W. V. TURNER.

BRAKE CONTROL VALVE.

APPLICATION FILED JAN. 30, 1911.

1,145,044.

Patented July 6, 1915.

3 SHEETS—SHEET 1.

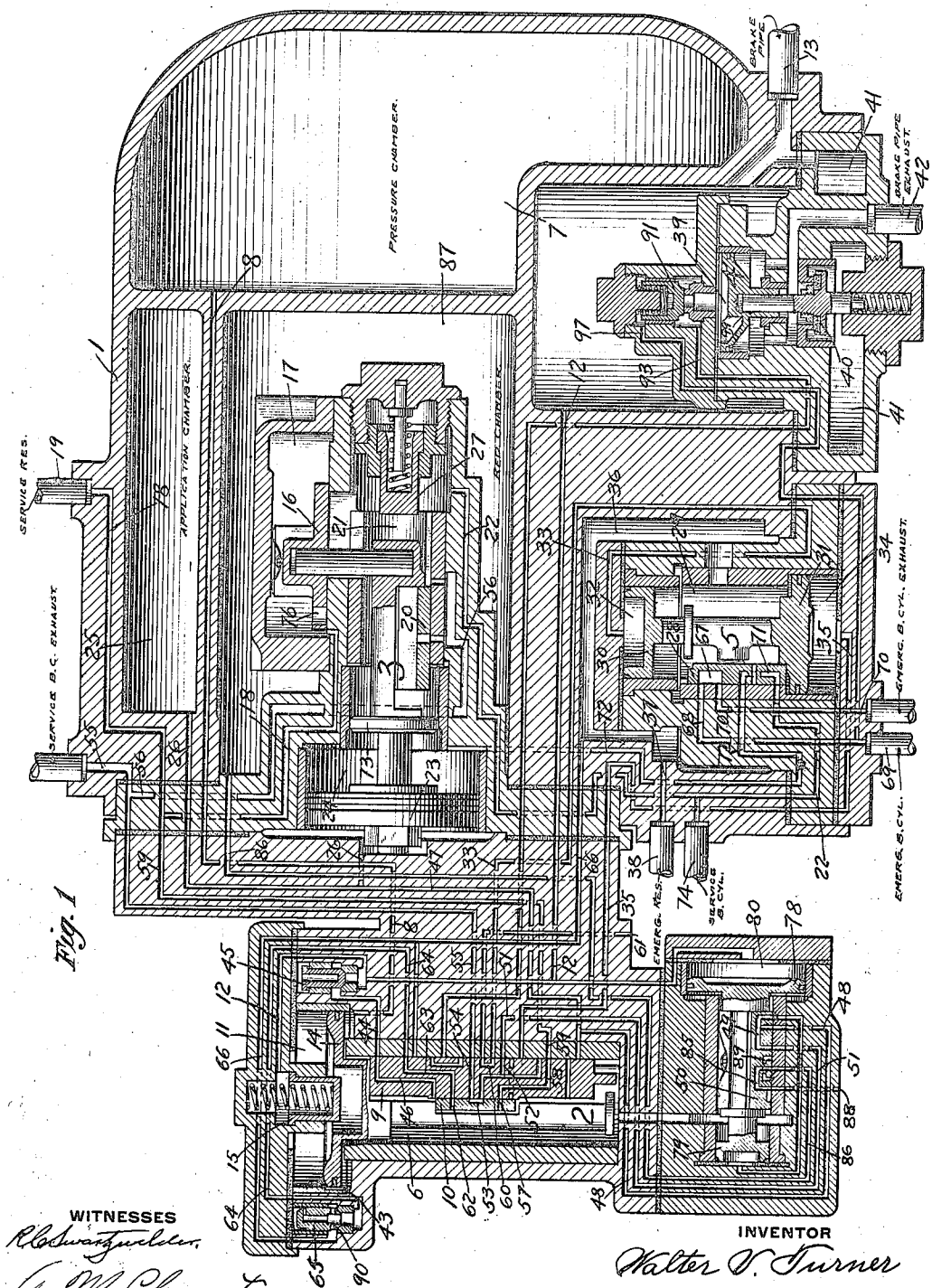

Fig. 1

WITNESSES

R. L. Swartzwelder

G. W. Clemmons

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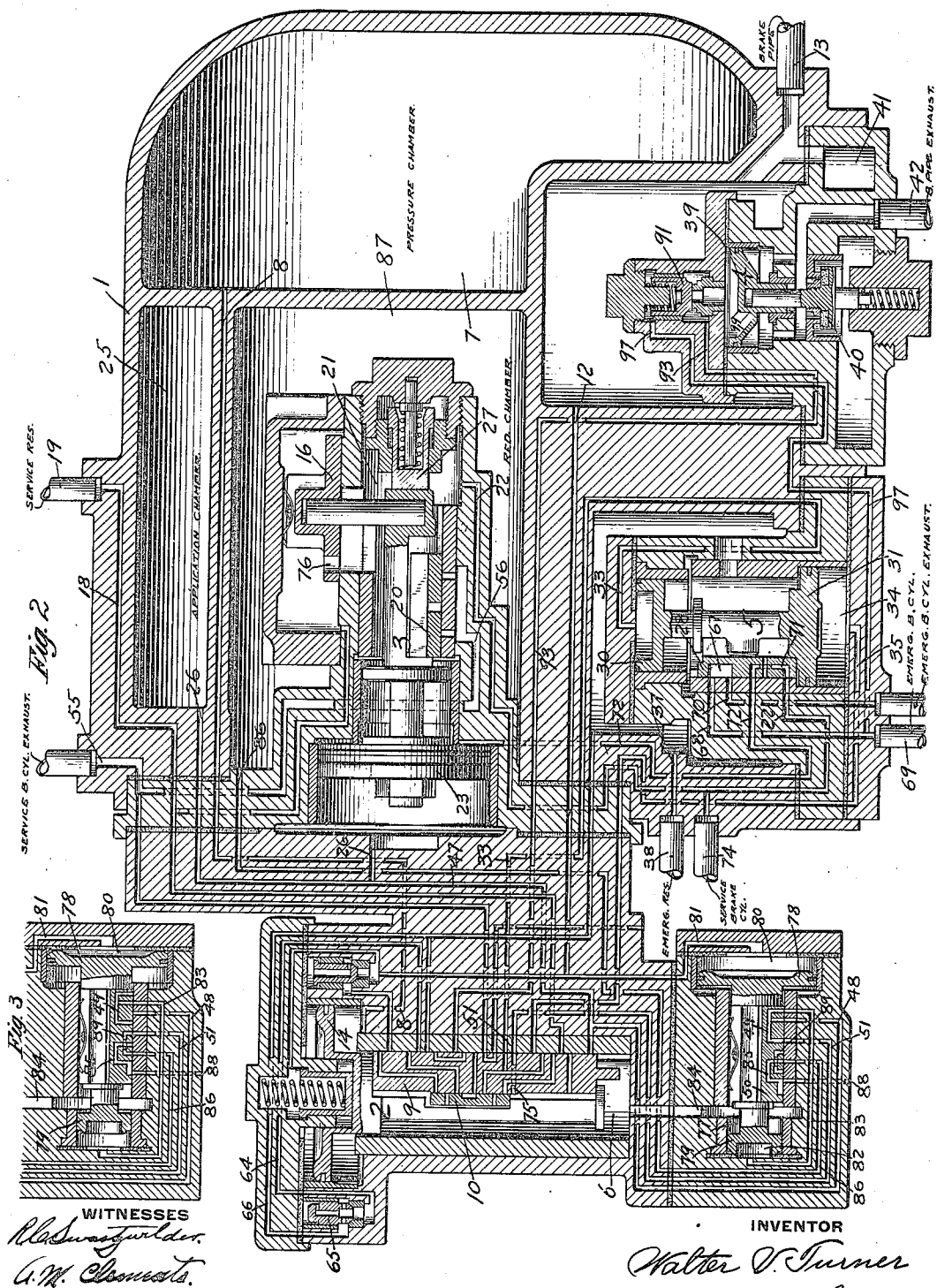

Fig. 2

Fig. 3

WITNESSES

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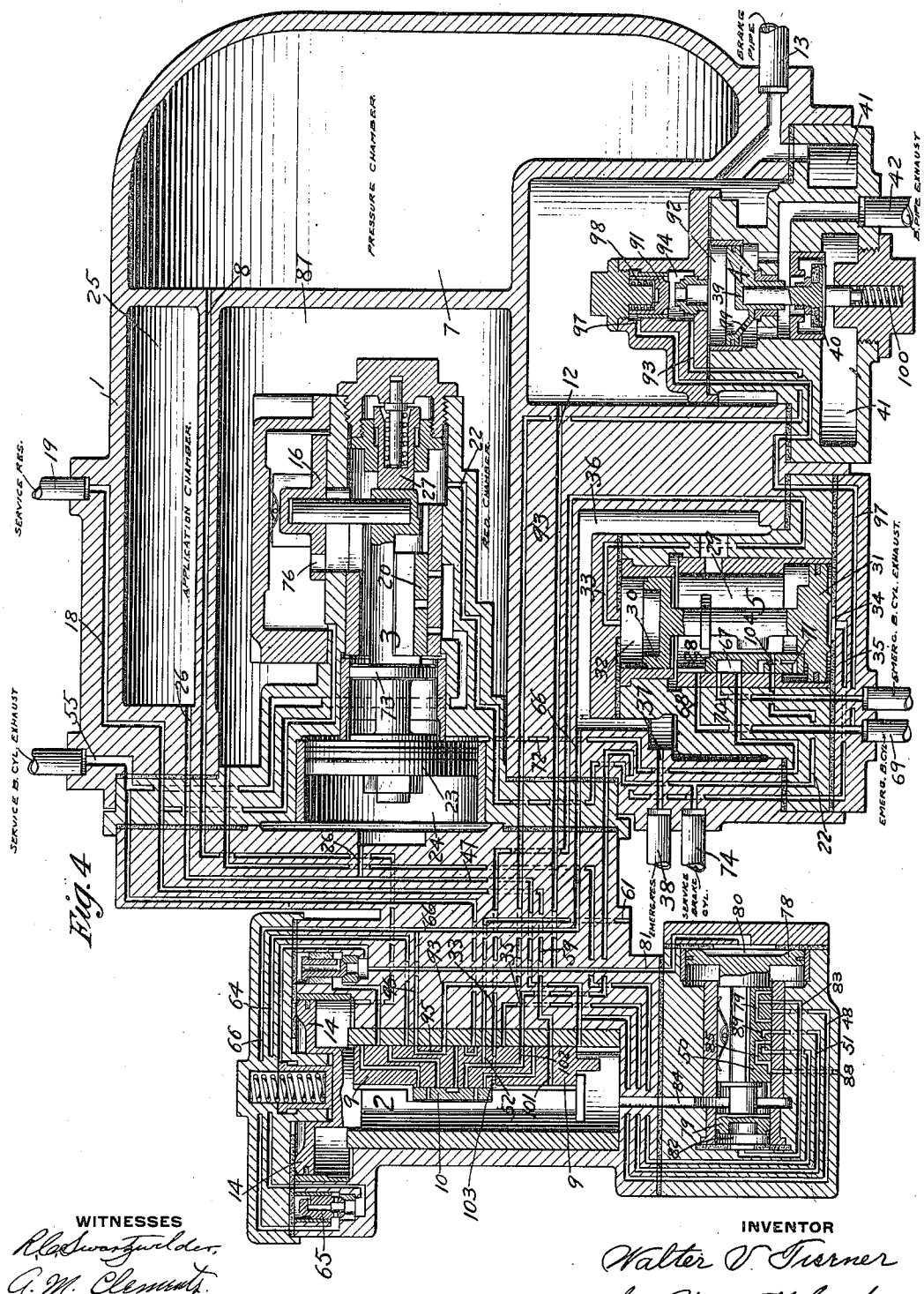

Fig. 4

WITNESSES

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UNITED STATES PATENT OFFICE.

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

BRAKE-CONTROL VALVE.

1,145,044. Specification of Letters Patent. Patented July 6, 1915.

Application filed January 30, 1911. Serial No. 605,387.

To all whom it may concern:

Be it known that I, WALTER V. TURNER, a citizen of the United States, residing at Edgewood, in the county of Allegheny and State of Pennsylvania, have invented new and useful Improvements in Brake-Control Valves, of which the following is a specification.

This invention relates to fluid pressure brakes, and more particularly to a valve mechanism adapted to be operated by variations in train pipe pressure for controlling the brakes on railway cars.

In my prior application Serial No. 549,229, filed March 14, 1910, a construction similar to the one in the present case is disclosed and one of the features of this prior application consists in providing means adapted to prevent the movement of the parts to effect an emergency application of the brakes upon a gradual reduction in train pipe pressure while insuring the production of an emergency application at any time upon a sudden reduction in train pipe pressure.

One object of the present invention is to provide improved means for accomplishing the above purpose.

Another object of my invention is to provide an improved quick action emergency valve mechanism adapted to automatically close the train pipe vent port and limit the reduction in train pipe pressure in an emergency application of the brakes.

While many cars are now provided with brake apparatus having means for graduating the release of the brakes, it sometimes happens that a train will contain a number of cars not so equipped and it may be desirable in such cases to cut out the graduated release on cars provided with means for effecting such action, especially where the cars are of the heavy modern type requiring large reservoir volumes.

Another object of my invention is therefore to provide means for cutting out the graduated release feature on a car, when desired.

In the accompanying drawings; Figure 1 is a diagrammatic sectional view of a control valve mechanism for railway cars embodying my improvements, showing the parts in normal release position; Fig. 2 a similar view, showing the parts in service application position; Fig. 3 a similar view, showing the parts in service application position after equalization of the pressure chamber and application chamber; and Fig. 4 a similar view, showing the parts in emergency application position.

As shown in the drawings, the control valve mechanism may comprise a casing 1 containing an equalizing portion 2, a brake cylinder application and release portion 3, a quick action emergency valve portion 4, and an emergency high pressure valve portion 5.

The equalizing valve mechanism 2 comprises a valve chamber 6 in open communication with a pressure chamber 7 through a passage 8 and containing a main slide valve 9 and a graduating slide valve 10 mounted on said main slide valve and having a movement relative thereto, and a piston chamber 11 connected by a passage 12 to the train pipe 13 and containing a piston 14 for operating said valves, the usual graduating spring stop 15 being provided for defining the service application position of the parts, the stop being loosely fitted to permit flow between the piston chamber 11 and the train pipe passage 12.

The brake cylinder application and release valve mechanism 3 comprises an application valve 16 contained in valve chamber 17 which is in open communication with a passage 18 leading to service reservoir pipe 19, a release valve 20 contained in valve chamber 21, which is constantly in communication with the service brake cylinder through a passage 22, and a piston 23 for operating said valves contained in piston chamber 24 and subject on its outer face to the pressure of the application chamber 25 with which communication is had through a passage 26, a spring stop device 27 being provided for defining the service lap position of the application and release valve mechanism.

The high pressure emergency valve mechanism 5 comprises a valve 28 contained in valve chamber 29 and a differential piston for operating said valve comprising two piston heads 30 and 31, the chamber 32 at the outer face of the piston head 30 having a passage 33 leading to the seat of the main slide valve 9 and the chamber 34 at the outer face of piston head 31 having a pas-

sage 35 also leading to the seat of the main valve 9. The valve chamber 29 intermediate said piston heads 30 and 31 is open to a chamber 36 which in turn communicates with a passage 37 leading to the emergency reservoir pipe 38.

The quick action emergency valve mechanism 4 comprises a piston 39 and a train pipe vent valve 40 operated by said piston for controlling communication from an annular chamber 41 open to the train pipe, to a train pipe exhaust passage 42.

Upon charging the train pipe with fluid under pressure, air flows through the passage 12 to piston chamber 11 and thence through the usual feed grove 43 around the piston 14 to the valve chamber 6 and from said valve chamber air flows through passage 8 to the pressure chamber 7 thus charging the pressure chamber to the pressure carried in the train pipe. The pressure chamber may also be charged from the passage 12 through a quick recharge passage 44 containing check valve 45 and leading to the seat of the main slide valve, said passage 44 being adapted in release position of the parts to register with a through port 46 in the main slide valve 9. The equalizing valve mechanism 2 being in release position, the application chamber 25 and the chamber at the outer face of piston 23 are connected to the atmosphere in the following manner: through passage 26, passage 47, passage 48, cavity 49 in a valve 50, the purpose of which will be described hereinafter, passage 51, port 52 in the slide valve 9, cavity 53 in graduating valve 10, port 54 in valve 9, and passage 55 which leads to the atmosphere. The outer face of the application piston 23 being subject to atmospheric pressure, the valve mechanism 3 will assume the position shown in Fig. 1, with the release valve 20 opening an exhaust passage 56 to the valve chamber 21 and therefore the service brake cylinder which is connected thereto by the passage 22. In the release position of the equalizing valve mechanism, the service reservoir is charged from the valve chamber 6 through a port 57 in the graduating valve 10, a port 58 in the main valve 9, and a passage 59, opening into passage 18, and the valve chamber 17 is charged with fluid under pressure from the service reservoir through the passage 18. Passage 33 from chamber 32 at one side of piston head 30 is connected by cavity 60 in main valve 9 with an exhaust passage 61 while passage 35 leading from chamber 34 at the outer face of piston head 31 is closed. The emergency reservoir is charged from the valve chamber 6 through a port 62 in the graduating valve 10, port 63 in main valve 9, passage 64, past check valve 65, and through passage 66 to chamber 36 which is connected to the emergency reservoir pipe 38 by passage 37. Fluid at emergency reservoir pressure leaks past the piston head 31, which is of sufficiently loose fit for the purpose, and equalizes into chamber 34, and as the opposite piston head 30 is now open to the atmosphere, the unbalanced pressure on the high pressure valve mechanism maintains the same in the position shown in Fig. 1, in which position a cavity 67 in the valve 28 connects passage 68, leading to the emergency brake cylinder pipe 69, with a passage 70 leading to the atmosphere, and a cavity 71 in the valve connects passage 22 leading to the valve chamber 21 and the service brake cylinder pipe 74 with a passage 72 leading to the chamber between piston 23 and a piston 73.

A service application of the brakes may be effected by making a gradual reduction in train pipe pressure in the usual manner and the equalizing valve mechanism is then shifted to service application position, as shown in Fig. 2. In this position, air is supplied from the pressure chamber to the application chamber through a port 75 in the main valve 9, passage 51, cavity 49 in valve 50, passage 48, passage 47, and passage 26. Fluid thus supplied to the application chamber shifts the application and release valve mechanism 3 to the position shown in Fig. 2, closing the exhaust port 56 and opening communication from valve chamber 17 through a port 76 in the valve 16 to valve chamber 21, so that fluid under pressure is supplied from the service reservoir to the chamber 21 and thence flows through passage 22 to the service brake cylinder. When the pressure in the pressure chamber 7 has been reduced by flow to the application chamber to a point equal to or slightly less than the train pipe pressure, the equalizing piston 14 shifts the graduating valve 10 and laps the port 75 and when the pressure in the service brake cylinder becomes substantially equal to the pressure in the application chamber, the piston 23 is shifted by the graduating spring stop 27 and causes valve 16 to close the port 76. To increase the brake cylinder pressure, further gradual reductions may be made, by which the piston 14 is operated to shift the graduating valve 10 and open the service port 75, the application piston then responding to the increase in application chamber pressure to cause the valve 16 to admit a further supply of air to the service brake cylinder.

As so far described, it will be evident that should the train pipe pressure be reduced below the point at which the pressure chamber equalizes with the application chamber, the pressure on the pressure chamber side of the piston 14 will exceed that on the train pipe side and thereby the equalizing valve mechanism will be shifted to emergency application position, even under a

gradual reduction in train pipe pressure, thus producing an emergency application of the brakes when not desired.

One feature of my invention consists in providing means for preventing an emergency application under the above conditions, and for this purpose a valve mechanism is provided comprising a valve 50 contained in valve chamber 77 and a differential piston for operating said valve having two heads 78 and 79, the chamber 80 at the outer face of piston head 78 being connected by passage 81 to the train pipe and the chamber 82 at the outer face of the head 79 being provided with a passage 83 leading to the seat of the valve 50. The valve chamber 77 is constantly open to the valve chamber 6 through a passage 84, so that the same always contains fluid at the pressure in the pressure chamber. When the piston 78 is in its inner position, the cavity 49 connects passage 83 from the chamber 82 to passages 48 and 51, so that said chamber is supplied with fluid at the pressure admitted to the application chamber and cavity 85 in the valve 50 connects passage 86 leading to a reduction reservoir 87 with a passage 88 opening to the atmosphere. So long as this pressure is less than the train pipe pressure, or in other words, up to the point of equalization, the relative areas of the piston heads 78 and 79 are such that the valve mechanism will be maintained in its inner position, but if in making a service application of the brakes, the pressure chamber becomes equalized with the application chamber then upon a further reduction in train pipe pressure, the equalized pressure acting on the inner side of the valve mechanism will exceed the train pipe pressure acting on the outer face of piston head 78, so that said valve mechanism is thereupon shifted to its outer position, as shown in Fig. 3. In this position, passage 51, which normally serves to supply fluid from the pressure chamber to the application chamber, is connected by a cavity 89 in valve 50 with passage 86, so that fluid from the pressure chamber is vented to the reduction reservoir 87. When the pressure in the pressure chamber and in the valve chamber 6 has become reduced by flow to the reduction reservoir to a degree equal to or slightly less than the reduced train pipe pressure acting on the outer face of piston head 78, the piston 14 is operated to move the graduating valve 10 to close the supply port 75 and the equalizing valve mechanism is thus prevented from going to emergency application position upon a reduction in train pipe pressure below the equalizing point. A further reduction in train pipe pressure causes the piston 14 to again move the graduating valve 10 to open port 75 and supply fluid from the pressure chamber to the reduction reservoir and as hereinbefore described the equalizing valve mechanism is thereby prevented from moving out past the usual service application position. This action continues until the pressure chamber equalizes with the reduction reservoir, then a further reduction in train pipe pressure will cause the movement of the equalizing valve mechanism to emergency position and an emergency application of the brakes will be produced. This degree of pressure is determined by the relative volumes of the pressure chamber and the reduction reservoir and preferably the volumes are such that the equalizing pressure is about 30 pounds. In releasing the brakes after a service application and after equalization, when the valve 50 is in its outer position, the increase in train pipe pressure on the outer face of piston head 78 quickly returns the valve mechanism to its inner position, so that the brakes may be promptly released in the usual manner.

To graduate the release of the brakes after an application, the equalizing piston 14 is shifted to release position by a gradual increase in train pipe pressure in the usual manner, and air is vented from the emergency reservoir through passage 66, openings 90 in check valve 65, passage 64, port 63 in the main valve 9 and port 62 in the graduating valve 10 to the valve chamber 6. The pressure in the valve chamber 6 is thus increased by flow of air from the emergency reservoir to thereby operate the piston 14 and graduating valve 10 to lap the port 63.

In order to be able to cut out the graduated release, the check valve 65 is made reversible, so that in one position, the openings 90 permit flow from passage 65 to passage 64, while if the check valve is reversed, communication is cut off in the direction to prevent flow from the emergency reservoir to the valve chamber 6 while still permitting the charging of the emergency reservoir by flow in the opposite direction from the valve chamber 6.

In order to insure the closing of the quick action train pipe vent valve after the pressures equalize in an emergency application of the brakes, a valve piston 91 is provided for controlling communication from the emergency reservoir to the chamber 92 above the emergency piston 39. In operation, upon a sudden reduction in train pipe pressure, the equalizing piston 14 is shifted to emergency position, as shown in Fig. 4, in which a passage 93 leading from chamber 94 at one side of the valve piston 91 to the seat of the main valve 9, is connected by cavity 95 in said valve with passage 96 which opens into passage 66 communicating with the emergency reservoir. A passage 97 connects the emergency brake cylinder with the opposite side of the valve piston 91. The valve piston 91 is normally held closed by a

spring 98 when the pressures on the opposite sides thereof are substantially equal.

In making an emergency application, fluid from the emergency reservoir flows through passage 93 to chamber 94 and this pressure acting on the valve piston 91 lifts the same from its seat and permits air to flow to the chamber 92, thereby actuating the piston 39 and opening the train pipe vent valve 40 to vent air from the train pipe to the exhaust port 42. As soon as the emergency brake cylinder pressure on the opposite side of the valve piston becomes substantially equal to the emergency reservoir pressure on the opposite side, the spring 98 operates to shift the valve piston 91 to its seat thus cutting off the flow of air from the emergency reservoir to the emergency piston 39 and the pressures on opposite sides of said piston quickly equalizing through the hole 99, the emergency valve parts are returned to the closed position by the spring 100, thus cutting off the further venting of air from the train pipe. In the emergency application position of the equalizing valve, passage 59 from the service reservoir pipe 19 registers with a port 101 in the main valve 9, so that air may flow from the service reservoir to the pressure chamber, in case the pressure in the pressure chamber tends to fall. This obviates any tendency of the air pressure acting on the seat side of the main valve 9 in the exposed ports and cavities, to lift the valve from its seat. In emergency position, passage 47 leading to the passage 26 is uncovered by the main valve 9, so that fluid from the pressure chamber 7 is supplied to the application chamber 25 and the piston chamber 24. The application piston 23 is thereupon shifted to open the port 76 and supply air to the service brake cylinder. Passage 35 leading to chamber 34 registers in this position with a port 102 in the main slide valve 9 which connects with port 52 therein, and port 52 registers with exhaust port 61, so that fluid is vented from the piston head 31. Passage 33 from the chamber 32 is connected to the valve chamber 6 by a port 103 in the main valve 9, so that fluid from the pressure chamber is supplied to the piston head 30. The opposite head 31 having been vented to the atmosphere, the valve mechanism 5 is shifted to the position shown in Fig. 4, in which a through port 104 in the valve 28 registers with passage 22 and port 68 is uncovered so that fluid from the emergency reservoir is supplied to the service brake cylinder and the emergency brake cylinder. Cavity 67 also connects passage 72 with exhaust passage 70, so that the space between pistons 23 and 73 is vented to the atmosphere and thereby assists in maintaining the application and release valve mechanism in application position.

While my improvements are shown in the drawings as applied to a brake control valve mechanism, for the most part these improvements may be employed in connection with an ordinary triple valve device for preventing an emergency application upon gradual reductions in train pipe pressure, for insuring the closure of the quick action valve mechanism and for cutting out graduated release, etc. In the case of a triple valve device, the brake cylinder would correspond with the application chamber in the construction shown in the drawings.

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

1. In a fluid pressure brake, the combination with a train pipe, of an application chamber, the admission of fluid under pressure to which is adapted to effect an application of the brakes, a pressure chamber, a valve device subject to the opposing pressures of the train pipe and said pressure chamber for supplying fluid from the pressure chamber to the application chamber, and a valve mechanism operating upon equalization of the pressure chamber into the application chamber for venting fluid from the pressure chamber.

2. In a fluid pressure brake, the combination with a train pipe, of an application chamber, the admission of fluid under pressure to which is adapted to effect an application of the brakes, a pressure chamber, a valve device subject to the opposing pressures of the train pipe and said pressure chamber and operating upon a reduction in train pipe pressure for supplying fluid from the pressure chamber to the application chamber, and a valve mechanism operating upon a reduction in train pipe pressure below the equalizing point for venting fluid from the pressure chamber.

3. In a fluid pressure brake, the combination with a train pipe, of an application chamber, the admission of fluid under pressure to which is adapted to effect an application of the brakes, a pressure chamber, a valve device subject to the opposing pressures of the train pipe and said pressure chamber and operating upon a reduction in train pipe pressure for supplying fluid from the pressure chamber to the application chamber, and a valve mechanism for controlling the flow of air from the pressure chamber to the application chamber and operating upon equalization of the pressure chamber into the application chamber for closing communication to the application chamber and for venting fluid from the pressure chamber.

4. In a fluid pressure brake, the combination with a train pipe, of an application chamber, the admission of fluid under pressure to which is adapted to effect an application of the brakes, a pressure chamber, a

valve device subject to the opposing pressures of the train pipe and said pressure chamber and operating upon a gradual reduction in train pipe pressure for supplying fluid from the pressure chamber to the application chamber and upon a sudden rereduction in train pipe pressure after an emergency application of the brakes, and a valve mechanism operating upon a gradual reduction in train pipe pressure after equalization of the pressure chamber into the application chamber for venting fluid from the pressure chamber to thereby prevent movement of said valve device to effect an emergency application of the brakes.

5. In a fluid pressure brake, the combination with a train pipe, of an application chamber, the admission of fluid under pressure to which is adapted to effect an application of the brakes, a pressure chamber, a valve device subject to the opposing pressures of the train pipe and said pressure chamber and operating upon a gradual reduction in train pipe pressure for supplying fluid from the pressure chamber to the application chamber, and a valve mechanism subject to the opposing pressures of the train pipe and the pressure chamber for normally establishing communication for supplying fluid from the pressure chamber to the application chamber, said valve mechanism operating upon a reduction in train pipe pressure below the equalizing point to close said communication and vent fluid from the pressure chamber.

6. In a fluid pressure brake, the combination with a train pipe and a valve device operating upon a reduction in train pipe pressure for effecting an application of the brakes, of a quick action emergency valve mechanism operating upon the admission of fluid under pressure thereto for venting fluid from the train pipe and means subject to the opposing pressures of the brake cylinder and said operating pressure for controlling the admission of fluid to said valve mechanism.

7. In a fluid pressure brake, the combination with a train pipe and a valve device operating upon a reduction in train pipe pressure for effecting an application of the brakes, of a quick action emergency valve mechanism operating upon the admission of fluid under pressure thereto for venting fluid from the train pipe and means operated by brake cylinder pressure for cutting off the admission of operating fluid to said emergency valve mechanism to thereby permit the closure thereof.

8. In a fluid pressure brake, the combination with a train pipe and a valve device operating upon a reduction in train pipe pressure for effecting an application of the brakes, of a quick action emergency valve mechanism operating upon the admission of fluid under pressure thereto for venting fluid from the train pipe and a valve piston subject to the opposing pressures of said operating fluid and the brake cylinder pressure for controlling the admission of fluid to operate said emergency valve mechanism, a spring for closing said valve piston upon equalization of the brake cylinder pressure with the controlling pressure, and means for permitting the closing of said emergency valve mechanism when the valve piston closes.

9. In a fluid brake, the combination with a train pipe, a pressure chamber, a valve device subject to the opposing pressures of the train pipe and the pressure chamber for controlling the release of the brakes, of a source of fluid pressure from which fluid is adapted to be supplied through a passage to the pressure chamber side of the valve device to effect a graduated release of the brakes, and a reversible check valve adapted in one position to permit flow through said passage in opposite directions and in its other position to permit flow only in one direction.

10. In a fluid pressure brake, the combination with a train pipe, a source of fluid under pressure, and an equalizing valve device subject on one side to train pipe pressure for controlling the release of the brakes and adapted in release position to establish communication from said source to the opposite side of said equalizing device, of means for controlling said communication having two positions of adjustment, one adapted to permit flow both ways and the other only in the direction of the source of fluid pressure.

In testimony whereof I have hereunto set my hand.

WALTER V. TURNER.

Witnesses:
A. M. CLEMENTS,
S. W. KEEFER.