No. 619,480. Patented Feb. 14, 1899.

M. W. HIBBARD.

DEVICE FOR ACTUATING FLUID PRESSURE BRAKES.

(Application filed July 21, 1898.)

(No Model.) 2 Sheets—Sheet 1.

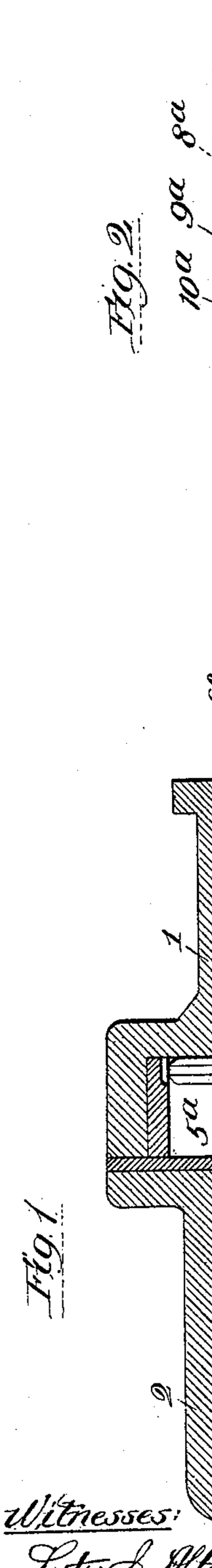

Fig. 1.

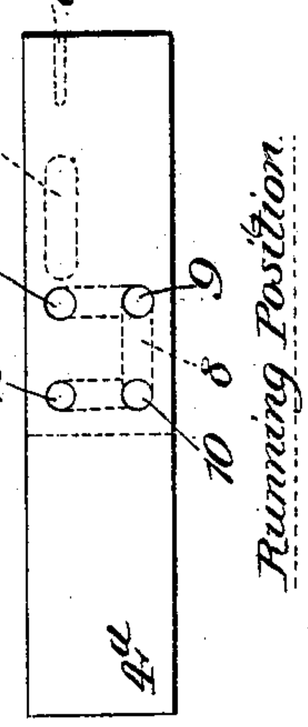

Fig. 2. Running Position.

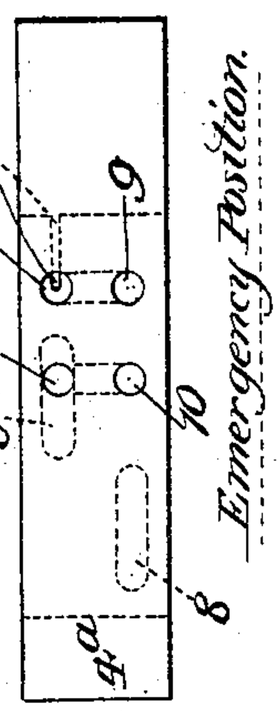

Fig. 3. Emergency Position.

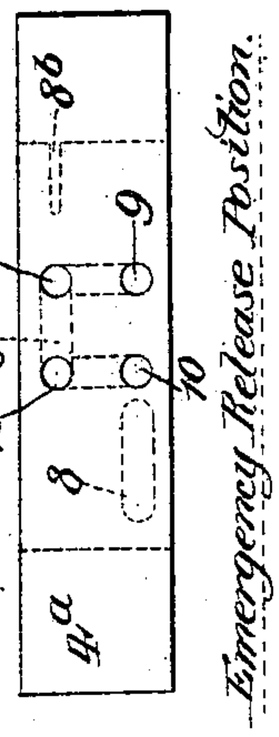

Fig. 4. Emergency Release Position.

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No. 619,480. Patented Feb. 14, 1899.

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DEVICE FOR ACTUATING FLUID PRESSURE BRAKES.

(Application filed July 21, 1898.)

(No Model.) 2 Sheets—Sheet 2.

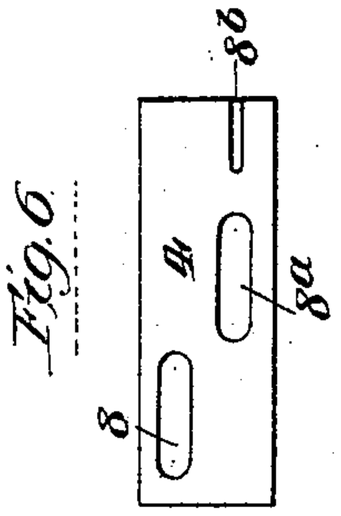

Fig. 6.

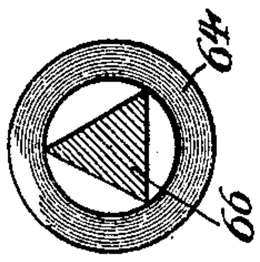

Fig. 7.

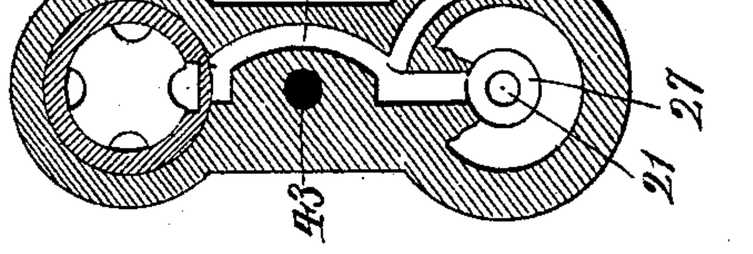

Fig. 8.

Fig. 9.

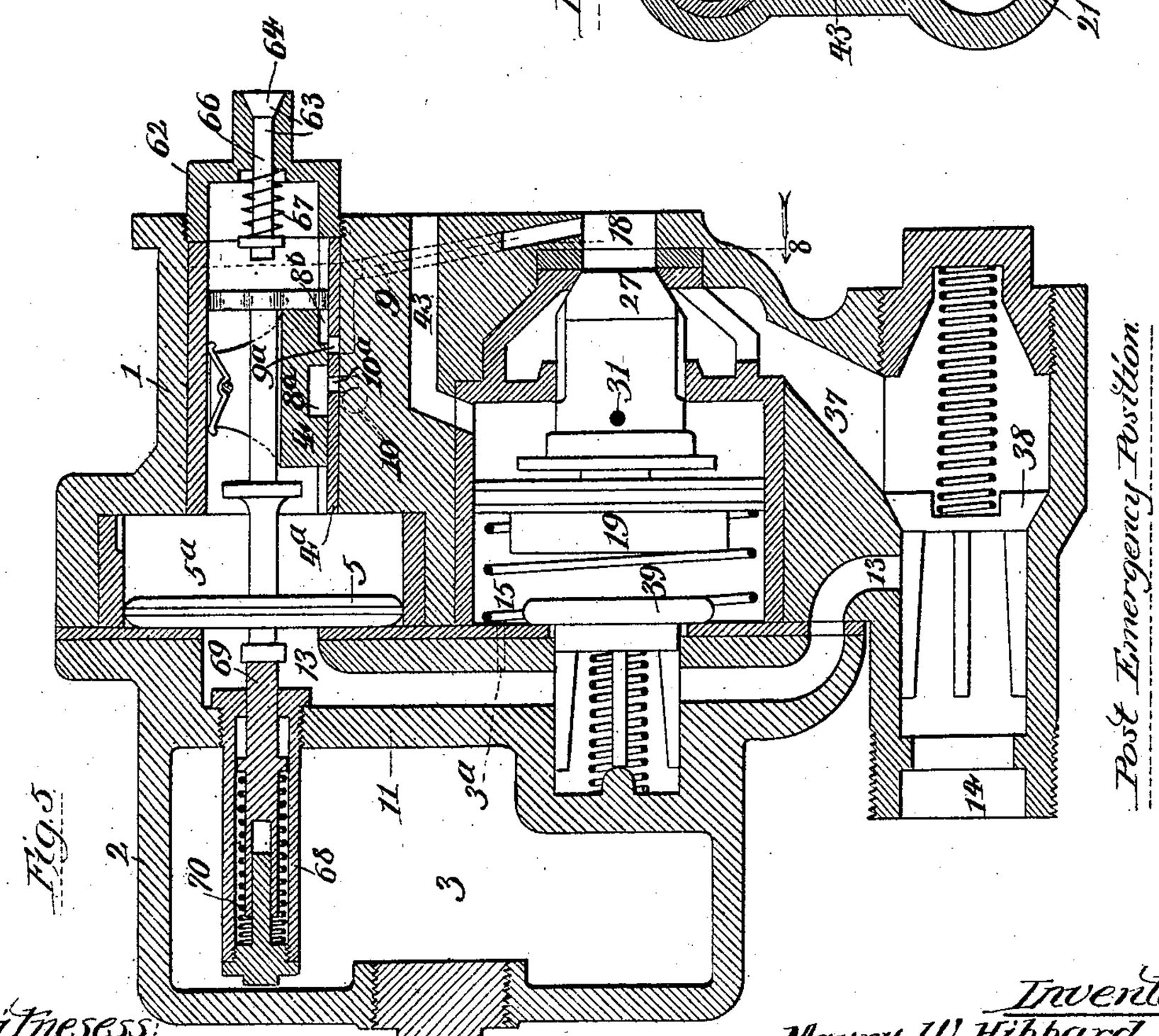

Fig. 5.

Post Emergency Position.

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UNITED STATES PATENT OFFICE.

MAURY W. HIBBARD, OF CHICAGO, ILLINOIS, ASSIGNOR TO RICHARD FITZGERALD, OF SAME PLACE.

DEVICE FOR ACTUATING FLUID-PRESSURE BRAKES.

SPECIFICATION forming part of Letters Patent No. 619,480, dated February 14, 1899.

Application filed July 21, 1898. Serial No. 686,486. (No model.)

To all whom it may concern:

Be it known that I, MAURY W. HIBBARD, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a certain new and useful Device for Actuating Fluid-Pressure Brakes, of which the following is a specification.

My invention relates to devices for actuating fluid-pressure brakes, more particularly in the system known as "high-speed" brakes, in which a valve device is employed for blowing down the brake-cylinder pressure proportionate to the decrease in the velocity of the car-wheels.

The particular object of my invention is to provide means for releasing the brakes with a low train-pipe pressure regardless of the auxiliary-reservoir pressure.

In the drawings, Figure 1 is a sectional view of my valve; Figs. 2, 3, and 4, detail views of the seat of the slide-valve, showing in dotted lines the different positions assumed by the slide-valve; Fig. 5, a view similar to Fig. 1, excepting that the valves are in post-emergency position; Fig. 6, a face view of the slide-valve; Fig. 7, an enlarged section of the check-valve 63; Fig. 8, a reduced section on line 8 of Fig. 5, showing my blow-down device; and Fig. 9, an elevation of part of the casing of the blow-down device.

For the purpose of illustrating and describing my invention I have selected the form of valve device shown in my Patent No. 610,052, issued August 30, 1898, for a device for actuating fluid-pressure brakes so far as the service and emergency valves are concerned; but it will be understood that my invention may be employed in connection with any other suitable form of valve device to accomplish the desired results. In the drawings the service and emergency valves are similar to those shown in my former patent, so that the corresponding parts will be similarly numbered.

The main casing 1 has a hollow cap 2, forming a chamber 3, and is provided with an upper chamber 5^a, designated the "release-chamber," and with a lower chamber 15, designated the "emergency-chamber." The parts in this latter chamber are the same in construction and operation as those in my former patent aforesaid. The piston 19 travels in the chamber 15 and actuates the service-valve 21. The emergency-valve 27, together with the service-valve, controls the passage 18, leading to the brake-cylinder, and governs the flow to the brake-cylinder of auxiliary-reservoir pressure through the passage 43 and of train-pipe pressure through nozzle 14 past check-valve 38 and through passage 37. The train-pipe pressure feeds into chamber 15 upon the left of piston 19, Fig. 1, through passage 13 and past the part 39, and such chamber also connects with the chamber 3 through the small port 3^a.

The piston 5 operates in the larger diameter of the release-chamber and actuates a slide-valve 4, which works upon a bushing or valve-seat 4^a in the smaller diameter thereof. The train-pipe is in communication with the release-chamber at the left of the piston 5, Fig. 1, through the passage 13. The slide-valve has the usual recess 8 to normally connect port 9 from the brake-cylinder with the release-port 10, which ports terminate upon the face of the valve-seat. This seat is also provided with a similar pair of ports 9^a and 10^a, communicating with the ports and passages 9 and 10, respectively, by means of branch passages, as indicated in dotted lines in Figs. 2, 3, and 4. The slide-valve is also provided with an additional recess 8^a and with an end slot 8^b.

The entrance from the release-chamber to the auxiliary reservoir is provided with a cap 62, which has a passage governed by what I will term an "auxiliary-reservoir check-valve" 63. This valve has a truncated conical head 64, adapted to fit into a recess or cavity 65 of similar shape, forming a valve and its seat. The stem 66 of this valve is preferably triangular, as shown in Fig. 7, so as to permit the passage of fluid under pressure into the auxiliary reservoir in the feeding operation when the valve is open. A spiral spring 67 of slight tension may, if desired, be used to assure or assist the seating of the valve at the proper time, although it is obvious that it may be entirely dispensed with, the auxiliary-reservoir pressure against the head 64 serving to seat it.

A tubular stem or extension 68 is screwed

into and through the rib 11, so that it extends into the chamber 3. Within the extension is located a plunger or stem 69, surrounded by a spiral spring 70, which tends to thrust the plunger outwardly toward the piston 5.

My blow-down device comprises a plug 71, adapted to be screw-fixed or otherwise secured in the oil-port of the brake-cylinder, or it may be fixed in the casing 1 of the valve device, as shown in the drawings, or in any other way so as to have direct communication with the brake-cylinder or its passages. This plug has a central bore terminating in a valve-seat 72, upon which is seated the valve 73. This valve is normally forced to its seat by the contact of a stem 74, which is held thereagainst by a spring 75. A casing 76 is screwed to the plug and is provided with a chamber in which a piston 77 travels. This piston has an annular groove 78, connecting, respectively, with passages 79 in the piston and the exhaust-port 80, which is of the form shown in Fig. 9. The port 81 is formed in the casing to connect the chamber 82 at the right of piston 77, Fig. 8, with the atmosphere. A spring 83 surrounds the stem 84 of the piston and abuts at one end against the piston and at the other end against a cup 85, screw-fixed to the casing 76. This cup governs the tension of the spring 83 and forms a guide for the stem 84. A cap 86 closes the outer end of the device and acts as a locking-nut for the cup.

In running trains of cars at a high speed and in making stops at such speed it is desirable to set the brakes with a very heavy initial tension and as the speed is reduced to release the tension proportionate to the decrease in speed of the train, so as to prevent the sliding of the wheels. At the same time it is desirable to hold the pressure in the auxiliary reservoir for further application of the brakes, and it is also desirable to speedily release the brakes after the train has come to a stop. To effect this speedy release and at the same time hold the high pressure in the auxiliary reservoir is the primary object of this invention and is accomplished by the construction hereinbefore described.

In running the train at ordinary speed a pressure of seventy pounds is usually maintained in the train-pipe and the auxiliary reservoir and a pressure of ninety pounds in the main or locomotive reservoir. This pressure will actuate brakes satisfactorily at ordinary speed and will ordinarily give a pressure of about fifty pounds in the brake-cylinder in service stops and about sixty pounds in emergency stops. In running at high speed the full ninety pounds or a higher pressure will be admitted to the train-pipe and auxiliary reservoir. This will give in emergency action about eighty pounds or more in the brake-cylinder, and the pressure-reducing valve or blow-down device will reduce this pressure to a predetermined amount as the train stops and eighty pounds or more pressure will be retained in the auxiliary reservoir. A construction embodying my present invention will release the brakes when the train-pipe pressure equals the pressure in the brake-cylinder regardless of the pressure in the auxiliary reservoir. In running with seventy pounds in the auxiliary reservoir a reduction of eight pounds or less is made in the train-pipe to set for service action. The piston 5 will move outward and abut the stem 69, the spring 70 around the stem being of such resistance as to prevent the piston 5 from moving farther than to abut the stem unless a greater reduction than eight pounds is made in the train-pipe. This travel of the piston will cause the recess 8 in the slide-valve 4 to close the ports 9 and 10 from the brake-cylinder and atmosphere, respectively. The service-valve 21 will then open and permit fluid under pressure to flow from the auxiliary reservoir through passages 43, 31, 32, 23, and 18 to the brake-cylinder, thereby setting the brakes with a tension proportionate to the train-pipe reduction.

The blow-down device may be adjusted to relieve the pressure in the brake-cylinder above any predetermined amount. If in service action a pressure in excess of such amount is admitted to the brake-cylinder, the valve 73 will lift and permit fluid under pressure to flow through passages 79, groove 78, and exhaust-port 80 to the atmosphere, thereby relieving the brake-cylinder of excess pressure and preventing the sliding of the wheels in service action.

When an emergency reduction is made in the train-pipe, the emergency-valve 27 admits auxiliary-reservoir pressure and train-pipe pressure to the brake-cylinder. The great reduction produced in the train-pipe pressure will cause the piston 5 to make its full travel, forcing stem 69 inward and carrying with it the slide-valve 4, so that the recesses 8 and 8^a will be in the position shown in Fig. 3, when none of the ports will be connected. The travel of the stem of the piston 5 will permit the valve 64 to close communication between the chamber 5^a and the auxiliary reservoir and the slot 8^b in the slide-valve 4 will connect with passage 9^a, which will produce an equalization between the brake-cylinder pressure and the pressure in the release-valve chamber on the inner side of piston 5. During the emergency application of the brakes, the emergency-valve having closed the communication between the auxiliary reservoir and the brake-cylinder, as seen in Fig. 5, owing to the pressure in the expansion-chamber 3, and the valve 64 having closed the auxiliary reservoir from the release-chamber, the high emergency-pressure as equalized will be maintained in the auxiliary reservoir, and the pressure in the release-chamber will equalize with that in the brake-cylinder, whose pressure will be reduced by the blow-down device in proportion to the decrease in speed of the train. The pressure in the release-chamber on the inner side of piston 5 is now re-

duced to brake-cylinder pressure—that is to say, fifty pounds, assuming that the blow-down device is set at such pressure. Therefore when the train stops the pressure will stand at seventy or eighty pounds or more in the auxiliary reservoir and at fifty pounds in the brake-cylinder. To release the brakes, the pressure in the train-pipe need not be increased to the auxiliary-reservoir pressure, but is increased to brake-cylinder pressure, whereupon the piston 5 will move inward and carry slide-valve 4, allowing the recess 8^a to connect passages 9^a and 10^a, as shown in Fig. 4, which is the emergency-release position, and the pressure will be exhausted from the brake-cylinder and the brakes will be released by a low train-pipe pressure. The stem 63 of the auxiliary-reservoir check-valve is of such length as to permit the inner end of the stem of the piston 5 to abut it when recess 8^a connects the passages 9^a and 10^a, and the piston may be held to that position until the pressure in the train-pipe equals the auxiliary-reservoir pressure, whereupon the piston will move inward its full travel to the position illustrated in Figs. 1 and 2.

In emergency action the blow-down device operates as follows: The high pressure in the brake-cylinder will lift the valve 73 from its seat and force piston 77 outward until its stem abuts cap 86. This will cause groove 78 in the piston to pass exhaust-port 80, whereupon the pressure will slowly leak around the outside of the piston into chamber 82 and to the atmosphere through port 81. As the pressure is reduced the spring 83 will slowly return the piston inward until the groove registers with the exhaust-port 80, when the pressure will pass through the passages 79 into the groove and through port 80 to the atmosphere. Owing to the shape of exhaust-port 80 the flow will be more rapid as the valve moves inward to its normal position.

It is obvious that the blow-down device may be adjusted to permit the brake-cylinder to be released by any predetermined train-pipe pressure.

I do not herein claim the process or method disclosed in this application, as the same is made the subject-matter of a separate application filed by me on September 2, 1898, Serial No. 690,084, for method of operating fluid-pressure brakes.

I claim—

1. In a device for actuating fluid-pressure brakes, a valve for releasing the brakes when the train-pipe pressure equals the brake-cylinder pressure in emergency action and after equalization between the auxiliary reservoir and brake-cylinder and independently of and less than auxiliary-reservoir pressure, in combination with means for maintaining the high equalized pressure in the auxiliary reservoir.

2. In a device for actuating fluid-pressure brakes, a valve for releasing the brakes after emergency action at any predetermined pressure below the auxiliary-reservoir pressure and after equalization between the auxiliary reservoir and brake-cylinder, in combination with means for maintaining the high equalized pressure in the auxiliary reservoir.

3. In a device for actuating fluid-pressure brakes, a piston-actuated slide-valve for releasing the brakes after emergency action with a train-pipe pressure less than the auxiliary-reservoir pressure and after equalization between the auxiliary reservoir and brake-cylinder, in combination with means for maintaining the high equalized pressure in the auxiliary reservoir.

4. In a device for actuating fluid-pressure brakes, a piston-actuated slide-valve and an auxiliary-reservoir check-valve in combination with an emergency-valve adapted to hold a high pressure in the auxiliary reservoir, and means for releasing the brakes with the train-pipe pressure less than the auxiliary-reservoir pressure.

5. In a fluid-pressure brake mechanism, a valve device for closing and opening communication between a brake-cylinder and the atmosphere in emergency action and actuated for closing such communication by the excess of auxiliary-reservoir pressure over train-pipe pressure and for opening that communication by the excess of train-pipe pressure over brake-cylinder pressure and independently of auxiliary-reservoir pressure, in combination with means for maintaining in the auxiliary reservoir the high pressure as equalized in emergency action.

6. In fluid-pressure brake mechanism, a valve device for controlling the communication between a brake-cylinder and the atmosphere whose partial travel closes the communication in service action and whose return to normal position releases the brakes in service action and whose full travel closes the communication in emergency action and whose partial return toward normal position releases the brakes in emergency action in combination with means for maintaining in the auxiliary reservoir the high pressure as equalized in emergency action,

7. In a fluid-pressure-brake-actuating device, the combination of a chamber, mechanism therein controlling the release of the brake-cylinder, the chamber being in communication with the auxiliary reservoir in service action, and closed from the auxiliary reservoir and in communication with the brake-cylinder after emergency action, and during the emergency application of the brakes.

8. In a fluid-pressure-brake-actuating mechanism, the combination of a chamber, a movable abutment therein, a device for releasing the brakes and actuated by the abutment, such abutment having, in service action, auxiliary-reservoir pressure on one side and train-pipe pressure on the opposite side, and having after emergency action brake-cylinder pressure on one side and train-pipe pressure on the opposite side, said chamber be-

ing closed from the auxiliary reservoir after emergency action and after equalization between the brake-cylinder and auxiliary reservoir, and means for closing said chamber from the auxiliary reservoir after said equalization.

9. In a device for actuating fluid-pressure brakes, the combination of a train-pipe, an auxiliary reservoir, a brake-cylinder, a casing having a brake-release-valve chamber, a brake-release valve therein and means for equalizing the pressure in the brake-cylinder and said release-valve chamber after an equalization between the brake-cylinder and auxiliary reservoir during emergency action.

10. The combination of a train-pipe, an auxiliary reservoir, a brake-cylinder, a movable abutment operative in a chamber, a release-valve actuated by the abutment, the valve in normal position releasing the brake-cylinder and after full emergency traverse and during emergency application closing the exhaust and connecting the brake-cylinder with the release-valve chamber, and means for cutting off communication from the auxiliary reservoir to the release-valve chamber during and after emergency action.

11. In a fluid-pressure brake system, a release-valve device operative in a chamber for normally releasing the brake-cylinder, and means for reducing the auxiliary-reservoir pressure in the release-valve chamber after emergency action independent of any reduction in the auxiliary reservoir and after equalization between the auxiliary reservoir and brake-cylinder.

12. In a device for actuating fluid-pressure brakes, the combination of a train-pipe, the auxiliary reservoir, a brake-cylinder, means for admitting fluid under pressure to the brake-cylinder and a brake-release mechanism physically and operatively independent of said means, said mechanism in service action being actuated by pressure from said auxiliary reservoir and in emergency action permitting a brake release independent of the pressure from said auxiliary reservoir.

13. In a fluid-pressure brake mechanism, the combination of a train-pipe, an auxiliary reservoir, a brake-cylinder, a separate service and emergency valve, a movable abutment a brake-release valve physically and operatively independent of the other valves and actuated by said abutment to release the brakes independently of the pressure from said auxiliary reservoir, said abutment in service action being actuated by pressure from said auxiliary reservoir.

14. In a fluid-pressure brake mechanism, valve mechanism for setting the brakes with a high pressure in the auxiliary reservoir and maintaining a high pressure in the auxiliary reservoir as equalized in the brake-cylinder, in combination with means for releasing the brakes by the action of a pressure in the train-pipe lower than that in the auxiliary reservoir.

15. In a fluid-pressure-brake-actuating device, the combination of a service-valve and an emergency-valve, means for closing the service and emergency valves after an emergency action to hold a high pressure in the auxiliary reservoir, means for reducing the pressure in the brake-cylinder, and a brake-release valve adapted to release the brakes when the train-pipe pressure exceeds the brake-cylinder pressure.

16. A fluid-pressure-brake-actuating device comprising a valve mechanism for admitting fluid under pressure from a train-pipe to a brake-cylinder in emergency action, means for closing such mechanism independent of the train-pipe pressure, and a brake-release device actuated independently of the auxiliary-reservoir pressure.

17. In a device for actuating fluid-pressure brakes, the combination of valve mechanism for admitting fluid-pressure from the auxiliary reservoir and train-pipe to the brake-cylinder, a pressure-reducing valve for reducing the pressure in the brake-cylinder, means for retaining the pressure in the auxiliary reservoir in emergency action, and a brake-release device for releasing the brakes independent of the auxiliary-reservoir pressure and when the train-pipe pressure exceeds the brake-cylinder pressure.

18. A device for actuating fluid-pressure brakes comprising a piston-actuated brake-release valve, service and emergency valves independent of the release-valve, and a pressure-regulating device in connection with the brake-cylinder to control the amount of pressure therein in service action and to obtain a high initial pressure in emergency action and to release such high pressure at a predetermined rate to a predetermined amount, such brake-release valve being adapted to release the brakes independent of the auxiliary-reservoir pressure and upon the train-pipe pressure exceeding the brake-cylinder pressure.

19. In a fluid-pressure brake mechanism, a piston-actuated slide-valve governing a port from the brake-cylinder and a port to the atmosphere and having a recess for normally releasing the brakes and also having a slot for connecting the brake-cylinder port with the slide-valve chamber in emergency action and means for cutting off said chamber from the auxiliary reservoir in emergency action after equalization between the auxiliary reservoir and brake-cylinder.

20. In a fluid-pressure brake mechanism, a piston-actuated slide-valve governing a port from the brake-cylinder and a port to the atmosphere and having a recess for normally connecting said ports to release the brakes and also having a slot for connecting the brake-cylinder port with the slide-valve chamber in emergency action, in combination with a check-valve between the slide-valve chamber and the auxiliary reservoir and actuated by auxiliary-reservoir pressure after emergency action has taken place.

21. In a fluid-pressure brake mechanism, a movable abutment, a slide-valve actuated thereby and governing a port from the brake-cylinder and a port to the atmosphere and having a recess for normally connecting said ports to release the brakes and also having a slot for connecting the brake-cylinder port with the slide-valve chamber in emergency action, in combination with a check-valve located between the slide-valve chamber and the auxiliary reservoir and held open by the abutment except in emergency action when the check-valve closes.

22. In a fluid-pressure brake mechanism, the combination of a movable abutment, a slide-valve operated thereby, a pair of ports in communication with the brake-cylinder, a pair of ports in communication with the atmosphere, said ports being governed by the slide-valve, such slide-valve having two recesses, one of which normally connects one brake-cylinder port with one atmosphere-port and the other of which connects the other ports after the slide-valve has partially returned from its full traverse in emergency action.

23. In a fluid-pressure brake mechanism, the combination of a movable abutment in a chamber, a slide-valve operated thereby in such chamber, a pair of ports in communication with the brake-cylinder, a pair of ports in communication with the atmosphere, said ports being governed by the slide-valve, such valve having two recesses connecting the ports at different traverses and also having a port or opening adapted to register with one of the brake-cylinder ports in emergency action and means for cutting off communication between the auxiliary reservoir and slide-valve chamber.

24. In a fluid-pressure brake mechanism, a brake-cylinder release device comprising a slide-valve working in a chamber and having two recesses and a port, a movable abutment actuating the slide-valve and governing the feed to the auxiliary reservoir, two brake-cylinder ports and two exhaust-ports governed by the slide-valve, one of the recesses normally connecting a brake-cylinder port and an exhaust-port and the other recess connecting the other ports after a partial return of the slide-valve after emergency traverse and the port in the slide-valve registering with one of the brake-cylinder ports in emergency action and causing an equalization between the slide-valve chamber and brake-cylinder in emergency action, in combination with a valve device for cutting off communication between the slide-valve chamber and the auxiliary reservoir in emergency action.

25. In a fluid-pressure brake mechanism, the combination of a train-pipe, a brake-cylinder, an auxiliary reservoir, a blow-down device in connection with the brake-cylinder for relieving it of pressure above a predetermined amount, valve mechanism for admitting fluid under pressure into the brake-cylinder and a brake-release device comprising an abutment movable in a chamber, a slide-valve actuated thereby and governing brake-cylinder and exhaust ports to release the brakes in normal position so as to connect the slide-valve chamber with the brake-cylinder in emergency position and produce equalization therebetween and to release the brakes upon a partial return of the slide-valve after emergency action and after a restoration of train-pipe pressure slightly in excess of the brake-cylinder pressure.

26. The combination of a train-pipe, an auxiliary reservoir, a brake-cylinder, means for blowing down the brake-cylinder to a predetermined pressure, a valve device for releasing the brake-cylinder and movable in a chamber, a movable abutment for actuating such release-valve and normally exposed on one side to train-pipe pressure and on the other to auxiliary-reservoir pressure and means for reducing, after an emergency action, the auxiliary-reservoir pressure in the release-valve chamber without reducing it in the auxiliary reservoir.

27. In a fluid-pressure brake system, a brake-cylinder-pressure-reducing valve device comprising a casing communicating with the brake-cylinder and having an exhaust-port, a valve adjusted to yield at a predetermined pressure to admit excess brake-cylinder pressure into the casing and a movable abutment controlling the exhaust-port and having passages normally communicating with such port, said valve being movable independent of the abutment to relieve excess brake-cylinder pressure.

28. In a fluid-pressure brake system, a brake-cylinder-pressure-reducing valve device comprising a casing communicating with the brake-cylinder and having an exhaust-port, a valve in the casing adjusted to yield at a predetermined pressure to admit excess brake-cylinder pressure into the casing and a piston traveling in the casing and provided with a hollow stem, such piston controlling the exhaust-port and having ports and passages normally communicating with such port, a closed sleeve adjustably secured within the hollow stem, a spring-pressed stem guided by the sleeve and abutting against said valve with an adjustable tension, the valve and the piston being independently movable.

29. In a fluid-pressure brake system, a brake-cylinder-pressure-reducing valve device comprising a casing communicating with the brake-cylinder and having an exhaust-port, a valve governing the flow of excess brake-cylinder pressure into the casing, a piston traveling in the casing and provided with a hollow stem, such piston having an annular groove with passages which communicate with the chamber in the casing and with the exhaust-port through means of the groove and a spring-pressed plunger movable in said hollow stem and abutting the said valve.

30. In a fluid-pressure brake system, a

brake-cylinder-pressure-reducing valve device comprising a casing communicating with the brake-cylinder and having an exhaust-port, a valve governing the flow of excess brake-cylinder pressure into the casing, a piston loosely fitted and traveling in the casing and governing the exhaust-port, said casing having a second exhaust-port whereby at emergency action the first exhaust-port will be closed and the pressure will leak around the piston and escape through the second exhaust-port until the piston approaches normal position whereupon the pressure is relieved through the first exhaust-port.

31. In a device for actuating fluid-pressure brakes, a valve operating in a chamber for releasing the brakes, after emergency action, with a train-pipe pressure below auxiliary-reservoir pressure but greater than the pressure in said valve-chamber, in combination with means for maintaining the high equalized pressure in the auxiliary reservoir after an emergency action and then reducing the pressure in the valve-chamber to brake-cylinder pressure.

32. In a device for actuating fluid-pressure brakes, a piston-actuated valve operating in a chamber for releasing the brakes, after emergency action, with a train-pipe pressure below auxiliary-reservoir pressure but greater than the pressure in said valve-chamber, in combination with means for maintaining the high equalized pressure in the auxiliary reservoir after an emergency action and then reducing the pressure in the valve-chamber to brake-cylinder pressure.

33. In a device for actuating fluid-pressure brakes, a valve for releasing the brakes, after emergency action, with a train-pipe pressure below the auxiliary-reservoir pressure during such releasing operation and after equalization between the auxiliary reservoir and brake-cylinder, in combination with means for maintaining a high equalized reservoir-pressure and reducing the pressure in the valve-chamber to brake-cylinder pressure.

34. In a device for actuating fluid-pressure brakes, valve mechanism for setting the brakes in emergency action and in such action causing an equalization between the brake-cylinder and auxiliary reservoir, a valve for releasing the brakes after emergency action with a train-pipe pressure below auxiliary-reservoir pressure without reducing the auxiliary-reservoir pressure, in combination with means for maintaining the high auxiliary-reservoir pressure during such release.

35. In a device for actuating fluid-pressure brakes, a brake-release valve operating in a chamber and governing ports and passages between said chamber and the brake-cylinder and between such brake-cylinder and the atmosphere, a movable abutment for actuating such valve and exposed to train-pipe pressure on one side and auxiliary-reservoir pressure on the other side in running and service position of the parts but exposed to brake-cylinder pressure on such other side after equalization between the brake-cylinder and auxiliary reservoir in emergency action, in combination with means for closing communication between the brake-cylinder and auxiliary reservoir after such equalization.

36. In a brake system, the combination of a train-pipe, an auxiliary reservoir, a brake-cylinder, means for admitting fluid-pressure from the train-pipe and reservoir to the brake-cylinder, a release-valve device operated, in running and service position, by the differential between auxiliary-reservoir pressure and train-pipe pressure and in releasing, after emergency action, by the differential between train-pipe pressure and brake-cylinder pressure and a movable part governing communication between the reservoir and the other parts of the brake system and actuated by said valve device to maintain said communication open during release and service action.

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