(No Model.)

H. S. HOPPER.

AIR BRAKE MECHANISM.

No. 458,626. Patented Sept. 1, 1891.

Fig. 2.

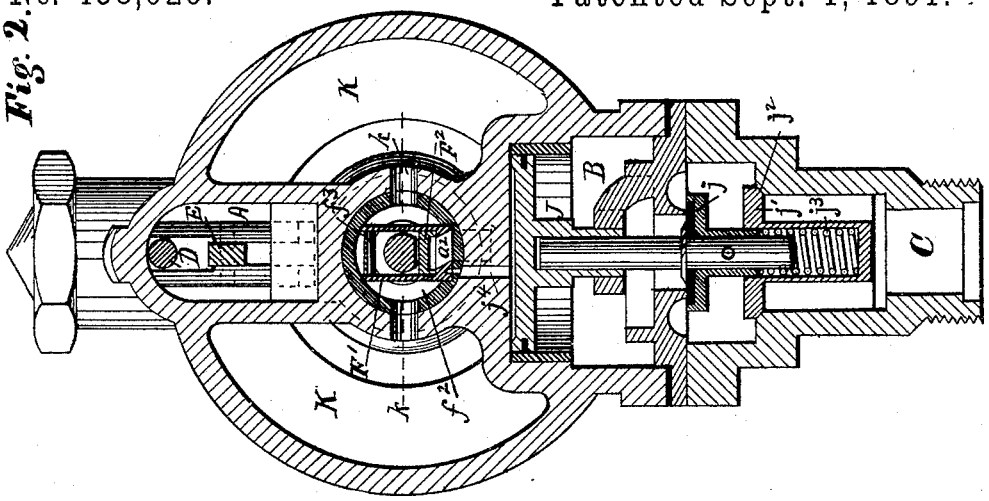

Fig. 1.

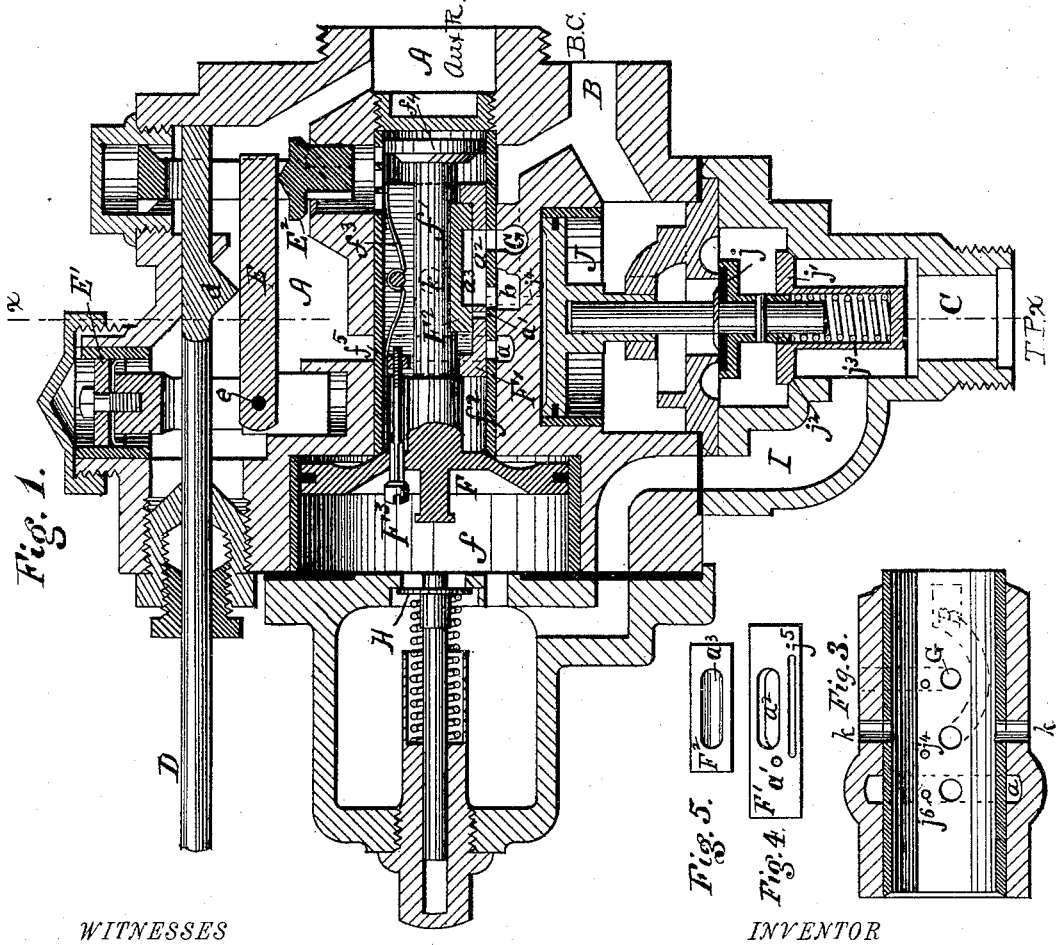

Fig. 5.

Fig. 4.

Fig. 3.

WITNESSES

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AIR-BRAKE MECHANISM.

SPECIFICATION forming part of Letters Patent No. 458,626, dated September 1, 1891.

Application filed August 11, 1890. Serial No. 361,684. (No model.)

To all whom it may concern:

Be it known that I, HENRY S. HOPPER, a citizen of the United States, residing at Detroit, county of Wayne, State of Michigan, have invented a certain new and useful Improvement in Air-Brake Mechanism; and I declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it pertains to make and use the same, reference being had to the accompanying drawings, which form a part of this specification.

In the drawings, Figure 1 is a central section, in a vertical plane, of an air-brake mechanism embodying my invention. Fig. 2 is a section in a vertical plane at right angles to Fig. 1 on the line *x x*. Fig. 3 is a separate view illustrating the relative positions of the air-ports. Fig. 4 is a separate view of the main valve. Fig. 5 is a separate view of the rider or auxiliary valve.

It is the purpose of my invention to produce an air-brake mechanism in which the air in the auxiliary reservoir may be admitted until it shall have attained a certain pressure corresponding with the load upon the car-trucks, and whereby said limit of pressure to which the air may be accumulated is automatically varied to correspond with variations in the said load, to the end that at all times the said pressure is automatically regulated to yield a braking-power against the wheels just sufficient to prevent their sliding regardless of variations in the load; also, to so construct the apparatus that, for a service-stop, air from the auxiliary reservoir is permitted to pass as required into the brake-cylinder, and thereafter the reservoir to open itself automatically to receive again its maximum charge from the train-pipe corsponding with the load; also, to adapt said apparatus to open the brake-cylinder directly to both the auxiliary reservoir and the train-pipe when required for a very quick emergency stop; also, to provide other features hereinafter explained.

This device is designed as an improvement on the apparatus patented to me June 10, 1890, No. 430,024.

In carrying out my invention, A represents the passage leading to the auxiliary reservoir.

B is the passage leading to the brake-cylinder.

C is the passage communicating with the train-pipe.

D is a rod connecting through any suitable intermediate means with the car-body in such a manner that as the car is loaded and its springs depressed this downward settling will draw the rod outwardly or to the left in a corresponding degree, and when the load is removed in whole or in part the upward motion or rising of the car due to the resiliency of the spring will thrust the rod in an inward direction or to the right in a corresponding degree. To this rod is formed or affixed the fulcrum *d*.

E is a lever pivoted at *e* to the stem of the piston or diaphragm E′, and at its opposite end it bears upon the admission-valve E^2, through which air may pass to the auxiliary reservoir.

F is a piston moving in the chamber *f*. Its stem *f′* plays within a chamber f^2.

F′ is a slide-valve governing the flow of air to the brake-cylinder. Its movement is controlled by a rider or auxiliary valve F^2, which is notched into the stem *f′* or otherwise engaged to move with the piston F.

f^3 is a spring designed to hold the valve F′ to its seat and prevent its accidental displacement by any sudden jar or in any way other than as moved by the piston F. On the inner end of the stem *f′* is a guide f^4.

F^3 is a supplemental valve having its stem fastened at f^5 to a projection from the valve F′.

a is an air-port from A.

b is an air-port leading to the brake-cylinder.

G is the exhaust-port.

a′ is a small port in the valve F′, designed for use in making a service stop.

a^2 is a large port in said valve designed for use in an emergency stop or in throwing off the brakes, and the port a^3 acts in conjunction with the latter.

H is a spring-stop designed to arrest and stop the motion of the piston F when making a service stop, but which will yield and permit a full travel of the piston in an emergency stop.

I is an air-passage.

J is a plunger or piston to which is attached a valve j. About this valve-stem is also sleeved a valve j', held on its seat j^2 by a spring j^3.

K is a chamber communicating through suitable orifices k with the chamber f^2. It is designed simply to increase the air capacity back of the piston F to insure its more certain operation.

j^4 is a port leading from the chamber f^2 to the piston J, adapted to communicate at the proper times with the small elongated port j^5.

The operation of the device will now be understood: The cars having been connected up in the usual manner, the air entering from the train-pipe passes through the supplemental valve F^3 into the chamber f^2 and thence through the valve E^2 into the auxiliary reservoir. In the meantime the rod D has by the load been shifted to a corresponding position, which has determined the position of the fulcrum d on the lever E, nearer to or farther from the valve E^2, according as the load on the car is less or greater. In a short time the pressure within the passage A will become so great that exerting itself against the piston E' this piston will move outwardly, and so close the valve E^2, cutting off any further admission of air to the auxiliary reservoir and leaving it stored with air at a pressure corresponding with the load and just suitable for braking the car without sliding the wheels. Air will still enter the chamber f^2 until the pressure in f^2 and the communicating chamber K is equal to that in the train-pipe. Now suppose the engineer wishes to make a service-stop. He simply reduces the pressure in the train-pipe C in the usual way. This partial relief from the front of piston F enables the air behind it to force the piston F partly out. The rider-valve F^2, carried by the piston, soon engages and moves the valve F' with it and brings the small port a' in juxtaposition with the port a, so that air from the auxiliary reservoir may pass thence through a^3 and b to the brake-cylinder. This relief of pressure in the auxiliary reservoir disturbs at once the equilibrium between it and the chamber f^2, the valve E^2 opens, and air from f^2 passes into the auxiliary reservoir. This relief of pressure in f^2 leaves a preponderance in the train-pipe, and the latter just starts the piston F toward the right, which instantly opens the supplemental valve F^3, simultaneously closing the small valve a', and air passes again into the chamber f^2 through E^2 and into the auxiliary reservoir, as before. Now when the engineer wishes to release his brakes he simply admits pressure again suddenly into his train-pipe, and this forces the piston F to the right. The rider-valve F^2 carries the main valve F' over to the right, cuts off admission from the port a, and opens the brake-cylinder to the exhaust G, and his auxiliary reservoir will now become again fully charged, as before. Now suppose the engineer wishes to make an emergency stop. He suddenly relieves his train-pipe of pressure. The piston F plunges to the left, thus suddenly opening the passage from the auxiliary reservoir through the port a to the brake-cylinder. This operates also to bring the small elongated port j^5 in position over the passage j^6, which communicates with the port a and at once admits pressure in against the piston J. This instantly forces this piston downwardly, opening the valve j, which opens the passage back of the valve j' freely to the brake-cylinder. The pressure in the brake-cylinder is of course at this instant much below the remnant of pressure in the train-pipe, so that the latter acts at once to open the valve j' and air rushes from the train-pipe to the brake-cylinder simultaneously with that from the auxiliary reservoir, and so the air in the train-pipe is caused to re-enforce that from the auxiliary reservoir to make an emergency stop. When the train has stopped or the emergency has passed, the pressure in the train-pipe is again quickly increased, the piston F is forced in, the valve F' is moved over to the right, and the elongated port j^5 shifts so as to connect the passage j^6 with the exhaust G and exhausts the air from above the piston J. Air-pressure from below, as well as the spring j^3, serves now to force the piston J up to its initial position.

It will be observed that through the medium of the supplemental valve F^3, as above explained, I am enabled to constantly recharge the auxiliary reservoir whenever the pressure in the train-pipe is sufficient to open the valve E^2.

The piston E' or a diaphragm may be employed, if desired, and being disconnected from the piston F may be made small and inexpensive, and so also may the valve E^2. They may also be given a smaller or greater range of movement, as may be desired, and may be caused to open and close without there being necessarily any corresponding movement of the main piston F, and being independent of the piston F the latter will not be affected by any vibrations which would cause momentary changes in the position of the fulcrum, due to the springing up and down of the cars when in motion.

It will be observed that the piston F, with its supplemental valve F^3, or feeding-groove, as heretofore employed, together with the valves F' and F^2, constitute what is known in air-brake apparatus as the "triple valve," and by the use of the term "triple valve" in my claims I would be understood as comprehending any such apparatus for governing the admission of and handling the air at three points. Again, the piston which operates the valves F' and F^2, as well as the valves themselves, are all in the high-pressure chamber f^2, while for a service stop it is desirable that the air shall only be fed to the brake-cylinder from the auxiliary chamber. Heretofore this has been accomplished by locating the said valves and piston-stem inside the

passages of the auxiliary chamber. I accomplish the same object by causing said valves in the chamber f^2 to handle the air that is led to them through the passage a, leading from the auxiliary reservoir.

What I claim is—

1. An air-brake apparatus consisting of the combination, with the train-pipe, auxiliary reservoir, and triple valve, of a separate valve through which air is admitted to the auxiliary reservoir, and an automatically-actuated lever adapted to close said valve when the pressure of air within the reservoir shall have accumulated to a predetermined limit, substantially as described.

2. An air-brake apparatus consisting of the combination, with the train-pipe, auxiliary reservoir, and triple valve, of a separate valve through which air is admitted to the said reservoir, means adapted to automatically close said valve when the pressure of air within the reservoir shall have accumulated to a predetermined limit, and mechanism adapted to automatically vary said limit of pressure to correspond with any variations in the load upon the trucks, substantially as described.

3. An air-brake apparatus consisting of the combination, with the train-pipe, auxiliary reservoir, and triple valve, of a separate valve through which air is admitted into the auxiliary reservoir, a counteracting piston or equivalent E′, and a lever connecting the two and provided with a movable fulcrum, substantially as described.

4. An air-brake apparatus consisting of the combination, with the train-pipe, auxiliary reservoir, and triple valve, of a separate valve through which air is admitted to the said reservoir, a counteracting piston or equivalent E′, a connecting-lever, and a movable fulcrum, the latter engaged with exteriorly-projecting means for shifting its position, said latter means constructed and adapted to receive and transmit to the fulcrum the settling or rising movements of the car due to increase or decrease in its load, whereby said fulcrum is correspondingly and automatically shifted, substantially as described.

5. In an air-brake mechanism, the combination, with the auxiliary reservoir, train-pipe, and triple valve, those portions of the latter which govern the admission to and exhaust from the brake-cylinder being in an apartment subject to train-pipe pressure, of a conduit leading from the auxiliary reservoir to said triple valve and adapted to communicate through the latter with the brake-cylinder, a valve through which air is admitted to the auxiliary reservoir, and an automatically-actuated lever for controlling said last-named valve, substantially as described.

6. The combination of the train-pipe chamber f^2, an auxiliary reservoir having conduit a, the piston F, the valves F′ and F^2, located in the train-pipe chamber and provided with ports a' a^2 a^3, the valve E^2, and the automatically-actuated lever E for controlling said valve, substantially as described.

7. The combination, with the train-pipe, the auxiliary reservoir, the train-pipe chamber f^2, and the triple valve located in said chamber, of the chamber K, communicating with the chamber f^2, the valve E^2, and the automatically-actuated lever E, substantially as described.

8. In a triple-valve mechanism for air-brakes, the combination, with the piston F, of a supplemental valve F^3, seated in the piston and having its stem engaged with the main valve, substantially as and for the purposes described.

In testimony whereof I sign this specification in the presence of two witnesses.

HENRY S. HOPPER.

Witnesses:

W. H. CHAMBERLIN,

WELLS W. LEGGETT.