No. 661,474. Patented Nov. 6, 1900.

L. KRIMMELBEIN.

AIR BRAKE VALVE MECHANISM.

(Application filed June 27, 1900.)

(No Model.) 2 Sheets—Sheet 1.

Fig. 1.

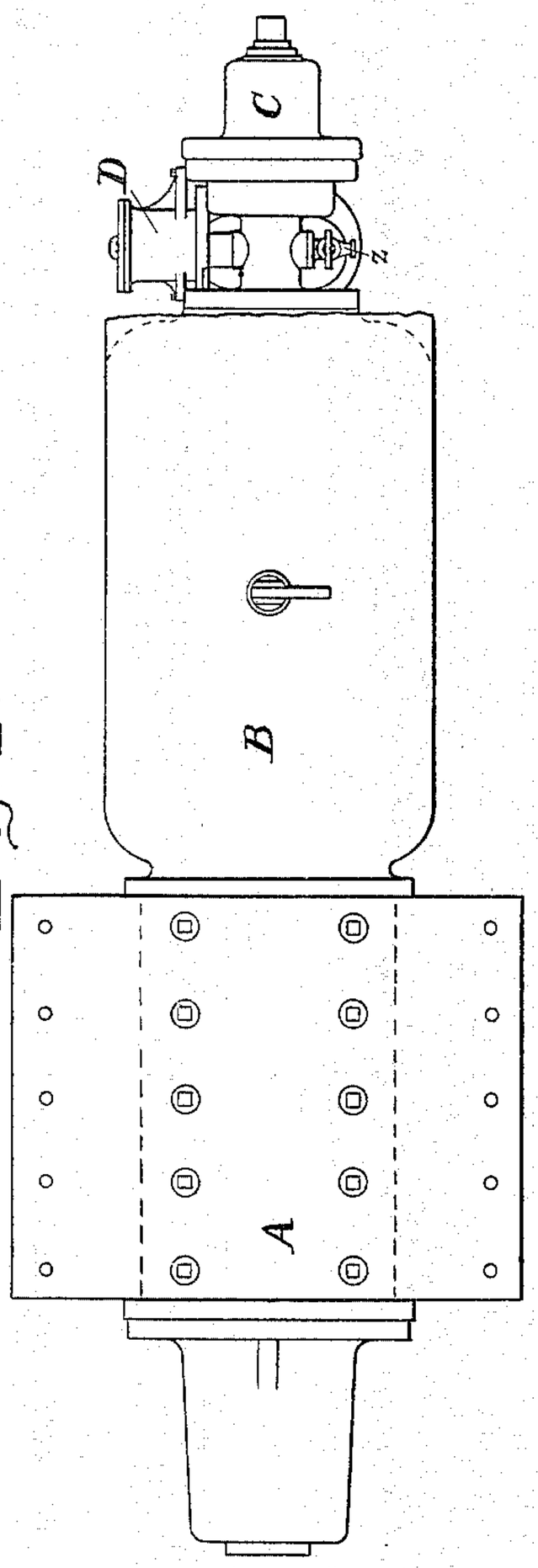

Fig. 2.

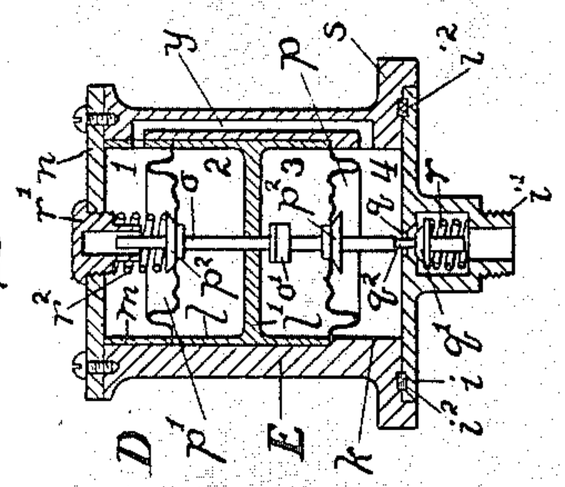

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Fig. 4.

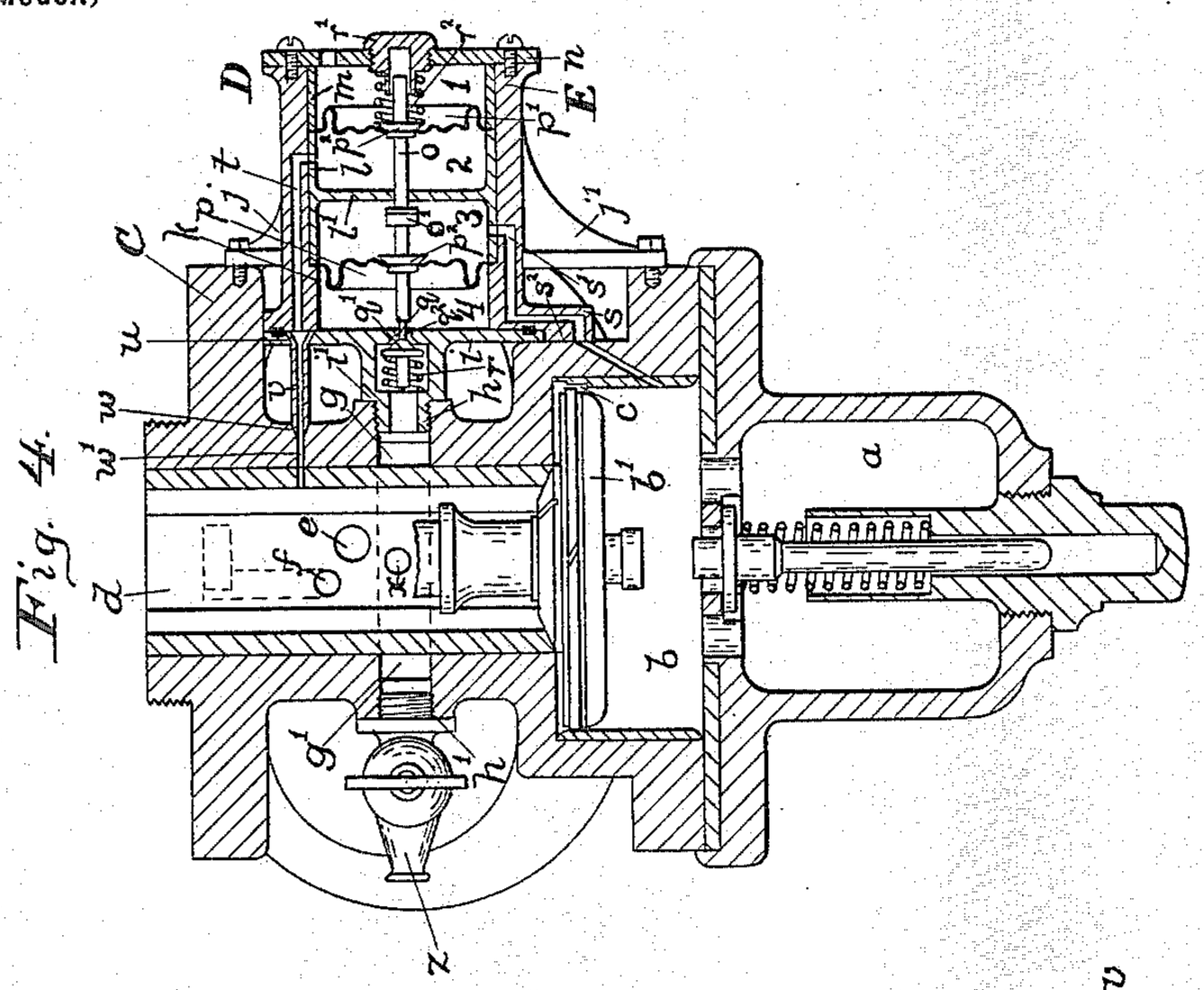

Fig. 5.

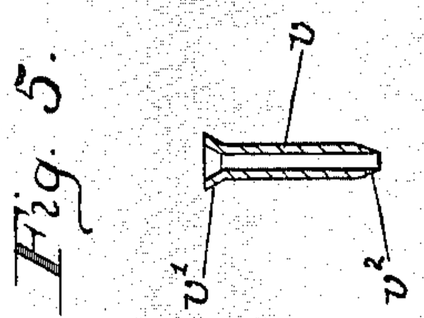

Fig. 3.

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UNITED STATES PATENT OFFICE.

LEOPOLD KRIMMELBEIN, OF BALTIMORE, MARYLAND, ASSIGNOR OF ONE-THIRD TO JOHN F. FELDMANN, OF SAME PLACE.

AIR-BRAKE VALVE MECHANISM.

SPECIFICATION forming part of Letters Patent No. 661,474, dated November 6, 1900.

Application filed June 27, 1900. Serial No. 21,717. (No model.)

To all whom it may concern:

Be it known that I, LEOPOLD KRIMMELBEIN, a citizen of the United States, residing at Baltimore, in the State of Maryland, have invented certain new and useful Improvements in Air-Brake Valve Mechanism, of which the following is a specification.

My invention relates to valve mechanism for railway air-brakes.

The standard triple valve in use to-day for long trains is capable of three distinct operations, namely: first, a service application of the brakes by a slight reduction of pressure in the train-pipe to apply the brakes by auxiliary-reservoir pressure only; secondly, an emergency application of the brakes with full force by a great and rapid reduction of pressure in the train-pipe to apply the brakes by both auxiliary-reservoir pressure and train-pipe pressure, and, thirdly, a release of the brakes by increasing the pressure in the train-pipe.

The object of my invention is to provide, in combination with a triple valve of this character, an automatic device which will enable the engineer to recharge the auxiliary reservoirs of the several cars of the train to the maximum pressure while the brakes are in the applied position without releasing the brakes and which will in no wise interfere with any of the usual actions of the triple valve to apply the brakes for service and for emergency or to release the brakes.

The invention is illustrated in the accompanying drawings as applied to a Westinghouse quick-action triple valve, in which—

Figure 1 is a plan or top view of a brake-cylinder, auxiliary reservoir, and quick-action triple valve of a freight-car equipment with my automatic device applied. Fig 2 is a transverse section of the device. Fig. 3 is a horizontal section of a Westinghouse quick-action triple valve and a horizontal section of the device applied thereto, the exhaust-air-retention valve of the device being closed. Fig. 4 is a similar view with the exhaust-air-retention valve of the device open. Fig. 5 is a view of the short pipe to connect between the new device and the triple-valve case.

Referring to Fig. 1 of the drawings, A designates the brake-cylinder, B the auxiliary reservoir, C the triple-valve, and D my automatic device, all shown in their relative positions.

Referring now to Figs. 3 and 4, the triple valve C has the usual train-pipe air-chamber *a*, through which air passes to and from the piston-chamber *b* to act on the head of the triple-valve piston *b'*. A bushing in said piston-chamber has the usual feeding or charging groove *c*, through which train-pipe air is fed to the valve-chamber *d* and thence to the auxiliary reservoir B when the piston *b'* is in the release position. (Shown in Fig. 4.) As is well known, the valve-chamber *d* has three ports *f*, *e*, and *x*. The port *f* communicates with the brake-cylinder A, the port *e* communicates with the piston of the emergency-valve, and the port *x* communicates with the two oppositely-extending exhaust-passages *g* and *g'* of the triple valve casing leading to the atmosphere.

Those versed in the art of air-brakes are aware that in the operation of triple valves a slight reduction of, say, five pounds pressure in the train-pipe by the proper manipulation of the engineer's valve will reduce the maximum air-pressure of seventy pounds in the train-pipe air-chamber *a* and behind the piston *b'* to, say, sixty-five pounds, and there being also the maximum air-pressure of seventy pounds in the auxiliary reservoir B and valve-chamber *d* the piston *b'* will move back approximately to the position shown in Fig. 3 and will move with it the slide-valve which covers the ports *f*, *e*, and *x* of the chamber *d*. The slide-valve is not shown in Figs. 3 and 4. This movement of the slide-valve uncovers the port *f* and admits air from the auxiliary reservoir B to the brake-cylinder A and applies the brakes. After the application just described has been made for a short period many engineers have found that the brake-shoes gradually loosen their pressure on the car-wheels on account of leakage of air around the pistons of the brake-cylinders in the train-pipe or elsewhere and that in consequence the air-pressure is being continually reduced to the point of depletion in the auxiliary reservoirs. In the ordinary construction of triple valves when pressure is restored in the train-pipe to recharge the auxiliary

reservoir the triple-valve piston b' will move to the release position, and thereby open the feeding or charging groove c; but such movement will also move the slide-valve and uncover the exhaust-port x, which will allow the air in the brake-cylinder to escape to the atmosphere and release the brake. In other words, after the brakes have been applied it is necessary to release the same before the auxiliary reservoirs can be recharged. If this were done while the train is descending a long grade, its impetus would be such that the train would likely get beyond control before the auxiliary reservoirs could be recharged and the brake again applied. It is one of the objects of my invention to avoid this danger and to change this operation by providing means whereby any of the triple valves in use to-day—such, for instance, as the Westinghouse quick-action triple valve illustrated in the accompanying drawings—may be prevented from releasing the brakes while the auxiliary reservoirs are being recharged, and yet at the same time not interfere with the customary service, emergency, and release actions of the triple valve. I shall now describe the construction of the means shown for this purpose. Upon both sides of the triple-valve case C are interiorly-screw-threaded exhaust-nozzles h and h' in communication with the exhaust-passages g and g'. In one of said exhaust-nozzles—in this instance, the nozzle h—is screwed a nipple i', formed on and extending from the center of a circular head i. Abutting against said head and a gasket i^2 is a cylinder E, formed with two exterior oppositely-extending webs $j\,j'$, bolted to the casing of a triple valve C, as shown in Figs. 3 and 4. Said cylinder E is also formed at its end adjacent said head i with an interior annular shoulder or flange k. A bushing l fits within said cylinder next to said flange k and is provided with an apertured partition l'. Another bushing m fits within the cylinder at its outer end and adjoining the said bushing l, and head n on the outer end abuts upon said last-named bushing and holds the two bushings tightly in place, being itself secured to the cylinder E by bolts, as shown. Centered within said cylinder and bushings is a valve-rod o, fitting snugly through the aperture in the partition l', and two flexible diaphragms p and p' are secured to disks p^2 on said valve-rod, and one diaphragm p' has its rim edge tightly held between the abutting edges of the two bushings l and m and the other diaphragm p between the bushing l and the interior annular shoulder or flange k. These two diaphragms and the partition divide the cylinder into four compartments or chambers, (designated 1, 2, 3, and 4,) for a purpose to be presently described.

The circular head i, on which the cylinder E abuts, is provided with a valve-port q, adapted to establish communication between the exhaust-nozzle h of the triple valve and the cylinder-chamber 4. An exhaust-air-retention valve q' is forced by a coil-spring r against said valve-port to close the same, and the forward end of said valve is provided with a projecting pin q^2. That end of the valve-rod o adjacent the outer head n of the cylinder slides in a cap-nut r', and a spring r^2 is compressed between this nut and the adjacent disk p^2. This spring is of somewhat greater tension than the first-named spring r, and thereby under normal conditions presses the opposite end of the valve-rod o against the projecting pin q^2 on the exhaust-air-retention valve q' and holds the latter off its seat q. In the chamber 3 and secured to said valve-rod o is a packing-collar o', provided with a washer adapted to fit against the partition l' around the aperture when the valve-rod moves in the direction to close the valve q'. The purpose of this packing-collar will be hereinafter described.

I shall hereinafter, for convenience, refer to the chamber 2 as the "retention-chamber" and to the chamber 3 as the "releasing-chamber."

Communication is established between the retention-chamber 2 and the auxiliary reservoir B and between the releasing-chamber 3 and the train-pipe in the following manner: The cylinder E is provided with an annular exterior flange s, which is eccentric to the circular head i and rests on said head and is made air-tight by a gasket i^2. The broader part of this flange at one side projects down around said head and contacts with the triple-valve casing at s^2, as shown in Figs. 3 and 4. A passage s' is formed in the wall of the cylinder E from the releasing-chamber 3 to the broad part of the eccentric flange s, thence at right angles through said flange and toward the triple-valve casing, and, finally, in an oblique direction through said triple-valve casing into the piston-chamber b on the train-pipe side of the piston. Another passage t leads from the retention-chamber 2 through the opposite side of the cylinder E toward the circular head i, and a suitable communication or passage is made from this passage t to the triple-valve chamber d or to the auxiliary reservoir. This communication or passage may be made as follows: The said head is provided with a tapering aperture u, the larger side of which coincides with the outer end of the passage t. A pipe v has one end flaring, as at v', which fits snugly in said aperture, while the other end of said pipe is tapered, as at v^2, and fits snugly in a tapering recess w in the triple-valve casing, and a passage w' leads from said recess into the slide-valve chamber d of the triple-valve case, and thus establishes communication with the auxiliary reservoir. A passage y, as shown in Fig. 2, establishes communication between the two chambers 4 and 1 and is adapted to carry off the exhaust-air from the triple valve C when releasing the brakes, the air being discharged into the atmosphere through an

outlet-opening y' in the outer head n of the cylinder E.

A cock z is secured in the exhaust-nozzle h' of the triple-valve case opposite the nozzle h, to which the circular inner head i is secured. The cock when open cuts out or short-circuits my improved device D, but when closed compels the exhaust-air issuing from the exhaust-port x to go through the passage g into the nipple i', in which the exhaust-air-retention valve is located.

In the description of the practical operation of a triple valve to which my improved device D is applied reference is to be first had to Fig. 4 of the accompanying drawings. When the parts are in the released position, as shown in said figure, there are seventy pounds air-pressure in the train-pipe air-chamber a of the triple valve, seventy pounds pressure in the auxiliary reservoir B and valve-chamber d, seventy pounds pressure in chambers 2 and 3 of my improved device D by means of the passages t and s', and only atmospheric pressure in chambers 1 and 4. The brakes are now in the released position.

To apply the brakes for an ordinary service application, the engineer manipulates his engineer's valve in the locomotive-cab to slightly reduce the pressure in the train-pipe. This slight reduction moves the triple-valve piston b' and slide-valve from the released position, so as to uncover the port f and admit air from the auxiliary reservoir B to the brake-cylinder A, and at the same time this slight reduction will reduce the air-pressure in the releasing-chamber 3 of the retainer. There being for the moment a greater air-pressure in the retaining-chamber 2 than in the chamber 3 the preponderance of pressure acting on the diaphragm p' will move the rod o away from the exhaust-air-retention valve q' and the said valve will immediately close to its seat, as shown in Fig. 3. After the engineer has made this slight reduction he brings his engineer's valve-lever back slightly to what is known as the "lap" or "blank" position, whereupon the air-pressure in the auxiliary reservoir B and train-pipe and in the two chambers 2 and 3 will become equalized and the exhaust-air-retention valve q' will be again opened by the greater tension of the spring r^2 over the spring r. This equalization is caused by the air rushing from the auxiliary reservoir to the brake-cylinder, and while the pressure is said to be equalized yet there is always just a slightly-greater reduction in the auxiliary reservoir and on the auxiliary-reservoir side of the piston b' than in the train-pipe and on the train-pipe side of said piston. This slightly-greater reduction just mentioned is just sufficient to move the triple-valve piston b' slightly toward the release position just far enough to close the graduating-port in the slide-valve by reason of the lost motion between the graduating-valve and slide-valve, but will not move the slide-valve itself. The slightly-greater pressure on the train-pipe side of the triple-valve piston, which moved said piston to close the graduating-port, will result in leaving a slightly-greater pressure in chamber 3 over that which is in chamber 2. Now, as this first reduction is not sufficient to set the brakes tightly against the wheels, should it be necessary to apply any further pressure the engineer will make another slight reduction, which will simply move the piston in the direction away from the release position far enough to again open the graduating-port in the slide-valve and admit more air into the brake-cylinder, but will not move the slide-valve. Accordingly every further reduction of air-pressure will cause the exhaust-air-retention valve q' to first open and then close when the air-pressure becomes equalized at the four points last named, except that there is a slightly-greater pressure in chamber 3 than in chamber 2, and these slight reductions will be repeated until there is the desired amount of air-pressure in the brake-cylinder. Should the engineer now desire to recharge the auxiliary reservoir while the brakes are applied, he restores the train-pipe pressure very gradually. This gradual restoration of pressure in the train-pipe moves the piston b' to the release position, which opens the feeding-groove c and also moves the entire slide-valve to cover port f and to open exhaust-port x. Now without my retainer D the air from the brake-cylinder would escape through said exhaust-port x to the atmosphere and the brakes would be released; but with the device of my invention this escape is impossible, as the cock z is closed. Therefore the air in the brake-cylinder will rush against the exhaust-air-retention valve q' and close it, because the said brake-cylinder air-pressure is so great that it readily overcomes any slightly-greater pressure in chamber 3 over chamber 2. Now the train-pipe air-pressure can pass through the feeding-groove c and recharge the auxiliary reservoir while the brakes are in applied position, so that it will be seen the auxiliary reservoir can be recharged, while the air in the brake-cylinder is held from escaping. Finally, when it is desired to release the brakes either before or after the auxiliary reservoir is recharged a quick restoration of pressure in the train-pipe will cause the air to rush into chamber 3 much faster than it can be restored in chamber 2, and the diaphragm p will then force the end of the valve-rod o against the pin q^2 on the exhaust-air-retention valve q' and cause said valve to open and permit the air from the brake-cylinder to exhaust through valve-port q, chamber 4, passage y, chamber 1, and outlet-opening y' into the atmosphere.

The purpose of the packing-collar o' referred to in the description of the construction of my device is as follows: Should an emergency application of the brakes be made, the air-pressure in the chamber 3 will be greatly reduced and the diaphragm p^2 of the

other chamber will draw the valve-rod so as to press the packing-collar tightly against the partition *l'*, which will prevent the air leaking from the auxiliary reservoir and chamber 2 through the opening through which the valve-rod *o* extends.

While I have described the operation of my device when making service application and releasing, the emergency applications and releasing of the brakes may also be made without any interference by the device of my invention.

While I have illustrated my invention as applied to a Westinghouse quick-action triple valve, it is manifest that it is applicable to any known form of plain or quick-action triple valve in use today, and therefore my invention is not limited to the exact construction shown and described.

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

1. The combination with the triple valve of air-brake mechanism, of an automatic retainer connected therewith and provided with a retention-chamber and releasing-chamber always in open communication with the auxiliary reservoir and train-pipe respectively; and an exhaust-air-retention valve in said retainer, as set forth.

2. The combination with the triple valve of an air-brake mechanism, of an automatic retainer connected therewith and provided with a rigid partition and a diaphragm on each side of said partition and forming therewith two chambers which are at all times in communication with the auxiliary reservoir and train-pipe respectively; a valve-rod extending through said partition and secured to said diaphragm; and an exhaust-air-retention valve adapted to be closed by the exhaust-air from the triple valve and opened by engagement with said valve-rod, as set forth.

3. The combination with the triple valve of an air-brake mechanism, of an automatic retainer connected therewith and provided with a partition and a diaphragm on each side of said partition and forming therewith two chambers in communication with the auxiliary reservoir and train-pipe respectively; a valve-rod extending through said partition and secured to said diaphragms; and an exhaust-air-retention valve in said retainer adapted to be closed by the exhaust-air from the triple valve, and disconnected from but arranged to be engaged and opened by said valve-rod, as set forth.

4. The combination with railway air-brake mechanism, of an automatic retainer connected with the triple-valve case and provided with a retention-chamber and a releasing-chamber always in open communication respectively, with the auxiliary reservoir and the train-pipe, and an exhaust-air-retention valve in said retainer, said valve being held off its seat when the pressure in the said releasing-chamber is equal to or greater than the pressure in the said retention-chamber, but closing to its seat when the pressure in said releasing-chamber is reduced below the other chamber, as set forth.

5. The combination with air-brake-valve mechanism, of a cylinder connected with the triple-valve case and provided with a rigid partition and two diaphragms one on each side of said partition and forming therewith a retention-chamber and a releasing-chamber in communication respectively, with the auxiliary reservoir and the train-pipe; a valve-rod extending through said partition and secured to said diaphragms; and an exhaust-air-retention valve adapted to control the exhaust from the triple valve and arranged for engagement and actuation by said valve-rod, as set forth.

6. The combination with railway air-brake mechanism, of an automatic retainer connected with the triple valve and provided with a partition and two diaphragms, one on each side of said partition and forming a retention-chamber and a releasing-chamber in communication respectively, with the auxiliary reservoir and the train-pipe; an exhaust-air-retention valve in said retainer adapted to control the exhaust-air from said triple valve and normally spring-pressed to its seat; a valve-rod fitted through said partition and secured to said diaphragms; and a spring tending to move said valve-rod in the direction to hold the exhaust-air-retention valve off its seat, whereby when pressure is reduced in the releasing-chamber of the retainer, said rod will move out of contact with said exhaust-air-retention valve and allow the latter to close, as set forth.

7. The combination with railway air-brake mechanism, of a head provided with a nipple screwing in one exhaust-nozzle of the triple-valve case; a cylinder abutting against said head and provided with webs securing it to said triple-valve case and an exterior flange abutting against said triple valve, and also provided with a retention-chamber and a releasing-chamber and passages establishing communication between said chambers and the auxiliary reservoir and train-pipe respectively; a spring-pressed exhaust-air-retention valve in said nipple adapted to control the exhaust from said triple valve; means for normally holding said exhaust-air-retention valve open; and means for permitting said exhaust-air-retention valve to close by the reduction of pressure in the said releasing-chamber, as set forth.

8. The combination with a triple valve provided with a brake-cylinder port, *f*, an emergency-port, *e*, and an exhaust-port, *x*, of an automatic retainer provided with four chambers, 1, 2, 3, and 4, of which the chambers 2 and 3 are always in open communication with the auxiliary reservoir and train-pipe respectively, and the chambers 1 and 4 are in communication with each other and the atmosphere; and an exhaust-air-retention valve

controlling the escape of air from said exhaust-port, *x*, to the chambers 1 and 4 and thence to the atmosphere, as set forth.

9. The combination with the triple valve of an air-brake mechanism, of an automatic retainer connected therewith and provided with a partition and a diaphragm on each side of said partition and forming therewith two chambers in communication with the auxiliary reservoir and train-pipe respectively; a valve-rod extending through said partition and secured to said diaphragms; and an exhaust-air-retention valve in said retainer adapted to be closed by the exhaust-air from the triple valve, said exhaust-air-retention valve being provided with a pin which extends through its seat and is adapted to be engaged by the end of said valve-rod, as set forth.

10. The combination with the triple valve of an air-brake mechanism, of an automatic retainer connected therewith and provided with a partition and a diaphragm on each side of said partition and forming therewith two chambers at all times in communication with the auxiliary reservoir and the train-pipe respectively; a valve-rod extending through said partition and secured to said diaphragms; an exhaust-air-retention valve in said retainer adapted to be closed by the exhaust-air from the triple valve and opened by engagement with said valve-rod; and a packing-collar on said valve-rod in that chamber which is in communication with the train-pipe, as set forth.

11. The combination with the triple valve of an air-brake mechanism, of an automatic retainer having a head formed with a nipple connected with one exhaust-nozzle of the triple-valve case and a valve-port extending through said head; a cylinder abutting against said head and provided with a partition and a retention-chamber and a releasing-chamber one on each side of said partition and in open communication with the auxiliary reservoir and train-pipe, respectively; an exhaust-air-retention valve in said nipple and provided with a pin extending through said valve-port; and a valve-rod extending through said partition and moved by the variations of air-pressure in the two chambers into and out of engagement with said pin, as set forth.

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

LEOPOLD KRIMMELBEIN.

Witnesses:
F. S. STITT,
CHARLES L. VIETSCH.