(No Model.) 2 Sheets—Sheet 1.

T. J. HOGAN.

AUTOMATIC FLUID PRESSURE BRAKE APPARATUS.

No. 551,822. Patented Dec. 24, 1895.

FIG. 1.

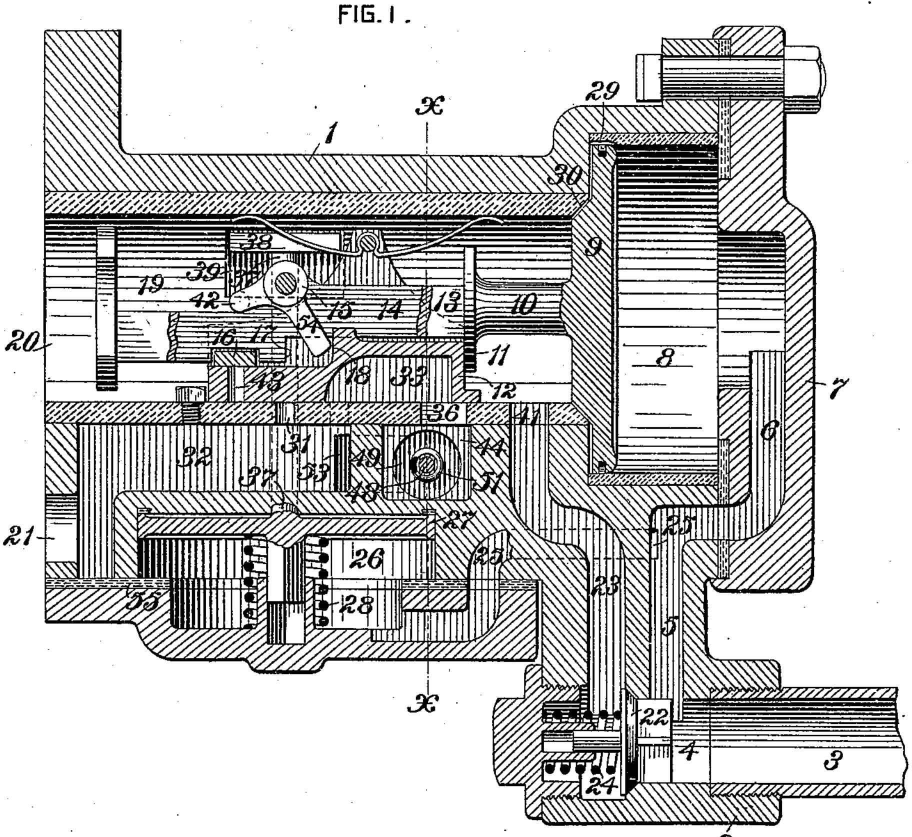


FIG. 4.

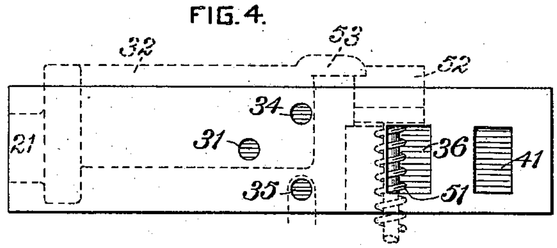
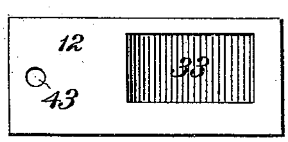


FIG. 5.



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(No Model.) 2 Sheets—Sheet 2.

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AUTOMATIC FLUID PRESSURE BRAKE APPARATUS.

No. 551,822. Patented Dec. 24, 1895.

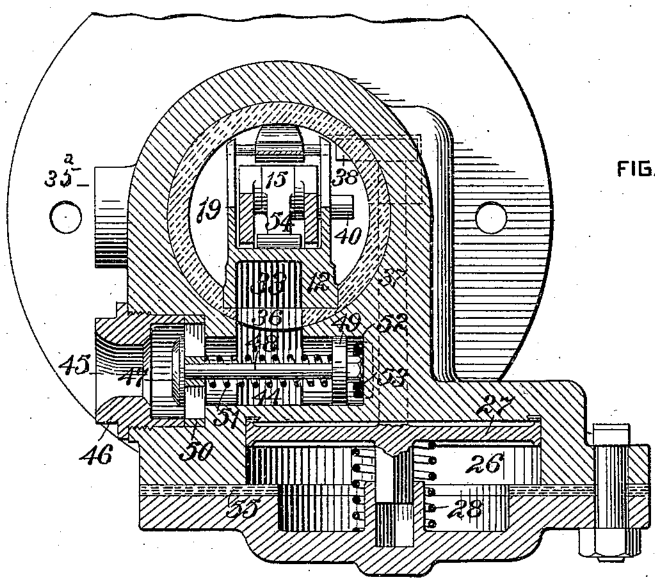

FIG. 2.

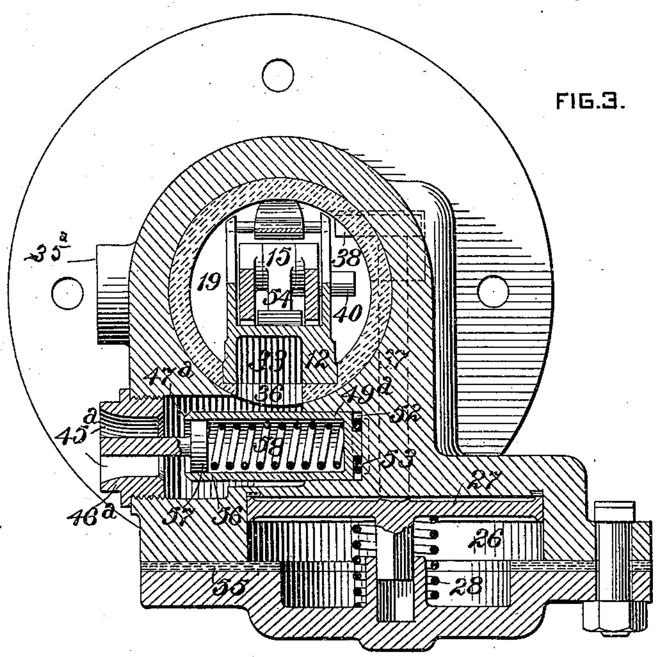

FIG. 3.

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UNITED STATES PATENT OFFICE.

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AUTOMATIC FLUID-PRESSURE BRAKE APPARATUS.

SPECIFICATION forming part of Letters Patent No. 551,822, dated December 24, 1895.

Application filed July 12, 1895. Serial No. 555,780. (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 Automatic Fluid-Pressure Brake Apparatus, of which improvement the following is a specification.

The object of my invention is to provide an improvement in automatic fluid-pressure brake apparatus for railway-cars; and to this end my invention consists in a new and improved means for controlling and limiting the exhaust of fluid from the train-pipe, in the combination of such means with a device for releasing fluid under pressure from the train-pipe, and in certain features of construction, all as hereinafter fully set forth.

In the accompanying drawings, which illustrate applications of my invention, Figure 1 is a central longitudinal section through a quick-action triple-valve device with my improvement applied thereto; Fig. 2, a transverse section on the line x x of Fig. 1, showing, in central section, the valve device for limiting the local exhaust of fluid from the train-pipe; Fig. 3, a similar section to Fig. 2, showing a modification of the valve device for limiting the local exhaust from the train-pipe; Fig. 4, a plan view of the seat of the main slide-valve of the triple-valve device, and Fig. 5 a view of the face of the main slide-valve of the triple-valve device.

While my improvement is not limited in its application to any particular form of triple-valve device, nor to any particular form of device for locally releasing fluid under pressure from the train-pipe, I have shown it in combination with a triple-valve device similar to that shown in Fig. 5 of my pending application, Serial No. 545,565.

As shown in the drawings, the casing 1 of the triple-valve device is provided with a screw-threaded nozzle 2, to which is connected a branch pipe 3, leading from the main train-pipe. The branch pipe 3 is connected by means of the passages 4 and 5 in the casing 1 and the passage 6 in the cap 7 with the triple-valve piston-chamber 8, in which the triple-valve piston 9 is fitted to work. A portion 10 of the triple-valve piston-stem is shown cylindrical in form, and is provided with a shoulder 11, which is adapted to bear against one end of the main slide-valve 12, to move it into position to release the brakes. The extension of the triple-valve piston-stem beyond the shoulder 11 is made in the form of two parallel bars 13 and 14, between which is pivoted a lever 15. The bars 13 and 14 are notched or recessed to fit over a graduating-valve 16, and are provided with shoulders 17, which are adapted to abut against a shoulder 18 on the main slide-valve 12 when the triple-valve piston is moved to the right for the purpose of applying the brakes. The main valve-chamber 19 communicates through the opening 20 with the auxiliary reservoir, and a port or passage 21 is always in open communication with the brake-cylinder. A check or non-return valve 22 closes communication between the train-pipe and a passage 23 which opens, through a port 41, into the valve-chamber 19. When the brakes are released, or when a service application of the brakes is made, the valve 22 is held to its seat by the spring 24 and the pressure of the fluid in the passage 23, and the valve 22 is opened only in emergency applications or when the pressure in the train-pipe, acting on one side of the valve, is sufficient to overcome the pressure of the spring and the fluid pressure in the passage 23 acting on the other side of the valve.

When the train-pipe is charged with fluid under pressure, the triple-valve piston and the slide-valve 12 are moved into the positions shown in Fig. 1 by the pressure of the fluid in the piston-chamber 8, which enters through the passages 4, 5, and 6 from the train-pipe. At the same time, fluid from the train-pipe flows through the passages 4, 5, and 25 into the chamber 26, and the supplemental piston 27 is moved upward into the position shown in Fig. 1 by the pressure of the fluid and the pressure of the spring 28.

When the triple-valve piston is in the position shown in Fig. 1, the feed-groove 29 is uncovered and fluid from the train-pipe flows through the feed-groove 29, around the piston, through the groove 30, into the chamber 19 and through the opening 20 into the auxiliary reservoir. The main slide-valve is then in position to close the port 31 in the valve-seat, which opens into the brake-cylinder passage 32, and the cavity 33 in the main slide-valve connects the port 34 in the valve-seat with the usual exhaust-port 35, leading to the nozzle 35ª, through which it opens to the atmosphere, and thereby puts the brake-cylinder passage 32 in communication with the atmosphere. At the same time the port 36 in the valve-seat also communicates with the exhaust-port 35 through the cavity 33 in the slide-valve.

The stem 37 of the supplemental piston 27 extends upward through a passage formed alongside of the valve-chamber 19 and is provided on its upper end with a piston or cap-piece 38, which projects through an opening 39 into the valve-chamber 19 above the pin 40 on the arm 42 of the lever 15.

A passage 43 through the main valve, which is adapted to register with the port 31 in the valve-seat in making service applications of the brakes, is controlled by the graduating-valve 16.

The port 36 in the valve-seat opens into a transverse passage 44 which is normally in communication with the atmosphere through a passage 45 formed in a screw-plug 46. A valve 47, (shown in Fig. 2,) which controls the passage 45, is provided with a stem 48, to the inner end of which a piston 49 is secured. The stem 48 passes through a guide 50, which is held in place by the screw-plug 46, and a spring 51 bears at one end against the guide 50 and at its other end against the piston 49 and tends to unseat the valve and hold the piston at the extremity of its movement to the right. The piston 49 is fitted in a cylindrical chamber 52, which communicates with the brake-cylinder passage 32 through a passage 53, so that the piston 49 is at all times exposed on one side to the pressure in the brake-cylinder.

When a comparatively slight or gradual reduction of train-pipe pressure is made, for the purpose of effecting a service application of the brakes, the triple-valve piston 9 will make its full stroke to the right, the supplemental piston 27 will remain in the position shown in Fig. 1, the shoulders 17 on the stem of the triple-valve piston will come in contact with the shoulder 18 on the main valve 12, the main valve will be moved to the right until the port 43 in the main valve registers with the port 31 in the valve-seat, the ports 34 and 35 will be closed, and the port 36 will be cut off from communication with these ports, but the valve will not be moved far enough to the right to connect the port 36 with the port 41.

Before the shoulders 17 on the piston-stem come in contact with the shoulder 18 on the valve 12 the graduating-valve 16 will uncover the passage 43, and when the passage 43 registers with the port 31 fluid under pressure will flow from the auxiliary reservoir through the passage 43, port 31, and passages 32 and 21 to the brake-cylinder, and the brakes will be applied. When the brake-cylinder pressure acting on one side of the piston 49 is sufficient to compress the spring 51 the exhaust-valve 47 will be closed by the movement of the piston 49.

Since the supplemental piston 27 and the plate or cap-piece 38 on the stem of the supplemental piston remain stationary when a service application is made, the lever 15 will be free to turn on its pivot, and the lower arm 54 of the lever 15 will be swung to the left about its point of support by contact with the shoulder 18 on the valve 12.

When a comparatively great and rapid reduction of train-pipe pressure is made, such as is necessary to cause an emergency application of the brakes, the triple-valve piston 9 will be moved to the limit of its stroke to the left, the supplemental piston 27 will be moved downward its full stroke until it seats on the gasket 55, and the plate or cap-piece 38 will be moved down far enough to prevent any upward movement of the pin 40 on the lever 15 if the supplemental piston makes its stroke before the triple-valve piston moves. If the triple-valve piston moves before the supplemental piston the arm 42 of the lever 15 and the pin 40 will at first be moved upward by the contact of the arm 54 with the shoulder 18, and when the supplemental piston moves downward the plate or cap-piece 38 will push the pin 40 and the arm 42 down and lock the lever in the position shown in Fig. 1. The lower arm 54 will be held in contact with the shoulder 18 on the valve 12, so as to hold the valve against the shoulder 11 on the stem 10, the lost motion between the shoulder 18 on the valve and the shoulders 17 on the stem will be taken up, and when the piston 9 reaches the end of its stroke the valve 12 will be in position to close the ports 34 and 35, to open the port 31 by moving to the right of the port 31, and to put the port 41 in communication with the port 36 through the cavity 33 in the main valve.

As the exhaust-valve 47 (shown in Fig. 2) is normally held open by the spring 51 the fluid under pressure in the passage 23 will escape through the port 41, cavity 33, port 36, and passages 44 and 45 to the atmosphere when the main valve is in the emergency position. The reduction of pressure in the passage 23 will permit the pressure in the train-pipe to unseat the check-valve 22, and fluid under pressure will flow from the train-pipe through the passage 23, port 41, cavity 33, port 36, and passages 44 and 45 to the atmosphere. At the same time fluid under pressure will flow from the auxiliary reservoir through the port 31 and passages 32 and 21 to the brake-cylinder, and the exhaust-port 45 will remain open until the pressure in the brake-cylinder and in the passages 32 and 53 and in the chamber 52 on one side of the piston 49 is sufficient to compress the spring 51 and close the exhaust-port 45. When the valve 47 closes, the pressure in the passage

44, cavity 33, and passage 23 will tend to quickly equalize with the pressure in the train-pipe, and before equalization takes place the pressure of the fluid in the passage 23 and the pressure of the spring 24 acting together will close the check-valve 22. After the closing of the exhaust-valve 47 and the check-valve 22, the fluid under pressure in the auxiliary reservoir will continue to flow through the port 31 and passages 32 and 21 to the brake-cylinder until the auxiliary reservoir and brake-cylinder pressures are equalized, and the brakes are fully applied.

By properly proportioning the areas of the piston 49 and the valve 47 and the resistance of the spring 51, the valve 47 may be made to close when any desired pressure is obtained in the brake-cylinder.

As shown in Fig. 2 the area of the valve 47 is substantially the same as the area of the piston 49, and the pressure of the fluid in the passage 44 has little or no tendency to close the valve 47. When the valve 47 is closed, if fluid from the brake-cylinder should leak around the piston 49, it will have no tendency to open the valve, even if the pressure in the passage 44 should equal the pressure in the brake-cylinder. The valve 47 will remain closed until the main valve is moved into the release position by an increase of train-pipe pressure sufficient for that purpose, and will not open until the brake-cylinder pressure is reduced sufficiently by exhaust to the atmosphere through the usual exhaust-passage 35 to permit the spring 51 to unseat the valve 47.

In Fig. 3 of the drawings I have shown a modification of my improvement in which the closed end 49^a of a tube 56 takes the place of the piston 49, (shown in Fig. 3,) and the exhaust-valve 47^a is formed on the other end of the tube. A spring 58 within the tube 56 bears at one end against the closed end of the tube and at its other end against a guide 57 which is formed on the screw-plug 46^a and fits in the tube 56.

It will be seen that in both of the constructions shown in Figs. 2 and 3, the exhaust-valve and the piston connected thereto are balanced so far as any fluid pressure in the passage 44 is concerned, and that the pressure of the fluid in that passage does not tend either to open or to close the valve. This is important on account of the difficulty of fitting the piston 49 or 49^a so that it will move easily and at the same time not permit leakage around it from the brake-cylinder. In the construction shown, fluid from the brake-cylinder may leak around the piston 49 or 49^a until the pressure of the fluid in the passages between the check-valve 22 and the exhaust-valve 47 equalizes with the pressure in the brake-cylinder, but the valve 47 or 47^a will still be held to its seat by the pressure in the brake-cylinder, and the effect of the pressure in the brake-cylinder acting on the right-hand side of the piston 49 or 49^a will be substantially the same as it would be if there were no pressure in the passage 44.

In recharging the train-pipe for the purpose of releasing the brakes, if the triple-valve piston and the main valve 12 should not move quickly into the release position and the high pressure in the train-pipe should then open the check-valve, the passages 23 and 44 and the cavity 33 in the main valve will be charged with fluid under a higher pressure than that in the brake-cylinder without opening the valve 47 or 47^a, and there will be no escape of fluid from the train-pipe to the atmosphere.

It will be obvious that either form of the exhaust-valve device shown in the drawings may be exployed in connection with other forms of release-valve or with an independent release-valve, and that my improvement is not limited in its application to a device in which the main valve of the triple-valve device acts as a train-pipe release-valve.

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

1. The combination, in a fluid pressure brake apparatus, of a release valve for locally releasing fluid under pressure from the train pipe, a passage controlled by the release valve, and an exhaust valve for closing the passage which is balanced as to fluid pressure in the passage, substantially as set forth.

2. In a fluid pressure brake apparatus, the combination, with a release valve for locally releasing fluid under pressure from the train pipe, of a passage controlled by the release valve, an exhaust valve for closing the passage which is balanced as to fluid pressure in the passage, and a piston which is acted on by pressure in the brake cylinder for closing the valve, substantially as set forth.

3. In a fluid pressure brake apparatus, the combination, with a release valve for locally releasing fluid under pressure from the train pipe, of a passage controlled by the release valve, a valve for closing the passage which is exposed to fluid pressure in the passage acting in one direction, and a piston which is connected to the valve and exposed on one side to fluid pressure in the passage acting in the opposite direction and substantially balancing the pressure on the valve, and which is operated by pressure in the brake cylinder to close the valve, substantially as set forth.

4. In an automatic fluid pressure brake apparatus, the combination, with a release valve for locally releasing fluid under pressure from the train pipe, of an exhaust valve device for limiting the discharge of fluid from the train pipe which is inoperative, and unaffected, by the fluid which is released from the train pipe, and which is operated by the pressure in the brake cylinder to cut off the discharge from the train pipe, substantially as set forth.

5. In an automatic fluid pressure brake apparatus, the combination, with a release valve for locally releasing fluid under pressure from the train pipe, of an exhaust port through

which the fluid escapes after passing the release valve, an exhaust valve device for limiting the discharge from the train pipe which is inoperative by the fluid discharged from the train pipe and which is held open by the pressure of a spring only and closed by the pressure in the brake cylinder, substantially as set forth.

6. In a fluid pressure brake apparatus, the combination, with the main valve of a triple valve device, of a passage controlled by the main valve for releasing fluid under pressure from the train pipe, an exhaust valve in the passage which seats in the direction of the flow through the passage a piston actuated by brake cylinder pressure to close the exhaust valve, and a spring which normally holds the valve open, substantially as set forth.

In testimony whereof I have hereunto set my hand.

THOMAS J. HOGAN.

Witnesses:
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CHAS. F. MILLER.