G. L. ICKES.

AIR BRAKE SYSTEM.

APPLICATION FILED OCT. 15, 1909.

992,564. Patented May 16, 1911.

3 SHEETS—SHEET 1.

Fig. 2.

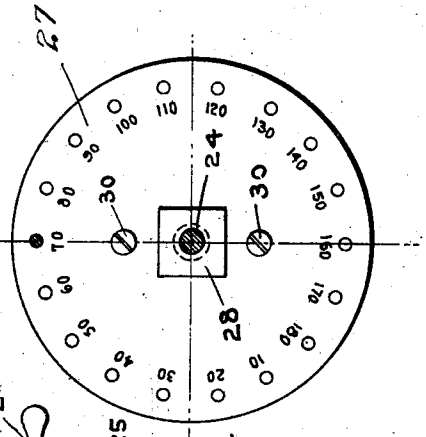
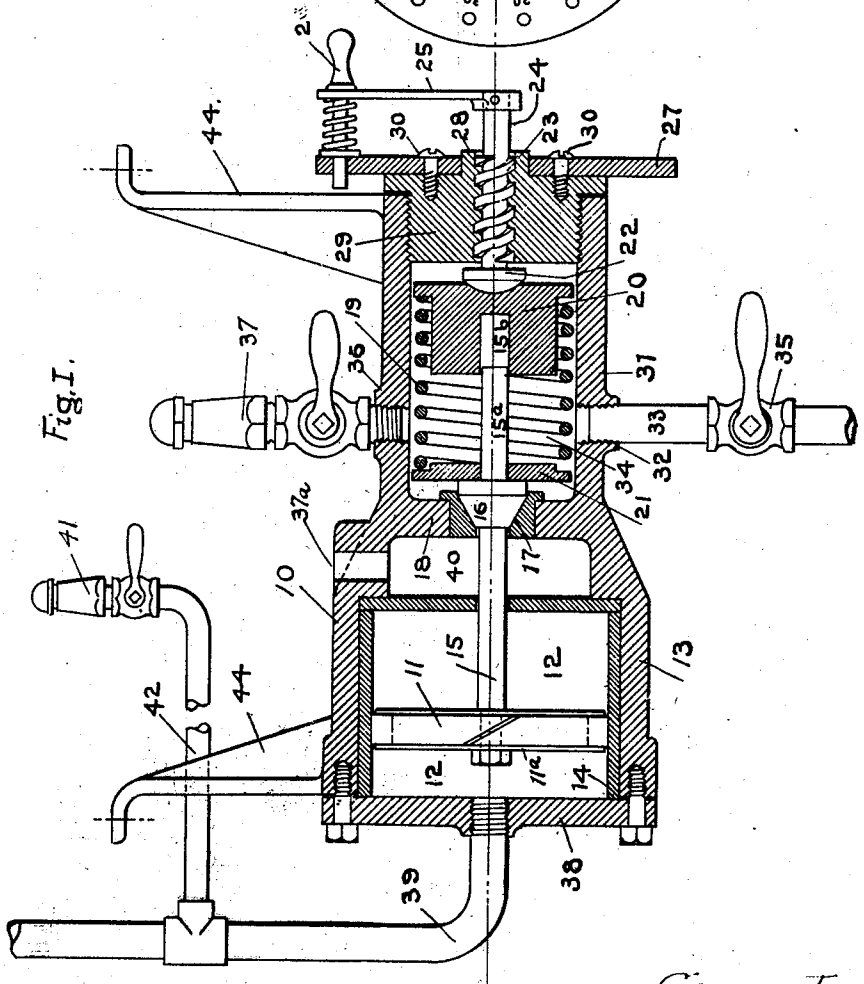


Fig. 1.



Witnesses

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3 SHEETS—SHEET 2.

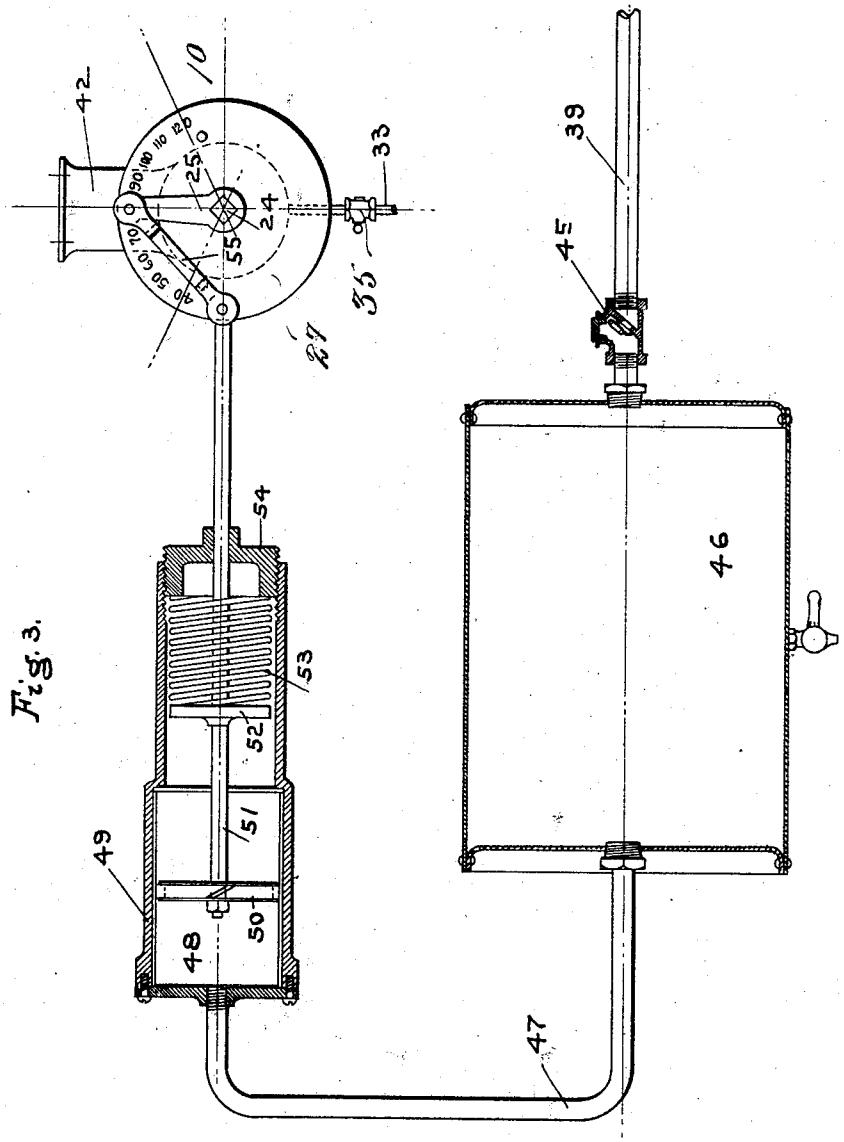

Fig. 3.

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3 SHEETS—SHEET 3.

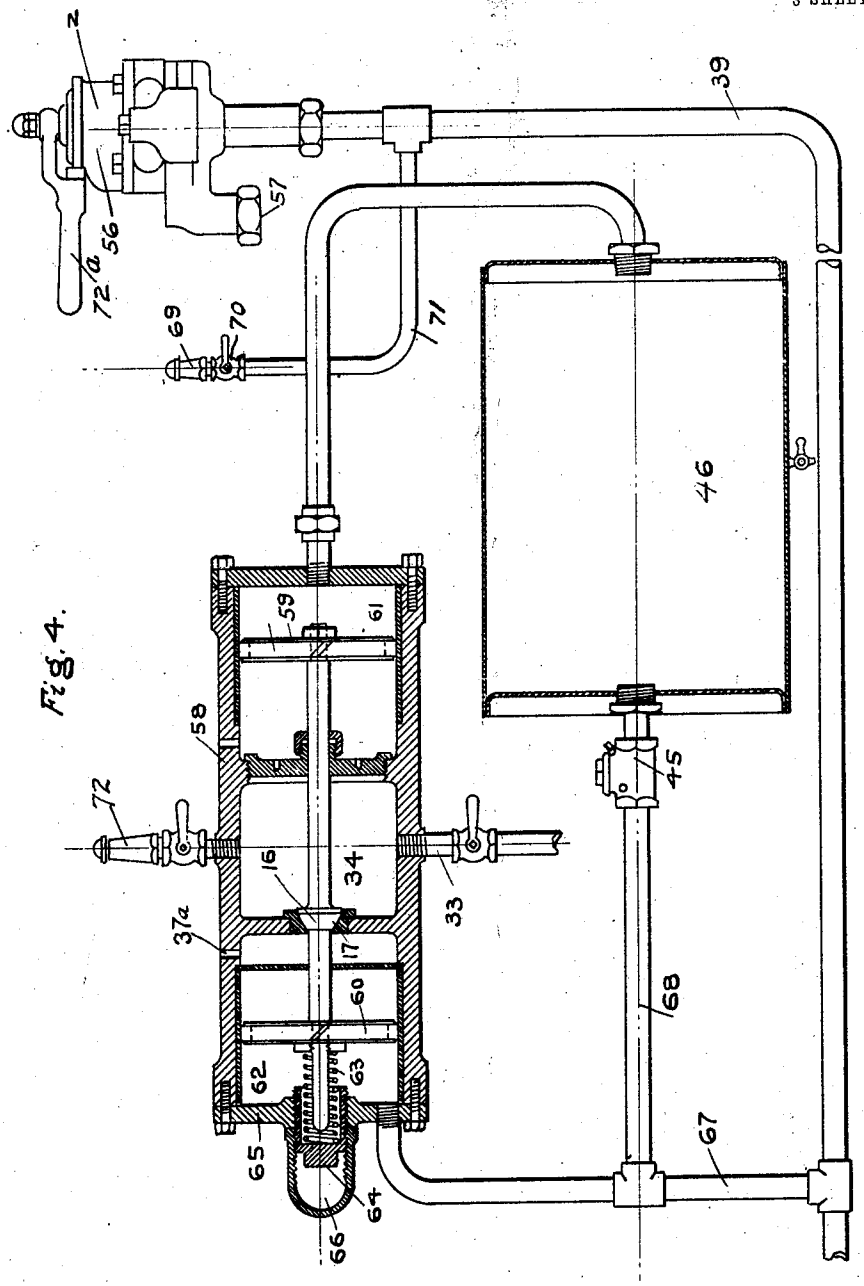

Fig. 4.

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UNITED STATES PATENT OFFICE.

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AIR-BRAKE SYSTEM.

992,564. Specification of Letters Patent. Patented May 16, 1911.

Application filed October 15, 1909. Serial No. 522,873.

To all whom it may concern:

Be it known that I, GEORGE L. ICKES, a citizen of the United States, residing at Newport, in the county of Perry and State of Pennsylvania, have invented certain new and useful Improvements in Air-Brake Systems, of which the following is a specification.

This invention relates to air brakes, and air brake mechanism on railway cars, and has for its primary object the feature of putting the control of the entire train in the hands of the engineman or engineer, and to this end the present invention contemplates specific improvements in the present air brake systems that are in common use on railway trains of today, and in order that a clear understanding of the present invention may be easily arrived at I will briefly describe in a general way the complete system as now found on railway trains, and show wherein my improvements are a necessary feature to the safe handling of trains on long and heavy grades.

The air brake mechanism as usually found on railway trains of the present type consists of a steam driven air compressor controlled by a pump governor. The air that is thus compressed is conducted through a suitable pipe to the main air reservoir, which is usually found attached to some part of the locomotive. The main air reservoir or storage tank contains air at a pressure which is in excess of the pressure contained in the auxiliary reservoir, and this excess pressure is used in releasing the brakes, as will be further illustrated and described in full when rendering the description of my invention.

Between the main air reservoir and train pipe is located the engineer's brake valve, which regulates the flow of air into the train pipe and auxiliary reservoirs, to charge the train pipe and release the brakes, and from the train pipe to the atmosphere, for applying the brakes. The train pipe leads from the engineer's brake valve and thence throughout the entire length of the train, supplying air to the auxiliary reservoirs which are located on each car in the train. It is by varying the pressure in this pipe that the brakes on each car are automatically applied and released.

Located between the train pipe and auxiliary reservoir is a valve which controls air communication between the train pipe, auxiliary reservoir and brake cylinder. This valve is known as the triple valve, and takes its name from the functions it performs, viz., regulating the supply of air to the storage reservoir, the quantity admitted to the brake cylinder for applying the brakes, and the discharge of air from the brake cylinder to release the brakes.

In applying the brakes in a service application, from six to eight pounds of air pressure are let out of the train pipe, and in the emergency application by a sudden reduction of ten or more pounds. When the train pipe pressure is reduced, communication between the train pipe and auxiliary reservoir is cut off, reservoir air then enters the brake cylinder, the quantity admitted being in proportion to the reduction of the train pipe pressure. When releasing the brakes, the pressure in the train pipe is increased, causing communication between the auxiliary reservoir and the train pipe pressure to be reëstablished and permits the brake cylinder air to escape into the atmosphere. Accordingly such successive reductions will waste the air and thus leave the engineer at the mercy of the momentum of the train when descending long grades with heavily loaded cars. Therefore it is the purpose of this invention to provide means whereby the perfect control of the train is at all time in the hands of the engineer.

Another object is to provide means whereby the exact braking pressure can be determined on a car in a train of cars; also to provide means for heavy braking with heavily loaded cars; and provision for light braking with light or empty cars.

With these and many other objects in view, which will be more readily seen as the nature of the invention is better understood, the same consists in the novel construction, combination and arrangement of parts as will be hereinafter illustrated, pointed out and claimed, reference being had to the accompanying drawings, in which:

Figure 1 is a cross-sectional view of my improved air brake retainer valve, showing a portion of the piping attached thereto. Fig. 2 is an elevational view of the pressure plate which is attached to the end of the retainer valve. Fig. 3 is a view showing an automatic mechanism for controlling the action of the improved retainer valve shown in Fig. 1. Fig. 4 shows a modified form of

automatic air brake retainer valve and gives an idea of the piping necessary to its successful operation.

Like references designate corresponding parts in the several figures of the drawings.

Referring to the drawings illustrating my invention, the numeral 10 designates my improved air brake retainer valve in its entirety. The valve comprises a main air actuated piston 11 placed in a cylinder 12. The outside 13 which I prefer to make of cast iron, and the bushing 14 of brass or some composition of brass to prevent the corroding of the several parts and the consequent inactivity of the valve mechanisms which would follow with irregular surfaces in the pressure cylinder. Attached to the piston 11 is a stem 15, carrying a valve 16, which normally rests on a seat 17 pressed into the dividing wall 18 of the valve casing. The valve 16 is held against its seat 17 by the tension of the spring 19, which is preferably held in position by an actuated abutment collar 20, and an oppositely located plate 21 held at one side of the valve 16, as illustrated in Fig. 1 of the drawings. I prefer to extend the valve stem 15 back beyond the face of the valve 16, through the collar 21, and have it fit in a socket in the abutment collar 20, this construction securing complete alinement of all working parts. At the rear end of this abutment collar 20 is a convexed wearing plate 22, held in position by a hand operated screw 23. Attached to the stem 24 of the screw is a crank 25, the handle 26 is adapted to coöperate with a pressure-registering disk 27, secured to the end of the retainer valve body by a square projection 28 on the end cap 29, together with machine screws 30, as shown. Attached to the bottom of the valve body is a boss 32 through which passes a pipe 33 which leads air directly from the triple valve exhaust to the spring chamber 34 in the valve body. This pipe 33 is preferably provided with a stop cock 35 through which the feature of the retainer valve may be cut out if it is desired to make repairs to the valve. Directly opposite the pipe 33 and screwed into the top face 36 of the valve body is a safety valve 37 the feature of which will be described later. Located near the safety valve 37 is the triple valve exhaust 37^a to the atmosphere. Attached to the pressure cylinder head 38 is one branch of the train pipe 39, which runs throughout the length of the train. A branch pipe 42 leads from the train pipe to a safety valve which is preferably located in the cab of the locomotive, the use of which will be presently described with the operation of the valve. The main air reservoir air passing through the engineer's brake valve enters the train pipe 39 and fills the cylinder 12, moving piston 11, and valve 16 is unseated allowing air from the triple valve exhaust to flow up through pipe 33, through valve 16, into chamber 40, thence through port 37^a into the atmosphere.

The above described operation is what would naturally occur if the spring 19 was not set to overcome the train pipe pressure on piston 11 in chamber 12. Under service conditions, however, this operation is somewhat different and may be described as follows:—Assuming that a train is equipped with this system of retainer valves and the pressure in the train pipe is known to be seventy pounds, and it is desired that the auxiliary reservoir be recharged without releasing the brakes, the air brake inspector in making up the train passes along the cars and adjusts the tension of the spring 19, 10 lbs. below the train pipe pressure in chamber 12 acting on the face 11^a of piston 11, by moving the handle 26 to the point marked 60 on the indicating disk 27 and the safety valve 41 attached to the train pipe 39 by a branch pipe 42, is set to blow off at 60 pounds. Assuming that the retainer valves have been set on each car and the train is descending a grade and the engineer has made service applications of the brakes reducing the train pipe pressure ten pounds, the valve 16 of the retainer valve closes holding the air in the air brake cylinder and allowing the engineer to recharge his auxiliary reservoir, and continue his service application until he has full control of the train. Upon reaching the bottom of the grade the brakes are released by closing valve 41, and increasing the pressure in the train pipe 39 above sixty pounds, thus overcoming the pressure exerted by the spring 19, unseating the valve 16, allowing air from the triple valve exhaust to pass into the atmosphere, and thus effecting the release of the brakes. The safety valve 43 is attached to the retainer opposite the triple valve exhaust pipe to enable the braking power to be reduced for light cars or maintained for loaded cars.

The retainer valve body 10 is provided with suitable brackets 44 with which the same may readily be attached to the car body. Another feature that is worthy of consideration is the method resorted to in order that the valve 16 will at all times perfectly seat, this being accomplished by extending the valve stem 15^a back to a socket or receptacle 15^b in the collar 20, as shown in Fig. 1 of the drawings.

It will be noted that the tension of the spring 19 is in this device operated by hand, the automatic feature of this part of the device, (either of which can be used) is shown in Fig. 3 of the drawings, in which reservoir air enters the train pipe 39, passes through check valve 45 into a storage tank 46, filling the tank and passing out through

the pipe 47 to the chamber 48 in the cylinder 49, exerting a pressure on the piston 50, attached to the rod 51, on which is an abutment collar 52 carrying a spring 53, the tension of which is fixed by the adjustable screw cap 54. The rod 51 is extended out through the cap 54 and provided with a link 55 which is attached to the arm 25 of the mechanism shown in Fig. 1 of the drawings. The operation of this part of the retainer valve may be described as follows:—The main air reservoir air enters the pipe 39, fills the storage tank 46, and passing through pipe 47 fills cavity 48 in cylinder 49, exerts a pressure on piston 50 which overcomes the tension on spring 53 and sets the retainer arm 25 at sixty pounds, as shown. A reduction in the train pipe pressure will cause a reduction in the pressure in pipe 39. The check valve 45 immediately asserts itself and closes, holding the air in the storage tank 46 in reserve and keeping the arm 25 at the point marked 60 on the disk, as shown. The retainer valve 16 remains closed by virtue of the pressure exerted by the spring 19, Fig. 1. An increase in the train pipe pressure over and above sixty pounds will immediately cause valve 16 to open, and the air from the triple valve exhaust can pass directly to the atmosphere, and the brakes release.

Fig. 4 represents what may be termed the direct automatic retainer valve, and is a slight modification of the above named parts. The device primarily consists of a storage tank 46, used in connection with a system of piping connecting the same to the train line pressure, and the engineer's brake valve. The device although shown in close relation to the engineer's brake valve can readily be placed at any desired distance from the locomotive without affecting its working parts whatever. The operation of this part of the device may be described as follows: Main reservoir air enters the engineer's brake valve 56 at the pipe connection 57, and passes into the train pipe 39, thence throughout the train. Associated with this modified retainer valve, designated in its entirety by the numeral 58, is a storage tank 46 in piped relation with the train pipe, engineer's brake valve and safety valves, as will be described fully later in the specification. The operation of this valve may be described as follows:—Train pipe air from pipe 39 fills the storage tank 46, and creates an equal air pressure on the pistons 59 and 60 which are located in cylinders 61 and 62, respectively. Associated with the piston 60 is a helical spring 63, designated to fit between said piston and the adjustable abutment cup 64, attached to cylinder head 65, and covered or locked in position by the combined lock and cup 66, as shown in Fig. 4 of the drawings. This spring normally keeps the valve 16 off its seat 17 and allows the air from the triple valve exhaust to flow from pipe 33, into the chamber 34, out through valve 16, and into the atmosphere at 37ª. A reduction of air in the train pipe 39, reduces the air pressure in chamber 62, also in pipes 67 and 68. The check valve 45, located in pipe 68 serves to keep the air in the storage tank 46 at the original pressure, also the pressure in chamber 61, thereby keeping the retainer valve closed, as illustrated in Fig. 4 of the drawings. This action follows an ordinary service application of the brakes, in which ten or more pounds of air has been discharged from the train pipe.

In order to allow the engineer to recharge the reservoirs and keep the brakes on the train applied there is provided a safety valve 69, controlled by a cut-out cock 70, in a branch pipe 71, of the train pipe 39, which valve is set at ten pounds less than the original train pipe pressure. The engineer's brake valve handle 72ª, is then placed in release position and air from the main air reservoir flows into the train pipe and auxiliary reservoirs until the pressure designated by the safety valve 69 is reached. The valve 16 yet remains closed due to the original pressure in the storage tank or reservoir 46, thus maintaining the pressure in the air brake cylinder, keeping the brakes on the wheels and allowing for as many recharges as may be necessary to control the speed of the train. When the brakes are to be released the stop cock 70 is closed cutting off the escape of air to the atmosphere through the safety valve 69. The engineer's brake valve is then placed in release position. The air from the main air reservoir flows into the train pipe and auxiliary reservoirs, thus maintaining the original pressure in chambers 61 and 62. The spring 63 then asserts itself and the valve 16 leaves its seat 17, and air from the triple valve exhaust flows into the atmosphere and the brakes are automatically released. Safety valve 72 is placed in chamber 34 to enable the full braking power to be obtained and maintained for loaded cars with the said valve closed. To maintain the pressure necessary for the braking of light cars, the safety valve 72 is open and set to the amount necessary to safely handle such cars. This valve is set in position for light or loaded cars when the train is made up in the classification yards.

With the retainer valves in use today, it is necessary for some member of the train crew to set these valves on each car, and in order to do this it is necessary to climb from car to car, regardless of the car loading or weather conditions and put the retainers up, to enable the engineer to recharge his train with the brakes on. After the grade

has been passed, it is again necessary to climb from car to car and open the retainers, which process is not only dangerous and troublesome, but ineffective and, in case of storms, heavy rains, and extreme weather, the brakeman, having succeeded in setting up a few of these retainers, feels that his mission has been accomplished, which probably can in some way explain why so many trains get beyond the control of the engineer.

I claim:

1. In an air brake system, a retainer valve device comprising a valve casing having an interior dividing wall provided with a valve seat, a piston chamber and a triple valve atmosphere port at one side of said dividing wall, a valved blow-off connection and also a separate pipe connection from the triple valve exhaust port with the chamber at the other side of said dividing wall, a train pipe connection with the piston chamber, a piston operating in the piston chamber, a reciprocating valve stem connected with the piston and carrying a valve coöperating with the valve seat in the dividing wall, a spring arranged to exert pressure in one direction on the valve stem, said spring being set to overcome a reduced train pipe pressure on said piston, and a tension adjusting device for said spring, said tension adjusting device including a graduated dial and an indicating member coöperating therewith.

2. In an air brake system, a retainer valve device comprising a casing having separate interior chambers, one of which is provided with a piston cylinder and a triple valve atmosphere port, and the other of which chambers is provided with a blow-off connection and with a pipe connection for the atmosphere exhaust of the triple valve of the system, a wall separating said chambers and provided with a valve seat, a pressure controlled piston operating in said cylinder, a valve stem connected with the piston and carrying a valve for said valve seat, a spring arranged to move said valve in one direction and set to overcome a reduced train pipe pressure, and a tension adjusting mechanism for said spring, said tension adjusting mechanism having indicating means.

3. In an air brake system, a retainer valve device comprising a casing having separate interior chambers, one of which chambers is provided with a piston cylinder and a triple valve atmosphere port, and the other of which chambers is provided with a valved blow-off connection and also with a pipe connection from the triple valve exhaust port, a separating wall between said two chambers and provided with a valve seat, a train pipe connection with said piston cylinder, a piston operating in said cylinder, a valve stem connected with said piston and carrying a valve coöperating with the valve seat, a spring exerting pressure against the valve in one direction and set to overcome a reduced train pipe pressure on the system, an abutment bearing against one end of the spring, a graduated dial, a suitably mounted adjusting screw operating against said abutment, and a hand crank connected with said screw and having a handle element cooperating with said dial.

In testimony whereof I hereunto affix my signature in the presence of two witnesses.

GEORGE L. ICKES.

Witnesses:
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J. P. STAUCH.