(No Model.) 2 Sheets—Sheet 1.

T. J. HOGAN.

AIR BRAKE.

No. 574,866. Patented Jan. 5, 1897.

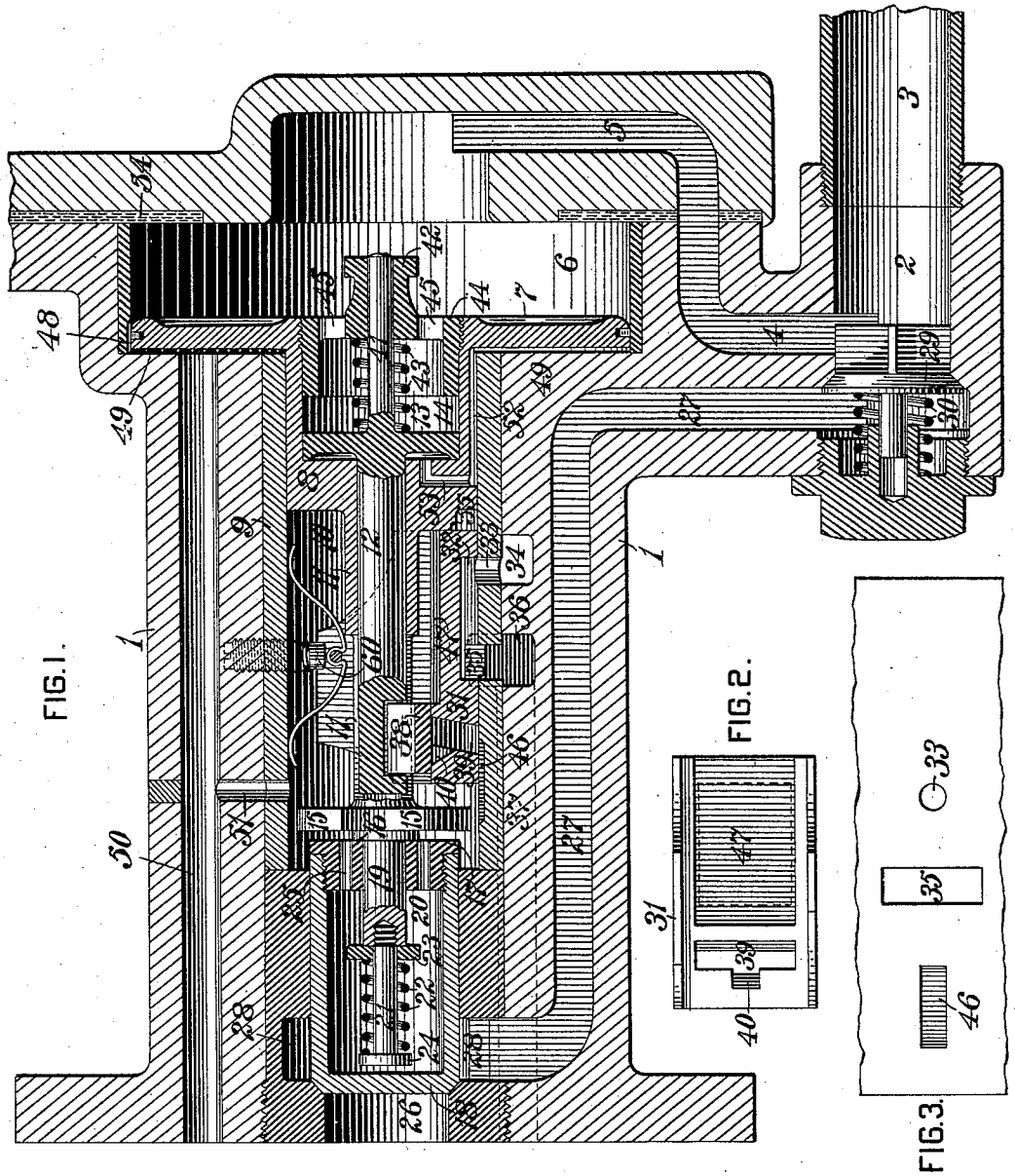

FIG. 1.

FIG. 2.

FIG. 3.

WITNESSES:

Chas. F. Miller.

P. E. Gaither

INVENTOR,

Thomas J. Hogan

by J. Rowden Bell

Att'y.

(No Model.)

2 Sheets—Sheet 2.

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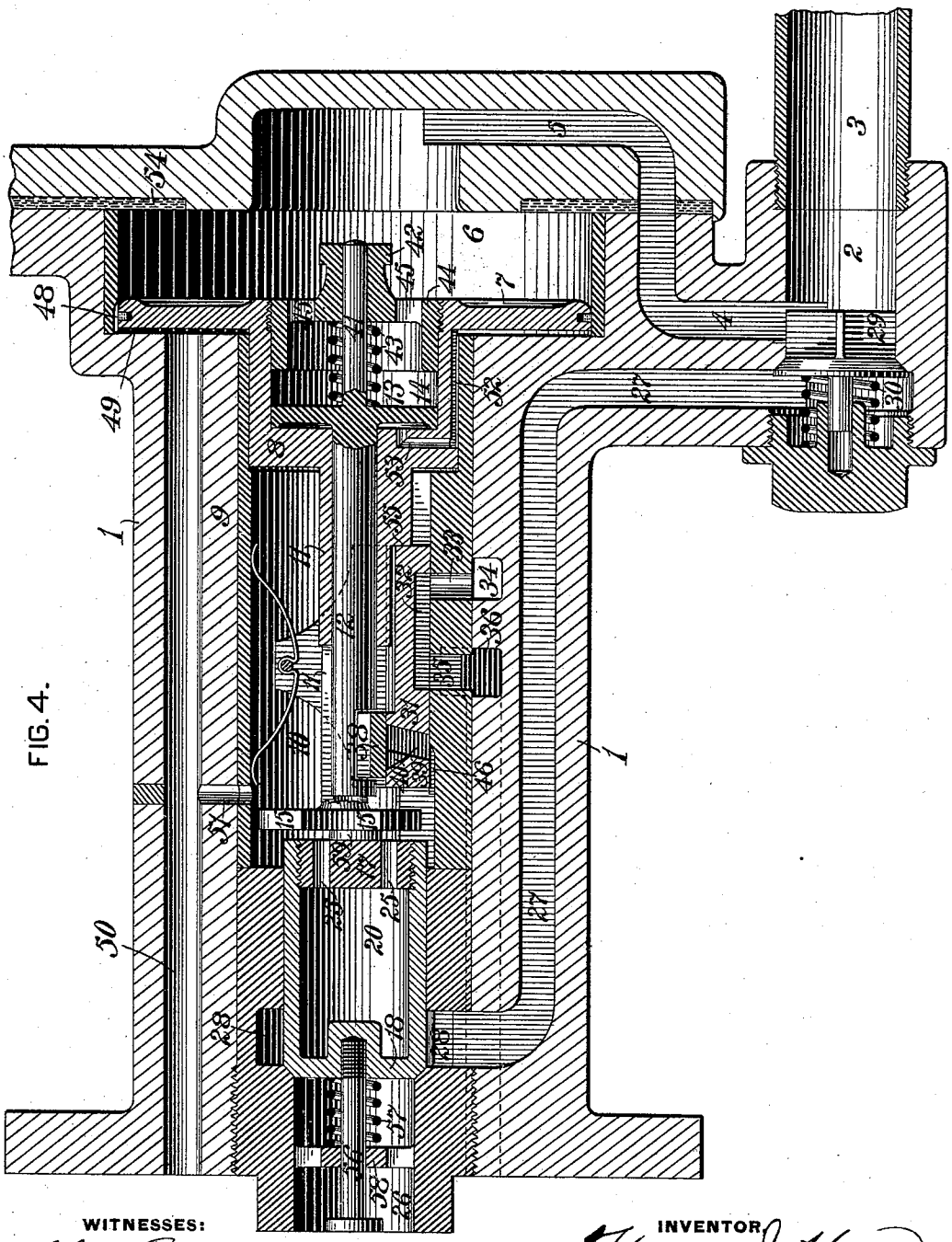

FIG. 4.

WITNESSES:

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INVENTOR

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Att'y.

UNITED STATES PATENT OFFICE.

THOMAS J. HOGAN, OF PITTSBURG, PENNSYLVANIA, ASSIGNOR TO THE WESTINGHOUSE AIR BRAKE COMPANY, OF SAME PLACE.

AIR-BRAKE.

SPECIFICATION forming part of Letters Patent No. 574,866, dated January 5, 1897.

Application filed February 14, 1896. Serial No. 579,287. (No model.)

To all whom it may concern:

Be it known that I, THOMAS J. HOGAN, a citizen of the United States, residing at Pittsburg, in the county of Allegheny and State of Pennsylvania, have invented or discovered a certain new and useful Improvement in Air-Brakes, of which improvement the following is a specification.

The object of my invention is to provide an improvement in automatic fluid-pressure brake apparatus; and to this end it consists in new and improved means for effecting emergency applications of the brakes, in the combination of such means with a triple-valve device, and in certain combinations and features of construction, all as hereinafter fully set forth.

My present invention is an improvement on that shown in Letters Patent No. 554,623, issued to me February 11, 1896, and its principal feature consists in the combination, with an emergency-valve device which is normally exposed to fluid under pressure in a chamber or space from which the fluid is released in both service and emergency applications, of means operative in both service and emergency applications for varying the rapidity with which fluid is released from the chamber, and thereby controlling the operation of the emergency-valve device.

In the accompanying drawings, which illustrate applications of my improvement, Figure 1 is a longitudinal central section through a quick-action triple-valve device embodying my invention; Fig. 2, a plan view of the back of the main slide-valve of the triple-valve device; Fig. 3, a plan view of the seat of the main slide-valve; and Fig. 4, a longitudinal central section through a quick-action triple-valve device, showing a modification of my improvement.

In the construction shown in Fig. 1 of the drawings the casing 1 of the triple-valve device is provided with a passage 2, which communicates by means of a branch pipe 3 with the train-pipe and by means of passages 4 and 5 with the main-piston chamber 6. The main piston 7 of the triple-valve device is provided with an extension 8, which is fitted into the bushing 9 of the main-valve chamber 10, so as to slide easily therein without permitting any considerable amount of fluid to pass around it. If preferred, the extension 8 may be provided with packing to prevent the passage of fluid around it. A supplemental piston 13 is fitted to work in a chamber 14, within the extension 8, and is provided with a stem 12, which is fitted to slide in the main-piston stem 11 without permitting any appreciable flow of fluid between the chamber 14 and the main-valve chamber 10. A stem 41 on the piston 13 passes through a guide 42 and is surrounded by a spring 43, which bears at one end on the guide and at the other end against the piston 13 and serves to prevent movement of the piston 13 relative to the main piston 7, except in emergency applications of the brakes. The guide 42 forms part of a screw-cap 44, which extends into the chamber 14 and forms a stop for the piston 13 to limit its outward movement. The chamber 14 is at all times in open communication with the main-piston chamber 6 through the openings 45 in the cap 44.

The stem 11 is provided with a guide 15, on the left of which is formed a shoulder 16, which abuts against the cap or head 17 of the local exhaust or emergency valve 18 when the main piston 7 is in its normal or release position. An extension 19 of the stem 11 passes through the head 17 of the local exhaust-valve 18 and projects into the chamber 20 within the valve 18. Secured to the end of the extension 19 is a small rod or stem 21, which is surrounded by a spring 22, bearing at one end against a fixed collar or head 24 on the stem 21 and at the other end against a loose collar 23, which is adapted to slide on the stem 21, but which normally bears against a shoulder formed by the end of the extension 19. The chamber 20 communicates freely with the main-valve chamber 10 through the passages 25, formed in the head 17 of the local exhaust-valve 18.

As shown in the drawings, the local exhaust-valve or emergency-valve 18 controls a passage 26, which preferably communicates with the brake-cylinder, but which may lead to the atmosphere or elsewhere. A passage 27 leads from the passage 2 to an annular chamber or passage 28, which surrounds the emergency-valve 18, and a check-valve 29, which is provided with a spring 30, permits

the passage of fluid from the train-pipe through the passage 2 into the passage 27, but prevents any return flow of fluid.

The main valve 31 of the triple-valve device is provided with a cavity 32, which when the valve is in release position connects the ports 33 and 35, which are formed in the valve-seat. The port 33 communicates with an exhaust-passage 34, leading to the atmosphere, and the port 35 opens into a passage 36, which is connected by means of a passage 37. (Shown in dotted lines with the brake-cylinder.)

The stem 12 of the supplemental piston 13 is connected with a graduating-valve 38, which is adapted to slide on the back of the main valve and controls the passage of fluid from the chamber 10 through a port 39, formed in the main valve 31. The port 39 is provided with an extension 40, and when the parts are in release position the port 39 and the extension 40 are both covered by the valve 38.

When the parts are in release position, fluid is admitted to the port 39 in the main valve through a groove 46, formed in the seat of the main valve, and a portion of the under side of the valve 38, equal in area to the port 39 and its extension 40, is thereby exposed to the same degree of pressure as the back of the valve, and the valve 38 is to that extent balanced by fluid-pressure and its frictional resistance to movement is thereby diminished. This is important, as it is desirable that the resistance to movement of the valve 38 should be as small as possible. In order to further balance the valve 38 and to decrease the friction of the valve on its seat after it has moved from its normal position, the back of the main valve 31 is provided with a broad channel or groove 47 on its back, which is nearly the whole width of the valve 38, and permits the pressure of the fluid in the chamber 10 to act on the under side of that portion of the valve which projects over the channel or groove 47 when the valve 38 has been moved to the right relative to the main valve. Fluid from the train-pipe, after entering the main-piston chamber 6, passes through the feed-groove 48 into the space 49 on the left of the main piston 7 and through the passage 50 to the auxiliary reservoir. The extension 8 on the main piston 7 at all times closes communication between the space 49 on the left of the main piston 7 and the main-valve chamber 10, and fluid is admitted to the chamber 10 from the passage 50 and from the auxiliary reservoir through the passage 51.

The supplemental piston 13 is at all times exposed on one side to train-pipe pressure admitted from the chamber 6 to the chamber 14 through the passages 45 in the cap 44, and on its other side the piston 13 is at all times exposed to auxiliary-reservoir pressure admitted from the space 49 on the left of the main piston 7 through the passages 52 and 53, formed in the extension 8.

When a slight reduction of pressure is effected in the train-pipe for the purpose of making a service application of the brakes, the main piston 7 moves to the right to the limit of its stroke, when it will bear on the gasket 54, and the supplemental piston 13 moves with the main piston without changing its position in the chamber 14. As the main piston 7 moves to the right the stems 11 and 12 move with it, but do not move relative to one another, and during the first part of their movement the valve 38 slides on the back of the main valve 31 until the guide 15 on the stem 11 bears against the main valve 7. The main valve and the valve 38 then move together until the main piston 7 reaches the end of its stroke. When the valve 38 slides on the main valve 31, it partly uncovers the extension 40 of the port 39, but the wider portion of the port 39 remains covered, and as the main piston continues its movement to the right communication between the ports 33 and 35 is cut off, the passage 39 through the main valve registers with the port 35 in the seat of the main valve, and fluid under pressure flows from the chamber 10 and from the auxiliary reservoir to the brake-cylinder through the extension 40 of the passage 39 and through the passages 39, 35, 36, and 37, the flow of fluid being restricted by the limited capacity of the uncovered portion of the passage 40, but being great enough for a service application of the brakes.

The passage 51 through which fluid is admitted from the auxiliary reservoir and from the passage 50 to the chamber 10 is so restricted in cross-sectional area that its capacity is only a little greater than the capacity of the uncovered portion of the extension 40 of the passage 39, but it is sufficiently large to supply fluid under pressure to the chamber 10 in greater quantity and more rapidly than the fluid can be released from the chamber 10 through the uncovered portion of the extension 40 of the passage 39. When the graduating-valve 38 partly uncovers the extension 40, as in service applications, the reduction of pressure in the chamber 10, effected by the release of fluid therefrom to the brake-cylinder, will therefore be substantially the same as the reduction of pressure in the auxiliary reservoir and in the passage 50.

When the pistons 7 and 13, the stems 11 and 12, and the extension 19 of the stem 11 are moved to the right in service applications, the loose collar 23 on the small stem 21 is brought in contact with the head 17 of the valve 18 and the spring 22 is compressed, but its resistance to compression is not great enough to move the valve 18 against the fluid-pressure acting on it in the chamber 10 during ordinary service applications, and the valve 18 will therefore remain on its seat. In case a full service application is made, in which the pressure in the auxiliary reservoir and in the chamber 10 is permitted to equalize with the pressure in the brake-cylinder, the valve 18 may be unseated by the spring 22 and

the brake-cylinder pressure acting against the reduced pressure in the chamber 10, but the application of the brakes will not be effected thereby for the reason that the pressure in the train-pipe will not then be sufficient to open the check-valve 29.

When in making a service appplication of the brakes the pressure in the auxiliary reservoir and in the chamber 10 equalizes with or is reduced a little below that in the train-pipe, the pistons 7 and 13 and their stems 11 and 12 will be moved to the left until the shoulder 55 on the extension 8 abuts against the main valve. The friction of the main valve on its seat will prevent movement of that valve, but the graduating-valve 38 will be moved to the left relative to the main valve until it closes the extension 40 of the port 39 and the flow of fluid from the chamber 10 to the brake-cylinder will be cut off. A further reduction of pressure in the train-pipe will cause the port 40 to be again partly uncovered, and fluid from the auxiliary reservoir and from the chamber 10 will again flow to the brake-cylinder until the pressure in the auxiliary reservoir and chamber 10 is sufficiently reduced to permit the pressure in the train-pipe to move the pistons and valve 38 to the left and close the port 40.

When a sufficiently great and rapid reduction of train-pipe pressure is made to effect an emergency application of the brakes, the main piston 7 moves to the right to the limit of its stroke, as in service applications, and the guide 15 on the stem 11 comes in contact with the main valve 31 and moves it into position to cause the port 39 to register with the port 35 in the valve-seat. The loose collar 23 on the extension 19 of the stem 11 is brought into contact with the head 17 of the valve 18 and the spring 22 is compressed, as in service applications. The auxiliary-reservoir pressure acting on the left of the piston 13 overcomes the reduced train-pipe pressure and the pressure of the spring 43 acting on the right of the piston 13 and moves it to the limit of its stroke to the right in the chamber 14. The movement of the piston 13 and its stem 12 moves the valve 38 relative to the main valve 31 far enough to entirely uncover the port 39 and its extension 40, and a large passage is thereby opened from the chamber 10 to the brake-cylinder. The capacity of the ports or passages 39 and 35 is several times greater than the capacity of the passage 51, and they open into the large passages 36 and 37 leading to the brake-cylinder, so that when the valves 31 and 38 are moved as described in emergency applications the fluid under pressure in the chamber 10 is released to the brake-cylinder much more rapidly than it can be supplied through the passage 51. The consequence is that a sudden and great reduction of pressure is effected in the chamber 10, and the reduction of pressure is sufficient to permit the spring 22, which is then under compression, to expand and unseat the emergency-valve 18.

When the valve 18 is unseated, the fluid under pressure in the passages 27 and 28 is suddenly exhausted through the passage 26, and the reduction of pressure thereby effected on the left of the check-valve 29 permits the train-pipe pressure to unseat the check-valve, and fluid under pressure in the train-pipe is exhausted through the passages 27, 28, and 26. It is preferred that the passage 26 should communicate with the brake-cylinder, but it may lead to the atmosphere or elsewhere without requiring any changes in the construction shown.

Fluid from the auxiliary reservoir will continue to flow through the passages 50 51, chamber 10, and passages 39, 35, 36, and 37 to the brake-cylinder until the brake-cylinder and auxiliary-reservoir pressures have equalized, the flow being limited by the capacity of the passage 51.

In the construction shown in Fig. 4 the local exhaust-valve 18 is provided with a stem 56, which is surrounded by a spring 57, bearing at one end against the valve 18 and at the other end against a guide 58. The extension 59 of the piston-stem 11 merely abuts against the cap 17 of the valve 18 without being connected with it in any manner, so that when the main piston and its stem move to the right the extension 59 is moved out of contact with the head 17 of the valve 18. The valve 18 is held to its seat by the pressure in the chamber 10 and the spring 57 is normally under compression. The pistons 7 and 13 and the valves 31 and 38 operate as in the construction shown in Fig. 1, the fluid being gradually released from the chamber 10 through the partly-uncovered port 40 in service applications and more rapidly by fully opening the port or passage 39 in emergency applications.

The valve 18 is held to its seat in service applications by the pressure of the fluid in the chamber 10, and the spring 57 unseats the valve 18 in emergency applications when the pressure is suddenly and greatly reduced in the chamber 10.

In the construction shown in Fig. 1 of the drawings the interior of the bushing 9 is circular in form throughout its length, and a guide 60 is provided to prevent the valve 31 from turning therein. In the construction shown in Fig. 4 the seat of the valve 31 is a plane surface, formed by grooving the bushing, and the extension 8 of the main piston 7 is fitted in a cylindrical enlargement of the chamber 10.

I claim as my invention and desire to secure by Letters Patent—

1. In an automatic fluid-pressure brake apparatus, the combination, with a train-pipe, an auxiliary reservoir, and a brake-cylinder, of a release-passage, a check or non-return valve in the release-passage, an emergency-valve which is normally held closed by fluid under pressure, a normally-closed-valve device, controlling a passage for the release of

the fluid under pressure, which may be opened by a reduction in train-pipe pressure without effecting the operation of the emergency-valve, and means for rapidly discharging the fluid under pressure and thereby effecting opening movement of the emergency-valve, substantially as set forth.

2. In an automatic fluid-pressure brake apparatus, the combination, with a train-pipe, an auxiliary reservoir, and a brake-cylinder, of an emergency-valve device which is held closed by the pressure of fluid in a chamber which is cut off from the train-pipe during emergency applications of the brakes, means for effecting a comparatively gradual release of fluid from the chamber in service applications of the brakes, and means for effecting a rapid release of fluid from the chamber and thereby effecting the operation of the emergency-valve, substantially as set forth.

3. In an automatic fluid-pressure brake apparatus, an emergency-valve device which is held closed by the pressure of fluid in a chamber and whose opening movement is independent of the direct pressure of the fluid in the train-pipe, a supply-passage through which fluid is admitted to the chamber, a passage of greater capacity through which fluid may be relsased from the chamber, and a valve device controlling the latter passage which is adapted, in service applications, to effect a comparatively gradual release of fluid from the chamber, and in emergency applications to effect a more rapid release of fluid from the chamber, and thereby cause opening movement of the emergency-valve, substantially as set forth.

4. In an automatic fluid-pressure brake apparatus, an emergency-valve device which is held closed by the pressure of fluid in a chamber which is disconnected from the train-pipe in making applications of the brakes, and a valve device which is operated by variations of pressure in the train-pipe to gradually release fluid under pressure from the chamber in service applications of the brakes, and means whereby opening movement of the emergency-valve is effected by rapidly releasing fluid from the chamber, substantially as set forth.

5. In an automatic fluid-pressure brake apparatus, the combination with a train-pipe, an auxiliary reservoir, a brake-cylinder and a triple-valve device of an emergency-valve device which is held closed by the pressure of fluid in a chamber which is, at all times, in open communication with the auxiliary reservoir, a passage from the train-pipe to the brake-cylinder which is controlled by the emergency-valve device, a check-valve in the passage, and a valve device which is adapted to release fluid under pressure from the chamber with greater rapidity than it is supplied thereto, and thereby effects opening movement of the emergency-valve, substantially as set forth.

6. In an automatic fluid-pressure brake apparatus, the combination, with a train-pipe, an auxiliary reservoir, and a brake-cylinder, of an emergency-valve which is held closed by the pressure of fluid in a chamber communicating with the auxiliary reservoir, a passage outside of the chamber, which is controlled by the emergency-valve, a check-valve in the passage, and a valve device which effects a comparatively gradual release of fluid from the chamber to the brake-cylinder in service applications of the brakes, and a more rapid release of fluid from the chamber in emergency applications, and thereby effects opening movement of the emergency-valve, substantially as set forth.

7. In an automatic fluid-pressure brake apparatus, the combination with a train-pipe, an auxiliary reservoir, a brake-cylinder, and a triple-valve device, of an emergency-valve which is held closed by the pressure in the main-valve chamber of the triple-valve device, a passage from the train-pipe to the brake-cylinder outside of the main-valve chamber, a check-valve in the passage, a restricted passage through which fluid is admitted to the valve-chamber, a main valve, and a graduating-valve controlling the release of fluid from the chamber and adapted to effect an emergency application of the brakes by releasing fluid from the chamber more rapidly than it is supplied through the restricted passage, substantially as set forth.

8. In an automatic fluid-pressure brake apparatus, the combination, with a train-pipe, an auxiliary reservoir, a brake-cylinder, and a triple-valve device, of an emergency-valve which is operated by a reduction of pressure in the main-valve chamber of the triple-valve device, and which controls a release-passage independent of the main valve of the triple-valve device, a restricted passage through which fluid is supplied to the chamber, a main valve controlling a port or passage, of greater capacity than the restricted passage, for releasing fluid from the chamber, and a graduating-valve controlling the flow of fluid through the main valve and adapted to open a passage for the release of fluid from the chamber of greater capacity than the restricted passage, whereby a sufficient reduction of pressure is effected to permit opening movement of the emergency-valve, substantially as set forth.

9. In an automatic fluid-pressure brake apparatus, the combination, with a triple-valve device, of an emergency-valve which is held closed by the pressure in the main-valve chamber of the triple-valve device and which controls a passage around the main-valve chamber, a main valve, a passage through the main valve for releasing fluid under pressure from the main-valve chamber, and a graduating-valve adapted to open the passage through the main valve in service applications, and to effect the operation of the emer-

gency-valve by opening the passage to a greater extent in emergency applications, substantially as set forth.

10. In an automatic fluid-pressure brake apparatus, the combination, with an emergency-valve which is held closed by the pressure in the main-valve chamber of a triple-valve device, of a main valve, a graduating-valve, a supplemental piston for operating the graduating-valve, a supply-port, or passage, through which fluid is supplied to the main-valve chamber, and which is open in making both service and emergency applications of the brakes, and ports, or passages, controlled by the main and graduating valves for rapidly releasing fluid from the main-valve chamber and thereby effecting opening movement of the emergency-valve, substantially as set forth.

11. In a triple-valve device, the combination, with a main valve, of a graduating-valve controlling a passage in the main valve, and a passage through which fluid under pressure is admitted to the passage in the main valve when the main valve is in release position, for the purpose of counterbalancing the pressure tending to hold the graduating-valve to its seat, substantially as set forth.

12. In a triple-valve device, the combination, with a main valve, of a graduating slide-valve which is adapted to slide on, and control a passage in, the main valve, and a passage through which fluid under pressure is admitted to the passage in the main valve, for the purpose of counterbalancing the pressure on the back of the graduating-valve, substantially as set forth.

13. The combination, with a train-pipe, a brake-cylinder, and an auxiliary reservoir, of a triple-valve device, the main piston of which has the same traverse in both service and emergency applications, a main valve controlling a passage from the auxiliary reservoir to the brake-cylinder, an emergency-valve controlling the release of fluid from the train-pipe through a separate passage, and which is normally held seated by the pressure in the main-valve chamber, and means whereby the emergency-valve may be unseated on a sudden reduction of pressure in the main-valve chamber, substantially as set forth.

14. The combination, in a triple-valve device, of a main valve which has the same traverse in both service and emergency applications, an emergency-valve device, exposed to the pressure in the main-valve chamber and controlling a passage from the train-pipe which is disconnected from the main-valve chamber and through which fluid is released from the train-pipe in emergency applications, and means for rapidly releasing fluid under pressure from the main-valve chamber and thereby effecting an emergency application of the brakes, substantially as set forth.

In testimony whereof I have hereunto set my hand.

THOMAS J. HOGAN.

Witnesses:
F. E. GAITHER,
W. H. ERSKINE.