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W. P. A. MACFARLANE.

FLUID PRESSURE BRAKE.

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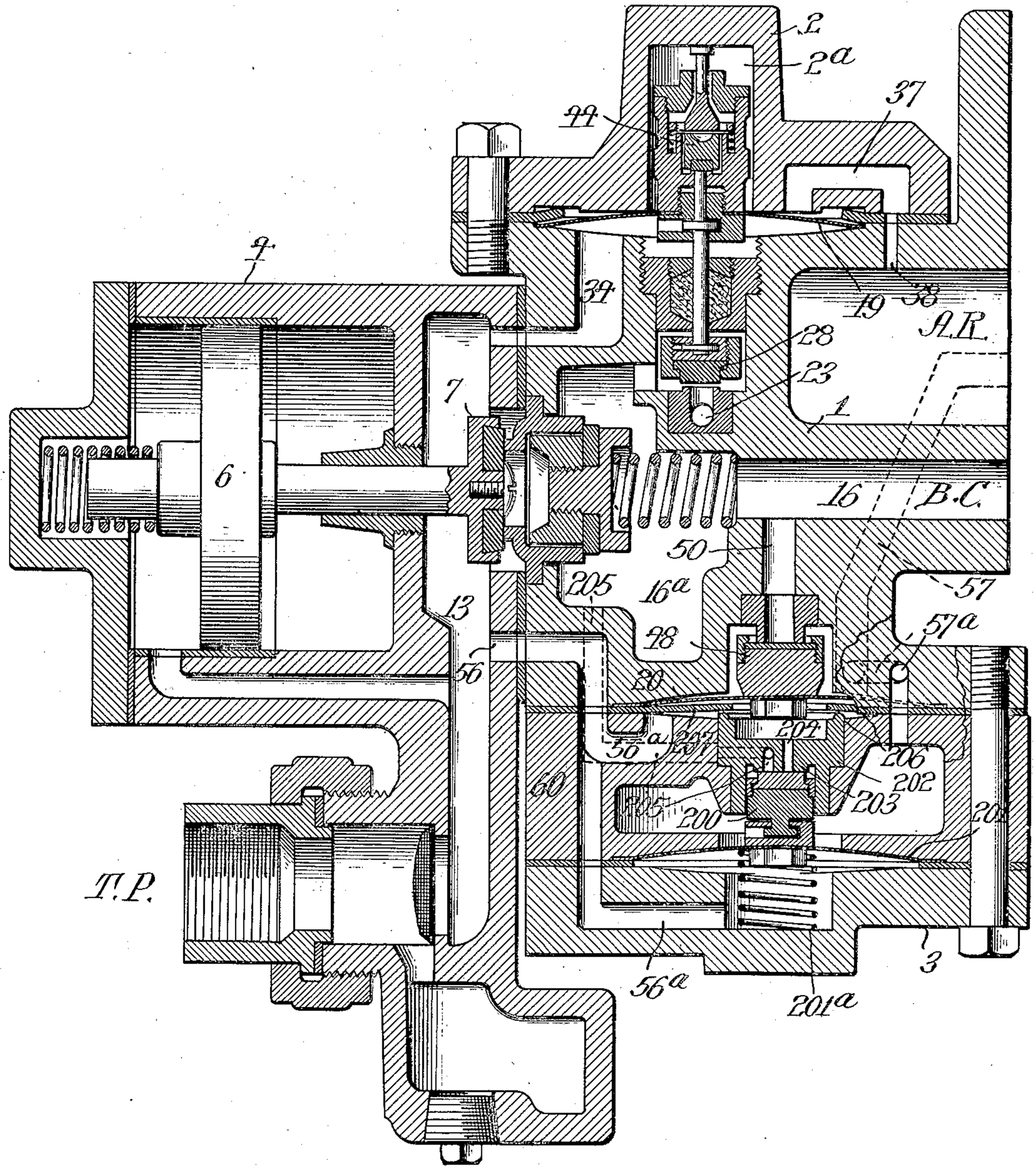

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UNITED STATES PATENT OFFICE.

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FLUID-PRESSURE BRAKE.

No. 845,366. Specification of Letters Patent. Patented Feb. 26, 1907.

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To all whom it may concern:

Be it known that I, WILLIAM P. A. MACFARLANE, a citizen of the United States, residing at Chicago, Cook county, Illinois, have invented certain new and useful Improvements in Fluid-Pressure Brakes, of which the following is a specification.

My invention relates to fluid-pressure brake systems and to the so-called "triple valve" thereof; and the object thereof is to provide a triple valve particularly designed for use in long trains having, say, from sixty to one hundred cars. In trains of this length the action of the ordinary triple valve is not sufficiently sensitive or the serial or consecutive operation sufficiently rapid for the proper braking of the train, with the result that too great an interval of time elapses between the application of the brakes on the first and last cars of the train.

My invention is designed to overcome this difficulty and to meet the conditions of present railroading by providing a triple valve having the required sensitiveness and rapidity in serial action, and to this end I make provision for venting from the train-pipe to the brake-cylinder a predetermined amount of the motive fluid, hereinafter referred to as "compressed air," preliminary to the admission of auxiliary-reservoir air into the brake-cylinder, so that the action of one triple valve assists the operation of the engineer's valve in causing the serial operation or action of the other triple valves, thereby hastening the application of the brakes in service action and at the same time augmenting the brake-cylinder pressure in such action.

The single figure of the drawing illustrates the present embodiment of my invention, although, as will be obvious from the description hereinafter given, my invention may partake of different embodiments.

My invention is shown embodied in a triple valve of the type in which the service, emergency, and brake-release mechanisms are separate and independent both physically and operatively, and in the present instance the particular triple valve with which my invention is incorporated is the same as that shown in my prior patent, No. 819,032, issued to me on April 24, 1906, and consequently I will herein describe in detail only those features or parts which are more or less directly concerned with my present invention, and I will describe the other parts only in a general way. Moreover, I have marked the corresponding parts with the same reference-figures as in said patent. In general terms and referring to said present embodiment of my invention, my triple valve comprises the main casing or body portion 1, having the brake-cylinder connection, (indicated by the letters B C,) the auxiliary reservoir, (indicated by the letters A R,) and the train-pipe connection, (indicated by the letters T P.) The main casing has a top cap-piece 2, a bottom cap-piece 3, and a supplemental casing, (marked 4.) The emergency-piston 6 is connected to and operates the emergency-valve 7, which governs in emergency action the venting of the train-pipe air to the brake-cylinder from the train-pipe passage (marked T P) through the passage 13 and through the passage 16, leading transversely through the valve-body to the brake-cylinder,

The brake-release mechanism is contained within and below the top cap 2, and, as shown, the movable abutment for operating the brake-release valve 28 is a diaphragm 19, clamped between the cap-piece and the upper surface of the valve-body. This release-valve governs the exhaust-port with the brake-cylinder passage 16 and chamber 16^a by means of the passage 25. When the port is in the relative position illustrated in the drawing, the brake-cylinder is at release, inasmuch as the exhaust to atmosphere is open through the passages and port referred to. The lower side of the diaphragm 19 is exposed to train-pipe pressure though the passage 34, while the upper side of such diaphragm is exposed to auxiliary-reservoir pressure, the reservoir being fed from the train-pipe by passing centrally through the diaphragm past a check-valve 44 and into the upper end or chamber 2^a in cap 2, from whence the air-pressure passes downwardly, pressing upon the upper pressure area of the diaphragm 19, and thence feeding to the reservoir through the passages 37 and 38.

The service-valve 48 is actuated and controlled by a diaphragm 20, clamped between the lower surface of the valve-body and a casing or cylindrical block 60, which is interposed between the valve-body and the lower cap 3. This service-valve controls the admission of the reservoir-air from the space above the diaphragm 20 to the port and pas-

sage 50, which communicates with the passage 16, extending to the brake-cylinder. Constant communication is had between the auxiliary reservoir and the space above the diaphragm 20 through the passage 57, extending through the valve-body. The lower side of the diaphragm 20 is exposed to train-pipe pressure entering from the train-pipe passage 13 through a passage 56, passing part way of its length through the valve-body 1 and for the remainder of its length through the block or casing 50, such passage terminating in the space underneath the diaphragm 20.

The triple valve thus far described is a complete and operative structure and is capable of use in automatic air-brake systems for properly and efficiently braking trains under ordinary conditions and also capable of braking long-length trains as well as or better than the ordinary standard triple valve. But for the purpose of improving such triple valve and rendering the same more efficient and serviceable for long-length trains to accomplish the objects hereinbefore stated I provide the triple valve with an auxiliary device which is constructed and arranged to vent train-pipe air to the brake-cylinder in service action preliminary to the admission of auxiliary-reservoir air to the brake-cylinder, such auxiliary device being incorporated with or grafted upon my type of triple valve. Referring to said auxiliary device, the same comprises a valve 200, which is operatively connected with and controlled by a movable abutment, which in the present instance is a diaphragm 201, clamped between the bottom cap 3 and the block or casing 60. This valve 200 is in the form of a piston traveling in the lower cylindrical portion of a bushing 202, inserted in a central opening in the block 60 and provided with a cross-partition forming a seat 203, on which the valve 200 is designed to seat. This seat or partition has a cross-passage 204 communicating with the space beneath the diaphragm 20 and adapted to communicate with a port and passage 205, which leads from the surface of the valve-seat 203 through the block or casing 60 and part way through the valve-body 1 and into the chamber 16^a, which is at all times in communication with the brake-cylinder. The upper side of the diaphragm 201 is in constant communication with the auxiliary reservoir through the branch passages 57^a, communicating with the auxiliary-reservoir passage 57, while the lower side of said diaphragm 201 is at all times in communication with the train-pipe through the passages 13, 56, and 56^a, which latter passage extends through the block or casing 60 and into the bottom cap 3. As a matter of preference, though not of necessity, a light spring 201^a is provided for the purpose of holding the valve 200 seated with a light pressure, particularly when there is no air in the brake system. The upper edge of the bushing 202 is rounded off, so as to form a seat 206, upon which the extended gasket 207 is designed to seat or be forced when the diaphragm 20 is moved downwardly in the application of the brakes, this arrangement being provided for a purpose hereinafter made apparent.

It will be understood that my attachment or auxiliary device is designed for action in the service application of the brakes and for the purpose of preliminarily admitting or venting train-pipe air to the brake-cylinder to hasten the serial action of the triple valves in long trains of cars. To this end the arrangement and construction is such that the auxiliary valve 200 is moved in advance of the service-valve 48, there being in practice a difference of one pound pressure in the train-pipe reduction at which the respective valves operate. For instance, if the diaphragm 201 moves with a three-pound reduction the other diaphragm 20 will remain quiescent until the train-pipe pressure reaches four pounds; but, as will be understood, the difference in the degree of train-pipe pressure required to move the two diaphragms may be varied as desired or required.

Now describing the operation, and assuming that a train-pipe reduction has been made sufficient to move the diaphragm 201, the movement of this diaphragm will lift or withdraw the auxiliary valve 200 from its seat, with the result that the train-pipe air which is always present below the diaphragm 20 will instantly be admitted to the brake-cylinder through the ports and passages 204 and 205 and chamber 16^a and passage 16. As soon as the train-pipe pressure has been reduced both at the engineer's valve and at the triple valve in the manner just explained to a point or degree which will cause the diaphragm 20 to be moved downwardly the service-valve 48 will be lifted or withdrawn from its seat, with the result that the auxiliary-reservoir air will be admitted through the passage 50 to the brake-cylinder through the passages 50 and 16. However, it is necessary to cut off the venting of train-pipe air to the brake-cylinder as soon as the admission of auxiliary-reservoir air has fairly begun, and to this end the valve-seat 206, hereinbefore referred to, is provided, it being understood that the movement of the diaphragm 20 forces the gasket 207 downwardly upon such seat, thereby cutting off the communication between the passage 204 and the train-pipe passage or connection 56. It will be understood that this preliminary venting of the train-pipe air to the brake-cylinder assists in the reduction of the train-pipe pressure, so as to facilitate the serial action of the succeeding triple valves in the train, and at the same time this vented train-pipe air is utilized in the partial filling of the

brake-cylinder prior to the introduction therein of the auxiliary-reservoir pressure. In the present instance the diaphragm 201 is more sensitive than the diaphragm 20, and thus caused to move in advance of the latter by reason of the fact that the diaphragm 20 is more heavily loaded than the other diaphragm, inasmuch as the port and passage 50 is of greater diameter than the port and passage 204, the load on the service-valve 48 and auxiliary valve 200 being in proportion to the respective diameters or sizes of said two passages. This preliminary venting of the train-pipe air to the brake-cylinder occurs at the initial application of the brakes in service action, and the brake-cylinder pressure in such action may be increased in graduation by repeated reductions of the train-pipe pressure until equalization is obtained between the brake-cylinder and the reservoir. In releasing the brakes the train-pipe air is restored, with the result that the different working parts take their relative positions illustrated in the drawing.

I claim—

1. In a fluid-pressure brake system, the combination with a triple valve, of means auxiliary thereto and independent thereof for venting train-pipe pressure to the brake-cylinder in the service applications of the brakes said means being controlled by opposing pressures from the train-pipe and auxiliary reservoir respectively.

2. In a fluid-pressure brake system, the combination with a triple valve, of means auxiliary thereto and independent thereof for venting train-pipe pressure to the brake-cylinder prior to the admission of auxiliary-reservoir pressure thereto in the service applications of the brakes said means being controlled by opposing pressures from the train-pipe and auxiliary reservoir respectively.

3. In a fluid-pressure brake system, the combination with a triple valve, of means auxiliary thereto and independent thereof for venting train-pipe pressure to the brake-cylinder prior to the admission of auxiliary-reservoir pressure thereto in the service applications of the brakes and means for cutting off said venting as soon as the auxiliary-reservoir pressure is admitted said auxiliary means being controlled by opposing pressures from the train-pipe and auxiliary reservoir, respectively.

4. In a fluid-pressure brake system, the combination with a triple valve, of means auxiliary thereto for venting train-pipe pressure to the brake-cylinder in the service applications of the brakes, said means being independent of the brake-release and emergency devices of the triple valve and being controlled by opposing pressures from the train-pipe and auxiliary reservoir, respectively.

5. In a fluid-pressure brake system, the combination with a triple valve, of a valve device auxiliary thereto and independent thereof to vent train-pipe pressure to the brake-cylinder in service action and arranged to open upon a less train-pipe reduction than that required to operate the triple valve said valve device being controlled by opposing pressures from the train-pipe and auxiliary reservoir, respectively.

6. In a fluid-pressure brake system, the combination, with a triple valve, of a valve device auxiliary thereto and independent thereof to vent train-pipe pressure to the brake-cylinder in service action and arranged to open upon a less train-pipe reduction than that required to operate the triple valve, and means for closing said valve device when the train-pipe pressure has been reduced sufficiently to operate the triple valve said valve device being controlled by opposing pressures from the train-pipe and auxiliary reservoir, respectively.

7. In a fluid-pressure brake system, the combination, with a triple valve, of a valve device auxiliary thereto to vent train-pipe pressure to the brake-cylinder in service action, said valve device being loaded as compared with the service-valve device of the triple valve whereby the auxiliary-valve device will be caused to operate in advance of the other.

8. In a fluid-pressure brake system, the combination of a triple valve of the type in which the brake-release-valve mechanism, the emergency-valve mechanism and the service-valve mechanism are independent, and means auxiliary thereto for venting train-pipe pressure to the brake-cylinder in the service application of the brakes.

9. In a fluid-pressure brake system, the combination of a triple valve of the type in which the brake-release-valve mechanism, the emergency-valve mechanism and the service-valve mechanism are independent, and a valve device coöperating with the service-valve mechanism for venting train-pipe pressure to the brake-cylinder in the service application of the brakes.

10. In a fluid-pressure brake system, the combination, with a triple valve, of a movable abutment independent thereof and exposed on its opposite sides to train-pipe and auxiliary-reservoir pressures respectively, and a valve actuated by said abutment for admitting train-pipe pressure to the brake-cylinder prior to the admission, by the triple valve, of auxiliary-reservoir pressure thereto.

11. In a fluid-pressure brake system, the combination, with a triple valve, of a movable abutment independent thereof and exposed on its opposite sides to train-pipe and auxiliary-reservoir pressures respectively, a valve-seat having ports and passages leading from the train-pipe and to the brake-cylinder, and a valve normally seated on said seat to

close said ports and passages, and actuated by the abutment.

12. In a fluid-pressure brake system, the combination, with a triple valve, of a movable abutment independent thereof and exposed on its opposite sides to train-pipe and auxiliary-reservoir pressures respectively, and a valve auxiliary to the triple valve for governing a passage from the train-pipe to the brake-cylinder, said triple valve being constructed to interrupt said passage upon the operation of the service-valve mechanism of the triple valve.

13. In a fluid-pressure brake system, the combination, with a triple valve, of a movable abutment exposed on its opposite sides to train-pipe and auxiliary-reservoir pressures respectively, a valve-seat having ports and passages leading from the train-pipe and to the brake-cylinder, and a valve normally seated on said seat to close said ports and passages, and actuated by the abutment, the service-valve mechanism of the triple valve having a movable abutment arranged to close said ports and passages and thereby interrupt said communication between the train-pipe and brake-cylinder when such service-valve mechanism has operated to admit auxiliary-reservoir pressure to the brake-cylinder.

14. In a fluid-pressure brake system, the combination, with a triple valve, of a movable abutment exposed on its opposite sides to train-pipe and auxiliary-reservoir pressures respectively, a valve-seat having ports and passages leading from the train-pipe and to the brake-cylinder, and a valve normally seated on said seat to close said ports and passages, and actuated by the abutment, said service-valve mechanism having a movable abutment arranged, when operated, to seat upon said seat to interrupt said communication between the train-pipe and brake-cylinder when the service-valve mechanism has been operated for service action.

15. In a fluid-pressure brake system, the combination, with a triple valve, of a movable abutment exposed on its opposite sides to train-pipe and auxiliary-reservoir pressures respectively, a valve-seat having ports and passages leading from the train-pipe and to the brake-cylinder, and a valve normally seated on said seat to close said ports and passages, and actuated by the abutment, said service-valve mechanism having a flexible diaphragm for operating the service-valve and a gasket on one side adapted to be seated on said seat to interrupt said communication between the train-pipe and brake-cylinder when the diaphragm moves to admit an auxiliary-reservoir pressure to the brake-cylinder.

16. In a flexible pressure brake system, the combination with a triple valve provided with service-valve mechanism having a movable abutment exposed on one side to train-pipe pressure, of an auxiliary movable abutment exposed on its opposite sides to train-pipe and auxiliary-reservoir pressures respectively, and a valve actuated by said auxiliary abutment for venting to the brake-cylinder the said train-pipe pressure pressing against the first-named movable abutment.

17. In a device for actuating fluid-pressure brakes adapted to admit auxiliary-reservoir pressure to the brake-cylinder in service applications of the brakes, valve mechanism acting independently of the means or device for admitting reservoir-pressure and arranged to vent train-pipe pressure to the brake-cylinder, said valve mechanism being opened by a preponderance of reservoir-pressure and closed by a preponderance of train-line pressure.

18. In a device for actuating fluid-pressure brakes adapted to admit auxiliary-reservoir pressure to the brake-cylinder in service applications of the brakes, a valve of the puppet type for venting train-pipe pressure to the brake-cylinder in the service applications of the brakes and acting independently of the device for admitting auxiliary-reservoir pressure to the brake-cylinder, and a movable abutment operating independently of said device and exposed on one side to auxiliary-reservoir pressure and on the other side to train-pipe pressure.

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