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LOCAL APPLICATION AND EQUALIZING VALVE.

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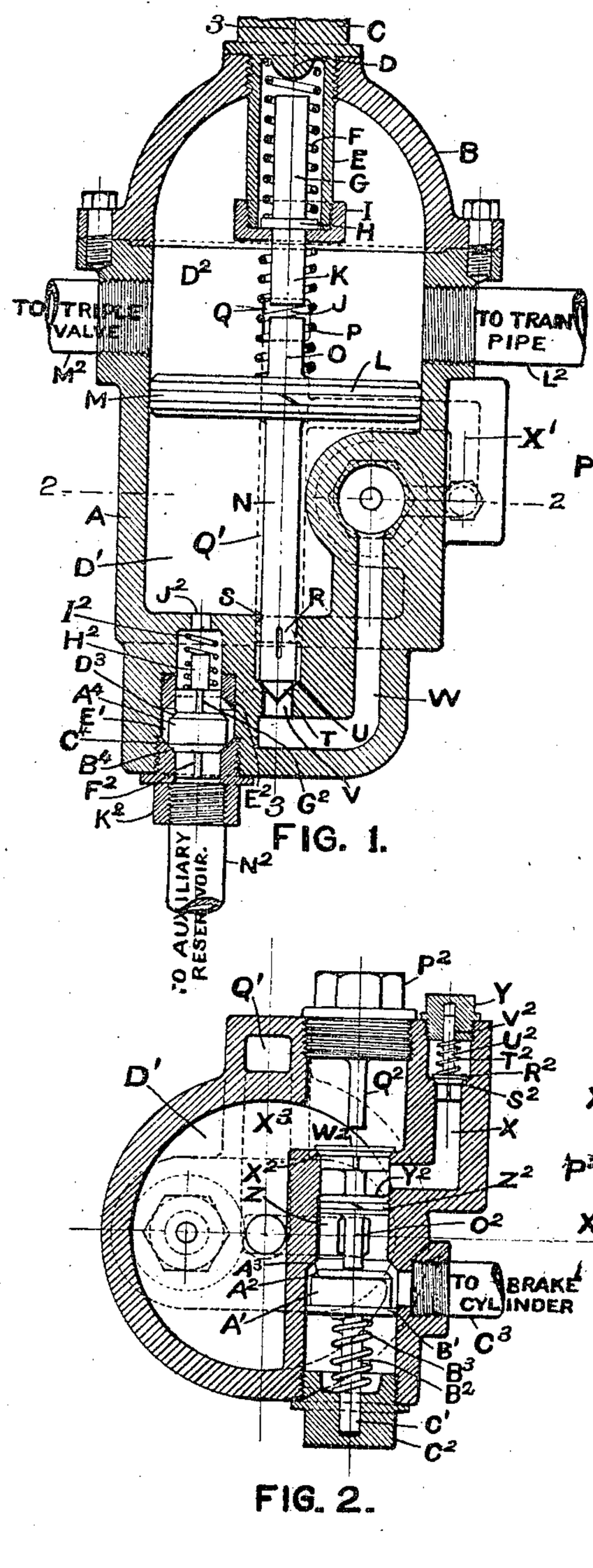

FIG. 1.

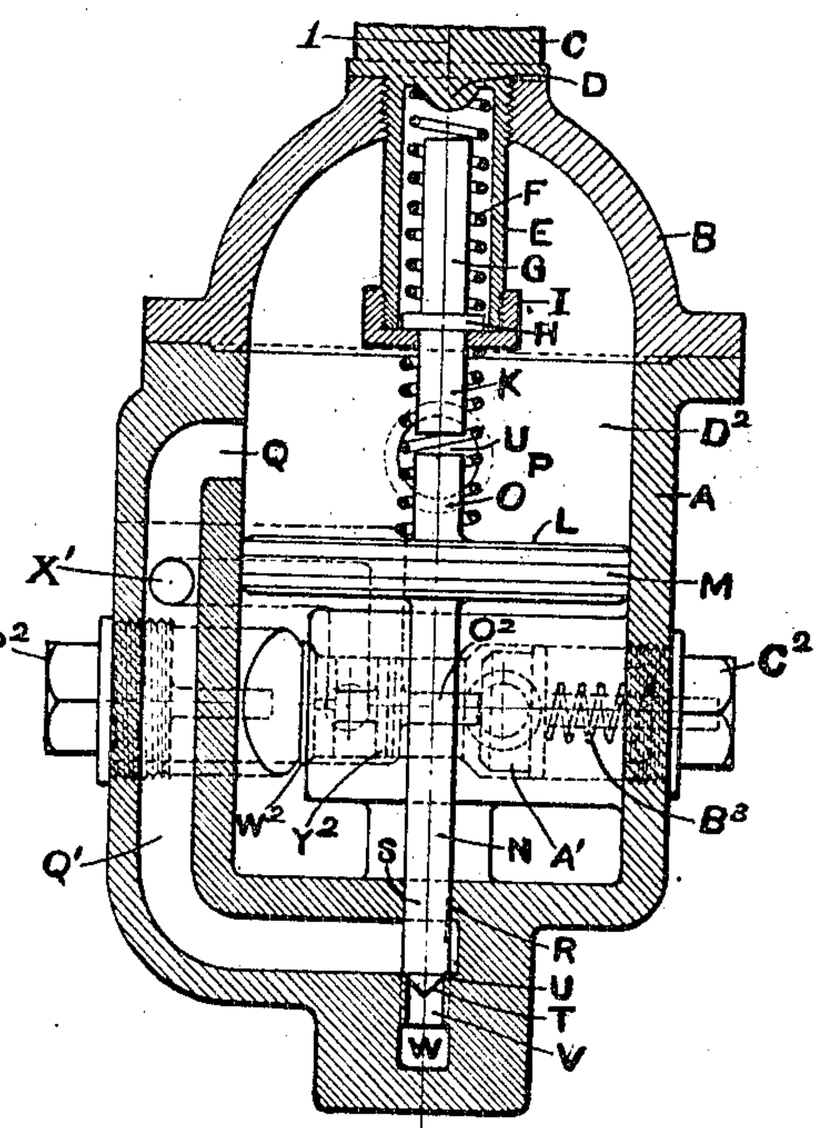

FIG. 3.

FIG. 2.

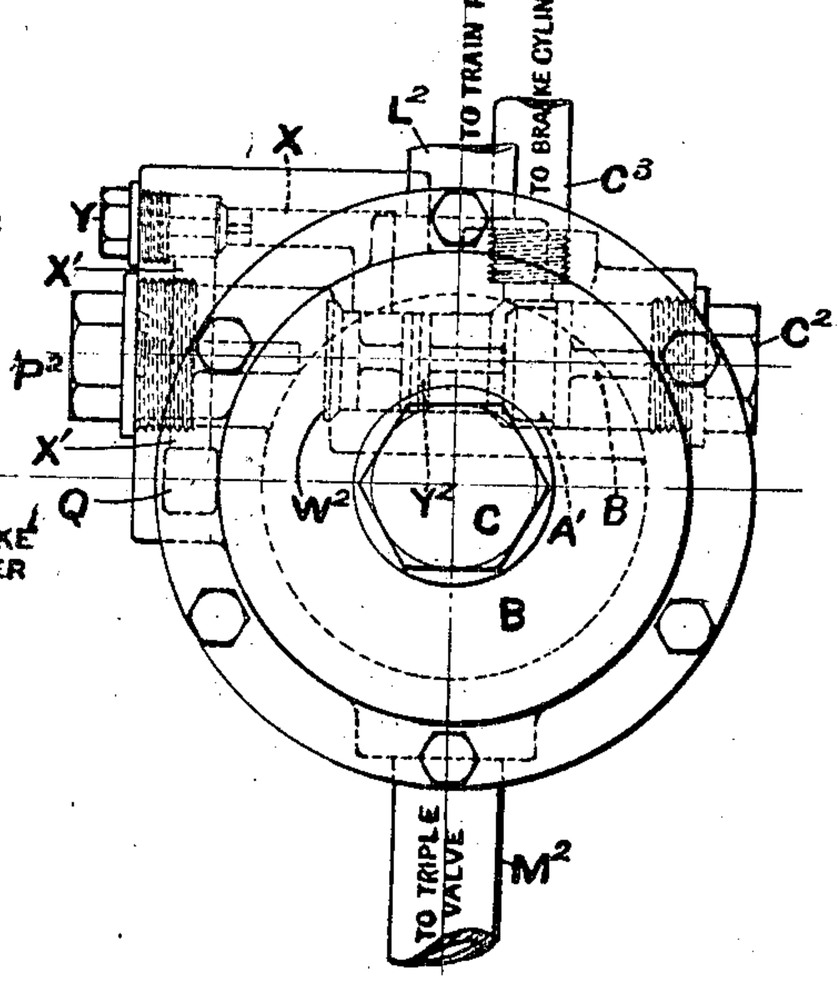

FIG. 4.

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LOCAL-APPLICATION AND EQUALIZING VALVE.

No. 837,358. Specification of Letters Patent. Patented Dec. 4, 1906.

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To all whom it may concern:

Be it known that we, WALTER V. TURNER and DAVID M. LEWIS, citizens of the United States, and residents of Raton, Colfax county, Territory of New Mexico, have invented certain new and useful Improvements in Local-Application and Equalizing Valves, of which the following is a specification.

Our invention relates to fluid-pressure railway-brakes, and more particularly to a local-application and equalizing valve adapted to be applied to the ordinary form of fluid-pressure railway-brakes, such as the common type of automatic air-brakes with which a triple valve, either with or without quick-action parts, is employed.

Our objects are to provide a valve mechanism of the character indicated by the use of which a local reduction can be secured on each car, thereby securing quicker and more uniform application of the brakes, thus preventing slack of the draft-gear from running in quicker than it can be taken up, obviating an objection which in the prior constructions with which we are familiar has been the cause of frequent damage; to secure a heavy and quick application for emergency service with air from the train-line in addition to the auxiliary air; to secure a uniform brake-cylinder pressure irrespective of piston travel, thereby causing each car to do its own share of the braking action in the train; to secure and maintain an auxiliary-reservoir pressure which shall be equal and uniform throughout the train, thereby insuring a more uniform release of the brakes, resulting in the elimination largely of rough handling of trains, which frequently causes the breaking in two of the trains and other damage; to provide a valve structure of the character defined in which the air from the train-line in a service application instead of being wholly exhausted to the atmosphere may be diverted partly to the brake-cylinder and there perform a useful service, and, finally, to provide a local-application and equalizing valve which shall comprise the fewest number of parts, arranged in the simplest and most compact manner and capable of ready application to existing and other similarly-constructed braking mechanisms and adapted to perform the service desired in the most effective manner and which shall embody the most durable arrangement of parts.

With these objects in view our invention consists of the novel construction and combination of parts and details thereof, as hereinafter described, with reference to the accompanying drawings, and more particularly pointed out in the claims.

In the drawings, Figure 1 is a central vertical section on the line 1 1, Fig. 3, with the piston and valves in elevation. Fig. 2 is a transverse section on the line 2 2, Fig. 1, with the valves in elevation. Fig. 3 is a central vertical section on the line 3 3, Fig. 1, with the piston and valves in elevation, and Fig. 4 is a top plan view of Fig. 3.

Referring to the drawings, in which the same reference characters relate to the same or corresponding parts in all the views, the letter A indicates a valve-body which is preferably cast in one piece, with cored passages and cavities for ports, conduits, and valve-chambers formed therein, the top of which chamber is preferably closed by a removable cap B. Within the chamber of the valve body or casing A is a movable equalizing abutment or piston L, dividing the casing into two chambers, an expansion and equalizing chamber D' below the piston and an expansion-chamber D^2 above the said piston, the latter of which is provided with the usual packing-ring M. Extending from the lower face of the abutment or piston L is a stem N, the lower end of which passes through a close-fitting feedway S, formed in the casing A, and terminates in a beveled lower face, thus constituting a train-line reduction-valve T, adapted to seat against a similarly-beveled seat U. Extending from the upper face of the piston L is a post O, which acts as a stop in service application by contact with a similar post K, projecting downwardly from the graduating-stem G, confined within a cage E, carried by a spring-case nut C, screwed in the cap B, the lower end of said cage being closed by a cap I, against which a collar H on the graduating-stem G normally rests and acts as a lower stop for said graduating-stem, the latter of which passes through a close-fitting opening in the cap I, which acts as a guide for said stem. Confined within the cage E is an emergency-spring F, the upper

end of which seats against the cap C and the lower end against the collar H on the stem G. A projection or boss D on the lower face of the nut C acts as the upper stop for the graduating-stem G. Confined between a fixed part of the structure, such as the cap I and the abutment or piston L, is a graduating-spring P, which surrounds the projecting post O, the latter acting as a guide therefor. Between the posts O and K is a space J, which is so proportioned as to provide for the proper movement of the piston L for the ordinary service application.

The chamber D^2 above the piston L is connected to the train-pipe by a pipe or conduit L^2 and to the triple valve by a pipe or conduit M^2, and the chamber D′ is connected to the auxiliary reservoir by a pipe or conduit N^2 through the medium of a passage or conduit J^2 and a valve cavity or chamber E′, into which the pipe or conduit N^2 opens. Confined within the chamber or cavity E′ is an auxiliary admission and check valve A^4, consisting of a double-face valve-body having beveled faces D^3 and B^4, adapted to seat against correspondingly-beveled seats E^2 and C^4, and projecting from each side of the valve-body A^4 are ordinary winged guides F^2 and G^2, from the latter of which extends a guiding-post H^2 for a spring I^2, confined between one side of the valve and a fixed part of the structure, such as the lower face of the partition-wall between the chamber D′ and the valve-cavity.

The chamber D^2 is connected with the chamber D′ by means of a passage or conduit Q′, forming a by-pass around the abutment or piston L, one end of which communicates, through a port Q, with the chamber D^2 and the other end with the space surrounding the lower end of the stem N, so that in the position shown in the drawings the flow is first through the port Q, thence through Q′ past the stem N and into the chamber D′, and under certain conditions hereinafter described when the valve T is in its extreme open position the chamber D′ is connected with the passage or conduit Q′ by means of a feed groove or conduit R, formed in the side of the stem N, the said feed groove or conduit under the ordinary conditions of operation, such as in service applications, being out of register with the chamber D′, but in emergency application being in register therewith. To provide a suitable communication between the space in the lower end of the conduit or passage Q′ and the brake-cylinder, the reduction-valve T controls a passage or conduit V, which connects the conduit Q′ with a conduit or passage W, communicating with a valve-cavity Z, preferably formed in the side of a valve-body A transverse to the axis of the same. When, therefore, the valve T is raised from its seat, it will be observed that free communication is established between the passage Q′, the passage V, the passage W, and the valve cavity or chamber Z, the latter of which is in communication with the brake-cylinder by means of a pipe or conduit C^3.

Operating within the cavity Z is a piston-valve W^2, connected to its operating-piston Y^2 by a stem, such piston being provided with the usual packing-ring Z^2. The valve W^2 is preferably of disk form, having a beveled face seated against the beveled seat X^2, (see Fig. 2,) and the chamber Z is in communication with the chamber D′ by means of a suitable port or passage X^3, opening into the said chamber above the valve W^2. The chamber Z is closed at each end by caps P^2 and C^2, from the former of which extends a stop Q^2, which limits the upward movement of the valve W^2, and extending from the lower side of the piston Y^2 is a post or stop O^2, which when the valve W^2 is seated, as shown in Fig. 2, is adapted to contact with the upper face of the brake-cylinder check-valve A′, whose beveled face A^2 is adapted to seat against a correspondingly-beveled seat A^3 when moved toward said seat, thereby shutting off communication between the brake-cylinder and the piston-valve cavity. Secured to or forming part of the check-valve A′ is a tight-fitting collar B′, between which and the nut C^2 is confined a spring B^3, guided by a stem B^2, extending from the lower face of the valve A′ and working in a guiding-recess C′ and in said cap C^2. This check-valve is so arranged that under a certain predetermined pressure when a predetermined reduction of pressure is attained in the expansion-chamber, which is communicated through the various connecting conduits or passages to the chamber Z, the said valve will be moved by the spring B^3 and the air confined between the cap C^2 and the collar B′, thereby seating the valve against its seat A^3 and cutting off the brake-cylinder, so as to prevent return of air from the brake-cylinder to the train-line. Communicating with the chamber Z is a passage X, whose opening into the chamber is slightly above the top of the piston Y^2. At the other end of this passage or opening X is a valve-seat S^2, upon which is adapted to seat an emergency exhaust-valve R^2, preferably in the disk form, the lower face of which is beveled to fit the correspondingly-beveled seat, from the other face of which valve extends the stem U^2, the end of which operates in a guiding-recess V^2, formed in the nut Y, closing the valve-chamber, and around this stem is a spring T^2, confined between a fixed part, as the nut, and the valve R^2. The chamber of this exhaust-valve is connected to the conduit Q′ by the passage or conduit X′, the conduits X and X′ thus being on opposite sides of the disk valve R^2.

The parts shown in the drawings are in the positions assumed when air has been supplied to the train-pipe in the usual manner.

To effect this, the air enters the train-pipe in the usual way, passes from the pipe L^2 into the chamber D^2, through the same to the triple valve by way of the pipe M^2, and consequently charges the auxiliary reservoir under each car in the ordinary way. At the same time air also passes through the port Q into the conduit Q′ and upwardly through what may be termed a "leak-passage" formed between the close-fitting stem N and the feedway S into the equalizing-chamber D′ and from the latter through the passage X^3 into the space above the valve W^2, and when the latter is slightly opened pressure is exerted against the piston Y^2 and forces the same downward, causing the valve W^2 to close against its seat. Air also passes from the chamber D′ through the passage J^2, holding the valve A^4 close against its lower seat C^4, thereby charging the various parts to standard pressure of, say, seventy pounds. With the parts in the positions thus attained, when an application, as in service, is made by a reduction of train-line pressure the pressure in the chamber D^2 above the abutment or piston L falls more rapidly than it does in the chamber D′, and consequently the abutment or piston L is caused to move upwardly, thereby unseating the train-line reduction-valve T and opening communication between the conduit Q′ and the conduit W. This action permits a train-line reduction to take place through the passages indicated by way of the valve-cavity Z past the valve A′ through the pipe C^3 to the brake-cylinder, such action taking place very gradually by the valve A′, and consequently the movement of the triple piston is locally assisted, thereby causing the brakes to apply in service more quickly than the slack of the draft-gear can be run in. The expansion-chamber pressure thus attained in the chamber D′ is, it will be observed, maintained by air from the auxiliary reservoir or other separate expansion-chamber, if desired, such air from the auxiliary reservoir flowing past the valve A^4 until the auxiliary pressure falls by reduction to the brake-cylinder, and air likewise feeds back slowly to the train-line past the stem N through the passage Q′ and chamber D^2. When equalization takes place between the train-line and the chamber D′, or slightly before this occurs, the abutment or piston L will be forced downward by the spring P, thereby causing the valve T to close against its seat, which action occurs about the time that the exhaust ceases at the engineer's valve, thereby stopping the train-line reduction and permitting the triple valve to go to lap position, such graduated application being repeated as often as desired until equalization takes place under all the cars. It will be observed that in the movement of the abutment or piston L upwardly the stop K and the spring F when the projection or post O comes in contact with said stop prevents further upward movement of the piston in ordinary service application. When, however, an emergency application or reduction is made, the air is suddenly drawn from the train-pipe in large volume, and consequently from the chamber D^2 above the abutment or piston L, and therefore greater excess of pressure in the chamber D′ causes the abutment or piston L to move suddenly and to forcibly strike the stop K, moving the stem N upwardly to an extent determined by the amount of reduction. This action causes the reduction-valve T to be raised higher from its seat and permits the train-line air to flow in large volume to the brake-cylinder port V, the passage or conduit W, past the check-valve A′ to the brake-cylinder. When the abutment or piston L lifts to this height, the feed groove or conduit R is brought into direct connection with the chamber D′, the upper end registering with the chamber and the lower end with the space around the reduction-valve T, and consequently the pressure in the chamber D′ is rapidly reduced to that of the train-line, whereupon the springs F and P force the abutment or piston L downwardly, thereby seating the valve T, thus preventing air from feeding back from the brake-cylinder to the train-line. With the pressure thus confined in the chamber D′ it is evident that if some means were not provided for emptying the chamber D′ of pressure as the train-line continued to reduce, as in the emergency application or in the event of the train breaking in two, thereby causing a sudden reduction, such expansion-chamber pressure would again raise the abutment or piston L, and thereby permit the brake-cylinder to feed back to the train-line, and therefore to release the brakes, and to prevent this occurrence the spring B^3 under the check-valve A′, acting in conjunction with the pressure confined below the valve by the close fit of the same and the pressure on the under side of the piston Y^2, raises the valve W^2 as soon as the brake-cylinder pressure reaches that of the train-line, and thereby permits the air remaining in the chamber D′ to pass through the conduit X to the valve R^2, and as the pressure on the train-line side of this valve is less than that created in the passage or conduit X the valve R^2 is raised from its seat, thereby affording exhaust for the chamber D′ through the conduit or passage X′, the conduit or passage Q′, the chamber D^2, and thence to the train-line, and at the same time the higher auxiliary pressure forces the valve A^4 to its seat, thereby preventing auxiliary pressure going back to the train-line. By this means both the auxiliary pressure and the brake-cylinder pressure are

retained. Thus it will be seen that all these operations are automatically performed in the most effective way and release of the brakes prevented until such release is desired, while the present operation of the triple is not interfered with in any way except that the present emergency parts of the triple are not required, and thus this valve can be so mechanically constructed as to be attached to the present quick-action triple, removing the present quick-action parts. The desired release of the brakes is accomplished in the usual manner—namely, by the engineer increasing the train-line pressure—though much more uniformly than at present, as it is evident that if there is a tendency on any brake on account of unequal piston travel to equalize higher than the required fifty pounds with twenty pounds reduction as the valve T is raised the pressure from the brake-cylinder and auxiliary reservoir will flow back to the train-line, and thence to the other brake-cylinders, where the pressure is lower on account of longer piston travel. Thus when equalization is attained by, say, a twenty-pound reduction all the auxiliaries will be of an equal pressure, which uniform pressure permits a uniform release of the brakes.

While we have used the terms "upper" and "lower," "upwardly" and "downwardly" in this specification, it is to be understood that such terms and those of a similar import are employed both in the description and claims merely for convenience and are not words of limitation, but only descriptive, since it is obvious that the valve structure may be employed in any suitable position, and, furthermore, the term "abutment" or "piston" is intended to cover the generic form of this element, whether diaphragm or piston, while the term "air" is likewise used for the sake of brevity in a similar manner and with the same legal effect, it being understood that our invention applies to any form of fluid-pressure railway braking mechanisms to which it is adapted, as will be readily understood by those skilled in the art, that form in which the fluid-pressure is created by the use of compressed air being a common type in use.

It will be further observed from the foregoing description that the movable abutment controls the feed-passage between the conduit or by-pass Q′, leading from the first or upper chamber around said abutment and the second or lower expansion and equalizing chamber, said passage being normally restricted, owing to the tight fit of the abutment-stem and enlarged by the groove when abnormal reduction takes place in the train-line, and that all the parts coöperate efficiently to permit local reduction in the train-line to effect service application or sudden or abnormal local reduction in the train-line to effect emergency application, such actions occurring locally under each car, and the service application locally assisting in the triple-valve movement, while repeated applications readily secure equalization, so as to permit uniform release of the brakes when desired.

We claim as our invention—

1. In a fluid-pressure railway-brake mechanism, the combination of a casing, a movable abutment dividing said casing into two chambers, one communicating with the train-line and the triple valve, a valve-controlled conduit leading from the other chamber to the auxiliary reservoir, a conduit connecting the first chamber with the brake-cylinder, and a valve operated by the movable abutment controlling said conduit, substantially as described.

2. In a fluid-pressure railway-brake mechanism, the combination of a casing, a movable abutment exposed to train-line pressure on one side thereof and a normally restricted leak-passage for the flow of fluid from said side of the abutment to the other, a by-pass around the abutment and communicating with the brake-cylinder in service as well as emergency applications, a valve operated by the abutment controlling said passage, and a valve-controlled passage leading from the casing to the auxiliary reservoir, substantially as described.

3. In a fluid-pressure railway-brake mechanism, the combination of a casing, a movable abutment dividing said casing into two chambers, one communicating with the train-line and the triple valve, a conduit connecting said chamber with the brake-cylinder, a valve operated by the movable abutment controlling said conduit, and a feed-passage between said latter conduit and the other chamber controlled by the movable abutment, substantially as described.

4. In a fluid-pressure railway-brake mechanism, the combination of a casing communicating with the train-line and triple valve, a conduit adapted to connect said casing with the brake-cylinder, and valve mechanism operated by a reduction of train-line pressure, whereby local reduction may be effected to the brake-cylinder, thereby locally assisting in the movements of the triple valve, substantially as described.

5. In a fluid-pressure railway-brake mechanism, the combination of a casing, a movable abutment therein dividing said casing into two expansion and equalizing chambers, one of which is in communication with the train-line and triple valve, a by-pass around said abutment connecting said latter chamber with the brake-cylinder, a restricted leak-passage from said conduit to the other chamber, and a valve operated by the movable abutment for controlling the flow of fluid through said conduit, substantially as described.

6. In a fluid-pressure railway-brake mechanism, the combination of a casing communicating with the train-line and the triple-valve structure and brake-cylinder, mechanism in said casing controlled by local reduction of pressure in the train-line for causing said train-line reduction to occur locally and be transmitted to the brake-cylinder thereby locally assisting in the movement of the triple valve, substantially as described.

7. In a fluid-pressure railway-brake mechanism, the combination of a casing interposed in the train-line leading to the triple valve and through which casing the train-line pressure is transmitted to the triple valve, said casing communicating with the brake-cylinder, and valve mechanism operating in said casing and controlled by the variations in pressure in the train-line to cause a local reduction from the train-line through the casing to the brake-cylinder, substantially as described.

8. In a fluid-pressure railway-brake mechanism, the combination of a casing interposed in the train-line leading to the triple-valve structure and through which train-line pressure is transmitted, said casing communicating with the brake-cylinder, valve mechanism in said casing controlled by variations in pressure in the train-line to cause a local reduction of pressure from the train-line to the brake-cylinder, thereby locally assisting the triple-valve movement, means for permitting an emergency movement of said valve mechanism upon sudden and abnormal reduction in the train-line, and a brake-cylinder valve operating to close communication between the brake-cylinder and the casing upon said reduction to prevent return of pressure from the brake-cylinder, substantially as described.

9. In a fluid-pressure railway-brake mechanism, the combination with the train-line, triple valve and brake-cylinder, of a local application and equalizing valve mechanism operated by a reduction of train-line pressure in service, as well as emergency, application to permit local reduction from the train-line to the brake-cylinder, thereby locally assisting the movement of the triple valve, substantially as described.

10. In a fluid-pressure railway-brake mechanism, the combination of a casing communicating with the train-line and triple-valve structure, conduits connecting said casing with the brake-cylinder, valve mechanism operated by a reduction of train-line pressure to permit a local reduction from the train-line to the brake-cylinder, a brake-cylinder check-valve controlling the conduit to the brake-cylinder and adapted to prevent return of fluid-pressure from the brake-cylinder when a sudden reduction occurs, but normally open for service application, substantially as described.

11. In a fluid-pressure railway-brake mechanism, the combination of a casing communicating with the train-line and triple-valve structure, conduits connecting said casing with the brake-cylinder, valve mechanism operated by a reduction of train-line pressure to permit a local reduction from the train-line to the brake-cylinder, a brake-cylinder check-valve controlling the conduit to the brake-cylinder and adapted to prevent return of fluid-pressure from the brake-cylinder when a sudden reduction occurs, but normally open for service application, and an emergency exhaust-valve normally closed in service application, but automatically operated to permit flow of pressure to the train-line after a sudden or emergency application, substantially as described.

12. In a fluid-pressure railway-brake mechanism, the combination of a casing communicating with the train-line and the triple-valve structure, conduits leading from the casing to the auxiliary reservoir and to the brake-cylinder, check-valves in each conduit, valve mechanism operated by a reduction of train-line pressure to permit reduction to the brake-cylinder, and an emergency-valve mechanism operated by a sudden reduction or emergency application, a conduit normally closed by said valve communicating with the train-line, and an emergency exhaust-valve in said conduit, substantially as described.

13. In a fluid-pressure railway-brake mechanism, the combination of a casing, a movable abutment dividing the casing into two chambers, one connected to the train-line and triple-valve structure, and the other to the brake-cylinder, a conduit connecting the first chamber with the brake-cylinder, a restricted feedway between the second chamber and said conduit, a reduction-valve operated by the abutment normally closing the conduit between the first chamber and the brake-cylinder, whereby local reduction in the train-line causes the abutment to move and operate the reduction-valve, substantially as described.

14. In a fluid-pressure railway-brake mechanism, the combination of a casing, a movable abutment dividing the casing into two chambers, one connected to the train-line and triple-valve structure, a conduit connecting the first chamber with the brake-cylinder, a restricted feedway between the second chamber and said conduit, a reduction-valve operated by the abutment normally closing the conduit between the first chamber and the brake-cylinder, a normally closed emergency reduction-valve in said conduit between the first valve and the brake-cylinder, and means for opening said valve when a sudden reduction occurs in the train-line, substantially as described.

15. In a fluid-pressure railway-brake mech-

anism, the combination of a casing, a movable abutment dividing the casing into two chambers, one connected to the train-line and triple-valve structure, a conduit connecting the first chamber with the brake-cylinder, a restricted feedway between the second chamber and said conduit, a reduction-valve operated by the abutment normally closing the conduit between the first chamber and the brake-cylinder, a normally closed emergency reduction-valve in said conduit between the first valve and the brake-cylinder, a normally open brake-cylinder check-valve in said conduit, and means for causing said valve to close and at the same time open the emergency reduction-valve, substantially as described.

16. In a fluid-pressure railway-brake mechanism, the combination of a casing, a movable abutment dividing the casing into two chambers, one connected to the train-line and triple-valve structure, a conduit connecting the first chamber with the brake-cylinder, a restricted feedway between the second chamber and said conduit, a reduction-valve operated by the abutment normally closing the conduit between the first chamber and the brake-cylinder, a normally closed emergency reduction-valve in said conduit between the first valve and the brake-cylinder, a normally open brake-cylinder check-valve on said conduit, means for causing said valve to close and at the same time open the emergency reduction-valve, and a valve-controlled conduit between the second chamber and the train-line normally closed by its valve, but opened thereby upon a sudden reduction, substantially as described.

17. In a fluid-pressure railway-brake mechanism, the combination of a casing, a movable abutment dividing said casing into two chambers, one open to the train-line and triple-valve structure, a by-pass around the abutment, a feedway between the second chamber and the by-pass, a stem on the abutment closely fitting said feedway and terminating in a valve, a conduit connecting the by-pass with the brake-cylinder and normally closed by said valve, substantially as described.

18. In a fluid-pressure railway-brake mechanism, the combination of a casing, a spring-pressed movable abutment dividing the casing into two chambers, one open to the train-line and triple-valve structure, a by-pass around said abutment, a feedway between the second chamber and said by-pass, a stem carried by the abutment closely fitting said feedway and terminating in a valve, a conduit normally closed by said valve communicating with the brake-cylinder, and a graduating-stem acting as a stop for the movable abutment in service application, substantially as described.

19. In a fluid-pressure railway-brake mechanism, the combination of a casing, a spring-pressed movable abutment dividing the casing into two chambers, one open to the train-line and triple-valve structure, a by-pass around said abutment, a feedway between the second chamber and said by-pass, a stem carried by the abutment closely fitting said feedway and terminating in a valve, a conduit normally closed by said valve communicating with the brake-cylinder, an emergency reduction-conduit between the second chamber and the train-line, an emergency reduction-valve normally closing the said conduit, and a graduating-stem acting as a stop for the abutment in service application, but movable thereby when sudden reduction occurs in the first chamber from the train-line, substantially as described.

20. In a fluid-pressure railway-brake mechanism, the combination of a casing, a spring-pressed movable abutment dividing the casing into two chambers, one open to the train-line and triple-valve structure, a by-pass around said abutment, a feedway between the second chamber and said by-pass, a stem carried by the abutment closely fitting said feedway and terminating in a valve, a conduit normally closed by said valve communicating with the brake-cylinder, a feed-passage connecting the second chamber with the by-pass normally closed by the stem, but opened by movement of the stem upon sudden reduction in the train-line, substantially as described.

21. In a fluid-pressure railway-brake mechanism, the combination of a casing, a spring-pressed movable abutment dividing the casing into two chambers, one open to the train-line and triple-valve structure, a by-pass around said abutment, a feedway between the second chamber and said by-pass, a stem carried by the abutment closely fitting said feedway and terminating in a valve, a conduit normally closed by said valve communicating with the brake-cylinder, a feed-passage connecting the second chamber with the by-pass normally closed by the stem, but opened by movement of the stem upon sudden reduction in the train-line, a passage connecting the second chamber with the train-line, an emergency reduction-valve normally closing the passage, substantially as described.

22. In a fluid-pressure railway-brake mechanism, the combination of a casing, a spring-pressed movable abutment dividing the casing into two chambers, one open to the train-line and triple-valve structure, a by-pass around said abutment, a feedway between the second chamber and said by-pass, a stem carried by the abutment closely fitting said feedway and terminating in a valve, a conduit normally closed by said valve communicating with the brake-cylinder, a feed-passage connecting the second chamber with the

by-pass normally closed by the stem, but opened by movement of the stem upon sudden reduction in the train-line, a passage connecting the second chamber with the train-line, an emergency reduction-valve normally closing the passage, and a reduction exhaust-valve in said conduit adapted to be opened by pressure in said conduit in excess of the train-line pressure when a sudden reduction is made, substantially as described.

23. In a fluid-pressure railway-brake mechanism, the combination of a casing, a spring-pressed movable abutment dividing the casing into two chambers, one open to the train-line and triple-valve structure, a by-pass around said abutment, a feedway between the second chamber and said by-pass, a stem carried by the abutment closely fitting said feedway and terminating in a valve, a conduit normally closed by said valve communicating with the brake-cylinder, a feed-passage connecting the second chamber with the by-pass normally closed by the stem, but opened by movement of the stem upon sudden reduction in the train-line, a passage connecting the second chamber with the train-line, an emergency reduction-valve normally closing the passage, a reduction exhaust-valve in said conduit adapted to be opened by pressure in said conduit in excess of the train-line pressure when a sudden reduction is made, a conduit connecting the second chamber with an auxiliary reservoir, and a valve for closing said conduit to prevent return of pressure from said auxiliary reservoir when a sudden reduction is made, substantially as described.

24. In a fluid-pressure railway-brake mechanism, the combination of a casing, a movable abutment dividing said casing into two chambers, one communicating with the train-line and triple-valve structure, valve mechanism controlled by the abutment for establishing communication between the first chamber and the brake-cylinder in service application, a valve-chamber in the conduit leading to the brake-cylinder and communicating with the second chamber, an emergency reduction piston-valve normally closing communication between the valve-chamber and the second chamber of the casing and having a projecting stem, and a normally closed brake-cylinder check-valve adapted in its closing movement to strike the said stem and open the emergency reduction-valve when sudden reduction is made, substantially as described.

25. In a fluid-pressure brake, the combination with a train-pipe, auxiliary reservoir, triple valve and brake-cylinder, of a valve device comprising a movable abutment subject to the opposing pressures of the train-pipe and auxiliary reservoir, and a valve operated by said abutment for controlling communication from the train-pipe to the brake-cylinder.

26. In a fluid-pressure brake, the combination with a train-pipe, auxiliary reservoir, triple valve and brake-cylinder, of a valve device comprising an equalizing-chamber, a piston subject to the opposing pressures of the chamber and the train-pipe, a valve operated by said piston for controlling a local train-pipe discharge-port, and a check-valve-controlled passage connecting the said chamber and the auxiliary reservoir.

In testimony whereof we have signed our names to this specification in the presence of two subscribing witnesses.

WALTER V. TURNER.
DAVID M. LEWIS.

Witnesses:
JOHN JOERNS,
C. A. WYHUS.