No. 661,311.

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M. W. HIBBARD.

FLUID PRESSURE BRAKE.

(Application filed May 23, 1900.)

(No Model.)

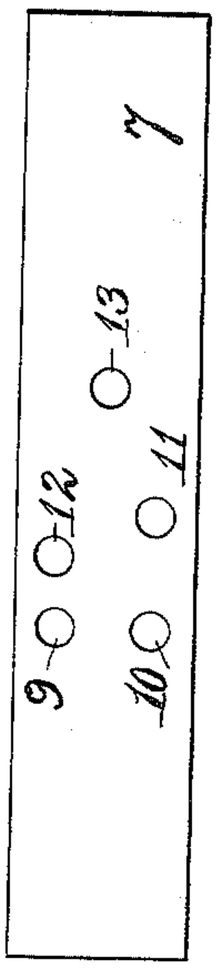

Fig. 2.

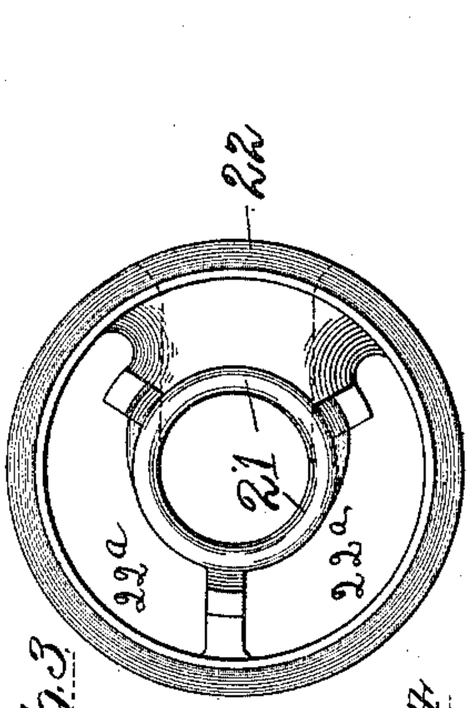

Fig. 3.

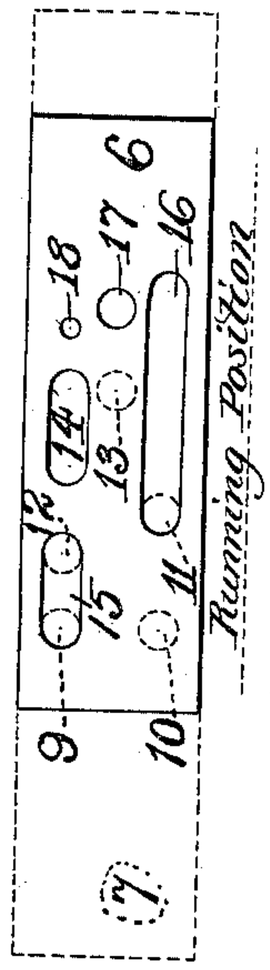

Fig. 4.

Fig. 5.

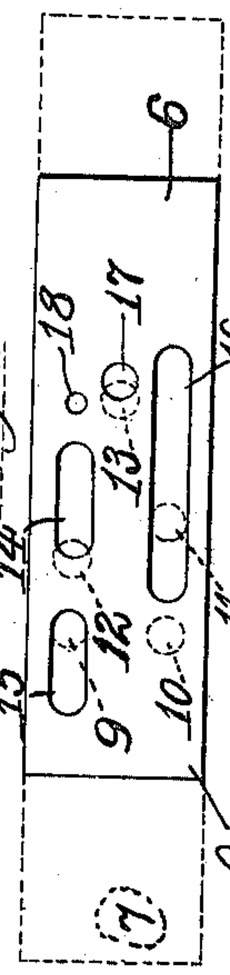

Fig. 6.

Fig. 1.

Fig. 7.

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UNITED STATES PATENT OFFICE.

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

FLUID-PRESSURE BRAKE.

SPECIFICATION forming part of Letters Patent No. 661,311, dated November 6, 1900.

Application filed May 23, 1900. Serial No. 17,691. (No model.)

To all whom it may concern:

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

The object of my invention is to produce a quick-acting valve operating in a high-speed brake system, which valve will be capable of retaining a high equalized pressure in the auxiliary reservoir after actuation of the brakes in emergency action and also capable of permitting a quick release of the brakes after such emergency action.

My invention is designed as an improvement upon that class of valve devices which employ a piston-actuated auxiliary emergency-valve and upon that type of such class in which the emergency-valve is actuated by a release of fluid under pressure from the chamber in which said piston travels instead of an admission of fluid-pressure.

In the drawings, Figure 1 is a sectional elevation of my valve device of the class and type described to which my invention is shown applied; Fig. 2, a face view of the slide-valve seat; Fig. 3, a plan view of a block or casting, showing the seat upon which the emergency-valve normally rests; Figs. 4, 5, and 6, views of the valve-seat in dotted lines, showing the slide-valve in full lines in different positions, according to the different conditions of the brakes; and Fig. 7, a sectional elevation of a form of a pressure-reducing valve or blow-down device that may be adopted to reduce the brake-cylinder pressure to a predetermined amount and at a rate proportionate to the decrease in speed of the train.

The valve device comprises a casing 1, having a train-pipe connection or nozzle 2 and brake-cylinder connection 3, the auxiliary reservoir being located, as usual, on the right, Fig. 1, of the triple-valve chamber and normally communicating therewith. The usual main piston 4 travels in a chamber 5 and operates a slide-valve 6, governing ports and passages through a bushing or valve-seat 7 in the triple-valve chamber 8. The valve-seat has two ports 9 and 10 leading to the atmosphere and ports 11, 12, and 13, the two latter ports leading to the brake-cylinder and the port 11 to the emergency-valve chamber. The slide-valve has two recesses 14 and 15 arranged in tandem, a recess 16, a port or passage 17, and a small port or passage 18, extending through the slide-valve. The slide-valve may be provided with the usual graduating-valve (not shown) to admit the fluid under pressure through port 17.

The emergency-valve 19 is actuated by a piston 20, which may be integral therewith, though not necessarily so, and is normally seated upon the seat 21, formed on a casting or bridge-piece 22, so as to govern the flow of train-pipe pressure past check-valve 23 through passages 22^a in the bridge-piece to the brake-cylinder and also auxiliary-reservoir pressure to the brake-cylinder. The emergency-valve chamber communicates with the auxiliary reservoir through a passage 24 entering below the piston, which passage is provided with a check-valve 25 to permit fluid under pressure to flow into such chamber, but prevent its return. The emergency-valve chamber also communicates with port 11 by means of a passage 26, which is closed in emergency action by a valve 27, that is seated by contact of the piston or the valve 19 with its stem. A suitable spring 28 may be used to assist in seating the emergency-valve.

In the communication between the triple-valve chamber and the auxiliary reservoir is arranged a casing or hollow cap 29, with an opening 30, and in which travels a valve 31, having a stem 32, which in all actions, except emergency action, keeps the valve 31 from its seat 33 by reason of its contact with the usual collar 34 on the stem of the main piston.

My valve device is designed to operate in a high-speed brake system in which a pressure-reducing valve is connected with the brake-cylinder or with its connections, so as to reduce the high pressure in the brake-cylinder at a rate proportionate to the decrease in speed of the train to prevent the sliding of the wheels. The pressure-reducing valve (shown in Fig. 7) comprises a casing or valve-box consisting of a cap A and a plug B, the latter being preferably screw-threaded and adapted to be screwed into the brake-cylin-

der or otherwise placed in communication therewith. A flexible diaphragm C is at its center secured to a valve-stem D, and it has its circumference clamped under the cap of the valve-box. The valve-stem D is at its upper part surrounded by a helical spring *d*, the force of which is adjusted to the maximum pressure desired in the brake-cylinder. The lower part of the stem is formed as a valve E, which fits the seating *e* at the edge of a hole *b* through the bottom of the valve-box. The stem projects into the hole, filling it, but not tightly, and a part of the side of this stem is grooved or flattened in the taper form, as shown at *x*, so as to give a passage for air, varying in area according to the position of the valve. While the pressure in the brake-cylinder, with which the valve-box communicates, remains lower than that to which the spring is adjusted, the valve remains closed; but should the pressure exceed that amount then the diaphragm C is bulged upward, as shown in Fig. 7, the stem D rising and opening the outlet valve, so that the air escapes and the pressure in the valve-box becomes reduced. By making the valve-stem tapered in the manner shown the escape of air and consequent reduction of pressure are rendered most rapid when the valve begins to open. The form of the notch or flattened part may, however, be varied to suit the conditions of the brake apparatus to which the escape-valve is applied. By suitably grooving or flattening the stem, as above described, the reduction of the pressure can be adjusted to suit the increase of friction as the velocity diminishes. It is obvious that a piston working in the valve-box might be substituted as an equivalent for the diaphragm.

Upon a reduction of train-pipe pressure for service action the slide-valve is moved to a position to close the brake-cylinder and connect ports 13 and 17 to admit fluid under pressure from the auxiliary reservoir to the brake-cylinder, the valve 31 being kept from its seat and the fluid under pressure passing freely along the angular stem of such valve into the triple-valve chamber. Upon a reduction of train-pipe pressure for emergency action the slide-valve is moved to full traverse, whereupon the recess 16 connects ports 10 and 11 and causes an exhaust of pressure from above piston 20 and permits the pressure from the auxiliary reservoir to raise the emergency-valve and admit the train-pipe pressure to the brake-cylinder. Simultaneously the auxiliary-reservoir pressure passing check-valve 25 flows through passage 24 and thence into the brake-cylinder to augment the train-pipe pressure vented thereto. The emergency-valve when open contacts the stem of valve 27 and closes the passage 26, and thereby the upper part of the emergency-valve chamber above the piston or abutment will be closed from the atmosphere. The piston is not fitted air-tight in its chamber, and consequently the fluid under pressure will pass by and get above the piston, and when the auxiliary-reservoir pressure and the brake-cylinder pressure have equalized the spring 28 will seat the emergency-valve. The triple-valve chamber is now cut off from the auxiliary reservoir by the seating of the valve 31 and is connected with the brake-cylinder through ports 12 and 18, (see Fig. 5,) so that the triple-valve chamber can be blown down to the same degree as the brake-cylinder and without reducing the high pressure in the auxiliary reservoir as equalized in emergency action. The high pressure admitted to the brake-cylinder is reduced or blown down by the pressure-reducing valve to a predetermined amount and at a rate proportionate to the decrease in speed of the train. Upon a restoration of train-pipe pressure equal to the brake-cylinder pressure reduced by the pressure-reducing valve or blow-down device the main piston will upon a slight travel carry the slide-valve so that the recess 14 thereof will connect brake-cylinder port 12 with exhaust-port 9 to release the brakes. When the main piston reaches this preliminary release position, or what might be termed a "post-emergency" position, its stem abuts the stem 32 of valve 31 and can travel no farther by reason of the high-retained pressure in the auxiliary reservoir. The brakes, however, have been released without the necessity of moving the main piston to "running" position, so that the restoration of train-pipe pressure to a high degree is not required before the train can proceed. When the train-pipe pressure is increased to equal the auxiliary-reservoir pressure, the parts will assume the normal position shown in Fig. 1. The recess 16 being now closed from the atmosphere, the small valve 27 will soon have equal pressure on both sides, as it does not fit air-tight and will drop from its seat.

While I have herein described my invention as applied to that type of triple valves which in emergency action vent fluid under pressure from the train-pipe into the brake-cylinder, it will be understood that the same may be applied to that type of triple valves which obtain emergency action by venting the train-pipe pressure to the atmosphere.

While it is desirable that the invention should be employed in connection with what is known as the "high-speed brake system," it will be understood that my invention is not necessarily limited to operating in such system, but that it may be used in connection with the ordinary system, broadly, for the purpose of cutting off the communication between the auxiliary reservoir and the brake-cylinder in emergency application of the brakes subsequent to the equalization of pressures between such reservoir and the brake-cylinder.

I claim—

1. In a brake mechanism, a triple-valve device operating in a chamber to control ports and passages between an auxiliary reservoir,

a brake-cylinder and the atmosphere, and an auxiliary emergency-valve operating alone in a second chamber and opened by said triple-valve device in emergency action by a release of fluid under pressure from such second chamber, in combination with means for maintaining in the auxiliary reservoir the high pressure as equalized in emergency action.

2. In a brake mechanism having a triple valve operative in a chamber and an auxiliary emergency-valve operating in a second chamber and opened by said triple-valve device in emergency action by a release of fluid under pressure from such second chamber, in combination with means for maintaining in the auxiliary reservoir the high pressure as equalized in emergency action and means for connecting the triple-valve chamber and the brake-cylinder in emergency action.

3. In a brake mechanism having a triple valve operative in a chamber and an auxiliary emergency-valve operating in a second chamber and opened by said triple-valve device in emergency action by a release of fluid under pressure in combination with means for maintaining in the auxiliary reservoir the high pressure as equalized in emergency action, means for connecting the triple-valve chamber and the brake-cylinder in emergency action; and a pressure-reducing device to reduce the pressure in the brake-cylinder, and triple-valve chamber to any predetermined amount.

4. In a brake mechanism having a piston-actuated slide-valve operative in a main chamber to govern the brake-release and the service application of the brakes and an auxiliary emergency-valve controlled by the slide-valve and operating in a chamber to govern the local exhaust of pressure from the train-pipe, said slide-valve having a port which in emergency action connects the brake-cylinder with the main chamber and having a recess for connecting the emergency-chamber on one side of the emergency-valve to the atmosphere to open such emergency-valve, in combination with means for maintaining in the auxiliary reservoir the high pressure as equalized in emergency action.

5. In a brake mechanism having a triple valve operative in a chamber to govern the brake-release and service application of the brakes, a piston-actuated auxiliary emergency-valve operative in a second chamber, controlled by the triple valve and opened upon the release of fluid under pressure from one side of the piston, a passage between the auxiliary reservoir and the emergency-valve chamber on the other side of the piston, in combination with means for maintaining in the auxiliary reservoir the high pressure as equalized in emergency action, means for reducing the brake-cylinder pressure to a predetermined amount and means for connecting the brake-cylinder and the triple-valve chamber in emergency action.

6. In a brake mechanism having a triple valve operative in a chamber, a piston-actuated emergency-valve operative in a second chamber and opened upon the release of fluid under pressure from one side of the piston, a passage between the auxiliary reservoir and the emergency-valve chamber said last-named chamber having an outlet through which said release takes place, and a valve closing such outlet after the emergency-valve is opened.

7. In a brake mechanism having a triple valve operative in a chamber, a piston-actuated auxiliary emergency-valve operative in a second chamber and opened upon the release of fluid under pressure from one side of the piston, such second or emergency-valve chamber having an outlet-passage through which said release takes place and a valve governing said outlet-passage and contacted by the emergency-valve in its movement when opened and causing a closing of the outlet-passage.

8. In a brake mechanism having a piston-actuated slide-valve operative in a chamber, a piston-actuated auxiliary emergency-valve operative in a second chamber, and opened upon the release of fluid under pressure from one side of the piston, such second or emergency-valve chamber having an outlet-passage through which said release takes place, a valve governing said outlet-passage and closing the same after the emergency-valve has opened, said slide-valve governing such release from the emergency-valve chamber, a check-valved passage between the auxiliary reservoir and the emergency-valve chamber opening on the other side of the piston therein, valve mechanism between the triple-valve chamber and the auxiliary reservoir, providing open communication therebetween in "running" and "service" positions but closing such communication in emergency action, the slide-valve having a port or passage which in emergency action establishes communication between the brake-cylinder and the triple-valve chamber, and a pressure-reducing valve to reduce the pressure in the brake-cylinder and triple-valve chamber to a predetermined amount.

9. In a brake mechanism having a piston-actuated slide-valve governing the brake-release and service application of the brakes, a piston-actuated auxiliary emergency-valve of the type operated in a chamber by a release of pressure from such chamber and under the control of said slide-valve in combination with valve mechanism for cutting off communication between the auxiliary reservoir and triple-valve chamber, the triple-valve chamber having a supplemental release-port 9 and a supplemental brake-cylinder port 12 and the slide-valve having a supplemental recess 14 adapted to connect ports 9 and 12 after a preliminary return travel of the slide-valve succeeding emergency action.

10. In a brake mechanism having a piston-actuated slide-valve operating in a chamber

and governing the brake-release and service application of the brakes, such slide-valve having recesses 14, 15 and 16, and passages 17 and 18 and governing exhaust-ports 9 and 10, an emergency-valve-chamber port 11, and brake-cylinder ports 12 and 13, a valve governing communication between the slide-valve chamber and the auxiliary reservoir and held open by such slide-valve except in emergency action, a piston-actuated emergency-valve operating in a chamber which has a passage 26 communicating with port 11 and governed by recess 16, a valve working in passage 26 and seated therein by contact of the emergency-valve therewith in emergency action and a check-valved passage 24 from the auxiliary reservoir to the emergency-valve chamber and entering such chamber on the side of the piston opposite to that on which the passage 26 leads.

11. In a brake mechanism having a piston-actuated slide-valve operating in a chamber and governing the brake-release and service application of the brakes, a piston-actuated auxiliary emergency-valve of the type operated in a chamber by a release of pressure from such chamber, said slide-valve having means for releasing the pressure from one side of the emergency-valve piston, a passage 24 from the auxiliary reservoir to the emergency-valve chamber on the other side of the piston therein, a check-valve in such passage to check return of fluid under pressure to the auxiliary reservoir, in combination with a valve governing the communication between the slide-valve chamber and the reservoir and maintained open by the slide-valve except in emergency action, such slide-valve having a port connecting the slide-valve chamber with the brake-cylinder in emergency action whereby the pressure in the slide-valve chamber equals the brake-cylinder pressure and the release can be effected by a restoration of train-pipe pressure equal to brake-cylinder pressure.

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