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H. M. MARSH.

AIR BRAKE.

APPLICATION FILED JULY 16, 1906.

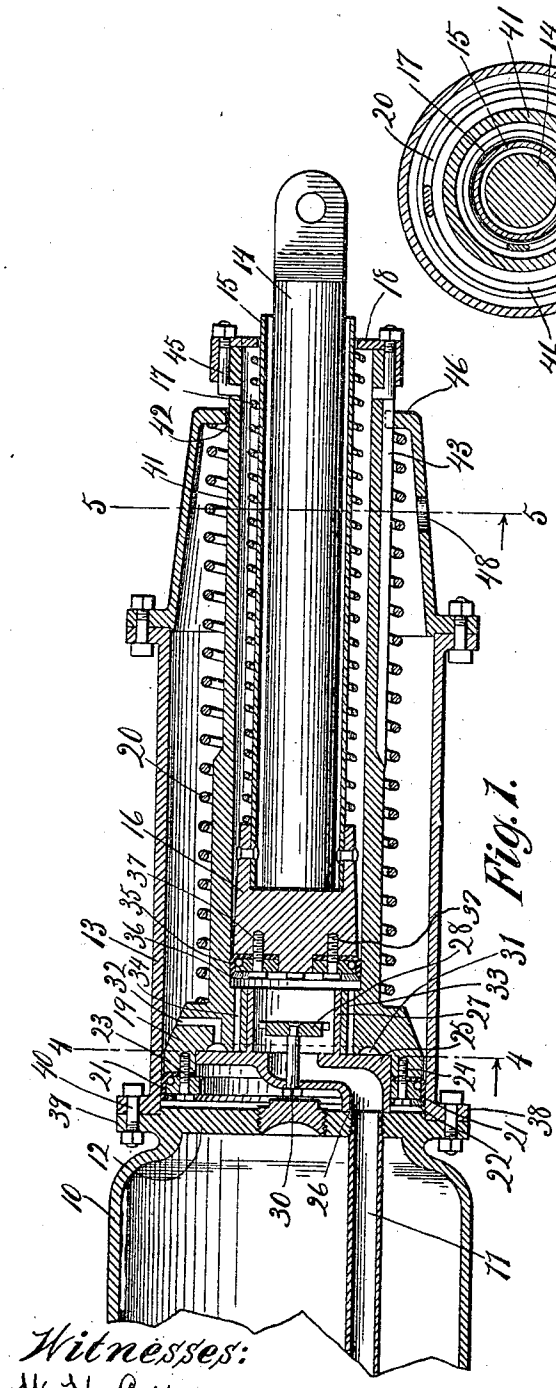


Fig. 1.



Fig. 5.

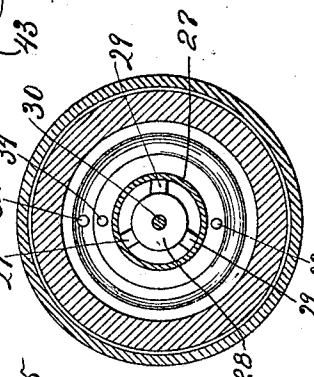


Fig. 4.

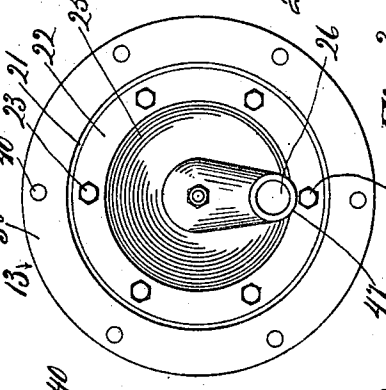


Fig. 3.

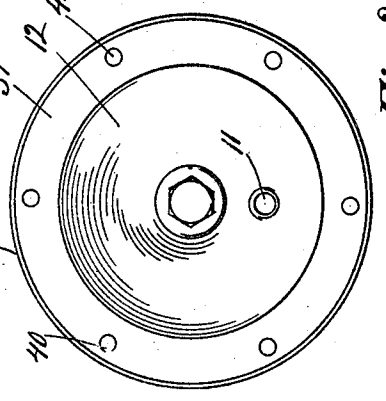


Fig. 2.

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# UNITED STATES PATENT OFFICE.

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## AIR-BRAKE.

No. 837,416. Specification of Letters Patent. Patented Dec. 4, 1906.

Application filed July 16, 1906. Serial No. 326,402.

*To all whom it may concern:*

Be it known that I, HUGH M. MARSH, a citizen of the United States, and a resident of Chicago, county of Cook, and State of Illinois, have invented certain new and useful Improvements in Air-Brakes, of which the following is a specification and which are illustrated in the accompanying drawings, forming a part thereof.

The invention relates particularly to that part of the air-brake system which is known as the "cylinder" and which is, in effect, an air-motor for applying the power to the brakes.

The object of the invention is to provide means for quickly taking up the slack in the brake system by the application of but a part of the power available and then applying full pressure during the latter part of the operation—that is to say, after the brake-shoe has actually come into contact with the wheel-face.

A further object is the provision of means for a quick release.

The invention consists in the device hereinafter described and which is shown in the accompanying drawings, in which—

Figure 1 is a detail longitudinal section through the cylinder and auxiliary reservoir. Fig. 2 is an end view of the reservoir with the cylinder detached. Fig. 3 is a view of that end of the cylinder which is adapted to be attached to the reservoir. Fig. 4 is a sectional view on the line 4 4 of Fig. 1, and Fig. 5 is a sectional view on the line 5 5 of Fig. 1.

The auxiliary reservoir of an ordinary air-brake system is represented in detail at 10, a duct 11 leading through the reservoir from the triple valve (not shown) and through the head 12 of the reservoir and into the brake-cylinder 13.

At 14 is shown a push-rod housed within a tube 15, projecting from the smaller piston-head 16. This push-rod is adapted to be attached to the brake-controlling levers. (Not shown.) An expansion-spring 17 is coiled about the tube 15 and reacts between the outer end of the piston 16 and the head 18 of the tubular stem of the larger piston 19. An expansion-spring 20, coiled about the stem of the piston 19, reacts between its outer face and the outer head 46 of the cylinder 13.

The piston 19 fits within the barrel of the cylinder 13 and carries a packing-flange 21 of suitable material, such as leather, which is secured to the piston-head by means of a ring 22, secured thereto by tap-screws 23 24.

A supplemental piston-head 25 is carried upon the inner face of the piston-head 19 and has a duct 26, the end of which bears against the reservoir-head 12 when the piston is fully retracted, the duct 26 registering with the duct 11. The head 25 carries a forwardly-projecting annular flange 27, which fits within a central aperture through the body of the piston-head 19 and opening to the chamber in its stem, within which the piston-head 16 plays.

The outer end of the duct 26 opens to the chamber inclosed by the flange 27, thereby providing for the application of air-pressure to the face of the piston-head 16. The valve 28 within the chamber of the flange 27 is provided with guide-lugs 29, which fit within and slide upon the inner face of the annular flange, the valve being adapted to close the inner end of the duct 26 and being guided by a stem 30, which extends through and slides in an aperture in the piston-head 25.

The inner face of the piston-head 19 is counterbored to receive the piston-head 25 and to allow it to play between the bottom of such counterbore and the ring 22, which overlaps it. The bottom of the counterbore of the head 19 is annularly grooved, as shown at 31, and from this groove there leads a duct 32, which opens through the outer face of the head 19 into the chamber of the cylinder 13. One or more ducts, as 33 34, lead through the cylinder-head 19, their inner ends opening to the bottom of its counterbore, and hence these ducts are closed by the piston-head 25 when the latter is seated against the head 19.

The piston-head 16 carries a flexible packing 35, of suitable material, such as leather, secured in place by a ring 36, held by the tap-screws 37. The cylinder 13 has an outstanding flange 38 at its inner end, through which and a similar flange 39 on the reservoir 10 pass bolts 40. The hollow stem of the piston 19 (shown at 41) makes a loose fit with the outer end or "back head" 46 of the cylinder 13, as shown at 42, to allow the free escape of air discharged from the duct 32, and preferably back pressure in the cylinder 13 behind the piston 19 is further avoided by means of an opening 48 of considerable size

in the wall of the back head. This stem 41 is provided with a rib or spline 43, fitting within a suitable recess in the back head 46, Fig. 5, thereby preventing rotative movement of the piston, while a recess 47 in the ring 22, Fig. 3, engages the wall of the duct 26 to prevent rotative movement of the supplemental piston-head 25 in its seat, and the registration of the ducts 11 and 26 is therefore insured. The head 18, applied to the outer end of the piston-stem 41, is shown as being secured in place by means of L-shaped bolts 45.

The operation of the device is as follows: When the brakes are off, the parts are in the position as shown in Fig. 1, the spring 20 holding the piston-head 19 at the inner end of the cylinder 13. Air-pressure being applied through the duct 11 acts first upon the smaller piston 16 and moves it outwardly along the stem 41 of the piston 19, which performs the function of a cylinder. When the brake-shoes have been brought up against the faces of the car-wheels (not shown) and further outward movement of the smaller piston 16 is therefore impossible by means of the limited power now available owing to its limited area, or when the spring 17 has been fully compressed or compressed until its tension exceeds that of the spring 20 in its expanded position, the larger piston 19 starts on its outward movement. As soon as the piston 25 leaves the outer face of the reservoir-head 12 air-pressure is immediately applied to the outer face of the larger piston, which is quickly advanced, tending to compress the air within its stem, and this air reacting upon the valve 28 forces it to its seat. The further advance of the larger piston compresses the air bearing upon the head of the piston 16 and moves this piston outwardly, because of the greater power now available owing to the considerable area of the piston 19, and the brakes are tightly set upon the car-wheels. By the lowering of the pressure upon the piston-heads 19 and 25—for example, by a change in the setting of the triple valve (not shown) permitting some of the air in front of the piston 19 to escape through that valve by way of the duct 11—the highly-compressed air acting upon the piston-head 16 forces back the piston 25, uncovering the ducts 33 34, and the channel 31 allowing the rapid escape of air and consequent recession of the piston 16. As soon as the pressure upon the face of this piston is reduced below that upon the face of the larger piston the valve 28 is unseated and all of the remaining air is permitted to escape through the ducts 33, 34, and 32, the springs 17 and 20 performing their function of restoring the pistons to their inner positions, leaving the appliance ready for the next application of pressure to the brakes.

It will be seen that the appliance provides for a quick initial movement of the brakes, taking up the slack and lost motion, and for the application of full pressure to set the brakes up to the desired force to the faces of the wheels. The discharge-ducts may be made as commodious as may be desired, thus providing for instantaneous release and preventing the dragging of the brake-shoes upon the wheels.

I claim as my invention—

1. In an air-brake cylinder, in combination, a cylinder, a piston movable within the cylinder, an induction-port, and an eduction-port openable by the movement of the piston upon a reduction of pressure within the cylinder.

2. In an air-brake cylinder, in combination, a cylinder, a piston reciprocable therein, an induction-port entering the cylinder-chamber, an eduction-port leading from the cylinder-chamber, and a valve for the eduction-port openable upon a reduction of pressure in the cylinder.

3. In an air-brake cylinder, in combination, a cylinder, a piston reciprocable therein, an induction-port entering the cylinder-chamber, an eduction-port leading from the cylinder-chamber, and a valve for the eduction-port adapted to be closed by pressure within the cylinder, and means acting upon a reduction of such pressure for opening the valve.

4. In an air-brake device, in combination, a cylinder, a reciprocable piston within the cylinder, an induction-port leading to the cylinder-chamber, an eduction-port leading from the cylinder-chamber, an auxiliary chamber normally open to the cylinder-chamber, and a normally closed valve for the eduction-port arranged to be held to its seat by pressure within the cylinder and to be unseated by the pressure in the auxiliary chamber.

5. In an air-brake cylinder, in combination, a cylinder, a piston reciprocable therein, an induction-port entering the cylinder-chamber, an eduction-port leading from the cylinder-chamber, and a valve for the eduction-port adapted to be closed by pressure within the cylinder, and means acting in opposition to the pressure within the cylinder for opening the valve.

6. In an air-brake cylinder, in combination, a cylinder, a piston movable within the cylinder and having a hollow stem, a piston movable within such hollow stem and having a power-transmitting stem, an induction-port leading to the first-mentioned cylinder, and a check-valve-controlled port leading through the piston to the chamber of its stem.

7. In an air-brake cylinder, in combination, a cylinder, a piston movable within the cylinder and having a hollow stem and an aperture leading to the chamber of the stem, a

piston-plate seated within a recess in the face of the first-named piston and covering its aperture, an induction-port entering the cylinder, a duct leading through the piston-plate and covering the induction-port, a check-valve in such duct, a piston movable within the stem of the first-named piston, and an eduction-port leading from the chamber of such stem and controllable by the piston-plate.

8. In an air-brake cylinder, in combination, a cylinder, a piston movable in the cylinder and having a hollow stem, an induction-port leading to one end of the cylinder, a spring reacting between the back of the piston and the cylinder, a piston movable within the stem of the first-named piston and having a power-transmitting stem, a spring reacting between the back of the last-named piston and the stem within which it moves.

9. In an air-brake cylinder, in combination, a cylinder, a piston movable in the cylinder and having a hollow stem, an induction-port leading to one end of the cylinder, a spring reacting between the back of the piston and the cylinder, a piston movable within the stem of the first-named piston and having a power-transmitting stem, a spring reacting between the back of the last-named piston and the stem within which it moves, and a passage leading through the first-named piston to the chamber of its stem.

10. In an air-brake cylinder, in combination, a cylinder, a piston movable in the cylinder and having a hollow stem, an induction-port leading to one end of the cylinder, a spring reacting between the back of the piston and the cylinder, a piston movable within the stem of the first-named piston and having a power-transmitting stem, a spring reacting between the back of the last-named piston and the stem within which it moves, and a valve-controlled passage leading through the first-named piston to the chamber of its stem.

11. In an air-brake cylinder, in combination, a cylinder, a piston movable in the cylinder and having a hollow stem, an induction-port leading to one end of the cylinder, a spring reacting between the back of the piston and the cylinder, a piston movable within the stem of the first-named piston and having a power-transmitting stem, a spring reacting between the back of the last-named piston and the stem within which it moves, a valve-controlled passage leading through the first-named piston to the chamber of its stem, and an eduction-passage leading from the chamber of the piston-stem and controlled by an appurtenance of one of the pistons.

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Witnesses:
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