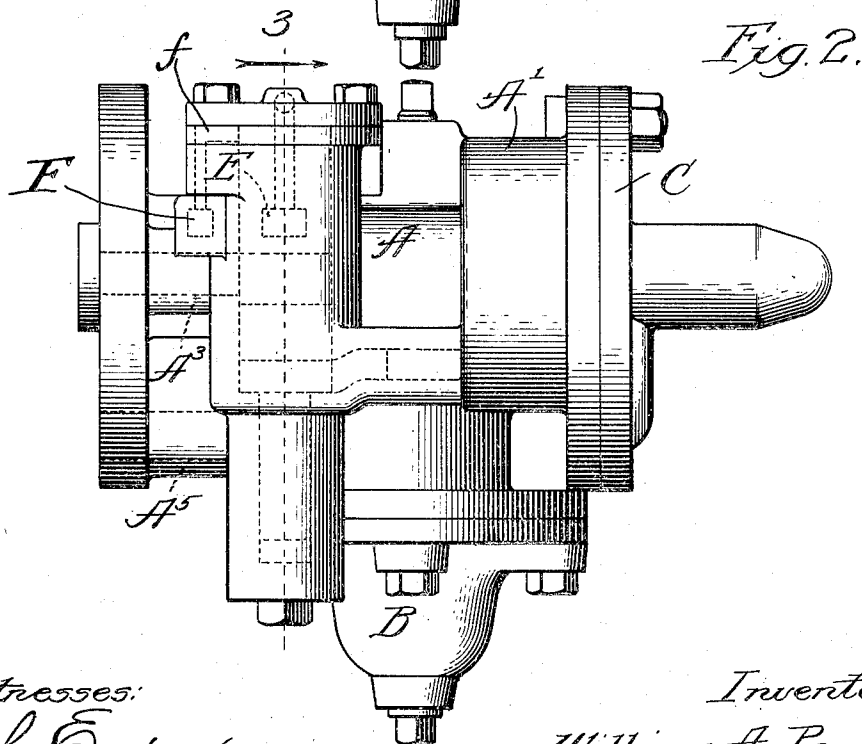
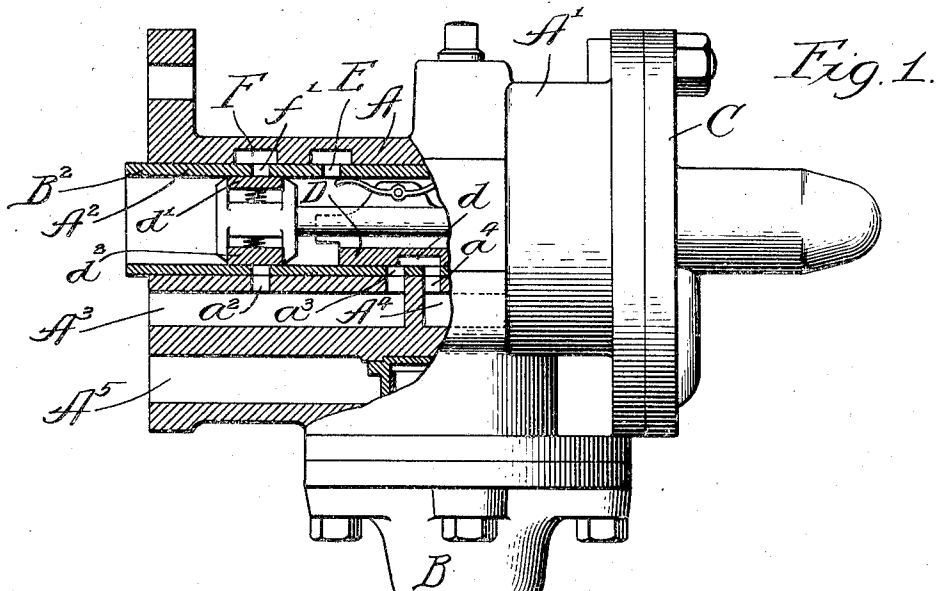


W. A. PENDRY.
 AUTOMATIC AIR BRAKE.
 APPLICATION FILED OCT. 8, 1909.

1,006,499.

Patented Oct. 24, 1911.

3 SHEETS—SHEET 1.



Witnesses:
 John Enders
 Chas. H. Bull.

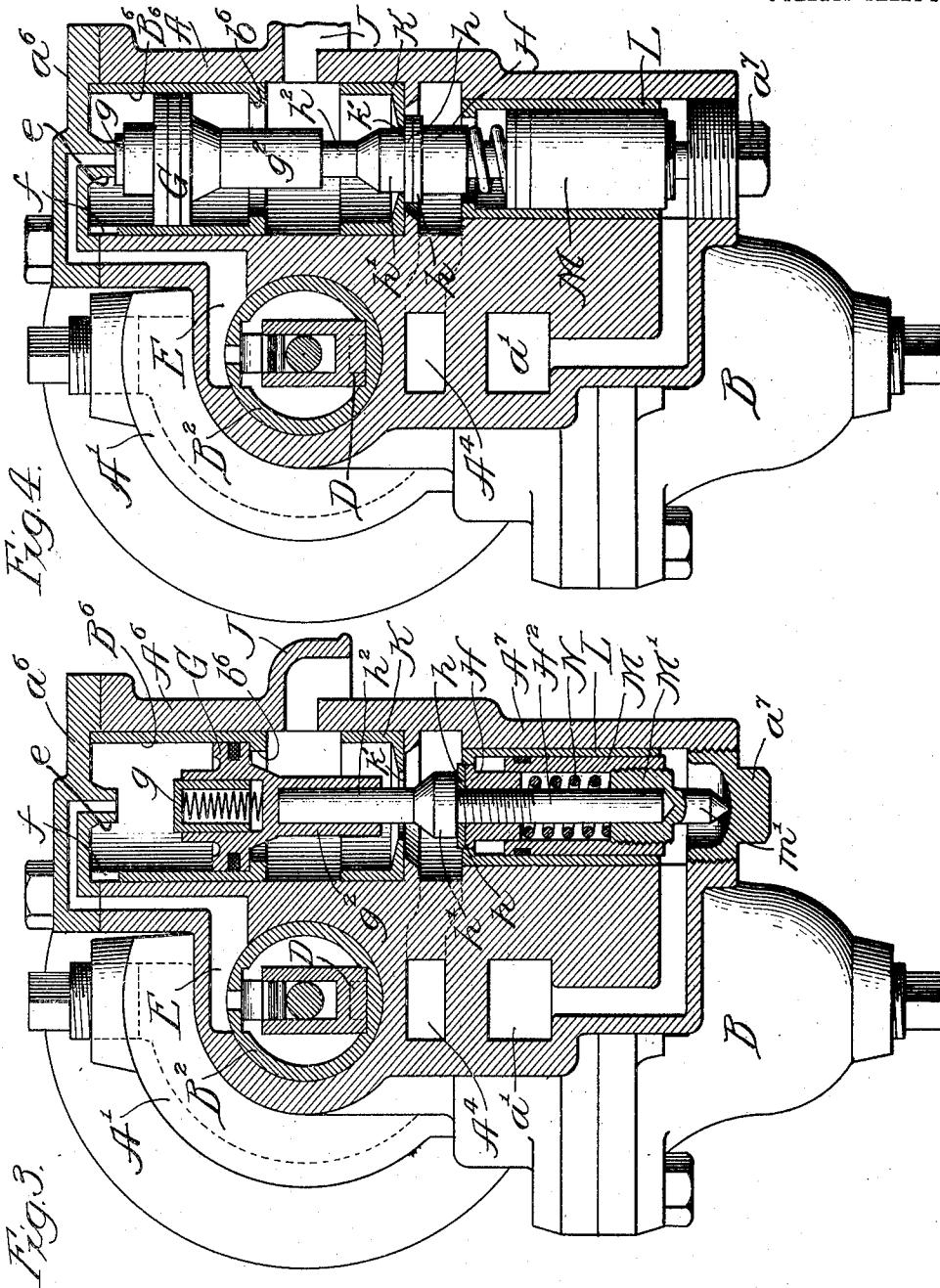
Inventor:
 William A. Pendry.
 By Sheridan, Wilkinson & Scott,
 Attys.

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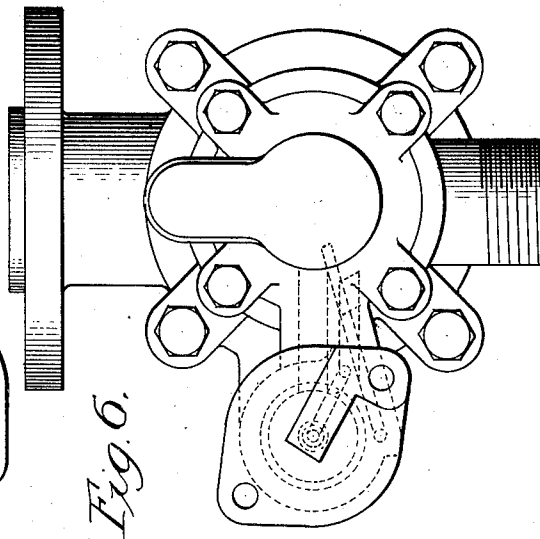
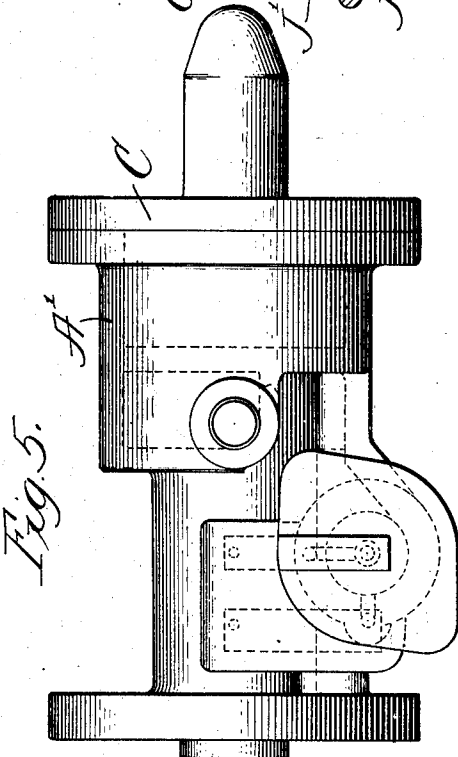
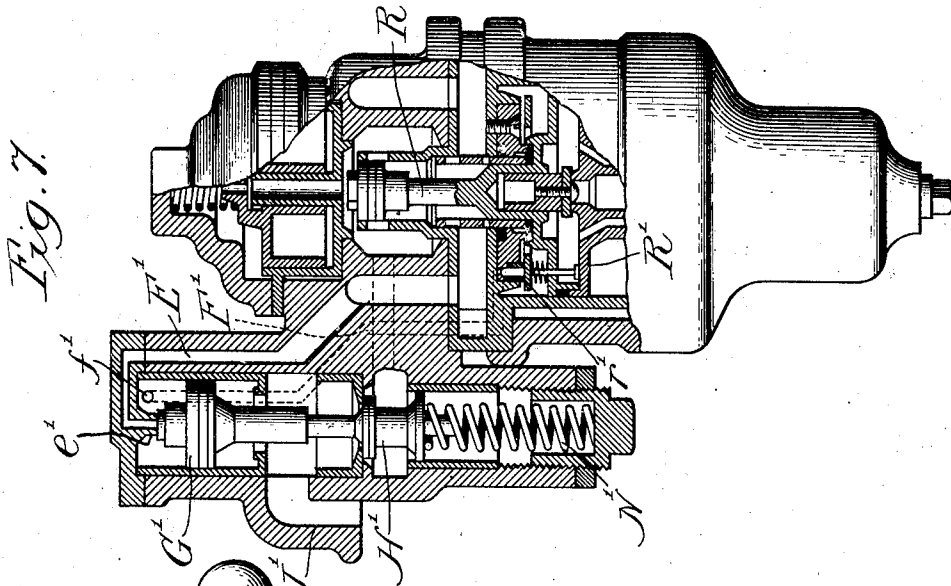


Witnesses:
 John Enders
 Chas. H. Buell.

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3 SHEETS—SHEET 3.



Witnesses:
John Enders
Chas. H. Buell

Inventor:
William A. Pendry.
By Sheridan, Wilkinson & Scott
Attys. #

UNITED STATES PATENT OFFICE.

WILLIAM A. PENDRY, OF DETROIT, MICHIGAN.

AUTOMATIC AIR-BRAKE.

1,006,499.

Specification of Letters Patent.

Patented Oct. 24, 1911.

Application filed October 8, 1909. Serial No. 521,694.

To all whom it may concern:

Be it known that I, WILLIAM A. PENDRY, a citizen of the United States, residing at Detroit, in the county of Wayne and State of Michigan, have invented certain new and useful Improvements in Automatic Air-Brakes, of which the following is a specification.

My invention relates in general to automatic air brakes, and more particularly to means for retaining the brakes applied while the auxiliary reservoirs are being recharged.

On long down grades, the leakage of air from the brake cylinders requires the repeated supply of compressed air to them from the auxiliary reservoirs, which often so depletes the auxiliary reservoir pressure that the brakes are not held applied with the requisite power. Various devices have been heretofore proposed for recharging the auxiliary reservoirs while the brakes remain applied, either by a supplemental train pipe connected with the auxiliary reservoirs for supplying pressure directly to them, or by retaining valves for preventing the exhaust of pressure from the brake cylinders while the triple valves are thrown into position to connect the train pipe with the auxiliary reservoirs. These proposed expedients are unsatisfactory, as the former necessitates the addition of an extra train pipe to the brake equipment, while the latter, namely, the retaining valves, not being under the control of the engineer, must be operated by the trainmen. The serial release of the brakes on the cars of a train incident to the flow of the high releasing pressure through the train pipe from the engine to the last car of the train is objectionable on down grades, as the cars progressively start by gravity immediately upon the release of their brakes, thereby exerting a jerk upon the couplings between each car as its brakes are released and the following car on which the brakes are still applied, such jerk often breaking the couplings.

The primary object of my invention is to provide an improved retaining valve for automatically holding the pressure in the brake cylinder while the triple valve is moved to and remains in position to recharge the auxiliary reservoir.

A further object of my invention is to provide a valve for automatically closing the brake cylinder exhaust when the auxil-

iary reservoir pressure falls below a predetermined degree, and for retaining the exhaust closed until the auxiliary reservoir has been recharged to the predetermined degree of pressure.

A further object of my invention is to provide valve mechanism for the several cars of a train, which will progressively retard the normal release of the brakes on the forward cars, so as to secure a substantially simultaneous release of the brakes on all of the cars of the train.

A still further object of my invention is to provide an improved triple valve, which will not only perform the usual functions of a triple valve, but which will automatically retain the pressure in the brake cylinder while the auxiliary reservoir is recharged, and which will also automatically control the rapidity of the release of the brake cylinder pressure according to the position of each particular car in the train.

My invention will be more fully described in connection with the accompanying drawings, in which the same is illustrated as embodied in two convenient and practical forms, and in which—

Figure 1 is a side elevational view, a portion being shown in vertical section; Fig. 2, a side elevational view similar to Fig. 1, some of the hidden parts and passages being shown in dotted lines; Fig. 3, a transverse section on line 3, Fig. 2, showing the retaining valve for running, or normal position; Fig. 4, a view similar to Fig. 3, showing the retaining valve in position to close the brake cylinder exhaust; Fig. 5, a plan view; and Figs. 6 and 7, views showing my retaining valve applied to a different form of triple valve.

Similar reference characters are used to designate similar parts in the several figures of the drawings.

Reference letter A indicates the main casting of a triple valve casing, while B indicates the removable cap which incloses the quick action valve mechanism.

C indicates the removable cap which closes the triple valve piston chamber.

A' indicates the triple valve piston chamber, A² the triple valve chamber, A³ the brake cylinder passageway, A⁴ the exhaust passageway, and A⁵ the passageway leading to the brake cylinder from the quick action valve mechanism.

D indicates the main slide valve of the triple valve having therein the recess d for connecting the brake cylinder port a^3 with the exhaust port a^4 when in release position.

d^2 indicates the graduating valve which controls the port a^2 leading from the valve chamber to the brake cylinder passageway.

The triple valve above described does not in itself constitute my invention, as it is a triple valve of usual or ordinary construction.

My improved retaining valve may obviously be applied to any other form of triple valve than that in connection with which it is illustrated in Figs. 1 to 5, inclusive. In fact, I have shown in Figs. 6 and 7 my improved retaining valve as applied to the improved form of triple valve covered by Patent No. 978,640, granted to me on December 13, 1910.

A cylinder A^6 is located adjacent the triple valve chamber and is preferably formed in an integral casting therewith. The upper end of the cylinder A^6 is closed by a cover plate a^6 .

E indicates a passageway leading from a port through the bushing B^2 in the triple valve chamber, and extending through the cover a^6 of the cylinder A^6 . The passageway E terminates in an annular valve seat e depending from the cover a^6 concentrically within the cylinder A^6 .

A second passageway F extends from a port f' through the bushing B^2 to the upper end of the cylinder A^6 , where it terminates in a port f . The port f' is controlled by a valve d' operatively connected with the triple valve in any suitable manner, as, for instance, by lugs projecting upwardly from the valve stem, as shown in Fig. 1.

A bushing B^6 is located within the upper end of the cylinder A^6 and closely surrounds a piston G. On the upper surface of the piston G is a yielding valve g adapted to engage the annular valve seat e . An annular shoulder b^6 projects inwardly around the lower edge of the bushing B^6 and is engaged by the piston G when the latter is in its normal position, as shown in Fig. 3. Depending from the piston G is a sleeve g^2 into which loosely extends a rod h^2 projecting upwardly from a valve H. The valve H is adapted to engage an annular seat K supported within the cylinder A^6 and resting upon an annular shoulder thereon. The valve H is provided with a reduced portion h' of a size to pass within the circular opening h' in the valve seat K prior to the seating of the valve H. In order to form a tight seat, a gasket h of suitable material overlies the valve H.

The brake cylinder exhaust passageway A^4 communicates with the space at the lower end of the cylinder A^6 below the valve seat

K, and normally is in communication through the valve seat with an exhaust outlet J leading from the chamber above the valve seat. A rod H^2 depends from the valve H concentrically within a cylinder A^7 located below and alining with the cylinder A^6 . The lower end of the rod H^2 loosely fits within a nut M' secured within the lower end of a cylindrical piston M. The piston M closely engages within a bushing or sleeve L within the cylinder A^7 . A spring N surrounds the rod H^2 and is interposed between the valve H and the nut M' , the latter being provided with a depending pointed stud m' which normally rests against the inner surface of a cap a^7 located in the lower end of the cylinder A^7 .

The operation of my invention as illustrated in Figs. 1 to 5, above described, is as follows: When the triple valve is in release or running position, as shown in Fig. 1, the valve d' closes the port f' , but the passageway E, which is always in free communication with the triple valve chamber, permits the auxiliary reservoir pressure to pass therethrough to the cylinder A^6 above the piston G. The area of the piston G is such that the reservoir pressure acting thereon forces the valve H downwardly against the tension of the spring N, thereby uncovering the valve seat K and permitting the brake cylinder exhaust passage A^4 to communicate with the exhaust port J. When the train pipe pressure is reduced to apply the brakes, and the triple valve piston moves toward the right in Fig. 1, the valve d' uncovers the port f' , thereby placing the auxiliary reservoir in communication with the cylinder A^6 through the passage F. Assuming that the brakes have been repeatedly applied and the auxiliary reservoir pressure depleted below the degree requisite to retain the brakes applied, then the spring N forces the valve H upwardly, overcoming the force of the depleted auxiliary reservoir pressure acting upon the piston G. The valve H is consequently seated and the exhaust from the brake cylinder closed. The train pipe pressure may then be increased and the triple valve thrown to release or running position so as to recharge the auxiliary reservoir without allowing the pressure to escape from the brake cylinder. The return of the triple valve to release position causes the valve d' to close the port f' , while the movement of the piston G upwardly, by the tension of the spring N, has forced the valve g against the seat e and consequently the cylinder A^6 is entirely disconnected from the triple valve chamber, owing to both of the passages E and F being closed. The increase in the auxiliary reservoir pressure as it is recharged cannot, therefore, force the piston G downwardly and unseat the valve H, thereby preventing

the escape of the brake cylinder pressure. After the auxiliary reservoir has been recharged and the triple valve again moved to application position by lowering the train pipe pressure, the increased auxiliary reservoir pressure flows through the passageway F and again unseats the valve H by exerting a force upon the piston G greater than the tension of the spring N. The brakes may then be released in the usual manner by increasing the train pipe pressure, thereby throwing the triple valve to release position. The tension of the spring N and the area of the piston G are so related that the spring will be compressed and the valve H held unseated at all times when the pressure in the auxiliary reservoir is adequate for applying the brakes with the requisite force, the tension of the spring being such as to only close the valve H when the auxiliary reservoir pressure has been so depleted as to be insufficient to furnish the necessary braking power.

When my improved retaining valve is provided with the cylinder piston M, and the train pipe passage a' is provided leading to the under surface thereof, it performs the additional function of timing the release of the brake cylinder pressure. The area of the piston M is small in comparison with the area of the piston G, and hence the normal running train pipe pressure is inadequate to force the piston M upwardly, but when the high brake releasing train pipe pressure flows through the passage a' , it forces upwardly the piston M and with it the valve H a sufficient distance for the portion h' of the valve to extend within the circular opening h through the valve seat, thereby throttling the flow of the brake cylinder pressure to the exhaust port J. Immediately upon the high releasing train pipe pressure being reduced by its flow through the train pipe, the piston M is forced downwardly and the valve H fully opened so as to permit the free exhaust of the brake cylinder pressure. As the wave of high releasing pressure flows from the engine toward the rear of the train, ordinarily the brakes are serially released from the engine to the last car of the train, but by providing my improvement, the release of the brakes on the forward cars is gradually retarded according to the position of each car in the train, so as to effect a substantially simultaneous release of all of the brakes on all of the cars of the train in lieu of the usual serial release of the brakes on the cars.

In Figs. 6 and 7 I have shown my improved retaining valve as applied to my improved triple valve covered by U. S. application Serial No. 489,418, filed April 12, 1909, and as not provided with means for retarding the release of the brakes. From an inspection of Figs. 6 and 7, it will be evi-

dent that my improved pressure retaining valve may be applied to any form of triple valve and either with or without the feature of retarding the release of the brakes. Inasmuch as the triple valve shown in Figs. 6 and 7 is fully illustrated and described in my said copending application, I will not describe it in detail, as the operation of my improved retaining valve may be fully understood irrespective of the operation of the particular form of triple valve to which it may be applied. Reference character E' designates a passageway leading from the triple valve space communicating with the auxiliary reservoir. The passageway E' corresponds to the passageway E of Figs. 1 to 5, and terminates in a similar annular seat e' within the chamber of the retaining valve piston G'. F' indicates a passageway leading from the triple valve chamber to the space above the piston G', such passageway corresponding to the passageway F heretofore described. A valve r' is yieldingly carried by the triple valve piston R' and closes the end of the passageway F' when the triple valve is in release position, but uncovers the passageway when the triple valve moves to application position. H' indicates the retaining valve which is seated by the spring N' when the reservoir pressure is depleted. The spring N' is interposed between the valve H' and the cap which closes the surrounding chamber.

The operation of my retaining valve as shown in Figs. 6 and 7 is in all respects the same as described in connection with Figs. 1 to 5, except that it is not provided with the piston M for throttling the brake cylinder exhaust.

From the foregoing description, it will be observed that I have invented an improvement in automatic air brakes, whereby the pressure may be retained in the brake cylinder while the auxiliary reservoirs are being recharged and without the necessity of a supplemental train pipe, or of manually operated retaining valves. It is further evident that I have also invented an improvement in air brakes by means of which the release of the brakes on the several cars of the train may be rendered substantially simultaneous, thereby avoiding the ordinary serial release of the brakes and the attendant objections.

While I have described more or less precisely the details of construction, I do not wish to be understood as limiting myself thereto, as I contemplate changes in form and the proportion of parts and the substitution of equivalents as circumstances may suggest or render expedient without departing from the spirit of my invention.

I claim:

1. The combination with a triple valve, of a pressure retaining valve controlling the

brake cylinder exhaust, and means for automatically closing said valve when the auxiliary reservoir pressure falls below a predetermined degree and for retaining said valve closed during the continuance of the triple valve in recharging position after the auxiliary reservoir pressure exceeds said predetermined degree.

2. The combination with a triple valve, of a retaining valve controlling the brake cylinder exhaust, a piston exposed to auxiliary reservoir pressure for opening said valve, means for closing said valve when the pressure exerted upon said piston falls below a predetermined degree, and means actuated by the triple valve for controlling the flow of auxiliary reservoir pressure to said piston.

3. The combination with a triple valve, of a pressure retaining valve, a piston exposed to auxiliary reservoir pressure for opening said valve, a spring for closing said valve when the auxiliary reservoir pressure falls below a predetermined degree, and means for disconnecting the auxiliary reservoir pressure from said piston during the continuance of the triple valve in recharging position after the auxiliary reservoir pressure exceeds said predetermined degree.

4. The combination with a triple valve, of a pressure retaining valve controlling the brake cylinder exhaust, a piston operatively connected to said valve for opening the same, means for normally exposing said piston to auxiliary reservoir pressure, means for closing said retaining valve when the auxiliary reservoir pressure falls below a predetermined degree, and means for disconnecting the reservoir pressure from said piston when the retaining valve is closed and the triple valve is in release position.

5. The combination with a triple valve, of a pressure retaining valve, a piston connected to said retaining valve, a piston chamber communicating with the triple valve chamber, and a valve operated by the triple valve piston for controlling communication between said piston chamber and the triple valve chamber independently of the brake cylinder pressure.

6. The combination with a triple valve, of a pressure retaining valve controlling the brake cylinder exhaust, a piston connected to said retaining valve, a piston chamber, a passageway leading from the triple valve chamber to said piston chamber, a valve operated by the triple valve to close said passageway when the triple valve is in release position and open said passageway when the triple valve is in application position, a by-pass leading from the triple valve chamber to said piston chamber, and a valve actuated

by said piston to close said by-pass when the retaining valve is closed.

7. The combination with a triple valve, of a pressure retaining valve controlling the brake cylinder exhaust, and means actuated by the triple valve piston for controlling the operation of said retaining valve independently of the brake cylinder pressure.

8. The combination with a triple valve, of a valve for controlling the brake cylinder exhaust, means for actuating said valve to restrict the brake cylinder exhaust in proportion to the degree of the releasing train pipe pressure, and means for automatically closing said valve when the auxiliary reservoir pressure falls below a predetermined degree.

9. The combination with a triple valve, of a valve for controlling the exhaust from the brake cylinder, a piston exposed to train pipe pressure for actuating said valve to restrict the brake cylinder exhaust in proportion to the degree of the brake releasing train pipe pressure, and a separate piston for applying auxiliary reservoir pressure to said valve in opposition to the train pipe pressure to open said valve when the train pipe pressure falls to its normal degree.

10. The combination with a triple valve, of a pressure retaining valve controlling the brake cylinder exhaust, a piston connected to said retaining valve, means for exposing said piston to auxiliary reservoir pressure to open said valve, means for automatically closing said retaining valve when the auxiliary reservoir pressure falls below a predetermined degree, and a second piston operatively engaging said retaining valve to move the same toward its seat and exposed to train pipe pressure.

11. The combination with a triple valve, of a pressure retaining valve controlling the brake cylinder exhaust, a piston connected to said retaining valve, means for exposing said piston to auxiliary reservoir pressure to open said valve, a second piston operatively engaging said retaining valve to move the same toward its seat and exposed to train pipe pressure, and a spring interposed between said retaining valve and said second piston, the tension of which normally forces said second piston toward the train pipe pressure and into contact with a fixed stop, said spring also serving to close said retaining valve when the auxiliary reservoir pressure falls below a predetermined degree.

In testimony whereof, I have subscribed my name.

WILLIAM A. PENDRY.

Witnesses:

GEO. L. WILKINSON,
HARRY S. GAITHER.