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W. S. PALMER.

AIR BRAKE.

(Application filed Dec. 5, 1900.)

(No Model.)

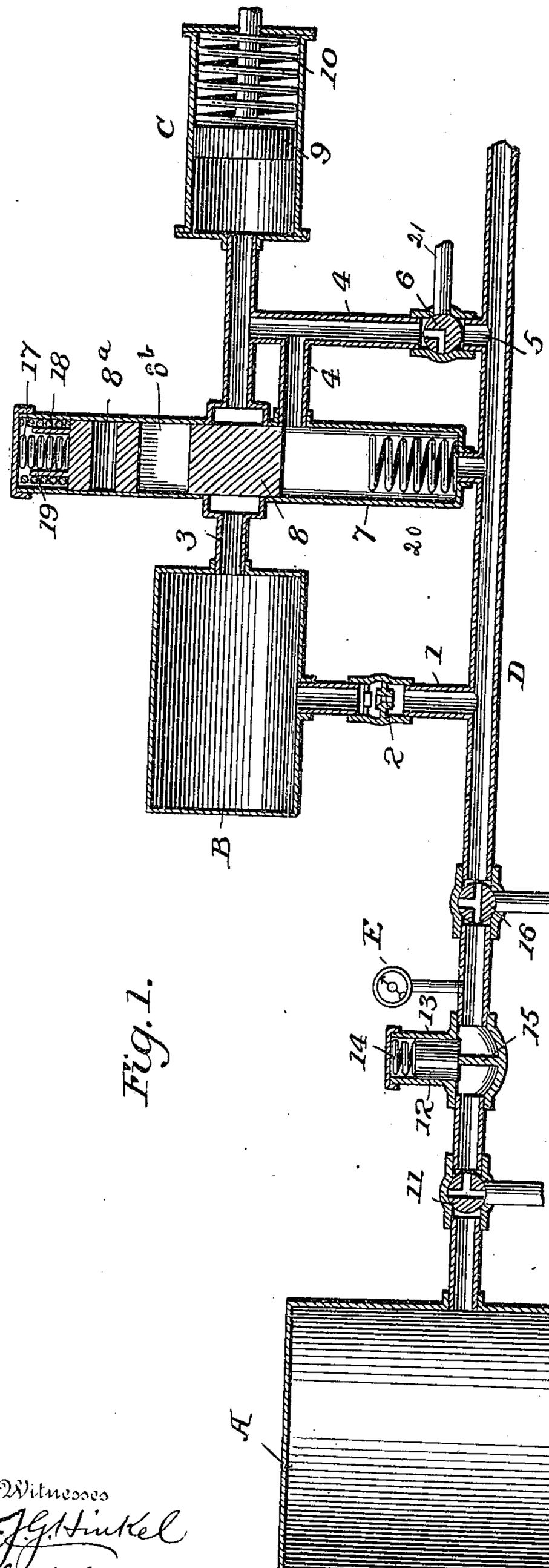

Fig. 1.

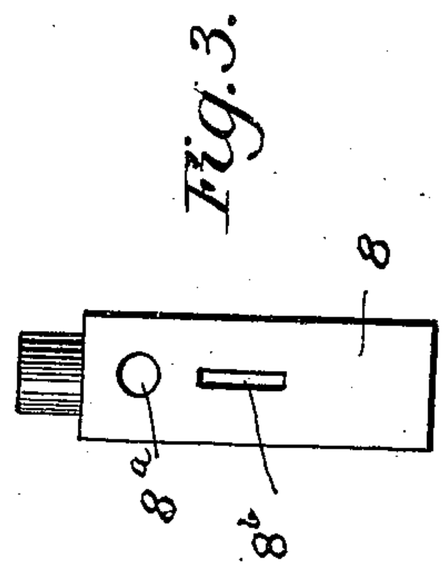

Fig. 3.

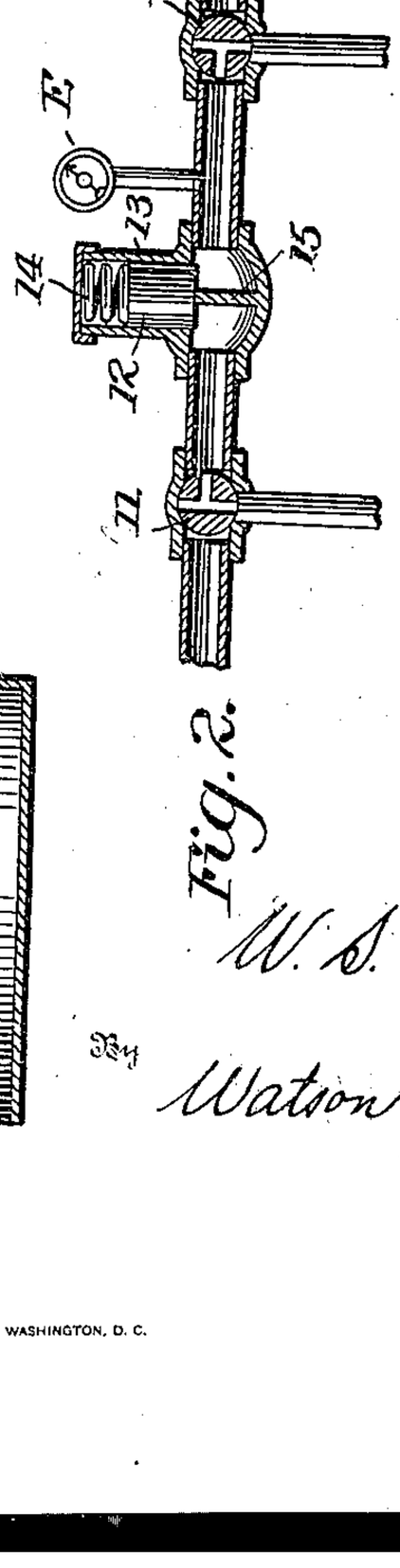

Fig. 2.

Witnesses
J. G. Hinkel
C. W. Clement.

Inventor
W. S. Palmer
By Watson & Watson
Attorneys

UNITED STATES PATENT OFFICE.

WINFIELD S. PALMER, OF GLENBURN, PENNSYLVANIA.

AIR-BRAKE.

SPECIFICATION forming part of Letters Patent No. 670,245, dated March 19, 1901.

Application filed December 5, 1900. Serial No. 38,750. (No model.)

To all whom it may concern:

Be it known that I, WINFIELD S. PALMER, a citizen of the United States, residing at Glenburn, in the county of Lackawanna, State of Pennsylvania, have invented certain new and useful Improvements in Air-Brakes, of which the following is a specification.

My invention comprises improvements in air-brake systems for cars whereby the brakes may be applied and released in ordinary service by direct pressure from the main reservoir, while in case of emergency the brakes may be set through the agency of a reserve supply of air contained in an auxiliary reservoir carried by each car, and in the event of an accident resulting in the opening of the train-pipe the brakes will be automatically applied by air-pressure from said auxiliary reservoirs.

The invention also includes means whereby the brakes may be operated in ordinary service by the reserve supply of air in the auxiliary reservoirs when desired, thus combining the advantages of the direct and indirect acting systems.

In Figure 1 of the accompanying drawings I have illustrated my invention diagrammatically. Fig. 2 shows a portion of the system with the emergency-valve in a different position from that shown in Fig. 1, and Fig. 3 is a detail view of the balanced valve controlling the ports leading from the auxiliary reservoir to the brake-cylinder.

In the drawings, A represents the main reservoir; B, the auxiliary reservoir; C, a brake-cylinder, and D the train-pipe. As shown in Fig. 1, the auxiliary reservoir is connected to the train-pipe through a branch pipe 1, having therein a check-valve 2, adapted to prevent the return of air from said reservoir to the train-pipe. The reservoir B is connected to the brake-cylinder through a valve-controlled pipe or passage-way 3, and the cylinder is connected to the train-pipe through the passage-way 3 and a valve-controlled passage-way 4. A branch passage-way 5 connects the passage-way 4 with the train-pipe and contains a normally-closed hand-valve 6.

Arranged within a suitable casing 7 is a balanced valve 8, adapted to control the passage-ways 3 and 4, the valve being so arranged that when one of said passage-ways is closed the other will be open. This valve is normally held in the position shown against the action of the springs 17 and 18 by means of the air-pressure in the train-pipe, as will be hereinafter explained. In this position the openings 8^a and 9^a in the upper part of the valve are out of register with the bore of the pipe 3, so that no air can pass through the latter from the auxiliary cylinder, while the lower end of the valve is at one side of the passage-way 4 and air may pass freely through said pipe from the train-pipe to the brake-cylinder. The brake-piston 9 is normally pressed inward by a spring 10.

The usual service-valve 11 is arranged to admit air from the main cylinder to the train-pipe for the purpose of applying the brakes by direct pressure and charging the auxiliary reservoir and to permit the air to escape from said pipe when it is desired to release the brakes. Adjoining the service-valve is a check-valve 12, so arranged that when the service-valve is turned to release the air from the train-pipe this check-valve will close when the air within the train-pipe is lowered to a predetermined pressure, retaining air under a comparatively low pressure—say ten pounds—within the pipe. As shown, the valve works within a casing 13 and is pressed downward by a spring 14 upon a partition 15, extending across the face of the valve. When the service-valve is turned to admit air to the train-pipe, the valve 12 is raised against the action of the spring by the pressure of the air against the face of the valve on the left side of the partition. When the service-valve is turned to release the air from the train-pipe, the spring 14 closes the valve 12 whenever the force of the spring is greater than the pressure of the air within the pipe acting against it, and air under pressure will thus be retained within the train-pipe at all times, except in cases of emergency, when an emergency-valve 16, convenient to the engineer, may be operated to permit all of the retained air to escape. The check-valve 12 is arranged between the service-valve and the emergency-valve.

The opening 8^a in the valve 8 is preferably of about the same area as the bore of the pipe 3, so that when said opening comes opposite the bore of the pipe the air may pass freely

through from the auxiliary reservoir to the brake-cylinder for emergency application. The opening 8^b, however, is a long narrow slit adapted to restrict the passage of the air, so that when the opening is brought opposite the pipe 3 the air will pass through it less rapidly for service application.

In operation when it is desired to apply the brakes by direct pressure the service-valve is turned to permit air to pass into the train-pipe. This air under high pressure raises check-valve 12 and the valve 8 against the action of their respective springs and passes directly through the pipes 4 and 3 into the brake-cylinder, forcing the piston out against the action of the spring 10 and causing the brakes to become set. The outward movement of the valve 8 cuts off communication between the auxiliary reservoir and the brake-cylinder, and air from the train-pipe enters and fills the auxiliary reservoir through the check-valve 2, the latter preventing the return of air to said pipe. To release the brakes, the service-valve is turned to shut off the supply of air from the main reservoir and to permit air to escape from the train-pipe. When the pressure in the train-pipe is reduced to, say, ten pounds per square inch or any other suitable predetermined pressure, which may be regulated by the construction of the check-valve 12 and the tension of the spring 14, said check-valve closes, thus retaining air under a comparatively low pressure in the train-pipe. The pressure of this retained air is sufficient to hold the valve 8 in the position shown, but not sufficient to set the brake. Hence the spring 10 forces the brake-piston inward. If the service-valve be again turned to admit air from the main cylinder to the train-pipe, it will be seen that the check-valve 12 will lift as before and the pressure will be conveyed directly to the brake-cylinder, the valve in the passage-way 4 being already open. Each time that air is admitted to apply the brake if the pressure in the auxiliary reservoir is below the train-pipe pressure said reservoir will be replenished through the check-valve 2, so that the reservoir will always be in readiness for use.

If the supply of air from the main reservoir becomes exhausted for any reason or is insufficient to hold the train by direct application, the service-valve may be closed and the emergency-valve 16 turned to release a part of the retained air in the train-pipe, reducing the pressure in said pipe to, say, five pounds. This reduction in pressure permits the spring 18 to force the valve 8 inward, closing the pipe 4 and bringing a part or all of the slit 8^b into register with the pipe 3, thus allowing a portion of the reserve supply of air in the auxiliary reservoir to pass through the pipe 3 into the brake-cylinder and set the brakes. The five pounds pressure remaining in the train-pipe and the spring 20 will hold the valve up, so that the large opening 8^a will not register with the pipe 3. In case of emergency, however, the remaining five pounds pressure may be released from the train-pipe, in which event the valve 8 will drop until the opening 8^a registers with the pipe 3, when the full force of the air in the auxiliary cylinder will be exerted against the brake-piston. In case of an accident resulting in the rupture of the train-pipe it is obvious that the escape of air therefrom will cause the supply of air from the auxiliary reservoir to pass over to the brake-cylinder and cause the brake to set in the same manner as when the emergency-valve is used to reduce the air-pressure.

To release the brakes after the emergency-valve has been used, the latter is closed and air sufficient to raise the valve 8 and charge the auxiliary reservoir is admitted to the train-pipe, after which the service-valve is turned to reduce the air-pressure within the pipe to its normal predetermined limit, which is regulated by the valve 12. The air from the train-pipe and auxiliary reservoir may be released at any time by the hand-valve 6 upon each car by giving said valve a half-turn to to the right, when the openings in the valve will register with the branch pipe 5 and a vent-pipe 21. The variations in air-pressure cause the valve 8 to play within its cylinder each time the brake is applied and prevent any danger of said valve sticking. A pressure-gage E is arranged within the engine-cab and is connected to the pipe system between the check-valve 12 and the train-pipe, so as to indicate the pressure in the latter. By means of this gage the engineer is enabled to observe the pressure in the train-pipe while applying the brakes, and when said pressure falls below the normal through leakage more air may be admitted from the main cylinder, thus preventing the setting of the brakes through fall of pressure in the train-pipe.

The valve-casings 7 and 13 are each provided with screw-caps, as shown, so that the valves may be readily removed for the purpose of cleaning or oiling. The spring 17, which acts as a buffer to limit the outward movement of the valve 8, is arranged within a circular collar or inclosure 19 upon the end of the valve, and the spring 18, which is more elastic and extensible, is coiled around said collar and serves to force the piston inward when the air-pressure in the train-pipe is reduced.

In order that the check-valve 12, which is located in the engine-cab, may be examined without setting the brakes, the three-way emergency and service valves 16 and 11 may be turned, as shown in Fig. 2, so as to release the air from the pipe between said valves and on either side of the check-valve without permitting the air from the train-pipe or the main reservoir to escape. This operation will be plain from an inspection of Fig. 2.

From the foregoing description it will be seen that by means of my improvements the

air-pressure normally carried in the train-pipe is quite low, and therefore there need be but little loss from leakage, and also that the air may be used with comparatively little restriction, for the reason that the brakes may be operated by direct pressure ordinarily, and if the direct supply becomes low the auxiliary supply may be brought into use either for service or emergency application.

I have not attempted to illustrate all the details of construction, for the reason that the essential features of my invention will be plain from the description and the drawings, and the parts may be variously constructed and arranged.

Having described my invention, what I claim, and desire to secure by Letters Patent of the United States, is—

1. The combination with a main reservoir, an auxiliary reservoir and a brake-cylinder, of a train-pipe connected to said reservoirs and cylinder, a service-valve for admitting air to the train-pipe to set the brakes and charge the auxiliary reservoir, and for releasing the air from said train-pipe, means for automatically preventing the further escape of air from the train-pipe when the pressure has been reduced to a predetermined degree by the operation of the service-valve, and for normally maintaining air at said predetermined pressure in the train-pipe, a check-valve arranged to prevent the return of air from the auxiliary reservoir to the train-pipe, a communicating passage-way between said auxiliary reservoir and brake-cylinder, a valve adapted to open and close said passage-way, said valve being normally held closed by the air-pressure within the train-pipe when said pressure is at or above the normal, and means for releasing the normally-retained air from the train-pipe.

2. The combination with a main reservoir, an auxiliary reservoir and a brake-cylinder, of a train-pipe connected to said reservoirs and cylinder, a service-valve for admitting air to the train-pipe to set the brakes and charge the auxiliary reservoir, and for releasing the air from said train-pipe, means for automatically preventing the escape of air from the train-pipe when the pressure has been reduced to a predetermined degree by the operation of the release-valve, and for normally retaining the air at said predetermined pressure in the train-pipe, a check-valve arranged to prevent the return of air from the auxiliary reservoir to the train-pipe, a communicating passage-way between said auxiliary reservoir and brake-cylinder, a valve adapted to open and close said passage-way, said valve being normally held closed by the air-pressure within the train-pipe, means for opening said valve when the air is released from the train-pipe, and a valve convenient to the engineer adapted to release the retained air from the train-pipe.

3. The combination with a main reservoir, an auxiliary reservoir and a brake-cylinder, of a train-pipe connected to said reservoirs and cylinder, a service-valve for admitting air to the train-pipe to set the brakes and charge the auxiliary reservoir, and for releasing the air from said train-pipe, means for automatically preventing the further escape of air from the train-pipe when the pressure has been reduced to a predetermined degree by the operation of the service-valve, and for normally maintaining air at said predetermined pressure in the train-pipe, a check-valve arranged to prevent the return of air from the auxiliary reservoir to the train-pipe, a communicating passage-way between said auxiliary reservoir and brake-cylinder, a valve adapted to open and close said passage-way, said valve being normally held closed by the air-pressure within the train-pipe and having two ports adapted to register successively with said passage-way, one of said ports being more restricted than the other, means for opening said valve when the air is released from the train-pipe and a valve convenient to the engineer adapted to release the retained air from the train-pipe.

4. The combination with a main reservoir, an auxiliary reservoir and a brake-cylinder, of a train-pipe connected to said reservoirs and cylinder, a service-valve for admitting air to the train-pipe to set the brakes and charge the auxiliary reservoir, and for releasing the air from said train-pipe, means for automatically preventing the escape of air from the train-pipe when the pressure has been reduced to a predetermined degree by the operation of the release-valve, and for normally retaining the air at said predetermined pressure in the train-pipe, a check-valve arranged to prevent the return of air from the auxiliary reservoir to the train-pipe, a communicating passage-way between said auxiliary reservoir and brake-cylinder, a valve arranged to close said passage-way and to open communication between the train-pipe and brake-cylinder when the pressure in the train-pipe is at or above the normal, and to open said passage-way and cut off communication between the train-pipe and brake-cylinder when the pressure in the train-pipe is below the normal, and a valve convenient to the engineer for releasing the retained air from the train-pipe.

5. The combination with a main reservoir, an auxiliary reservoir and a brake-cylinder, of a train-pipe connected to said reservoirs and cylinder, a service-valve for admitting air to the train-pipe to set the brakes and charge the auxiliary reservoir, and for releasing the air from said train-pipe, means for automatically preventing the escape of air from the train-pipe when the pressure has been reduced to a predetermined degree by the operation of the release-valve, and for normally retaining the air at said predetermined pressure in the train-pipe, a check-valve arranged to prevent the return of air from the auxiliary reservoir to the train-pipe,

a communicating passage-way between said auxiliary reservoir and brake-cylinder, a valve arranged to close said passage-way and to open communication between the train-pipe and brake-cylinder when the pressure in the train-pipe is at or above the normal, and to open said passage-way and cut off communication between the train-pipe and brake-cylinder when the pressure in the train-pipe is below the normal, said valve having two ports adapted to register successively with said passage-way, one of said ports being more restricted than the other, and a valve convenient to the engineer for releasing the retained air from the train-pipe.

6. The combination with a main reservoir, an auxiliary reservoir and a brake-cylinder, of a train-pipe connected to said reservoirs and brake-cylinder, a service-valve for admitting air to the train-pipe to set the brakes and charge the auxiliary reservoir, and for releasing the air from said train-pipe, means for automatically preventing the escape of air from the train-pipe when the pressure has been reduced to a predetermined degree by the operation of the release-valve, and for normally retaining the air at said predetermined pressure in the train-pipe, a check-valve for preventing the return of air from the auxiliary reservoir to the train-pipe, a communicating passage-way between said auxiliary reservoir and brake-cylinder, a valve adapted to open and close said passage-way, said valve being normally held closed by the air-pressure within the train-pipe, a spring arranged to open said valve when the air-pressure is below the normal in said train-pipe, a valve convenient to the engineer for permitting the retained air to escape, and a release-valve 6 upon the car.

7. The combination with a main reservoir, an auxiliary reservoir and a brake-cylinder, of a train-pipe connected to said reservoirs and cylinder, a service-valve for admitting air to the train-pipe to set the brakes and charge the auxiliary reservoir, and for releasing the air from said train-pipe, a check-valve arranged between the service-valve and brake-cylinder and adapted to close when the pressure in the train-pipe is lowered to a predetermined extent, a check-valve for preventing the return of air from the auxiliary reservoir to the train-pipe, a communicating passage-way between said auxiliary reservoir and brake-cylinder, a valve adapted to open and close said passage-way, said valve being normally held closed by the air-pressure within the train-pipe, a spring arranged to open said valve when the air is released from the train-pipe, and a valve convenient to the engineer adapted to release the retained air from the train-pipe.

8. The combination with a main reservoir, an auxiliary reservoir and a brake-cylinder, of a train-pipe connected to said reservoirs and cylinder, a service-valve for admitting air to the train-pipe to set the brakes and charge the auxiliary reservoir, and for releasing the air from said train-pipe, a check-valve arranged between the service-valve and brake-cylinder and adapted to close when the pressure in the train-pipe is lowered to a predetermined extent, a check-valve for preventing the return of air from the auxiliary reservoir to the train-pipe, a communicating passage-way between said auxiliary reservoir and brake-cylinder, a valve adapted to open and close said passage-way, said valve being normally held closed by the air-pressnre within the train-pipe, a spring arranged to open said valve when the air is released from the train-pipe, a valve convenient to the engineer adapted to release the retained air from the train-pipe, and a pressure-gage connected between said latter valve and the service-valve.

9. The combination with a main reservoir, an auxiliary reservoir and a brake-cylinder, of a train-pipe connected to said reservoirs and cylinder, a service-valve for admitting air to the train-pipe to set the brakes and charge the auxiliary reservoir and for releasing the air from said train-pipe, a check-valve arranged between the service-valve and brake-cylinder and adapted to close when the air-pressure in the train-pipe is lowered to a predetermined extent, a valve arranged convenient to the engineer between said pressure-retaining valve and the brake-cylinder for releasing the retained air, a check-valve for preventing the return of air from the auxiliary reservoir to the train-pipe, a communicating passage-way between said auxiliary reservoir and brake-cylinder, a valve adapted to open and close said passage-way, said valve being normally held closed by the air-pressure within the train-pipe, and means for opening said valve when the air is released from the train-pipe.

In testimony whereof I affix my signature in presence of two witnesses.

WINFIELD S. PALMER.

Witnesses:

ROBERT WATSON,

M. F. SANDO.