as the train-pipe is charged, and also goes through passage

35 against the diaphragm 30. As the pressure rises above sixty-seven or sixty-eight pounds, at which it balances the spring 37, the spring begins to yield, so that by the time the full seventy-pounds pressure is reached the diaphragm 30 moves to the right and opens valve 31, thus exhausting the pressure from the right-hand side of piston 43 through the ports 47 and 48 into passage 90 and the parts connected therewith. Piston 43 being thus unbalanced while piston 49 remains balanced, the two pistons start to the right and open the valve 45. Thereupon the remaining pressure at the right of piston 43 escapes past the valve 45, and the two pistons perform an instantaneous movement to the right-hand end of their chamber, at which time the piston 49 closes communication between the ports leading to the passages 13 and 93. This movement of the pistons to the right pulls the large valve 32 off its seat, whereupon pressure from the auxiliary reservoir is bled to the atmosphere through passage 93 to the inner side of bush 44 and thence past the valve 32 and also through the passage 94, if said passage is made in the casing. The only purpose of the passage 94 is to allow a freer exhaust of the air from reservoir up to and past the valve 32. This exhaust of the auxiliary-reservoir pressure will continue until the pressure at the left of piston 4 declines sufficiently to permit the train-pipe pressure on its other side to move the triple valve to the normal or release position, in which position the valve 5 moves to the left of port 21 and opens said port to the triple-valve chamber, whereupon the pressure flows through the ports and passages 21 22 92 91 90 past the valve 45 and against the piston 43, rebalancing that piston and permitting the spring 46 to move pistons 43 and 49 back to normal position, seating the valve 45 and likewise closing the valve 32. The system is now fully charged, the air going to the reservoir both through the port 10 and likewise through passages 11, 12, 13, and 93. Speaking specifically, we may say that the triple valve is caused to move to release position while the recharging-passage is open from train-pipe to auxiliary reservoir by means of a valve device which is operated so as to close communication between the recharging-passage and the auxiliary reservoir, while at the same time opening communication from the auxiliary reservoir to the atmosphere, thus bleeding the reservoir, but without wasting any of the train-pipe air.

Fig. 2 illustrates a modification which will be readily understood from the above description. All the parts are similarly numbered and operate in identically the same manner, with the exception of the part 49, which instead of being a piston, as in Fig. 1, is a mere guide for the piston 43. Reservoir-pressure coming through the passage 94 is therefore always present at the left-hand side of piston 43. The recharging-passage 13 may enter through the bush 44 by a small port or be otherwise open to the auxiliary reservoir, while the passage 94 is fully as large as the capacity of the port controlled by the valve 32. The mechanism operates in the same way as already described in connection with Fig. 1, with the exception that when the apparatus is operated for release and the piston 43 moves to the right-hand end of its chamber and opens the valve 32 the guide 49 no longer closes communication between the passage 13 and the reservoir. As the port 13 is very small and the passage 94 and that controlled by the valve 32 are very large, the air will be exhausted very rapidly from the reservoir in sufficient quantity to cause the triple valve to move to release, while but little air can flow from the train-pipe through the small passage 13. This will not prevent the successful operation of the mechanism. Of course the device shown in Fig. 1 will be more economical in the amount of air exhausted to the atmosphere, since it wastes none of the train-pipe air.

Thus far it has been assumed that when the triple valve moves to position for setting brakes cavity 24 connects port 21 with exhaust-port 20. A modification is shown in Figs. 3 and 4 in which the graduating-valve 7 gives way to a small slide-valve 105. The main slide 5 also has a second cavity 107 on its face, which controls the port 21, the latter being at one side of the valve-seat, while the cavity 24 still operates over ports 19 and 20. Two small ports 108 and 109 lead from the top of the valve 5 into cavities 24 and 107, respectively, and these ports are controlled by the valve 105. When the triple valve moves to brake-setting position, the port 21 is kept out of communication with cavity 24 and exhaust 20 until such time as the train-pipe is recharged for taking off the brakes or charging the auxiliary reservoir. The valve 5 also controls the graduating-port 25, a port 106 registering with the port 25 to admit reservoir-pressure to the brake-cylinder in setting the brakes in service application. A small port 111 may likewise be made in this valve to communicate with the port 109 in the main valve when the triple is moving to brake-setting position and is admitting reservoir-pressure to the cylinder. This latter port, however, is not necessary. At the time of recharging for release of brakes the cavity 110 in the face of valve 105 connects ports 108 and 109, and therefore cavities 24 and 107, thus placing passages 90 91 92, &c., at exhaust, when the apparatus operates as explained with reference to Fig. 1.

In all the figures if the port 21 is not uncovered when the triple valve moves to release the apparatus will nevertheless operate successfully, because the leak of pressure past the piston 43 will very quickly rebalance it—

as quickly as port 21 is closed—so as to permit the spring 46 to move said piston back to normal position, seating valves 45 and 32.

I claim—

1. In a fluid-pressure brake system, the combination, with a primary piston controlling by its movements the admission and exhaust of pressure to and from a brake-cylinder, of a passage for bleeding the auxiliary reservoir to the atmosphere, a secondary piston controlling by its movements said passage, a valve device actuated by a variation of pressure, independently of the movement of the primary piston, for controlling the secondary piston and a passage from one side of the secondary piston which is controlled by the operation of both the valve device and the primary piston.

2. In a fluid-pressure brake system, the combination with a triple valve, of a passage for bleeding the auxiliary reservoir to the atmosphere, a secondary piston controlling by its movements said passage, a valve device actuated by a variation of pressure, independently of the movement of the triple-valve piston, for unbalancing said secondary piston and a passage from one side of the secondary piston which is controlled by the movement both of said valve device and of the triple-valve piston, whereby said bleed-passage from the reservoir may be opened and subsequently closed, while the triple valve is respectively in brake setting or release position.

3. In a fluid-pressure brake system, the combination, with a triple valve, of a passage or cavity which is opened to the atmosphere by the triple valve while in brake-setting position, a passage for bleeding the auxiliary reservoir to the atmosphere and a supplemental valve device actuated by a variation of pressure, independently of the movement of the triple-valve piston, for controlling the last-mentioned passage, the relationship of the parts being such that the opening of both passages depends upon the triple valve being in brake-setting position and their subsequent closing upon its being in brake-release position.

4. In a fluid-pressure brake system, the combination, with a triple valve, of a passage for bleeding the auxiliary reservoir to the atmosphere, a recharging-passage for admitting air from train-pipe to reservoir while the triple valve is in brake-setting position and means actuated by a variation of pressure, independently of the movement of the triple-valve piston, for controlling said passages, and for bleeding air from the reservoir more rapidly than it can pass from train-pipe to reservoir, whereby the triple valve may be moved to release.

5. In a fluid-pressure brake system, the combination, with a triple valve, of a recharging-passage for admitting pressure from train-pipe to auxiliary reservoir while brakes are set, a passage for bleeding the reservoir to the atmosphere and a valve device actuated by a variation of pressure, independently of the movement of the triple-valve piston, for controlling both passages, and alternately closing the former while the latter is open, and vice versa.

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