(No Model.) 2 Sheets—Sheet 1.

W. HIRST.

QUICK ACTION TRIPLE VALVE.

No. 564,073. Patented July 14, 1896.

Fig 1

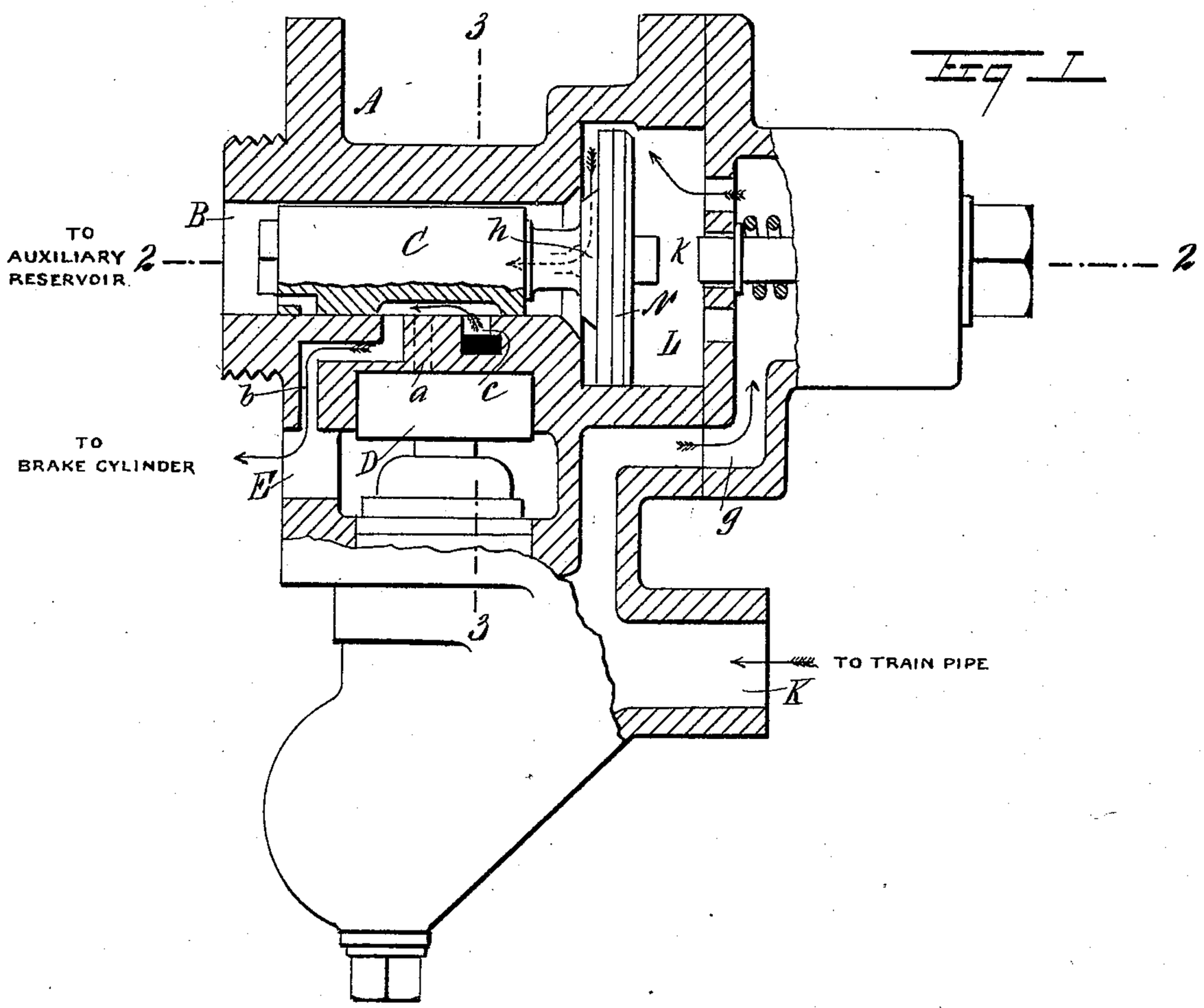
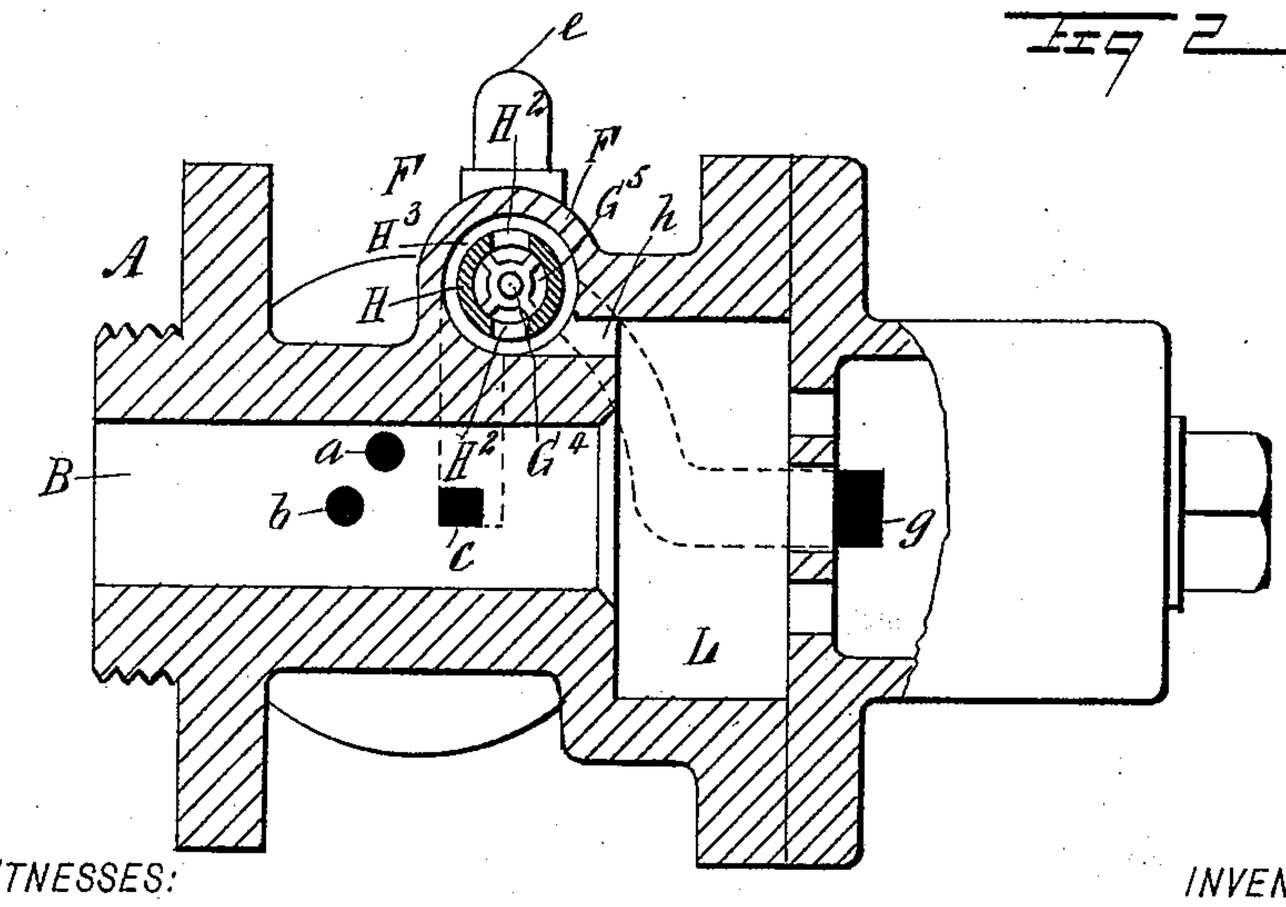


Fig 2



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(No Model.) 2 Sheets—Sheet 2.

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QUICK ACTION TRIPLE VALVE.

No. 564,073. Patented July 14, 1896.

Fig 3

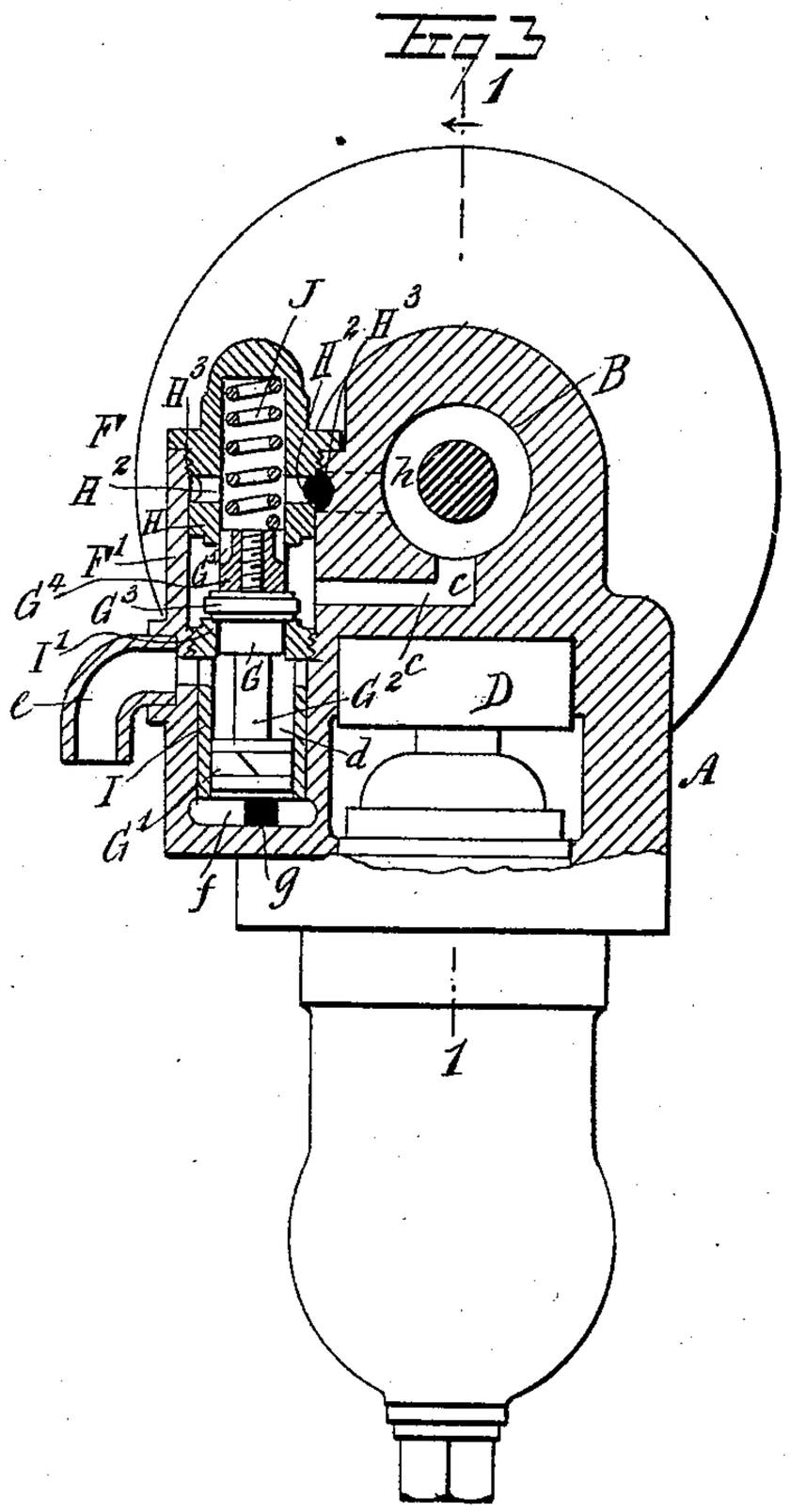


Fig 4

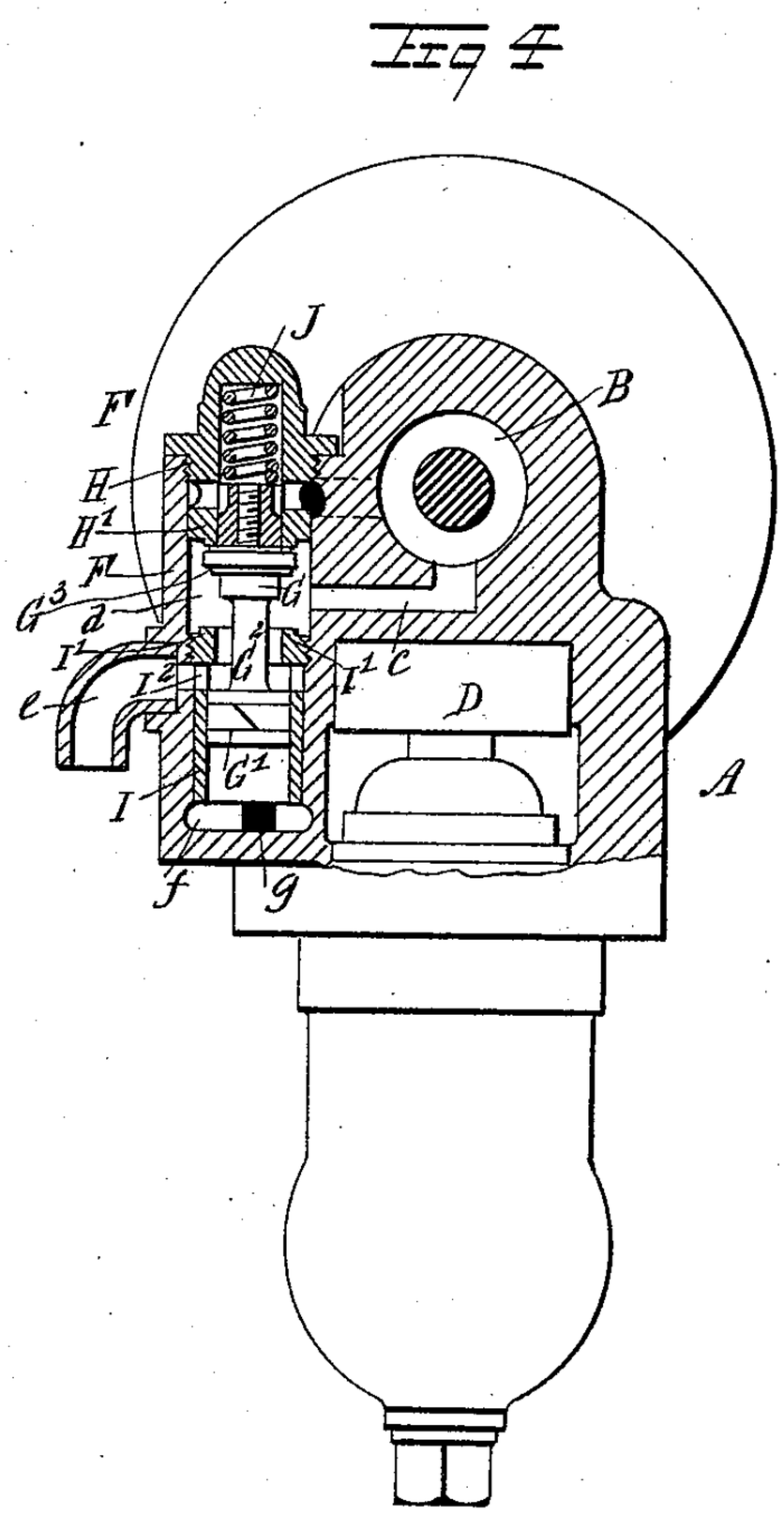
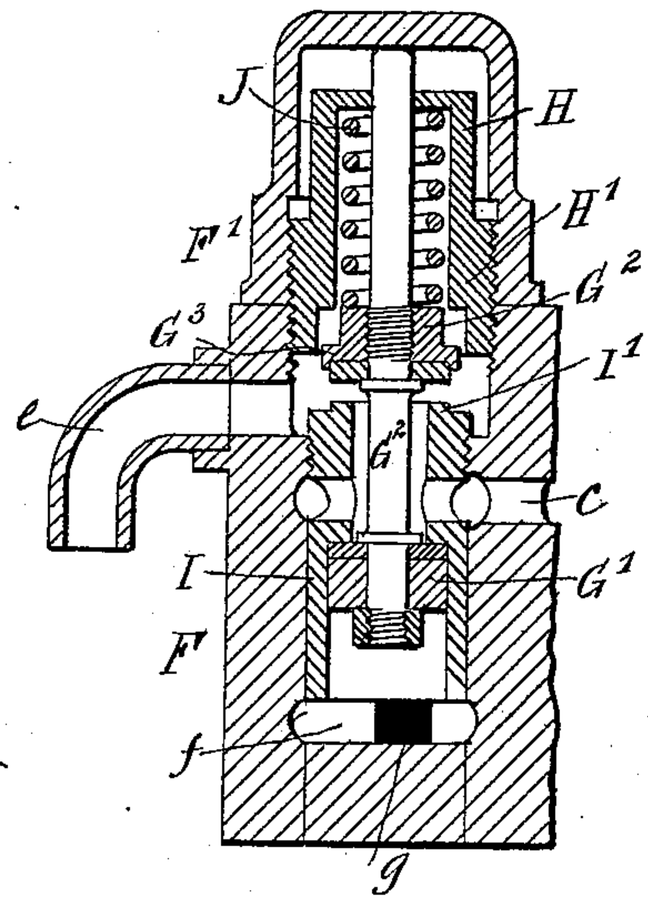


Fig 5



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UNITED STATES PATENT OFFICE.

WILLIAM HIRST, OF TRENTON, NEW JERSEY.

QUICK-ACTION TRIPLE VALVE.

SPECIFICATION forming part of Letters Patent No. 564,073, dated July 14, 1896.

Application filed July 18, 1895. Serial No. 556,424. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM HIRST, of Trenton, in the county of Mercer and State of New Jersey, have invented certain new and useful Improvements in Quick-Action Triple Valves, of which the following is a full, clear, and exact description.

The invention relates to fluid-pressure brakes, and more particularly to quick-action triple valves, such as shown and described in Letters Patent of the United States No. 545,289, granted to me on August 27, 1895.

The object of the present invention is to provide certain new and useful improvements in quick-action valves, whereby the triple valve is automatically moved into a released position for recharging the auxiliary reservoir without releasing the brakes and whereby the pressure in the brake-cylinder is always maintained.

The invention consists of a retaining-valve of an especial construction, as is hereinafter more fully described, and pointed out in the claims.

The invention also consists of certain parts and details and combinations of the same, as will be fully described hereinafter, and then pointed out in the claims.

Reference is to be had to the accompanying drawings, forming a part of this specification, in which similar characters of reference indicate corresponding parts in all the figures.

Figure 1 is a sectional side elevation of the improvement on the line 1 1 of Fig. 3. Fig. 2 is a sectional plan view of the same on the line 2 2 of Fig. 1. Fig. 3 is a cross-section of the same on the line 3 3 of Fig. 1. Fig. 4 is a like view of the same with the parts in a different position, and Fig. 5 is an enlarged cross-section of a modified form of the retaining-valve.

The car equipment of a quick-action fluid-pressure brake of the ordinary Westinghouse system comprises a train-pipe, triple valve, auxiliary reservoir, brake-cylinder, and a retaining-valve which is attached to the exhaust of the triple valve and is opened and closed by the trainmen in the present systems.

In a train of cars the train-pipe is made continuous by connecting each car with its neighbor by couplings for that purpose. The rear end of the train-pipe is closed by a cock, and each car is provided with two for that purpose, one at each end. The first end of the train-pipe is connected with the engine, and the admission and exhaust of pressure to and from the train-pipe is under the control of the engineer.

The triple valve is set between the train-pipe and the auxiliary reservoir and between the auxiliary reservoir and the brake-cylinder, the pressure passing from the train-pipe to the triple valve causing a forward movement in the triple valve, which opens passages to the auxiliary reservoir, which becomes charged with train-pipe pressure, which is usually seventy pounds per square inch.

What is known as a "service" application of the brakes is made by a reduction of train-pipe pressure of not more than ten pounds, the pressure in the auxiliary reservoir then exceeding that in the train-pipe, causing a backward movement of the triple valve and closing the passage from the auxiliary reservoir to the train-pipe and opening a passage from the auxiliary reservoir to the brake-cylinder. When the pressure in the auxiliary reservoir has become lowered by expansion in the brake-cylinder below that in the train-pipe, then by its peculiar construction the triple valve moves sufficiently forward to close all intercommunication until a further reduction or increase in the train-pipe pressure is made. If the latter, the triple valve moves forward its full stroke and pressure passes into the auxiliary reservoir as before, and that in the brake-cylinder is allowed to pass out into the atmosphere.

The ratio of volume between the auxiliary reservoir and brake-cylinder is such that if the pressure in the auxiliary reservoir at seventy pounds was permitted to expand in the brake-cylinder, it would equalize at about fifty pounds. Then successive service applications amounting to a reduction in the train-pipe pressure of twenty pounds would give the maximum service application of the brakes without reducing the train-pipe pressure below fifty pounds. It is clear then that the closing of the exhaust-port of the triple valve when the train-pipe pressure falls below fifty pounds will not interfere with ordinary working of the brakes.

Now in unusually long applications of the brakes of the ordinary Westinghouse system, as, for instance, in descending long grades, the pressure leaks out of the brake-cylinder and auxiliary reservoir before it is desired to

release the brakes, and to prevent this premature release by being compelled to recharge the auxiliary reservoir, the trainmen close the pressure-retaining valve before mentioned, which by a pipe leading from the exhaust-ports of the triple valve is placed in a convenient position for that purpose. This valve when closed will retain in the brake-cylinder a pressure of about fifteen pounds, thus permitting the triple valve to be moved into what is called the "release" position—that is, the position when the auxiliary reservoir is being recharged—without releasing the brakes until the pressure-retaining valve is reopened by the trainmen.

The object of the invention, presently to be described in detail, is to perform this function automatically, and at the same time to provide means to keep up the pressure in the brake-cylinder.

The triple-valve casing A is provided with the usual chamber B, connected with the auxiliary reservoir and containing a slide-valve C, operating over the ports *a*, *b*, and *c*, of which the port *a* leads to the chamber containing the emergency-valve piston D, the port *b* leads to the passage connected with the brake-cylinder, and the port *c* is the exhaust-port and leads to the casing F′ of the retaining-valve F, the said casing forming an integral part of the triple-valve casing A, as will be readily understood by reference to Fig. 2.

The retaining-valve F is provided with a piston-valve having the valve G, the piston G′, and the stem G^2 for connecting the valve G with the piston G′, and on the upper end of the said valve G is secured a double valve G^3, adapted to be seated at its top on the valve-seat H′, formed on a cap screwed or otherwise secured in the top of the casing F′. The under side of the double valve G^3 is adapted to be seated on a valve-seat I′, forming part of the bushing I, in which operate the piston G′ and the stem G^2.

In the cap H is arranged a coil-spring J, pressing on the top of an extension G^4, secured on the top of the double valve G^3 and having vertically-disposed grooves G^5, to permit of forming a connection between the exhaust-port *c*, the interior of the casing F′, the said grooves G^5, and the interior of the cap H, as will be readily understood by reference to Fig. 3.

The lower end of the casing F′ and the bushing I are connected by a port *f* with a passage *g*, leading from the train-pipe chamber K to the cylinder L containing the piston N, connected with the main valve C in the usual manner. The valve-seat I′ of the bushing I is adapted to connect the annular chamber *d* in the casing F′ with ports I^2, opening into an outlet *e*, leading to the atmosphere, the said outlet being curved downward in the form of an elbow secured to the casing F′. Now it will be seen that the train-pipe pressure can pass through the port *f*, to act on the piston G′, to force the latter into an uppermost normal position, as shown in Fig. 4, to hold the double valve G^3 off the seat I′, and against the seat H′ of the cap H. In doing so the exhaust-port *c* is connected by the chamber *d*, the valve-seat I′, and the port I^2 with the atmosphere, by means of the outlet *e*, and the spring J is compressed by the extension G^4 within the cap H, and as soon as a sufficient reduction of pressure in the train-pipe takes place, the spring J forces the retaining piston-valve G^3 upon the seat I′; that is, into the position shown in Fig. 3. In doing so the valve G^3 moves off the seat H′ to connect the exhaust-port *c* and annular chamber *d*, by the grooves G^5, with the interior of the cap H. The latter is provided with ports H^2, leading to an annular chamber H^3, connecting by a port *h* with the cylinder L between the main valve C and the piston N, as shown in Fig. 2. This connection between the exhaust-port *c* and the port *h* is broken at the time the piston-valve moves into an uppermost position; that is, when the double valve G^3 is seated on the valve-seat H′, and consequently communication between the ports *c* and *h* is cut off; but when a reduction of pressure takes place in the train-pipe and the main valve is moved into release position, and the port *c* is cut off from the outlet *e*, then the said exhaust-port *c* is in communication with the port *h*.

The piston G′ and the extension-piston G^4 serve to cut off intercommunication, while the retaining-valve is in mid-travel. The area of the piston G^4 is somewhat less than that of the piston G′, the proportion being about two to three, and the extension-piston G^4 is exposed to the auxiliary-reservoir pressure by way of the cylinder L, port *h*, annular chamber H^3, ports H^2, and the interior of the cap H. By this arrangement the retaining-valve will work with a light spring and has less resistance when the auxiliary reservoir is empty, so that the raising of the valve G is accomplished with much less pressure when the train is first being charged and the auxiliary reservoirs are empty than if the resistance to the valve was altogether in the spring J.

It is intended that the valve should begin to close at fifty pounds train-pipe pressure, but no pressure can be admitted into the brake-cylinder through the retaining-valve until the triple valve is in the release position. Thus, while the retaining-valve closes at fifty pounds, no pressure need be admitted to the brake-cylinder through the retaining-valve until the auxiliary reservoir fails, and then the admission of, say, five pounds extra pressure to the train-pipe will move the piston N and main valve C into the release position and allow the pressure to pass into the auxiliary reservoir, and at the same time through the port *h* to the interior of the cap H, into the exhaust *e* of the triple valve, and thence into the brake-cylinder.

It is not necessary under ordinary condi-

tions, in running grades, that the pressure in the brake-cylinder should exceed twenty-five pounds, so that, while the retaining-valve closes at fifty pounds, it is not necessary to move the main valve *c* into the release position until the auxiliary-reservoir pressure falls to that in the brake-cylinder, which, under these circumstances, would be about from ten to twenty pounds.

As the pressure becomes reduced, from leakage or other causes, below that required to work the brakes and apply them with sufficient force, it is necessary to move the triple valve into the position to recharge the auxiliary reservoir; but the auxilary reservoir in the ordinary brake system cannot be recharged automatically without the release of the brakes. Now, when the pressure in the auxiliary reservoir and train-pipe has been reduced below that required to apply the brakes with sufficient force, then the spring J having forced the piston-valve G into a closed position, as shown in Fig. 3, so that the exhaust *e* is closed to the atmosphere, air is admitted from the auxiliary reservoir by the main valve C, port *h*, cap H, casing F′, and exhaust-port *c*, under side of the main valve C, and port *b* to the chamber E and brake-cylinder. Thus the triple valve becomes a passage for the air or fluid pressure from the auxiliary reservoir through the main valve-chamber and the other ports described to maintain a working pressure in the brake-cylinder. It is understood that the main valve C is in the release position when this takes place by the pressure passing into the auxiliary reservoir from the train-pipe. Now on a reduction of pressure, say to fifty pounds, in the train-pipe, then the retaining-valve closes, as previously explained, and when the engineer applies pressure from the main reservoir to the train-pipe when the auxiliary reservoir fails the triple valve is moved into the release position to recharge the auxiliary reservoir with just enough pressure to apply the brakes with sufficient force to keep the speed of the train under control.

When it is desired to release the brakes, the full working pressure is admitted to the train-pipe, and as this pressure also extends into the passage *f*, and is exerted against the piston G′, the latter is forced upward into the position shown in Fig. 4, so that the double valve G^3 is seated on the seat H′, and communication is established between the exhaust-port *c* and the atmosphere by way of the outlet *e*. The double valve G^3 is firmly seated on the seat H′, and any possible leakage from the auxiliary reservoir to the atmosphere through the described exhaust-passages is completely prevented.

In Fig. 5 is shown a retaining-valve whose function is simply to automatically close the exhaust-port of the triple valve, and this retaining-valve has its exhaust-port *c* opening into a bushing I, while the outlet *e* leads from the interior of the casing F′; but otherwise the operation is exactly the same as the one described in reference to the other figures.

It is understood that in both forms shown in the drawings the piston-valve is actuated on a reduction of pressure in the train-pipe, and serves to retain the pressure in the brake-cylinder.

In the form shown in Figs. 1 to 4 a passage is opened between the auxiliary reservoir and the brake-cylinder, and the train-pipe pressure in this case is not raised above the amount required to apply the brake, while in the device shown in Fig. 5 the pressure is retained within the brake-cylinder during the recharging of the auxiliary reservoir, and when this is done pressure is admitted from the auxiliary reservoir to the brake-cylinder by the triple valve in the usual manner.

Having thus fully described my invention, I claim as new and desire to secure by Letters Patent—

1. A quick-action triple valve, provided with a retaining-valve comprising a casing into which opens the exhaust-port of the triple valve, a cap held on the said casing and in communication with the main slide-valve chamber, and a spring-pressed piston-valve having seat-faces, one of which is adapted to be seated on the said cap, to close the connection between the triple-valve exhaust-port and the main slide-valve chamber, substantially as shown and described.

2. A quick-action triple valve, provided with a retaining-valve comprising a casing into which opens the exhaust-port of the triple valve, a cap held on the said casing and in communication with the main slide-valve chamber, and a spring-pressed piston-valve having seat-faces, one of which is adapted to be seated on the said cap, to close the connection between the triple-valve exhaust-port and the main slide-valve chamber, and the other face is adapted to be seated on a bushing, to disconnect the triple-valve exhaust-port and the air-outlets leading from the said casing to the atmosphere, substantially as shown and described.

3. A quick-action triple valve provided with a retaining-valve comprising a casing integral with the triple-valve casing and having connection with the outer air; the exhaust-port of the triple valve and a passage leading to the train-pipe chamber, a bushing held on the said retaining-valve casing and provided with a valve-seat for connecting or disconnecting the triple-valve exhaust-port with the outer air and a piston-valve of which the piston is fitted to slide in the said bushing and the valve is adapted to be seated on the said bushing valve-seat to disconnect the said triple-valve exhaust-port and the outlet to the atmosphere substantially as described.

WILLIAM HIRST.

Witnesses:
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WILLIAM B. OSMOND.