(No Model.)

2 Sheets—Sheet 1.

E. G. SHORTT.

AIR BRAKE.

No. 469,176. Patented Feb. 16, 1892.

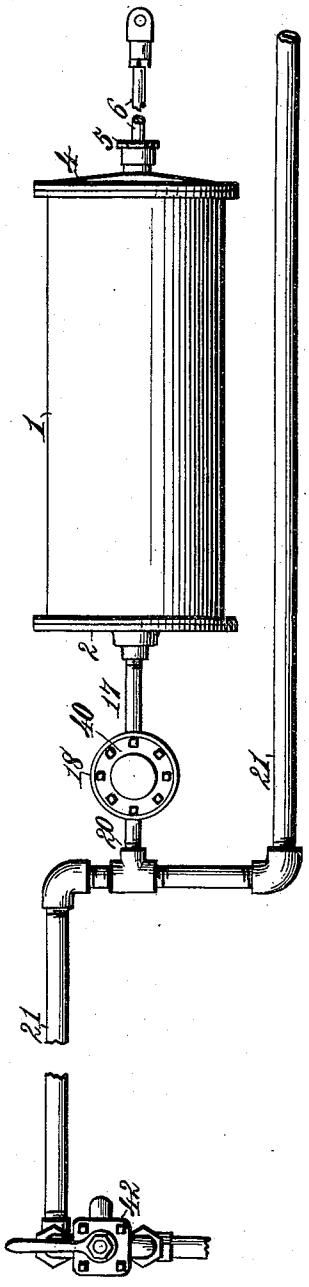

Fig. 1.

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(No Model.)

2 Sheets—Sheet 2.

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Fig. 2.

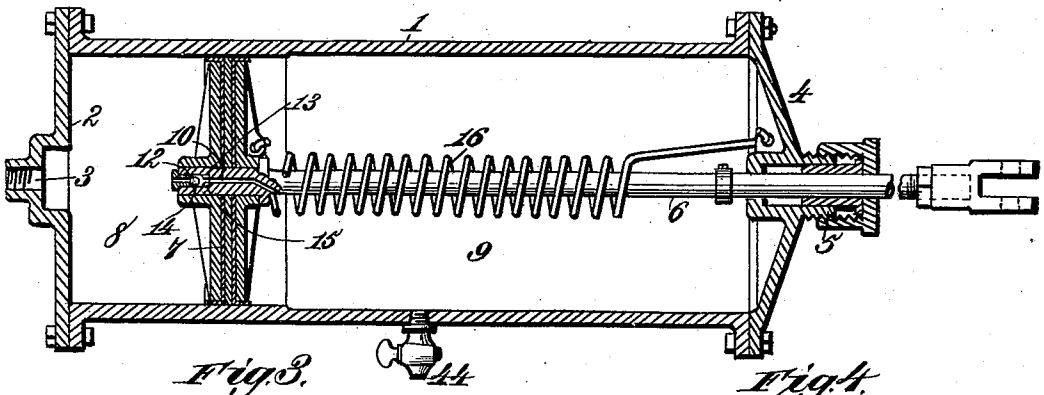


Fig. 3.

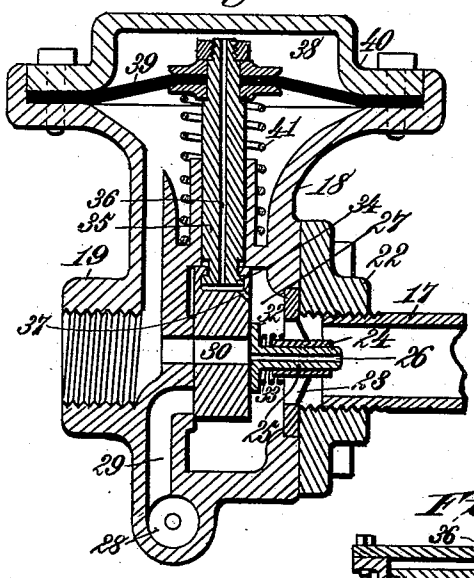


Fig. 4.

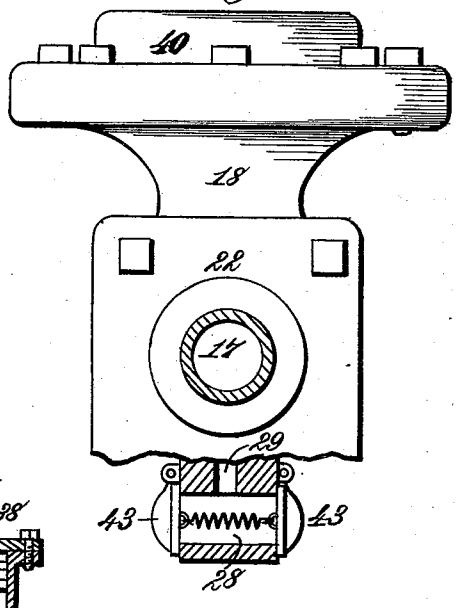
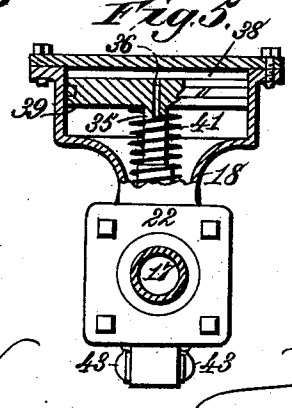


Fig. 5.



Witnesses.
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UNITED STATES PATENT OFFICE.

EDWARD G. SHORTT, OF CARTHAGE, ASSIGNOR TO CHARLES G. EMERY, TRUSTEE, OF BROOKLYN, NEW YORK.

AIR-BRAKE.

SPECIFICATION forming part of Letters Patent No. 469,176, dated February 16, 1892.

Application filed March 30, 1891. Serial No. 387,011. (No model.)

To all whom it may concern:

Be it known that I, EDWARD G. SHORTT, a citizen of the United States, residing at Carthage, in the county of Jefferson and State of New York, have invented new and useful Improvements in Automatic Brake Mechanisms, of which the following is a specification.

This invention relates to that type of automatic brake mechanism wherein a cylinder contains a piston provided with a check-valve and arranged to divide the cylinder into a closed air-reservoir and a working chamber.

The object of my invention is to improve the prior mechanism and provide a novel arrangement whereby leakage at the stuffing-box of the brake-operating rod cannot cause the brake to creep on.

The invention consists, essentially, in the combination, with a brake-cylinder, of a movable diaphragm or partition dividing the cylinder into a working chamber and a closed air-reservoir and provided with a passage-way or port adapted to place the working chamber and air-reservoir in communication, a stuffing-box at the outer end of the closed air-reservoir, a valve to admit the flow of air into the reservoir and prevent its escape therefrom through such passage-way or port, a brake-operating rod extending through the air-reservoir and through the stuffing-box at the outer end thereof and connected with the movable diaphragm or partition, and a spring which acts on the movable diaphragm or partition to force it in a direction to release the brakes.

The invention is illustrated in the accompanying drawings, in which—

Figure 1 is a plan view showing sufficient of the improved automatic brake mechanism to illustrate my invention. Fig. 2 is a longitudinal central sectional view of the brake-cylinder. Fig. 3 is a vertical central sectional view of the relief-valve mechanism for connecting the brake-cylinder with the train-pipe. Fig. 4 is a sectional end elevation of the same. Fig. 5 is a similar view showing a modification.

In order to enable those skilled in the art to make and use my invention, I will now describe the same in detail, referring to the drawings, wherein—

The numeral 1 indicates a brake-cylinder having at one end a suitable head 2, provided with a central orifice 3, and at the opposite end a head 4, suitably bolted in position and carrying a stuffing-box 5, through which passes a rod 6, which connects the movable diaphragm or partition 7 with the brake-actuating levers. The connections between the rod 6 and the brakes may be of any well-known construction, and therefore it is not deemed necessary to illustrate the same.

The movable diaphragm or partition 7 shown in Fig. 2 is composed of a disk in the form of an ordinary piston rigidly secured at its center to the rod 6 and serving to divide the brake-cylinder into a chamber 8, and an air-tight reservoir 9, through which latter passes the actuating-rod 6. The piston is provided at its center with a passage-way or port 10, which serves to place the chamber 8 at one side of the piston in communication with the air-reservoir at the opposite side of the piston. The passage-way or port 10 is formed into a stop or rest 13 and a valve-seat 12 for a spherical or other suitably-constructed valve 14, which is adapted to rest against either the stop or rest 13 or the valve-seat 12 in such manner as to permit the flow of air from the chamber 8 into the air-reservoir and prevent the escape of air from such reservoir into the chamber. To accomplish this the stop or rest 13 is preferably constructed with a series of slots 15, so that when the spherical valve is at rest against such stop or rest the air may flow through the passage-way or port and past the valve into the air-reservoir, as will be quite obvious.

A spiral or other suitably-constructed spring 16 of considerable power is arranged around the brake-actuating rod 6 within the air-reservoir of the brake-cylinder, and this spring is secured at one end to the cylinder-head 4 and at the opposite end to the piston or to the rod in juxtaposition to the piston. The spring is of the type known as a "retractile spring," and consequently its tendency is to pull or draw the piston in a direction to release the brakes and compress the air contained in the air-reservoir.

It will be obvious that when the air-pressure is raised in the train-pipe and the brakes

are held released it is impossible for the valve to move or fall by gravity away from its valve-seat 12, and therefore all danger of air escaping past the valve when the air-pressure in the train-pipe is reduced is entirely avoided. If the valve were employed without the spring operating to move the diaphragm or piston in a direction to compress the air in the air-reservoir, the valve would move or fall from its seat when the pressure at opposite sides of the diaphragm or piston became equal, and therefore if the pressure in the train-pipe were reduced the air from the air-reservoir might escape past the valve and render the brake mechanism defective and objectionable.

The orifice 3 of the air-chamber 8 connects by a tube 17 with an automatic relief or exhaust-valve mechanism. (Exhibited in detail in Figs. 3 and 4.) The casing 18 of this valve mechanism is provided at one side with a screw-socket 19, connected, as at 20, with the train-pipe 21 and at the opposite side with a detachable coupling 22, attached to the tube 17 and serving to confine in position a vertically-arranged spider 23, supporting a sleeve 24, in which is adapted to yield a plug-valve or device 25, having a contracted channel or orifice 26, extending longitudinally therethrough.

The valve-casing is formed with a suitable partition constituting a valve-chamber 27, and is furnished with a port 28, adapted to connect by a channel 29 with the valve-chamber 27 through a transverse port 30, formed in a slide-valve 31, when such valve is moved into such position that the port 30 registers with the channel 29. The plug-valve or device 25, having the contracted channel 26, is provided at one extremity with a face-plate or disk 32, resting against one side of the slide-valve and acted upon by a spring 33, interposed between the face-plate or disk and the spider for the purpose of permitting the plug-valve to yield and enable the slide-valve to properly operate without binding. The face-plate or disk of the plug 25 subserves the function of a valve to the transverse port 30 of the slide-valve, so that when the pressure is restored in the train-pipe the fluid entering the port 30 will move the face-plate or disk 32 of the plug 25 away from such port to open the latter its full capacity for the rapid flow of fluid to the chamber 8 of the brake-cylinder, thereby obtaining a quick release of the brakes.

The slide-valve is provided with a cavity at its upper portion, with which loosely engages the shouldered head 34 of a valve-stem 35, having a longitudinal channel 36 extending entirely through it. The cavity with which the head 34 engages connects by a port 37 with the valve-chamber 27 for the admission of air to the channel 36, from whence such air flows into the air-chamber 38, formed in the top portion of the valve-casing, through the medium of a movable diaphragm or partition 39, which, as shown in Fig. 3, is composed of a flexible material clamped at its periphery to the valve-casing through the medium of a chambered head 40 suitably bolted in position.

An expansible spring 41, of suitable form, acts on the diaphragm or partition to elevate the same to the position indicated by Fig. 3, and in this position the lower extremity of the head 34 is lifted from the port 37 for the purpose of placing the latter in communication with the valve-stem channel 36, whereby air may flow from the valve-chamber 27, through the port 37 and channel 36, into the air-chamber 38.

When the pressure of air is raised in the train-pipe 21, the air flows through the transverse port 30 of the slide-valve 31 and presses the valve-plug 25 away, as before explained. The air flows through the port 30, chamber 27, and channel 26 into the air-chamber 8 of the brake-cylinder, whereby the movable diaphragm or partition in the brake-cylinder is moved to release the brakes to place them in position for running the train. If now air-pressure in the train is reduced by the engineer through the medium of a suitable valve mechanism 42, Fig. 1, for the gradual application of the brakes, as in stopping at stations, the air flows from the air-chamber 8 of the brake-cylinder, through the contracted channel 26 and port 30 to the train-pipe. If the brakes are to be applied suddenly, as in case of an emergency or immediate danger, the valve mechanism 42 is operated by the engineer to release the entire pressure in the train-pipe, whereupon the compressed air in the air-chamber 38 of the valve-casing 18 will instantly act to depress the movable diaphragm or partition 39 against the tension of the spring 41, and thereby move the head 34 to close the port 37 and adjust the slide-valve into such position that its transverse port 30 will register with the channel 39, and consequently air will escape to the external atmosphere through the air-outlet 28. By this means the entire air-pressure is suddenly released from the air-chamber 8 of the brake-cylinder, and consequently the brakes are instantly applied. It will be obvious that the same mode of operation would occur as regards the sudden application of the brakes were the train-pipe ruptured, as by an accident to the train or the unintentional uncoupling of the cars, because the air-pressure in the train-pipe would be entirely released, and consequently the compressed air in the air-chamber 38 would move the slide-valve into position to register its port with the channel leading to the air-outlet 28.

To explain the manner in which the closed-air reservoir 9 is charged and the operation of the retractile spring to retain the valve 14 on its seat for preserving the air-pressure in the closed reservoir 9, the following statement is made: When air at forty-pounds pressure, for example, is introduced at the commencement, it will flow into the chamber 8 and

through passage 10 into the closed air-reservoir 9, thereby producing an equal pressure of forty pounds at each side of the diaphragm or partition 7. On allowing the air to escape from the chamber 8 (through the train-pipe to the outside) the diaphragm or partition moves toward the orifice 3, the air in the reservoir 9 expands, thereby reducing the actual air-pressure therein, and the valve 14 instantly closes against its seat 12, so that there is an air-pressure of forty pounds in the closed air-reservoir 9 and only an acting pressure of thirty pounds on the diaphragm or partition if the spring 16 has a pulling power or retractile force of ten pounds. Consequently the diaphragm or partition will be moved by thirty-pounds pressure in the reservoir 9 to its full extent for applying the brakes. In releasing the brakes the air from the train-pipe fills the chamber 8, the diaphragm or partition instantly recedes by reason of the power of the spring 16, and the fact of the reduced air-pressure in the reservoir caused by its expansion, as above stated, and the valve 14 is held against its seat 12. In other words, to release the brakes the air entering the chamber 8 equalizes the air-pressure in such chamber and the reservoir 9, and instantly the power of the spring 16 moves the diaphragm or partition in the direction to release the brakes, so that gradually the air in the reservoir 9 is additionally compressed and the valve 14 is held seated. The valve 14 is always held seated, except when air is renewed in the reservoir 9 to compensate for leakage from said reservoir.

The engineer's valve 42 may be of any construction suitable for the conditions required to partially or entirely release the air-pressure in the train-pipe for the gradual or sudden application of the brakes. I prefer, however, to employ the engineer's valve described and shown in my application for Letters Patent filed of even date herewith, Serial No. 387,012. Instead of employing a flexible diaphragm to create the air-chamber 38, I may use a sliding piston, as represented by the modification, Fig. 5, to form the diaphragm or partition 39, which will attain the same result.

The arrangement described and shown is important in that by extending the brake-operating rod through the closed air-reservoir 9 it is impossible for the brakes to creep on by any leakage of air from the air-reservoir that may occur at the stuffing-box 5, through which the brake-operating rod 6 passes. Where a cylinder is divided by a movable diaphragm or partition to provide an air-reservoir at one side and a chamber at the opposite side thereof, and the brake-operating rod extends through the chamber in which the fluid-pressure serves to move the diaphragm or partition in the direction required to release the brakes, any leakage from the said chamber at the stuffing-box for the brake-operating rod causes the brakes to creep on, and this has been the cause of fatal accidents. By my invention I utilize the simple, useful, and desirable cylinder divided by a diaphragm or partition to provide an air-reservoir therein; but I effectually avoid creeping of the brakes from the cause stated, since leakage from the air-reservoir renders the diaphragm or partition susceptible of moving in the direction to release the brakes.

In my invention the brake-operating rod is rigidly or immovably fixed to the diaphragm or partition, and these parts must move in unison, and by this construction the mechanism is materially simplified and rendered more reliable and economical than where a piston slides on a channeled brake-operating rod to apply and release the brakes. I have herein illustrated and described my improved relief or exhaust valve, but obviously any other relief or exhaust valve mechanism may be employed in connection with my improved brake-cylinder.

I do not herein confine myself to any particular construction of valve for admitting air from the chamber 8, through a passage-way in the diaphragm or partition, into the air-reservoir 9; but such valve, under the action of the spring 16, should prevent the return of air through such passage-way from the air-reservoir to the chamber.

My invention is particularly designed to provide an automatic brake mechanism actuated by fluid-pressure, which is equally adapted without any change of construction for the compressed air or the vacuum systems for the purpose of enabling a car to be coupled to a train having either system, and enabling the brakes of such car to be practicably operated. This is rendered possible by my simplified arrangement and by reason of the fact that the brake-actuating rod 6 passes through the air-reservoir 9 of the brake-cylinder and is drawn into the cylinder for the purpose of applying the brakes.

It will be obvious that if a car fitted with my invention be coupled to a train having the vacuum system the vacuum created in the chamber 8 of the brake-cylinder will move the diaphragm or partition 7 in the same direction as it is moved by the action of the compressed air in the air-reservoir 9, thereby applying the brakes.

When the vacuum is destroyed by the atmospheric pressure, the diaphragm or partition is moved to release the brakes, and this is facilitated by the retractile force of the spring which pulls or draws the piston.

The air-outlet 28 preferably opens at opposite sides, and at each side is arranged a valve 43, which valves exclude the entrance of external air but permit the escape of the fluid from within. The brake-cylinder is provided with an air-escape cock or valve 44, which enables the compressed air in the reservoir 9 to be discharged. In using the improved mech-

anism with a vacuum-brake system the air cock or valve 44 is opened to permit the inflow and outflow of the atmosphere.

I do not herein claim the relief or exhaust valve described and shown, as such constitutes the subject-matter of my application for Letters Patent, filed June 19, 1891, Serial No. 396,829.

Having thus described my invention, what I claim is—

1. The combination, with a brake-cylinder, of a movable diaphragm or partition dividing the cylinder into a working chamber and a closed air-reservoir and having a passage-way for placing the chamber and reservoir in communication, a movable valve which admits air through the passage-way into the air-reservoir and prevents such air returning through the passage-way to the chamber, a stuffing-box at the outer end of the closed air-reservoir, a brake-operating rod extending through the closed air-reservoir and through the stuffing-box at the outer end thereof and connected with the diaphragm or partition for the purpose of actuating the brakes, and a spring which acts on the diaphragm or partition to force it and the rod in a direction to release the brakes for additionally compressing the air in the reservoir and holding the valve closed against its seat, substantially as described.

2. The combination, with a brake-cylinder, of a movable diaphragm or partition dividing the cylinder into a chamber and a closed air-reservoir and having a passage-way for placing the chamber and reservoir in communication, a movable valve which admits air through the passage-way into the air-reservoir and prevents such air returning through the passage-way to the chamber, a stuffing-box at the outer end of the closed air-reservoir, a brake-operating rod extending through the closed air-reservoir and through the stuffing-box at the outer end thereof and rigidly or immovably connected with the diaphragm or partition for actuating the brakes, and a retractile spring located in the closed air-reservoir and acting to pull the diaphragm or partition and the rod in a direction to release the brakes for additionally compressing the air in the reservoir and holding the valve closed against its seat, substantially as described.

3. The combination, with a brake-cylinder, of a movable diaphragm or partition dividing the cylinder into a chamber and an air-tight reservoir and having at the center a passage-way for placing the chamber in communication with the reservoir, a spherical valve movable back and forth within the said passage-way and serving to admit air therethrough into the air-reservoir, but preventing such air returning through the passage-way to the chamber, a stuffing-box at the outer end of the air-reservoir, a rod rigidly or immovably connected with the diaphragm or partition and extending through the air-reservoir and through the stuffing-box at the outer end of the air-reservoir to actuate the brakes, and a retractile spring arranged in the air-reservoir, connected at one end with the cylinder and at the opposite end with the diaphragm or partition and acting by its retractile power to pull such diaphragm or partition in a direction to release the brakes for additionally compressing the air in the reservoir and holding the spherical valve closed against its seat, substantially as described.

In testimony whereof I have hereunto set my hand and affixed my seal in presence of two subscribing witnesses.

EDWARD G. SHORTT. [L. S.]

Witnesses:

ALBERT H. NORRIS,

JAMES A. RUTHERFORD.