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FLUID PRESSURE BRAKE.

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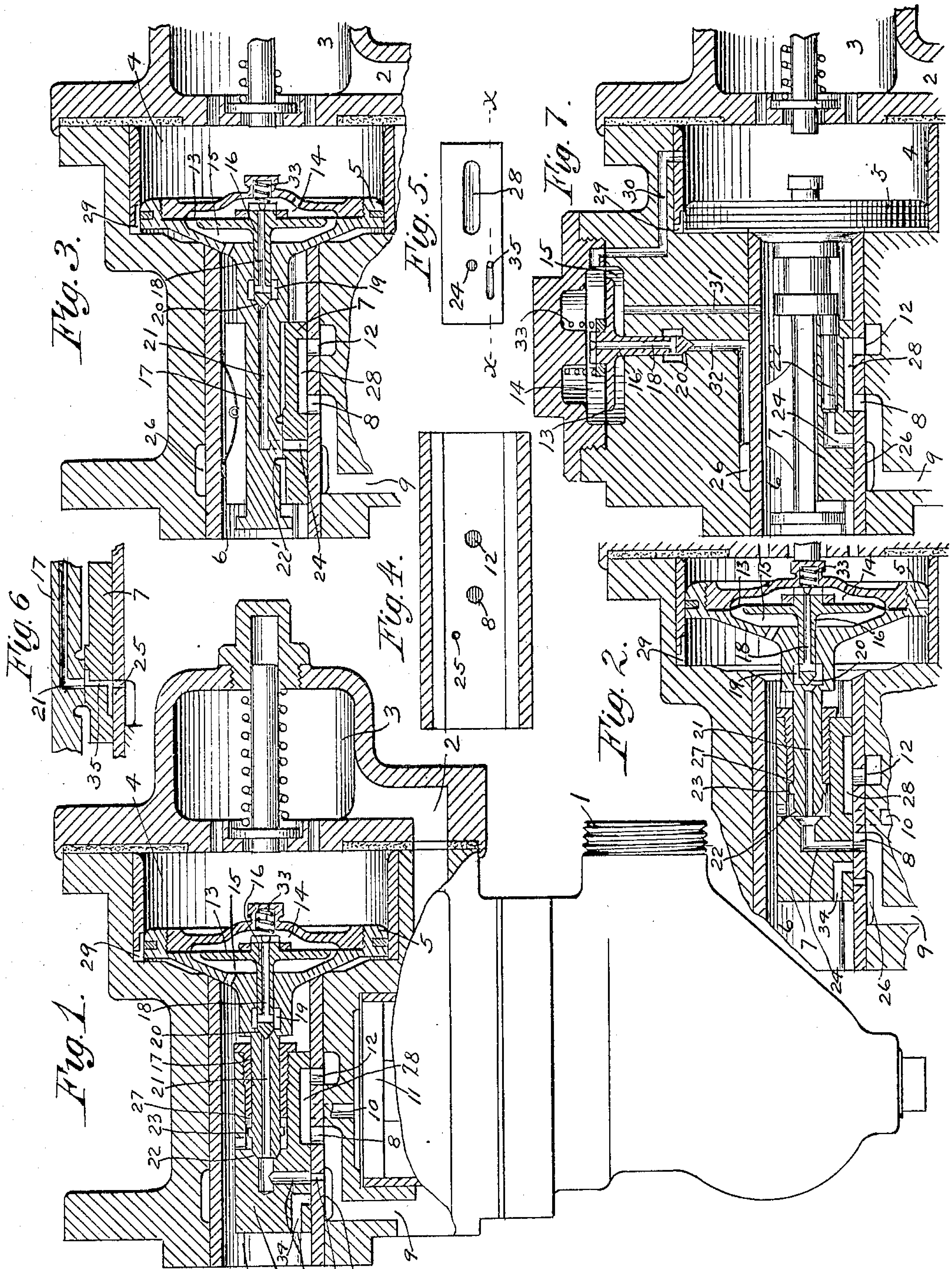

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FLUID-PRESSURE BRAKE.

No. 869,606. Specification of Letters Patent. Patented Oct. 29, 1907.

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To all whom it may concern:

Be it known that I, GEORGE WESTINGHOUSE, a citizen of the United States, residing in Pittsburg, county of Allegheny, State of Pennsylvania, have invented a certain new and useful Improvement in Fluid-Pressure Brakes, of which improvement the following is a specification.

This invention relates to automatic fluid pressure brakes, and has for its object to provide an improved means for securing a local discharge of fluid from the train pipe at or near each triple valve device throughout the train in service applications of the brakes, and thereby accelerate the movement of the successive triple valves by the well known serial action as the wave of reduction is thus carried rapidly through the full length of the train pipe.

With the present standard automatic air brake equipment, as is well known, a service application of the brakes is produced by making a gradual reduction in train pipe pressure at the train pipe discharge port of the engineer's brake valve on the locomotive, consequently all of the compressed air which is vented from the train pipe for a service application must be discharged at the front end of the train pipe, thereby causing a slow reduction in pressure at the rear end of the train pipe, due to the expansion of the air toward the forward end, and a correspondingly slow action of the rear triple valves, especially on long trains. My invention is designed to overcome this objectionable feature of the present system, and comprises a valve device having a diaphragm or other movable abutment subject to the opposing pressures of an auxiliary reservoir and the train pipe for controlling the local discharge of air from the train pipe, the device being designed to be more sensitive in its movement than the triple valve piston and adapted to be operated to open a local train pipe discharge port upon a slight reduction of train pipe pressure and before the triple valve piston moves to service position. By this means the wave of reduction which is started at the train pipe discharge port of the brake valve is rapidly transmitted through the train pipe and each triple valve is caused to move promptly and positively to full service position, thereby securing a quick service application of any desired degree of pressure. My invention may be embodied in the triple valve structure or may be constructed separately therefrom and operate independently.

In the accompanying drawing, Figure 1 is a view partly in section and partly in elevation showing a quick action triple valve device with my improvement embodied therein; Fig. 2 a broken sectional view of a similar device showing the movable parts of the triple valve in service position; Fig. 3 a similar broken sectional view of a plain triple valve device showing a modification of my improvement, in which the graduating valve is in the form of a slide valve and the main slide valve is provided with a local train pipe discharge port separate from the service graduating port for the auxiliary reservoir; Fig. 4 a plan view of the main slide valve seat of the structure shown in Fig. 3; Fig. 5 a face view of the main slide valve; Fig. 6 a detail sectional view of the slide valve and seat taken in the plane of the local train pipe discharge ports indicated by line X—X of Fig. 5; and Fig. 7 a broken sectional view of a triple valve device showing still another modification, in which my improved valve device is supported on the casing of triple valve, but operates independently thereof.

According to the construction shown in Figs. 1 and 2, I have illustrated the ordinary standard form of quick action triple valve comprising a casing having a nozzle 1 for connection with the train pipe, a train pipe passage 2, a cap chamber 3, piston chamber 4, containing piston 5, valve chamber 6, containing slide valve 7, and adapted to communicate with the auxiliary reservoir, a port 8 leading to the brake cylinder passage 9, an emergency port 34 in the slide valve, an emergency port 10 leading to the chamber of the emergency piston 11, and an exhaust port 12 leading to the atmosphere, all of which is of the well known standard construction. According to this modification my improvement comprises a movable abutment or diaphragm subject to the opposing pressures of the auxiliary reservoir and the train pipe for controlling a local train pipe discharge port and, as shown in Figs. 1 and 2, this diaphragm 13 is located within the triple valve piston 5, dividing the space therein into two chambers 14 and 15, which communicate with the train pipe and the auxiliary reservoir respectively, as shown. Secured to the diaphragm is a hollow stem 16 extending by a close fit into the hollow stem 17 of the main piston and having a port 18 leading through the diaphragm to a chamber 19 formed in the main stem 17, the end of the stem 16 forming a valve 20 for closing communication from the chamber 19 to the port 21 leading through the main stem 17 and communicating with the service or graduating port 24 in the main slide valve 7. The end of the main stem 17 forms the graduating valve 22 for controlling the communication from the auxiliary reservoir and valve chamber 6 to the port 24 in the main slide valve and a collar 23 is located on the stem for engaging a shoulder 27 in the main slide valve, the usual amount of lost motion being provided for opening and closing the graduating valve without moving the main valve. The slide valve is provided with the usual exhaust cavity 28 and an additional port 25 is located in the valve seat and adapted to establish communication between the graduating port 24 of the main slide valve and the brake cylinder passages 26 and 9 when the valve is in full release position, as shown in Fig. 1. The operation of this form of my improvement is as follows: The train pipe being charged with fluid under pressure from the main reservoir, the piston 5 and valve 7 are moved to full release position with the graduating valve 22, and the local discharge valve 20 closed, the brake cylinder ports 9 and 8 communicating with the atmosphere through cavity 28 and exhaust port 12. The auxiliary reservoir is then charged to normal pressure through the feed groove 29 in the usual way. When a light reduction of train pipe pressure is made at the brake valve for producing a service application of the brakes, the first effect of the reduction wave at the first triple valve is to cause the outward movement of the diaphragm 13 by the slight preponderance of auxiliary reservoir pressure acting on the opposite side, before the movement of the triple valve piston, thereby opening the local train pipe discharge port 21 and permitting a local venting of air from the train pipe through ports 18, 21, 24, 25 and 9 to the brake cylinder, and consequently to the atmosphere, since at this time the brake cylinder is in communication with the exhaust port 12. This local reduction of train pipe pressure acting directly upon the triple piston immediately causes the same to move back to service position, see Fig. 2, thereby opening the graduating valve 22 and bringing the port 24 of the slide valve in register with the brake cylinder port 8, at the same time closing the port 25 and the brake cylinder exhaust. The local reduction from the train pipe at each triple valve also assists in accelerating the action of the next succeeding diaphragm and train pipe discharge valve, thereby carrying the wave of reduction rapidly through the train and bringing all the triple valves promptly to service position. Air from the auxiliary reservoir then flows to the brake cylinder through the graduating port 24 and brake cylinder ports 8 and 9 in the usual way, while at the same time a limited amount of air from the train pipe continues to discharge to the brake cylinder through ports 18 and 21 until the auxiliary reservoir pressure is reduced to substantially that of the train pipe, when the local discharge valve 20 closes and immediately thereafter the piston 5 moves back to lap position closing the graduating valve 22. If desired, a light spring 33 may be used to assist in the closing of the local discharge valve. The capacity of the local train pipe discharge port must be so calculated as not to cause the triple valve to go to emergency position when a service application is made and must also be relatively smaller than the graduating port from the auxiliary reservoir to the brake cylinder so that the auxiliary reservoir pressure may reduce more rapidly than the train pipe when the triple valve is in service position and the train pipe discharge port at the brake valve has closed, in order to insure the movement of the triple valve to lap position. The brakes are released in the usual way by restoring the train pipe pressure and thereby moving the piston and slide valve to full release position, the local discharge valve remaining closed by the preponderance of pressure on the train pipe side of the diaphragm.

The modification shown in Fig. 3 is similar to that already described, except that a portion of the main stem 17 of the piston is made in the form of a graduating slide valve 22′, through which the port 21 is adapted to register with an additional port 35 in the main slide valve, which in turn communicates with port 25 leading to the brake cylinder, see Fig. 6, the port 35 being provided with extensions in the upper and lower faces of the slide valve, so that the port 21 remains in open communication with port 25 and the brake cylinder, as the triple piston moves successively to service position and back to lap in graduating the application of the brakes. When a reduction of train pipe pressure is made for applying the brakes in service, the local train pipe discharge valve 20 is immediately opened by diaphragm 13, as before described, and air from the train pipe flows through ports 21, 35 and 25 to the brake cylinder, then as the triple piston and graduating valve 22′ move back to service position the upper end of the graduating port 24 is uncovered and opened to valve chamber 6 and registers with the brake cylinder port 8. In this position the local train pipe discharge port 21 still communicates with the discharge port 35 and the brake cylinder port 25 by means of the extensions or grooves in the faces of the slide valve. Air from the auxiliary reservoir now flows to the brake cylinder through graduating port 24 and brake cylinder port 8, while at the same time air from the train pipe continues to flow to the brake cylinder through ports 21, 35 and 25. When the auxiliary reservoir pressure has reduced to substantially equal that of the train pipe the local discharge valve 20 is closed, and upon a slight further reduction of the reservoir pressure the triple piston moves the graduating slide valve 22′ back to lap position and closes the graduating port 24. By means of using the local discharge port 35 in the main slide valve separate from the graduating port 24, the communication from the auxiliary reservoir to the brake cylinder is not opened until the slide valve has moved to close the brake cylinder exhaust.

According to the modification shown in Fig. 7, my improved local train pipe discharge valve device is made separate from the triple valve mechanism and operates independently, although the same is for convenience illustrated as supported on the triple valve casing. The chamber 14 on one side of diaphragm 13 is connected to the train pipe space of the piston chamber 4 by means of a passage 30, and the chamber 15 communicates with the valve chamber 6 and the auxiliary reservoir by means of passage 31. The diaphragm stem 16 and valve 20 controls a port 32 leading to the brake cylinder passages 26 and 9. The operation of this form of my improvement is substantially the same as that before described, except that the local train pipe discharge port 32 leads from the valve 20 directly to the brake cylinder passage without passing through the slide valve and is therefore in open communication with the brake cylinder at all times. The local discharge of train pipe to the brake cylinder will therefore be governed solely by the valve 20 and diaphragm 13, which being more sensitive in its movement than the triple valve piston, will operate in service applications to open this local discharge before the triple moves to service position and then close said discharge in advance of the movement of the triple piston to lap position.

In emergency applications of the brakes my improvement will operate to open the local train pipe discharge valve in advance of the movement of the triple valve piston and thereby produce a slight preliminary discharge of train pipe air to the brake cylinder before the triple valve moves to emergency position and cuts off communication through the local discharge port to the brake cylinder. The action of the apparatus in emergency applications is so rapid that the period of time between the opening of the local train pipe discharge and the movement of the triple valve to emergency position is so small as to be almost inappreciable, but the momentary local discharge of train pipe air which does occur at that time assists to that extent in accelerating the quick action of the triple valve devices to emergency position. My improvement is also equally well adapted to be applied to so-called plain triple valves having no emergency valve feature, as shown in Figs. 3 and 4.

In all the modifications illustrated, it will be noticed that the diaphragm for controlling the local train pipe discharge valve is arranged to have a movement independent of the movement of the triple valve piston, and to be more sensitive in its action. The greater part of the air that is vented from the train pipe at the local train pipe discharge port is utilized in the brake cylinder for assisting in applying the brakes since, although the brake cylinder exhaust port is open when the air first enters the brake cylinder, this will be closed almost immediately afterward by the movement of the triple slide valve, and further discharge of air from the train pipe will assist in increasing the pressure in the brake cylinder.

From the foregoing it will now be apparent that by means of this improvement the action of the triple valve devices will be greatly accelerated in service applications of the brakes, thereby facilitating the handling of long trains in ordinary service without shock or danger of breaking the train in two.

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

1. In an automatic fluid pressure brake, the combination with a train pipe, auxiliary reservoir and triple valve, of a valve for controlling a local train pipe discharge port, and a diaphragm subject to the opposing pressures of the auxiliary reservoir and the train pipe for opening the local discharge port in advance of the movement of the triple valve piston and also when the triple valve is in service position.

2. In an automatic fluid pressure brake, the combination with a train pipe and triple valve device, of a local discharge port from the train pipe to the brake cylinder, a valve controlling said port, and a diaphragm subject to the opposing pressures of the auxiliary reservoir and the train pipe and having a movement independent of the triple valve piston for opening said local discharge port when the triple valve is in service position.

3. A triple valve device for fluid pressure brakes, comprising a piston and valve operated by variations in train pipe pressure for controlling communication from the auxiliary reservoir to the brake cylinder, and means mounted on said piston and operated by a reduction of train pipe pressure to open a local train pipe discharge in advance of the movement of the triple valve piston and also when the main valve is in service position.

4. A triple valve device for fluid pressure brakes, comprising a piston and valve operated by variations in train pipe pressure for controlling communication from the auxiliary reservoir to the brake cylinder, a movable abutment mounted in said piston and subject to the opposing pressures of the auxiliary reservoir and the train pipe, and a valve operated by said abutment for controlling a local train pipe discharge port when the main valve is in service position.

5. A triple valve device for fluid pressure brakes, comprising a piston and valve operated by variations in train pipe pressure for controlling communication from the auxiliary reservoir to the brake cylinder, a movable abutment mounted in said piston and subject to the opposing pressures of the auxiliary reservoir and the train pipe, a local train pipe discharge port leading through the main piston stem, and a valve operated by said abutment for controlling said port.

6. A triple valve device for fluid pressure brakes, comprising a piston, a main slide valve operated thereby and having a graduating port and a local discharge port, a brake cylinder port communicating with the discharge port, another brake cylinder port for communicating with the graduating port in service position, a graduating valve movable with the piston and having a local train pipe discharge port for communicating with the discharge port in the main slide valve, and a movable abutment and valve for controlling said train pipe discharge port.

7. A triple valve device for fluid pressure brakes, comprising a piston, a main slide valve operated thereby and having a graduating port and a local discharge port, a brake cylinder port communicating with the discharge port in release and service position, another brake cylinder port for communicating with the graduating port in service position, a graduating slide valve movable with the piston and having a local train pipe discharge port for communicating with the discharge port in the main slide valve, and a movable abutment and valve mounted in the triple valve piston for controlling said train pipe discharge port.

8. A triple valve device for fluid pressure brakes, comprising a piston, a main slide valve operated thereby and having a discharge port, a brake cylinder port communicating with the discharge port in the release position of the valve, a graduating valve movable with the piston, a local train pipe discharge port in said graduating valve, and a movable abutment and valve mounted in the triple valve piston for controlling said train pipe discharge port.

In testimony whereof I have hereunto set my hand.

GEO. WESTINGHOUSE.

Witnesses:
R. F. Emery,
Jas. B. MacDonald.