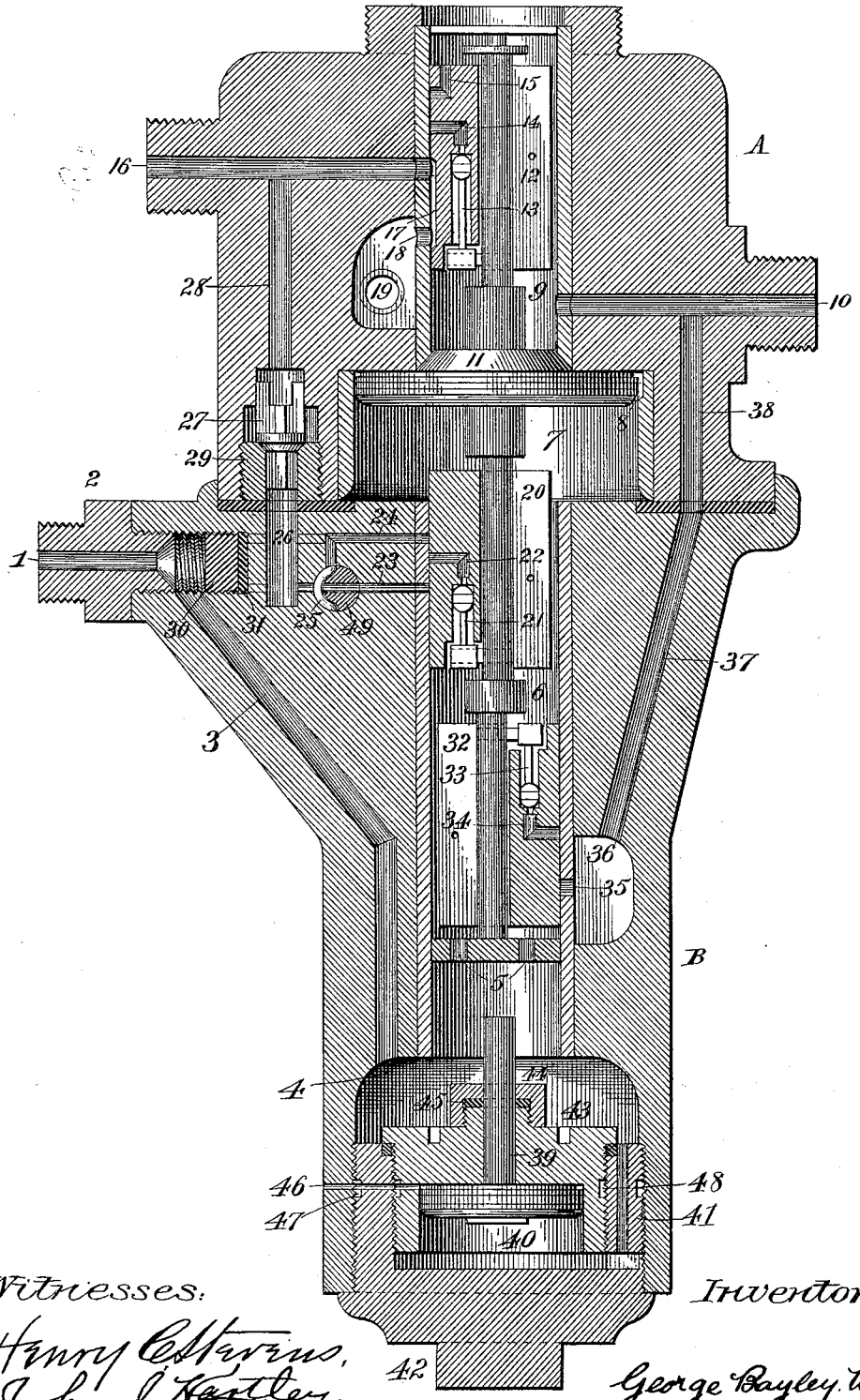
(No Model.)

G. B. WILLIAMS.

FLUID PRESSURE AUTOMATIC BRAKE MECHANISM.

No. 386,514. Patented July 24, 1888.



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FLUID-PRESSURE AUTOMATIC-BRAKE MECHANISM.

SPECIFICATION forming part of Letters Patent No. 386,514, dated July 24, 1888.

Application filed December 5, 1887. Serial No. 257,019. (No model.)

To all whom it may concern:

Be it known that I, GEORGE BAYLEY WILLIAMS, a citizen of the United States, residing at La Crosse, in the county of La Crosse and State of Wisconsin, have invented or discovered certain new and useful Improvements in Fluid-Pressure Automatic-Brake Mechanism, of which improvements the following is a specification.

The object of my invention is to provide for the recharging of the auxiliary reservoirs of the automatic air-brake while the brakes are applied, without releasing the brakes, or with the release of the brakes, as may be desired, in order that trains may be enabled to descend dangerous grades with far greater safety and with greater economy in the use of compressed air than with the brakes at present in use, the necessity for delays to adjust the brake mechanism under every car before descending dangerous grades, and again after descending such grades before the brakes can be entirely released, being also obviated by my improvements.

To this end my invention, generally stated, consists in a novel combination of a brake-pipe, an auxiliary reservoir, a brake-cylinder, and a "triple-valve" device, governing, primarily, communication between the auxiliary reservoir and the brake-cylinder; secondarily, communication directly from the brake-pipe to the brake-cylinder under the control of a stop-cock, and, thirdly, communication directly from the brake-pipe or main air-pipe to the auxiliary reservoir through an auxiliary channel or pipe provided for this purpose.

It will be readily seen that my invention is an improvement upon the Westinghouse system of automatic air-brakes.

The improvements claimed are hereinafter fully set forth.

The objections to the present Westinghouse automatic air-brake are that after the brakes have been applied the auxiliary reservoirs cannot be recharged without a waste of air in partially releasing the brakes; that in such case the brakes would be entirely released but for the use of a pressure-retaining valve governing the exhaust-outlet of the triple valve on every car; that the use of such pressure-retaining valve requires that the train be stopped and the valve adjusted on every car before descending a dangerous grade, which operation has to be repeated after the descent of such grade before the brakes can be fully released; that the accidental moving of plug of pressure-retaining valve to cut-off, or the loss of such plug, followed by a wooden plug being tightly driven in by a well-meaning brakeman, would prevent any release of the brakes and cause all the wheels to slide and be ruined, and that an auxiliary engineer's valve has to be used in order to keep the brakes applied on the locomotive driving-wheels, while the auxiliary reservoirs are being recharged and the brakes partially released on the cars. These various defects, and the danger resulting from allowing the auxiliary reservoirs to become gradually exhausted while descending dangerous grades, are entirely eliminated by my improvement.

I am aware that Charles H. Perkins, in Patent No. 163,242, described a method of recharging the auxiliary reservoirs without releasing the brakes by means of his improvement, and I am equally well aware that his improvement is not constructed on correct mechanical principles to enable it to satisfactorily perform this operation. My improvement is, however, entirely different from his, and is properly adapted to satisfactorily perform what is claimed for it.

Reference is to be had to the accompanying drawing, which is a vertical central sectional view of a triple valve embodying my improvements, and which forms a part of this specification.

A represents the upper cap, and B the lower cap, of the triple valve, which together form the triple-valve case, having a channel, 1, leading from main air-pipe through nipple 2 and channel 3 into air-chamber 4. From chamber 4 communication is established, through channel or channels 5, with valve-chamber 6, which has direct communication at all times with piston-chamber 7, in which piston 11 operates. From piston-chamber 7 communication is established, through a groove, 8, in the side of piston-chamber, when piston 11 is at the upper limit of its traverse, with valve-chamber 9, which is in direct communication at all times with auxiliary reservoir through channel 10.

In chamber 9 is a slide-valve, 12, having a

limited free motion on stem of piston 11 in order to provide for its perfect graduation, and to neutralize the effects of reaction caused by the engineer allowing a considerable quantity of air to escape from main air-pipe, and then suddenly closing his brake-valve. Slide-valve 12 has a graduating-valve, 13, and discharge-ports 14 and 15, adapted for communicating with channel 16 during the descent of piston 11, thereby allowing air to pass from auxiliary reservoir to brake-cylinder for the purpose of applying the brakes. Slide-valve 12 has also a groove, 17, in its face, adapted for connecting channel 16 with port 18, leading to exhaust-outlet 19, when piston 11 is at the upper limit of its traverse, thereby allowing compressed air in the brake-cylinder to escape into the open air to facilitate the release of the brakes. Auxiliary slide-valve 20 similarly controls the admission of compressed air from main air-pipe into brake-cylinder during the descent of piston 11. It has a graduating-valve, 21, and a port, 22, adapted for communicating with channel 23 during the descent of piston 11, thereby allowing air to pass from main air-pipe or brake-pipe through channel 23, three-way cock or other stop-cock 49, chamber 26, check-valve 27, channel 28, and channel 16 into brake-cylinder. When slide-valve 20 is at its extreme lower limit, air will pass over its top into channel 24, leading to brake-cylinder, through groove 25 in cock 49, chamber 26, check-valve 27, and channels 28 and 16. Three-way cock 49 is so constructed that channels 23 and 24 may both be closed, both left open, or channel 24 only left open, as may be desired for use in eliminating shock. Slide-valve 23, in combination with three-way cock 49, check-valve 27, and the connections through these to brake-cylinders, form the subject-matter of applications, Serial Nos. 249,169 and 249,170, for Letters Patent of the United States filed by me and now pending, and need not, therefore, be more particularly described herein. The construction herein is somewhat modified and a more sensitive and efficient check-valve, 27, substituted for the spring-actuated check-valve previously used. A case, 29, is provided for double-wing fluid-pressure-actuated check-valve 27. An inner jam-nut, 30, compresses rubber or other suitable packing, 31, closing up holes made in boring channels 23 and 24. The end of channel 24, communicating directly with chamber 26 when drilled, can be suitably closed by a screw or otherwise, or, if desired, may be left open, leaving channel 23 only to be controlled by a stop-cock.

Auxiliary slide-valve 32, like slide-valves 12 and 20, has a limited free motion on stem of piston 11, for the same purpose of providing for its perfect graduation. While, however, this free motion in valves 12 and 20 neutralizes reaction, as they operate only during the downward traverse of piston 11, the case is the reverse with slide-valve 32, which operates only during the upward traverse of piston 11; hence its port 34 must pass so far below discharge-port 35 during the downward traverse of piston 11 that reaction may not open communication between auxiliary reservoir and main air-pipe through channels 10, 38, and 37, while the pressure is greater in auxiliary reservoir than in main air-pipe, thus causing the air-pressure to become equal in both and checking the desired application of the brakes. Slide-valve 32 has a graduating-valve, 33, and a port, 34, adapted for communicating with discharge-port 35 and allowing compressed air to pass from main air-pipe through chamber 36, channels 37, 38, and 10 to auxiliary reservoir, for the purpose of recharging the latter without releasing the brakes, during the upward traverse of piston 11, by means of a gradual increase of pressure, which will equalize on both sides of piston 11, instead of lifting it to the upper limit of its traverse and releasing the brakes, which would result from admitting air from main reservoir into main air-pipe faster than could pass readily through the specially-limited size of port 34.

In lower cap, B, is a graduating-piston, 39, actuated by air-pressure passing from chamber 4 through channel 41 into chamber 40, which is an improvement upon the Westinghouse spring-actuated graduating-stem. The piston-case 43 screws into cap-nut 42, thus forming graduating piston-chamber 40. To prevent compressed air passing from chamber 4 to act on upper side of graduating-piston 39, rubber or other suitable packing is held in place against stem of piston 39 by means of packing-nut 44. In order to prevent compressed air from acting on upper side of graduating-piston 39, in case of leakage around the edge of said piston or otherwise, I provide annular groove 47 in cap-nut 42 and annular groove 48 in piston-case 43, and then drill a channel through lower cap, B, to groove 47, through the sleeve portion of cap-nut 42, thence to groove 48, and thence through the sleeve portion of piston-case 43 to the upper part of piston-chamber 40. The differential fluid-pressure-actuated graduating-piston 39, with case, chamber, and connections provided for same, forms the subject-matter of application, Serial No. 255,901, for Letters Patent of the United States, filed by me and now pending, and need not, therefore, be more particularly described herein.

In order that the triple valve may perform the additional functions requisite in the practice of my present invention, it has been provided with certain additional members, as hereinbefore described, consisting of slide-valve 32, discharge-port 35, chamber 36, and channels 37 and 38. In other respects the triple valve, though modified in construction, accords in all substantial particulars with the Westinghouse triple valve, as modified by other improvements for which I have filed application for Letters Patent of the United States, as hereinbefore referred to.

In the operation of the brake mechanism, as above described, air from the main reservoir and main air-pipe passes through the passages and chambers 1, 3, 4, 5, and 6 into chamber 7, forcing the piston 11 to the upper extremity of its stroke and uncovering a small feeding-groove, 8, in the piston-chamber, through which air passes into the auxiliary reservoir through chamber 9 and channel 10 until the pressures in the auxiliary reservoir and in the main air-pipe are equal, the brake-cylinder being meanwhile in communication with the atmosphere through channel 16, groove 17, discharge-port 18, and exhaust-outlet 19.

To apply the brakes in making ordinary stops, a portion of the air is discharged from the main air-pipe by the engineer's valve, thereby correspondingly reducing the pressure in the main air-pipe, whereupon the higher pressure in the auxiliary reservoir causes the piston 11 to descend, covering the feeding-groove 8 and severing the connection between the auxiliary reservoir and the main air-pipe. The motion of piston 11 will now be governed by the difference in the air-pressures on its opposite sides, and the higher pressure in the auxiliary reservoir will make it continue to descend until arrested by the decrease of pressure in the auxiliary reservoir or by graduating-piston 39. With a fluid-pressure-actuated graduating-piston the stem of piston may be caused to arrest the downward motion of piston 11 sooner and with better results than with the spring-actuated graduating-stem. If channel 23 is left open in the two or three last cars of a train and closed in all the other cars, it will readily be seen that air will pass from the main air-pipe to the brake-cylinder on the two or three last cars only, lowering piston 11 on these cars more than on the other cars, thereby resulting in a greater application of brake-pressure on the rear cars than elsewhere, and having a consequent tendency to eliminate impact or shock, which is the result when the rear cars only get the same application of brake-pressure as on the forward cars, while the application does not take place as soon as on the forward cars. In its preliminary downward traverse, piston 11 opens slide-valves 12 and 20 by withdrawing their graduating-valves 13 and 21, respectively, while it keeps slide-valve 32 closed during its descent by pressing graduating-valve 33 tightly to its seat. When the pressure of air in the auxiliary reservoir has been reduced by expansion into the brake-cylinder till the pressure in the auxiliary reservoir and the main air-pipe are equal, there is an equal pressure on both sides of piston 11, and the additional pressure exerted by graduating-piston 39 will cause piston 11 to rise, forcing graduating-valves 13 and 21 to their respective seats, and thus closing slide-valves 12 and 20, at same time lifting graduating-valve 33 from its seat and opening slide-valve 32. When graduating-piston 39 has reached the upper extremity of its traverse, port 34 in auxiliary slide-valve 32 must not by such traverse have been carried past port 35. Port 34 should either then register with port 35, or else should not have been moved far enough to register with port 35. In the former case there will be an entirely unobstructed communication between the main air-pipe and the auxiliary reservoir through auxiliary slide-valve 32, ports 34 and 35, cavity 36, and channels 37, 38, and 10, and by means of this unobstructed communication the auxiliary reservoir can be recharged by a gradual increase of pressure in the main air-pipe that is insufficient to move piston 11.

If port 34 should not have been moved far enough to register with port 35 when the graduating-piston 39 has reached the upper extremity of its traverse, then the gradual increase of pressure which is admitted into the main air-pipe in order to recharge the auxiliary reservoir without releasing the brakes will cause piston 11 to rise till port 34 registers with port 35, when the auxiliary reservoir can be recharged, as in the former case, by a gradual increase of pressure in the main air-pipe that is insufficient to move piston 11 farther.

Whenever it is desired to release the brakes, the full main reservoir-pressure is admitted into the main air-pipe, which lifts piston 11 to the upper extremity of its traverse and establishes communication between the brake-cylinder and the atmosphere through channel 16, valve-cavity or leakage-groove 17, port 18, and release-port or exhaust-outlet 19.

In the event of its becoming necessary to apply the brakes with great rapidity and with their greatest available force, the engineer, by means of his brake-valve, instantly discharges sufficient air from the front end of the main air-pipe to effect a sudden reduction of about twenty pounds per square inch therein, whereupon the piston 11 of the triple valve is forced to the extreme downward limit of its stroke, carrying with it the slide-valves 12 and 20, so that port 15 will register with channel 16, and slide-valve 20 will pass below channel 24, with the same result as before, but differing in degree of the application of the brakes, which is much greater in the latter case. The discharge of air from the main air-pipe into the brake-cylinder, as controlled by three-way cocks 49, takes place in every application of the brakes, however small, for the purpose of expediting the application of the brakes and for eliminating impact or shock.

In using the terms "triple valve" and "triple-valve device" I refer to a valve device, however specifically constructed, having a connection with the main air or brake pipe; another with an auxiliary reservoir or chamber for the storage of power, and another with a brake-cylinder or its equivalent for the utilization of the stored power, and with a release or discharge passage for releasing the operative power from the brake-cylinder, whether the valves governing these passages or connections are arranged in one or more cases

and are moved by a piston or its equivalent, or by a series of pistons or their equivalents, there being numerous examples in the art of constructions varying materially in appearance whereby those functions are performed, both in pressure and vacuum brake mechanisms.

While I have herein described my invention as applied in a brake mechanism utilizing air under pressure, such as is in general and approved use, I do not desire to limit myself to brakes so operated, as my improvements are likewise susceptible of application without variation of principle in connection with brakes worked by atmospheric pressure. Neither do I restrict myself to the exact construction here shown, while mechanical equivalents can be substituted in various other ways to accomplish substantially the same results in substantially the same way.

I am aware that there is in Patent No. 163,242 a construction which is claimed to produce the same results as my improvement, and in which there is only one connecting-channel between main air-pipe and auxiliary reservoir, which is controlled only by a check-valve, and such construction, which involves an operation different from that of my invention, I therefore hereby disclaim.

Having thus described my invention, I claim as new and desire to secure by Letters Patent—

1. In a brake mechanism, a main air-pipe, an auxiliary reservoir, a brake-cylinder, and a triple valve, in combination with an auxiliary-valve device actuated by the piston of triple valve for admitting compressed air from the main air-pipe into the auxiliary reservoir through a secondary feed channel, pipe, or groove for the purpose of recharging the auxiliary reservoir by means of a gradual increase of pressure in the main air-pipe and without releasing the brakes, substantially as set forth.

2. In a brake mechanism, a main air-pipe, an auxiliary reservoir, a brake-cylinder, and a triple valve, in combination with an auxiliary-valve device actuated by the piston of triple valve in such manner that the preliminary upward traverse of said piston admits compressed air from the main air-pipe into the auxiliary reservoir through such auxiliary-valve device and a secondary feed channel, pipe, or groove for the purpose of recharging the auxiliary reservoir by means of a gradual increase of pressure in the main air-pipe and without releasing the brakes, and which piston, by a further upward traverse, admits air from the main air-pipe into the auxiliary reservoir through the ordinary feed-groove simultaneously with the release of the brakes, substantially as set forth.

3. In a brake mechanism, a main air-pipe, an auxiliary reservoir, a brake-cylinder, and a triple valve, in combination with an auxiliary-valve device actuated by the piston of triple valve for admitting compressed air from the main air-pipe into the auxiliary reservoir through a secondary channel, pipe, or groove governed and controlled by such valve device, as well as through the ordinary feed-groove in piston-chamber round edge of piston, in order that the auxiliary reservoir may be recharged, when the brakes are applied, with or without the release of the brakes, as may be desired, substantially as set forth.

4. In a triple-valve device, a case or chest, a piston fixed upon a stem and working in a chamber therein, a valve moving with the piston stem and governing-ports, and passages in the case leading to connections with an auxiliary reservoir, a brake-cylinder, and to the atmosphere, respectively, an auxiliary valve actuated by the piston-stem and controlling communication between passages leading to connections with a main air pipe and a brake-cylinder, respectively, in combination with a second auxiliary valve actuated by the piston of triple valve and controlling a secondary communication between the main air-pipe and the auxiliary reservoir for the purpose of recharging the auxiliary reservoir, when the brakes are applied, by means of a gradual increase of pressure in the main air-pipe and without releasing the brakes, substantially as set forth.

5. The valve 32, actuated by piston 12, having graduating-valve 33 and port 34, in combination with port 35, cavity 36, and channels 37, 38, and 10, substantially as set forth.

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