(No Model.)

H. E. GRANT.

QUICK ACTION TRIPLE VALVE DEVICE.

No. 588,419. Patented Aug. 17, 1897.

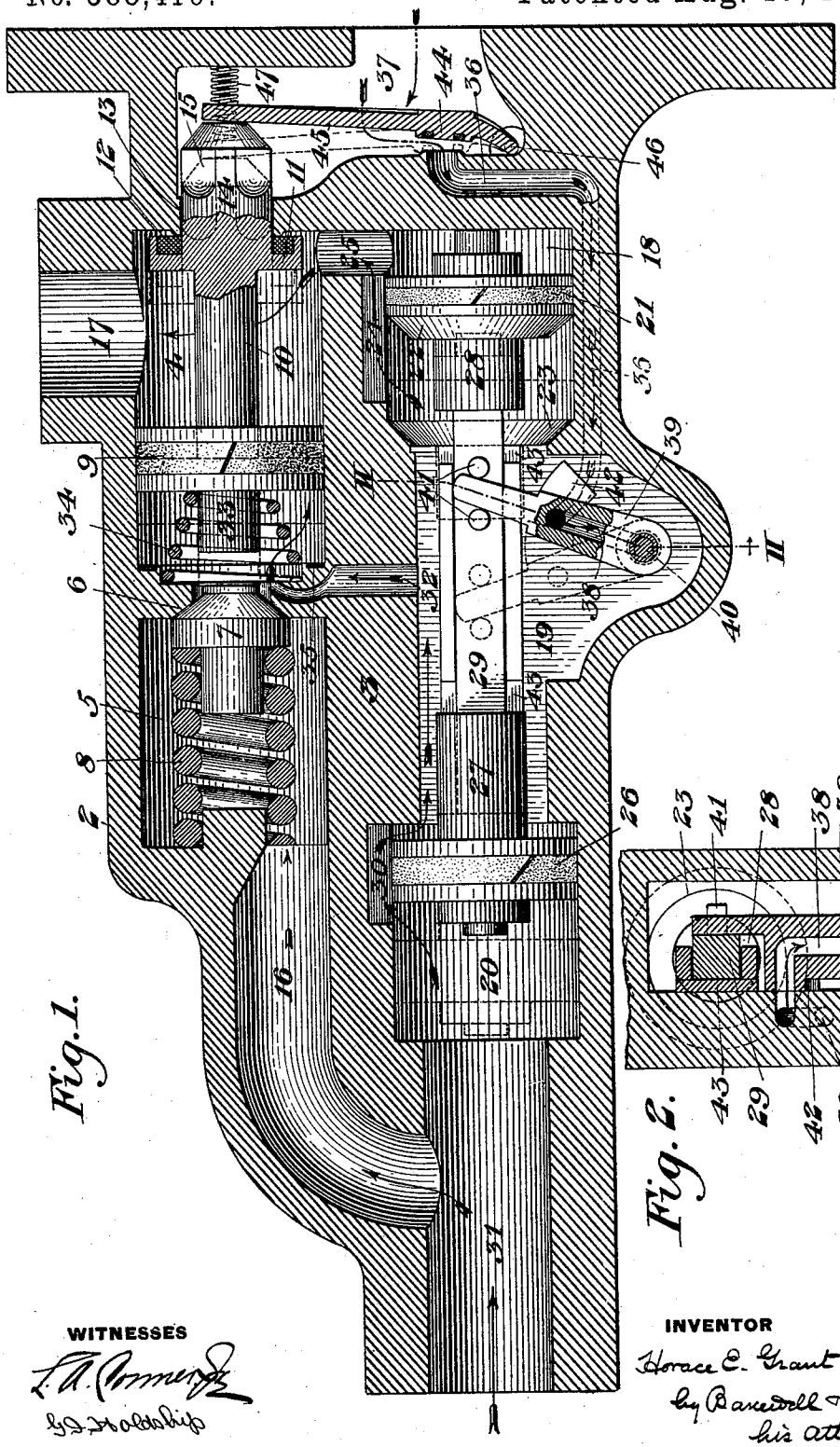


Fig. 1.

Fig. 2.

WITNESSES

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UNITED STATES PATENT OFFICE.

HORACE E. GRANT, OF PITTSBURG, PENNSYLVANIA.

QUICK-ACTION TRIPLE-VALVE DEVICE.

SPECIFICATION forming part of Letters Patent No. 588,419, dated August 17, 1897.

Application filed January 21, 1897. Serial No. 620,011. (No model.)

To all whom it may concern:

Be it known that I, HORACE E. GRANT, of Pittsburg, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Quick-Action Triple-Valve Devices, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming part of this specification, in which—

Figure 1 is a central longitudinal section through a triple-valve device constructed in accordance with my invention, and Fig. 2 is a detail cross-section on the line II II of Fig. 1.

My invention relates to automatic fluid-pressure brake apparatus; and it consists in a new and improved triple-valve device in which the auxiliary reservoir is controlled indirectly by the exhaust from the train-pipe.

It also consists in a triple-valve device having a slide-valve moved and controlled by two pistons, as well as in the construction and arrangement of the parts, as hereinafter more fully described, and set forth in the claims.

In the drawings, in which similar numerals indicate corresponding parts, 2 represents the casing, which is divided longitudinally into compartments by a partition 3. The one compartment is divided into two chambers 4 and 5 by a transverse partition 6, having a hole or passage which is normally closed by a check-valve 7, held to its seat by a spring 8, surrounding its stem. The chamber 4 is cylindrical in form and within it moves the piston 9, having a stem 10, to which is secured a valve 11, having upon one face a packing 12, arranged to seat against an annular projection surrounding a port 13, leading from the chamber 4 to the brake-cylinder. The valve 11 is provided with a projecting stem 14, which nearly fills the port 13, leaving a small annular opening to regulate the flow of air through the port when a service application of the brakes is made. The outer end of the stem 14, however, is cut away, as shown at 15, so as to allow almost a full opening of the port when the piston 9 moves to the end of the chamber 4 in making an emergency application of the brakes.

16 is a passage leading from the main train-pipe to the chamber 5, and 17 is a port leading from the chamber 4 to the auxiliary reservoir.

The other compartment formed by the partition 3 is divided into three chambers 18, 19, and 20. In the chamber 18 moves the piston 21, having a beveled edge 22, arranged to contact with a seat 23 at the inner end of the chamber, this chamber having a longitudinal grooved port 24, leading to a port 25, which forms a communication between the chamber 4 and the chamber 18. In the chamber 20 moves a piston 26, whose stem 27 is connected with the stem 28 of the piston 21 by the rod 29, extending through the intermediate chamber 19. The chamber 20 is provided at one side with a grooved feed-port 30, extending a portion of the length of the chamber, which chamber opens into the passage 31, leading to the main train-pipe. The chamber 19 is provided with a port 32, leading into the chamber 4 in the rear of the piston 9, which piston is provided on its rear face with a projecting stem 33, adapted to contact with the check-valve 7, this stem 33 being surrounded by a spring 34, normally tending to press the piston to the right and off a seat 35, provided therefor at the inner end of the chamber 4. A port 36 leads from the chamber 19 through the case to a chamber 37, which communicates with the brake-cylinder, and the opening of this port in the chamber 19 normally communicates through a port 38 in an oscillatory slide-valve 39 with an exhaust-port 40, passing through the pivot of the valve and open to the atmosphere.

The valve 39 is oscillated by pins 41 upon the rod 29, these pins acting upon the sides of the lever forming the slide-valve. This valve is provided with a curved projecting lip 42, adapted to cover and close the port 36 until the slide-valve has moved a certain distance, after which the port is opened to the interior of the chamber 19.

43 is a blank slide or resistance block of such a length that it will allow a certain movement of the pistons 21 and 26 before it becomes engaged by their stems, after which it is moved lengthwise, and, sliding upon the flat floor of the chamber, offers a resistance to the movement of the piston.

44 is a check-valve arranged to close the

end of the port 36 and mounted upon a lever 45, pivoted at 46, and having its upper end engaged by a light spring 47, which insures the closing of the valve 44, this valve being normally held open by the stem 14 of the valve 11 acting thereon.

The operation of the device is as follows: Air from the main reservoir on the engine being discharged into the train-pipe through the engineer's brake-valve enters the chamber 5 through passage 16 and also enters chamber 20 and forces the pistons 21 and 26 back to the normal position shown in Fig. 1, which is the position occupied when the brakes are released. In this position of the pistons ports 30 and 24 are uncovered and air passes through the ports and through the chamber 19 to the port 25, through which it passes into the chamber 4 and by port 17 to the auxiliary reservoir, charging this reservoir at the same pressure as that in the train-pipe. At the same time the air passes from chamber 19, through port 32, into the chamber 4 upon the rear side of the piston 9, equalizing the pressure upon this piston, less the diameter of the stem 10, which difference, combined with the spring 34, forces the piston to the normal position shown, which position it occupies whenever the pressure in the auxiliary reservoir and the train-pipe is the same. In this position the valve 11 closes the port leading from the chamber 4 to the brake-cylinder and prevents the air passing through this port 13. The port 24 in the chamber 18 extends nearly to the seat 23 for the piston, so that a very slight movement of the piston allows air to enter the chamber 19 from the auxiliary reservoir. When the pistons 21 and 26 move forward, they move in succession first the slide-valve 39 and thereafter the resistance-block 43 until they occupy the normal position shown.

When it is desired to apply the brakes gently, a reduction of, say, six to eight pounds being made in the train-pipe, the pistons 21 and 26 move to the left, closing the port 30 and chamber 20, and confining the air in chamber 19, and moving the slide-valve 39 to the left, after which the stem 28 of piston 21 striking the resistance-block moves it to the left until the pistons are stopped in their movement by the piston 21 engaging the seat 23. In this position the port 36 in chamber 19 is opened and air confined in the portion of the chamber 4 in the rear of the piston 9 and in chamber 19 pass to the brake-cylinder through ports 32 and 36 and chamber 37. This exhausting on the rear side of the piston 9 causes the pressure in the auxiliary reservoir to drive this piston back, moving the valve 11 away from its seat, so that the air passes from the auxiliary reservoir through the small annular port surrounding the portion 14 of the valve-stem to the brake-cylinder, thus applying the brakes. The pressure in the auxiliary reservoir having been reduced by expansion into the brake-cylinder to an amount slightly less than that in the train-pipe, the pistons 21 and 26 are moved to the right until stem 27 of piston 26 comes in contact with the resistance-block 43, and port 24 is opened, allowing air to pass from the auxiliary reservoir through ports 25, 24, and 32 to the chamber 4 in the rear of the piston 9, thus seating the valve 11. In this movement of the pistons 21 and 26 the lip 42 moves to a position over the port 36, thus closing it and retaining the pressure in the brake-cylinder. If the brakes are to be applied with greater force, a further reduction of pressure in the train-pipe will again move the pistons 21 and 26 to the left, seating the piston 21 and opening the port 36, again allowing air to escape from the chamber 4 in the rear of the piston 9 and chamber 19, and moving the piston 9 to the left, admitting additional pressure from the auxiliary reservoir to the brake-cylinder until equalization takes place.

To release the brakes, pressure being admitted to the train-pipe, the pistons 21 and 26 are driven to the right, bringing the parts into the position shown in Fig. 1, thus permitting the pressure in the brake-cylinder to exhaust to the atmosphere through the chamber 37 and ports 36, 38, and 40.

The action of the brakes above described is that ordinarily used in station stoppages, being what is known as a "service application," caused, as above described, by a gradual reduction of pressure in the main train-pipe.

To apply the brakes with their full force in an emergency application, a quick reduction of the pressure in the train-pipe of, say, ten or twelve pounds is made, causing the pistons 21 and 26 to move to the left, uncovering the port 36 in chamber 19, and allowing pressure confined therein to escape from the rear of piston 9 through ports 32 and 36 to the brake-cylinder, as before. The pressure in the auxiliary reservoir then forces the piston 9 to the left the entire length of the cylinder, and its stem 33, contacting with the valve 7, forces the valve from its seat and allows pressure to pass from the train-pipe through the chamber 5 and ports 32 and 36, uniting with the pressure from the auxiliary reservoir, which is at the same time passing through the port 13 to the brake-cylinder. The valve 44 prevents pressure from the brake-cylinder from passing back through ports 36 and 32 and chamber 5 to the train-pipe.

It will be seen from the foregoing description that a reduction in pressure in the train by the operation of the engineer's valve does not move the main piston and open the main valve, but simply moves another valve device that confines the air in a chamber between the auxiliary reservoir and the train-pipe, and the main piston does not move, or the main valve, which closes the ports between the auxiliary reservoir and the brake-cylinder, open until air is exhausted from the said chamber and from the main-piston chamber at the back of the piston connected there-

with, and when the brakes are released, or in making a service application, air from the auxiliary reservoir is admitted to this chamber and, recharging it to the same pressure as the auxiliary reservoir, closes the main valve.

The advantages of my invention will be apparent to those skilled in the art, since the auxiliary reservoir is controlled indirectly by the exhaust from the train-pipe, the preliminary exhaust taking place from the rear of the piston 9 before the auxiliary reservoir exhausts. The exhaust is thus removed from the slide-valve, and all pistons may be made of small size.

Many variations in the form, construction, and relative arrangement of the parts may be made by the skilled mechanic without departure from my invention, since

What I claim is—

1. In a triple-valve device, the combination with a main valve controlling a port leading from the auxiliary reservoir to the brake-cylinder, of a main piston connected to and arranged to operate said valve, a chamber located between the train-pipe and the main-piston chamber and having a port leading to the main-piston cylinder in the rear of the piston, a valve device arranged to be operated by variation in the train-pipe pressure, and to cut off the auxiliary reservoir and train-pipe from the said chamber and confine air therein, and a valve arranged to exhaust the air from the said chamber and main-piston cylinder and open the main valve.

2. In a triple-valve device, the combination with a main valve controlling a port leading from the auxiliary reservoir to the brake-cylinder, of a main piston connected to and arranged to operate said valve, a chamber located between the train-pipe and the main-piston chamber and having a port leading to the main-piston cylinder in the rear of the piston, a valve device arranged to be operated by variation in the train-pipe pressure, and to cut off the auxiliary reservoir and train-pipe from the said chamber and confine air therein, and a valve arranged to exhaust the air from the said chamber and the main-piston cylinder into the brake-cylinder and open the main valve.

3. In a triple-valve device, the combination with a main valve controlling a port leading from the auxiliary reservoir to the brake-cylinder, of a main piston connected to and arranged to operate said valve, a chamber having a port leading to the main-piston cylinder in the rear of the piston, a valve device arranged to be operated by variation in the train-pipe pressure, and to confine air in the said chamber, a valve arranged to exhaust the air from the said chamber and main-piston cylinder and open the main valve, and a valve arranged to allow air to reënter said chamber and piston-cylinder from the auxiliary reservoir and close the main valve.

4. In a triple-valve device, the combination with a main valve controlling a port leading from the auxiliary reservoir to the brake-cylinder, of a cylinder containing a main piston connected to and operating the main valve, a chamber having a port leading to the main-piston cylinder in the rear of the piston, an exhaust-port leading from the chamber, and two cylinders containing connected pistons arranged to operate a valve controlling the exhaust-port.

5. In a triple-valve device, the combination with a main valve controlling a port leading from the auxiliary reservoir to the brake-cylinder, of a cylinder containing a main piston connected to and operating the main valve, a chamber having a port leading to the main-piston cylinder in the rear of the piston, an exhaust-port leading from the chamber, and two cylinders containing connected pistons, the connected pistons having a resistance-block arranged to retard their movements.

6. In a triple-valve device, the combination with a main valve controlling a port leading from the auxiliary reservoir to the brake-cylinder, of a cylinder containing a main piston connected to and operating the main valve, a chamber having a port leading to the main-piston cylinder in the rear of the piston, an exhaust-port leading from the chamber, and two cylinders containing connected pistons arranged to operate a valve controlling the exhaust-port, one of said cylinders having a port leading into the main-piston cylinder in front of the piston.

7. In a triple-valve device, the combination with a main valve controlling a port leading from the auxiliary reservoir to the brake-cylinder, of a cylinder containing a main piston connected to and operating the main valve, a chamber having a port leading to the main-piston cylinder in the rear of the piston, an exhaust-port leading from the chamber, and two cylinders containing connected pistons arranged to operate a valve controlling the exhaust-port, one of said cylinders having a port leading into the main-piston cylinder in front of the piston, said cylinder having also a longitudinal feed-port connecting with the port leading to the main-piston cylinder.

8. In a triple-valve device, the combination with a main valve controlling a port leading from the auxiliary reservoir to the brake-cylinder, of a cylinder containing a main piston connected to and operating the main valve, a chamber having a port leading to the main-piston cylinder in the rear of the piston, an exhaust-port leading from the chamber, and two cylinders containing connected pistons arranged to operate a valve controlling the exhaust-port, one of said cylinders having a port leading into the main-piston cylinder in front of the piston, the other cylinder also having a longitudinal feed-port extending a portion of its length.

9. In a triple-valve device, the combination with a main valve controlling a port leading

from the auxiliary reservoir to the brake-cylinder, of a cylinder containing a main piston connected to and operating the main valve, a chamber having a port leading to the main-piston cylinder in the rear of the piston, an exhaust-port leading from the chamber, and two cylinders containing connected pistons arranged to operate a valve controlling the exhaust-port, said valve having also a port leading to the open air, said port being connected to the exhaust-port when the brakes are released and being closed in all other positions.

10. In a triple-valve device, the combination with a main valve, controlling a port leading from the auxiliary reservoir to the brake-cylinder, of a main piston connected to and arranged to operate said valve, a check-valve controlling a passage from the train-pipe into the cylinder in the rear of the main piston, means upon the main piston for opening the check-valve, a chamber having a port leading to the main-piston cylinder in the rear of the piston, a valve device arranged to be operated by variation of the train-pipe pressure and to confine air in said chamber, and a valve arranged to exhaust the air from the said chamber and main-piston cylinder and open the main valve.

11. In a triple-valve device, the combination with a main valve controlling a port leading from the auxiliary reservoir to the brake-cylinder, of a main piston connected to and arranged to operate said valve, a check-valve controlling a passage from the train-pipe into the cylinder in the rear of the main piston, a chamber having a port leading to the main-piston cylinder in the rear of the piston, a valve device arranged to be operated by variation in the train-pipe pressure and to confine air in said chamber, a valve arranged to exhaust the air from the said chamber and main-piston cylinder and open the main valve, a back-pressure check-valve arranged to prevent the return of air from the brake-cylinder to the train-pipe, and means upon the main piston for operating said check-valves.

In testimony whereof I have hereunto set my hand.

HORACE E. GRANT.

Witnesses:
H. M. CORWIN,
G. I. HOLDSHIP.