No. 876,876. PATENTED JAN. 14, 1908.

E. B. HILLMAN & L. E. ROBERTS.

AUTOMATIC PRESSURE RETAINING AND GRADUATING RELEASE DEVICE FOR AIR BRAKES.

APPLICATION FILED FEB. 14, 1907.

5 SHEETS—SHEET 1.

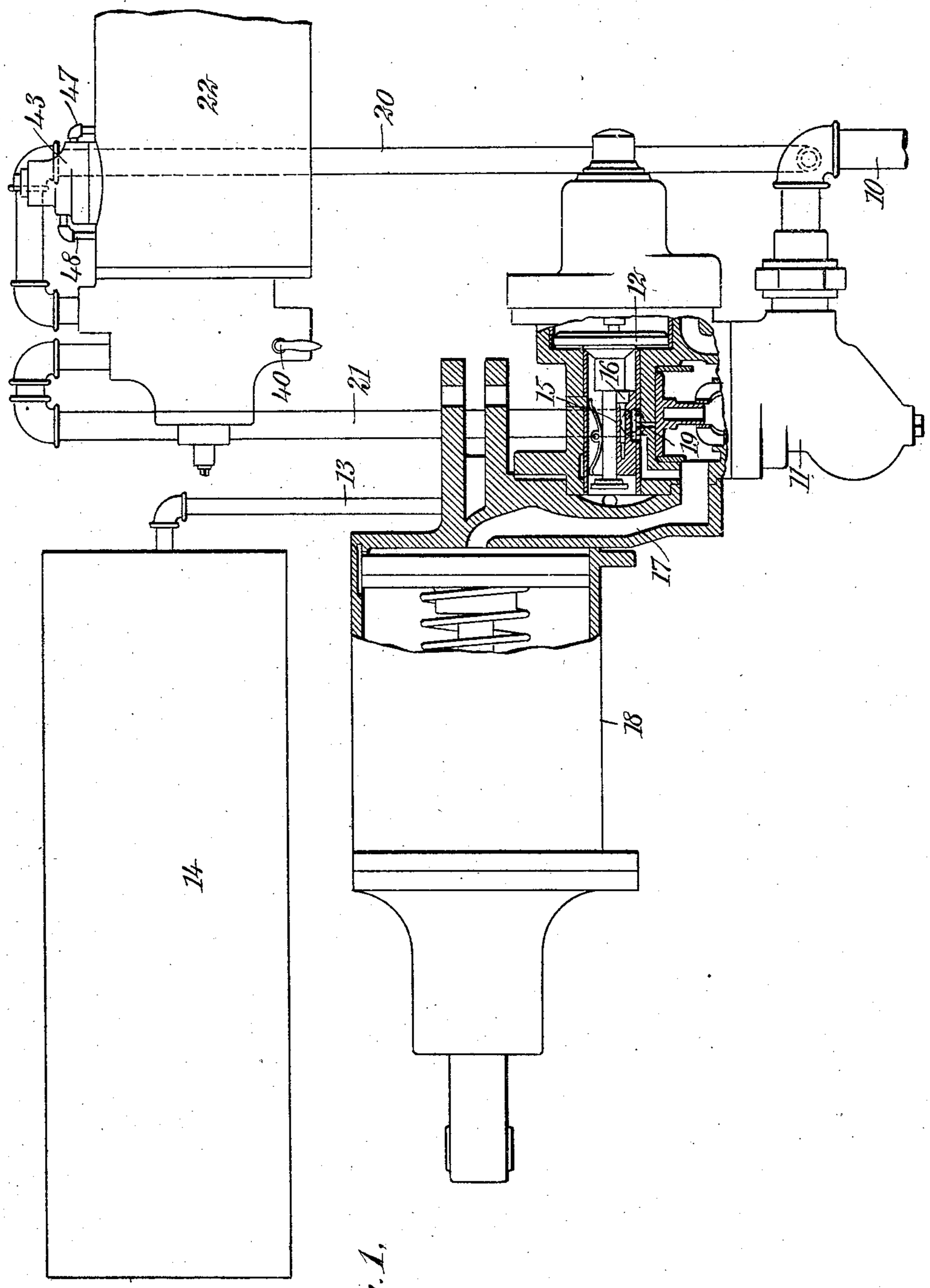

Fig. 1.

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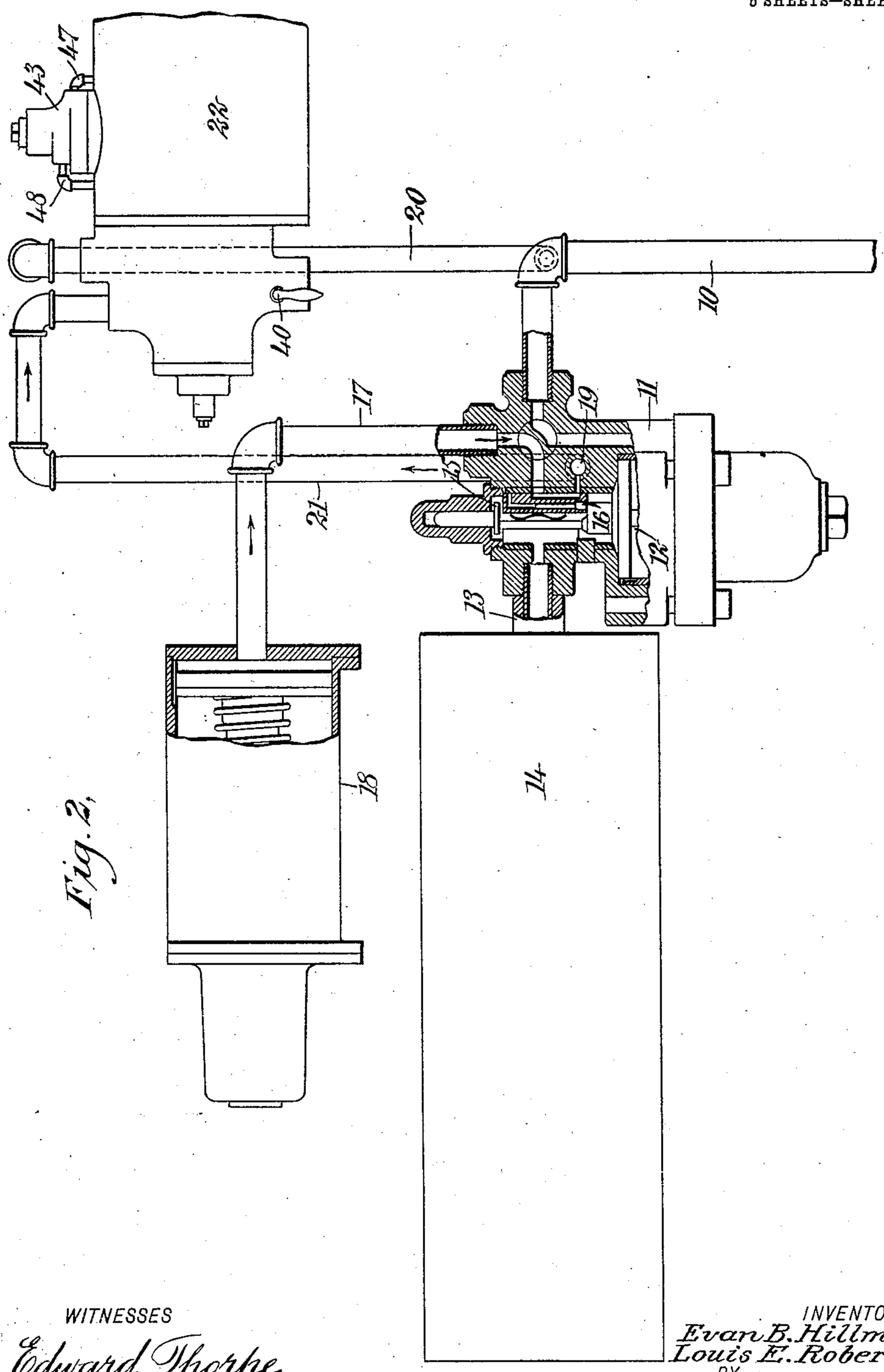

Fig. 2.

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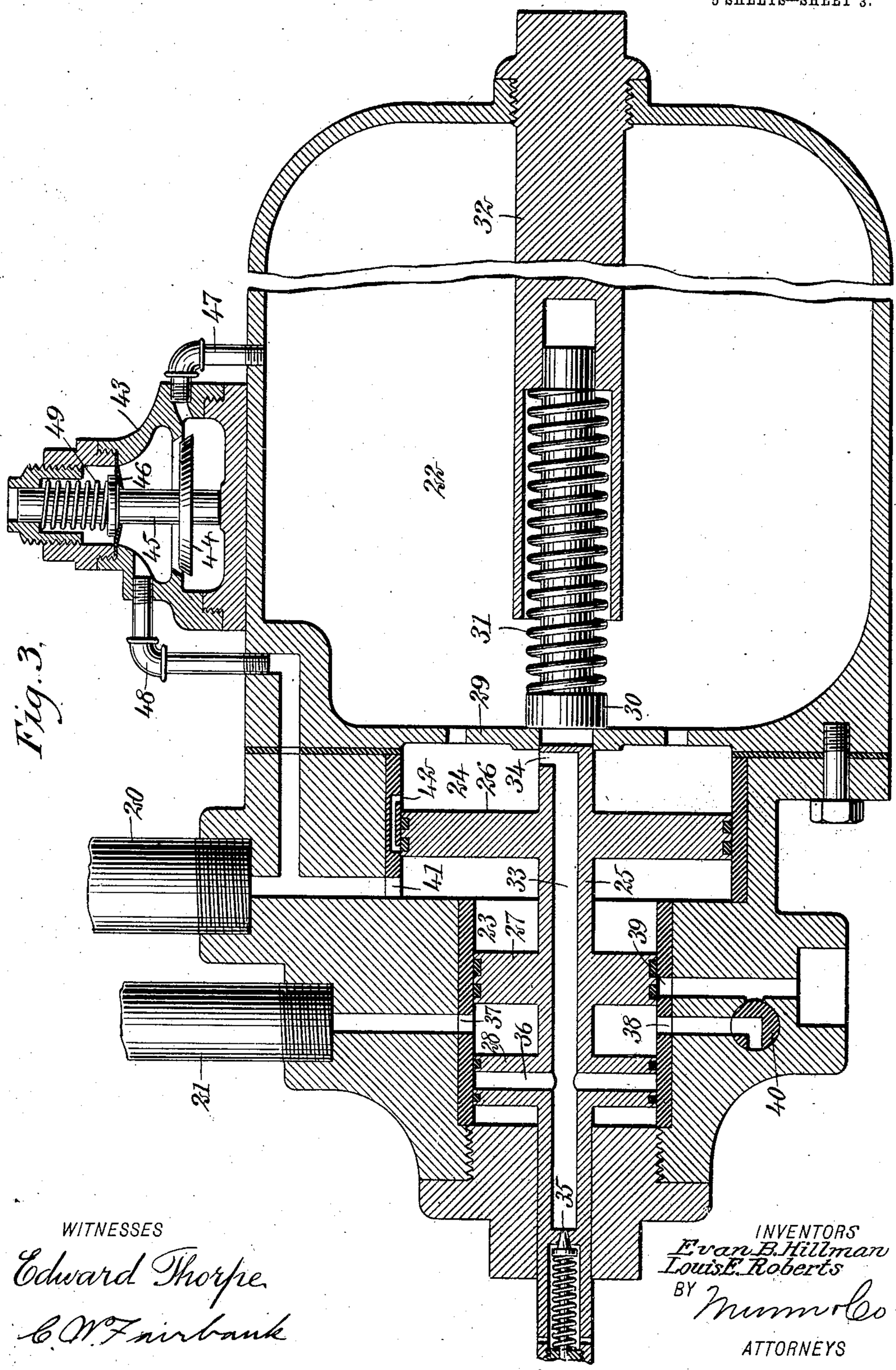
5 SHEETS—SHEET 3.

Fig. 3.



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5 SHEETS—SHEET 4.

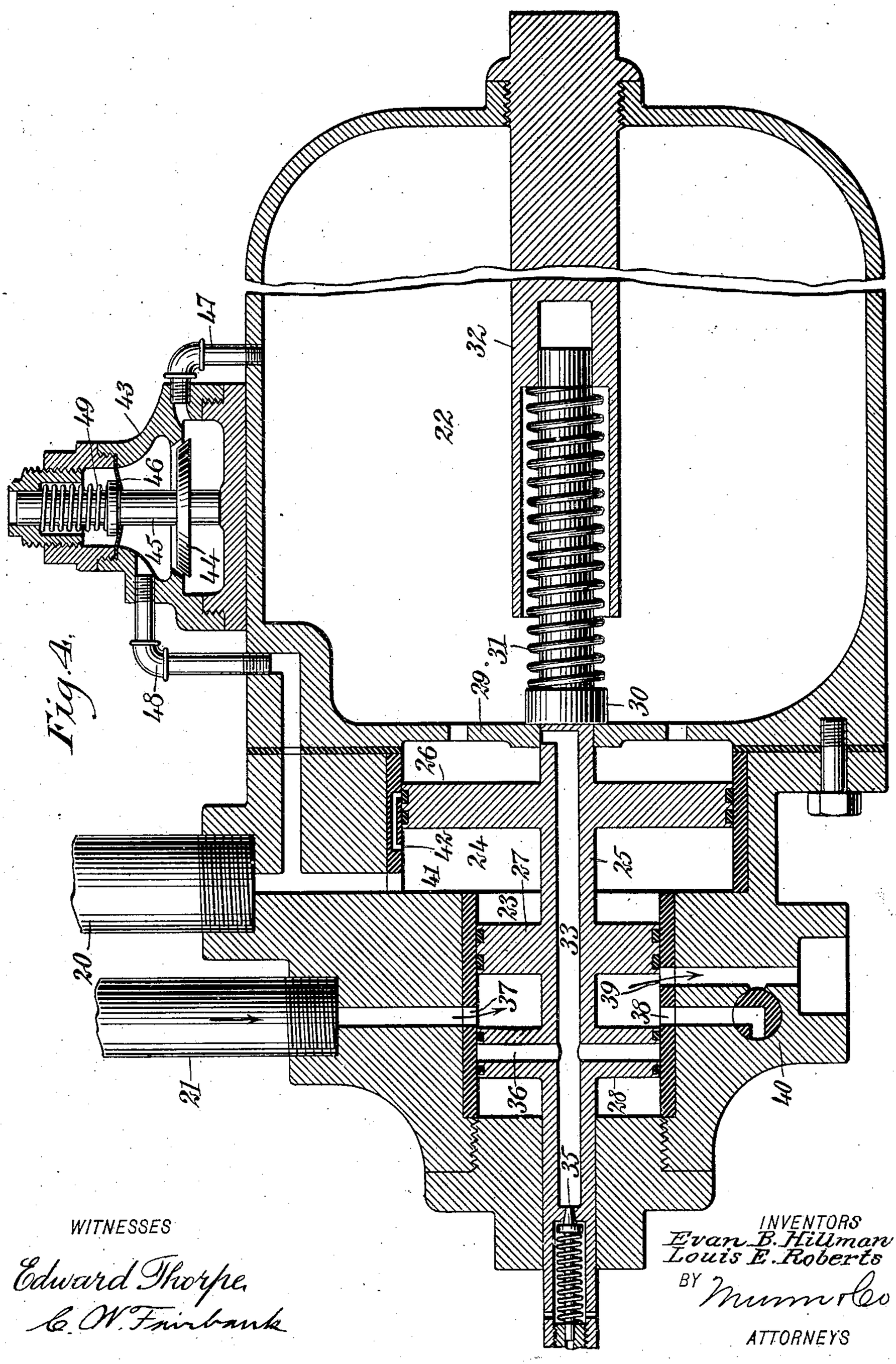

Fig. 4.

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5 SHEETS—SHEET 5.

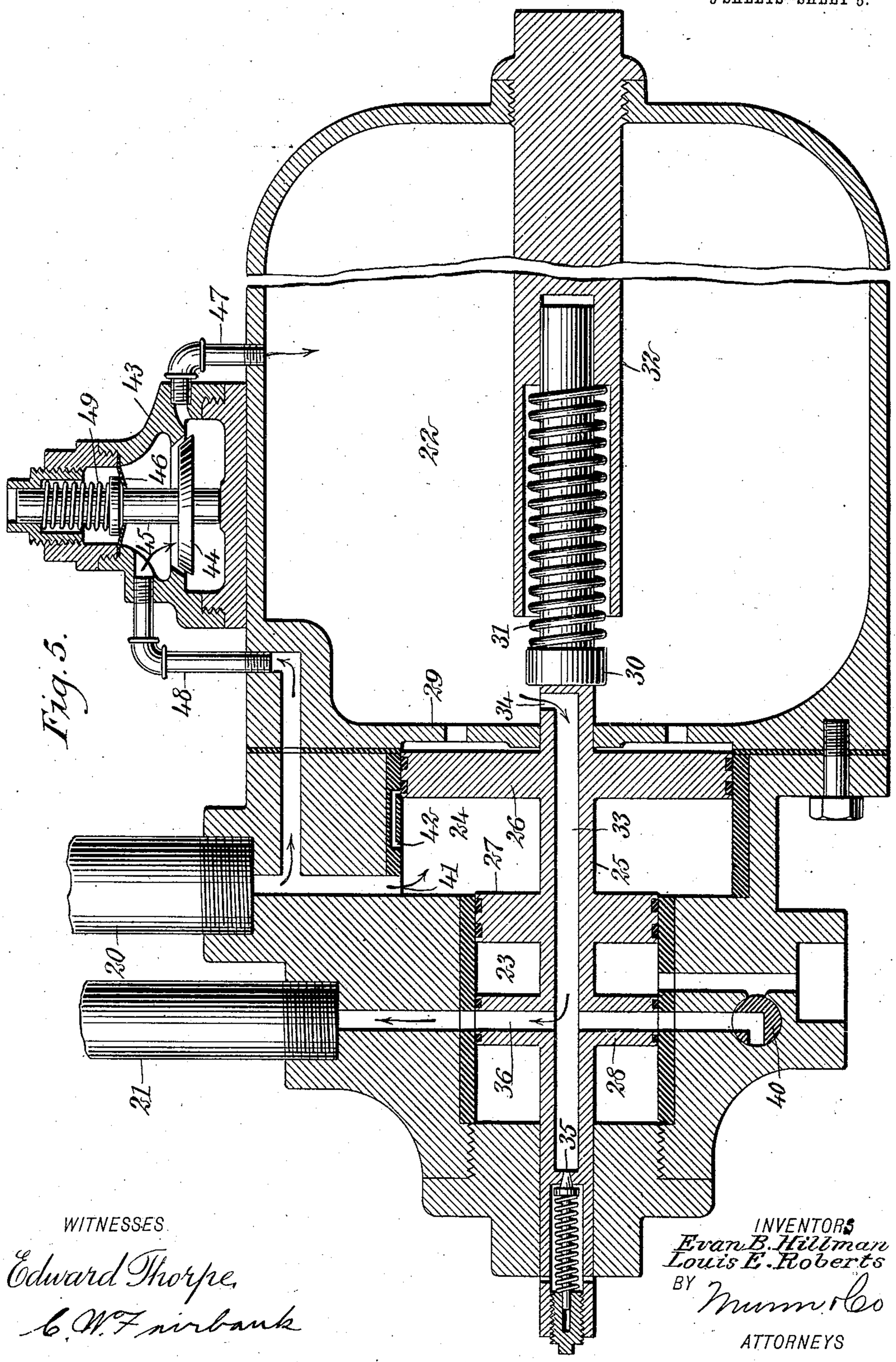

Fig. 5.

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UNITED STATES PATENT OFFICE.

EVAN B. HILLMAN AND LOUIS E. ROBERTS, OF CHICO, CALIFORNIA; SAID ROBERTS ASSIGNOR TO SAID HILLMAN.

AUTOMATIC PRESSURE RETAINING AND GRADUATING RELEASE DEVICE FOR AIR-BRAKES.

No. 876,876. Specification of Letters Patent. Patented Jan. 14, 1908.

Application filed February 14, 1907. Serial No. 357,308.

To all whom it may concern:

Be it known that we, EVAN B. HILLMAN and LOUIS E. ROBERTS, both citizens of the United States, and residents of Chico, in the county of Butte and State of California, have invented a new and Improved Automatic Pressure Retaining and Graduating Release Device for Air-Brakes, of which the following is a full, clear, and exact description.

This invention relates to certain improvements in air brake systems for trains, and more particularly to means whereby the pressure within the brake cylinder may be automatically retained until the brake pipe and auxiliary cylinder have been re-charged to the desired pressure after the brakes have been set.

The object of the invention is to provide means whereby the brakes may be applied instantly after having been released, and the second application of the brakes secured with as fully as great a pressure as was employed in the last preceding application of the brakes.

In the ordinary brake systems now in use, the brakes are set by a reduction in pressure and the train line pressure must be raised above the auxiliary cylinder pressure or the auxiliary pressure reduced before the brakes can be released. The auxiliary reservoir cannot be re-charged until the exhaust port in the triple valve is wide open, as the feed port does not open until the exhaust port is opened. Thus, a second application after release does not set the brakes as tightly as the first full application, unless the auxiliary reservoirs have had time to re-charge to standard pressure. Ordinarily this takes from twenty-five to forty-five seconds, which delay is often very disastrous and the cause of serious accidents. According to our invention, the auxiliary reservoirs are re-charged while the brakes are still applied; and, therefore, at the instant that the brakes are released the auxiliary reservoirs are in a condition to permit an instant re-setting of the brakes if desired.

Our invention does not relate to the specific structure or arrangement of any of the parts now commonly employed in air brake systems, but consists solely in an attachment capable of being applied to air brake systems already in use without necessitating any modifications or alterations of the latter. By means of our improved attachment, it is also possible to employ the direct pressure of the train pipe system upon the brakes rather than employing the auxiliary pressure, thus operating the system as straight air brakes rather than as automatic brakes. This change may be automatically brought about and does not necessitate the manipulation of any hand operated valves upon the several cars.

Although the attachment is secured to the train pipe system at two different points, namely, the brake pipe and the exhaust from the triple valve, yet we provide a single cut-out valve, whereby the entire attachment may be thrown out of operation and the brakes operated in the customary manner and entirely independently of our improved device in case, for any reason, it is found desirable or necessary to cut it out of the system.

The invention consists in certain features of construction and combination of parts, all of which will be fully set forth hereinafter and particularly pointed out in the claims.

Reference is to be had to the accompanying drawings forming a part of this specification, in which similar characters of reference indicate corresponding parts in all the figures, in which

Figure 1 illustrates a portion of a quick action passenger air brake system having our improved device attached thereto and showing a portion of the triple valve in section; Fig. 2 illustrates a portion of an air brake system having our improved device attached thereto, and showing a portion of the more common form of triple valve in section; Fig. 3 is a central longitudinal section through our improved device, and illustrating the moving parts in the position which they occupy while the brakes are applied; Fig. 4 is a section similar to Fig. 3, but showing the moving parts in the position which they occupy when the brakes are released; and Fig. 5 is a section similar to Fig. 3, but showing the parts in the position which they occupy when the brakes are being operated by straight air pressure.

In Figs. 1 and 2 we have shown the portions of two similar air brake systems but employing different forms of triple valve. In each case there is provided a brake pipe

10 leading air into a triple valve case 11, from which it may pass a piston 12 to a conduit 13 communicating with the auxiliary reservoir 14. Within the triple valve and constituting a portion thereof is a slide valve 15 and graduating valve 16, whereby the flow of air from the auxiliary reservoir 14 through a conduit 17 to a brake cylinder 18 may be readily controlled, and upon an increase in pressure in the brake pipe, the air within the brake cylinder 18 may be permitted to return through the conduit 17 and exhaust through a port 19. In the common form of air brakes of the types shown in Figs. 1 and 2, the port 19 communicates directly with the atmosphere when the slide valve and graduating valve are in their proper positions. As the air within the auxiliary reservoir 14 passes to the brake cylinder 18 to operate the brakes when the pressure in the brake pipe decreases and the triple valve operates, it is evident that the auxiliary reservoir cannot be again re-charged until the triple valve is moved to close the communication between the brake cylinder and the auxiliary reservoir, and the brake cylinder permitted to exhaust to the atmosphere. It is also evident that the brakes are released as soon as this last step is accomplished, namely, permitting the air in the brake cylinder to exhaust to the atmosphere. According to our improved device, the air is prevented from exhausting from the brake cylinder and the brakes are thus held in their set position until the auxiliary reservoir has been nearly re-charged to the desired pressure. It is then a simple matter to slightly increase the pressure to remove the brakes, and should it be found necessary to instantly re-apply the brakes, the reservoir will be found charged to approximately its full capacity.

Our improved device is illustrated in section in Figs. 3, 4 and 5, but its connection to the brake system is clearly illustrated in Figs. 1 and 2. In these last mentioned figures, it will be noted that the brake pipe 10 is provided with a branch pipe 20, and the exhaust port 19 from the triple valve communicates with a conduit 21. Both of these conduits lead directly but independently to the mechanism involving our invention, which latter may be located at any suitable point upon the car but preferably in the vicinity of the brake cylinder, auxiliary reservoir and triple valve.

One specific embodiment of our invention, namely, that illustrated in the drawings, involves a suitable storage chamber 22 provided with a valve body adjacent one end thereof and containing the valve for controlling the operation of the device. The valve body is preferably formed of two cylindrical portions 23 and 24 of different diameters and each provided with suitable bushings. Extending through the valve body is a piston rod constituting a valve stem 25 carrying a piston 26 within the larger cylindrical portion 24 and in engagement with the bushing thereof, and also carrying two smaller pistons 27 and 28 within the smaller cylinder 23 and in engagement with its bushing. Each of the pistons is provided with suitable circumferential packing rings, whereby the escape of air past said pistons may be prevented, and the walls of the cylinders are provided with suitable ports and passages controlled by said pistons in a manner hereinafter described. The larger cylinder 24 is separated from the main storage chamber 22 by a perforated wall 29 which serves to support one end of the piston rod 25 and also serves as an abutment for the piston returning means, which latter comprising a longitudinally movable rod 30 surrounded by a coil spring 31 and held in place and guided by a suitable support 32. If for any reason the pistons and piston rod are moved to a position in which the end of the piston rod enters the chamber 22, it will normally come in contact with the end of the rod 30 and compress the spring 31. The piston rod 25 is provided with a passage 33 extending longitudinally thereof and terminating at one end with a port 34 normally in open communication with the chamber 22. The outer end of the conduit 33 is closed by a spring-pressed safety valve 35 through which the air within the chamber 22 may escape to the outside atmosphere should the pressure within said chamber become too high. The piston 28 is provided with radial passages 36 communicating with the axial passage 33 within the piston rod and terminating at the circumferential surface of the piston.

The cylinder 23 is provided with a port 37 in open communication at all times with the conduit 21 leading to the exhaust port of the triple valve, the port being so located as to normally communicate with the space between the pistons 27 and 28, but capable of communicating with the conduit 36 within the piston 28 when the latter is moved to its extreme inner position. The cylinder 23 is also provided with two inlet ports 38 and 39, the former of which is preferably located directly opposite to the port 37 and adapted to communicate with the port 37 either by way of the chamber intermediate the pistons 27 and 28 or through the passage 36 in the last mentioned piston. The port 39 is located adjacent the port 38 and is adapted to be closed by the piston 27, or to communicate with the space between this piston and the adjacent piston 28. The port 38 is normally closed by means of a three-way valve 40, and serves no useful purpose save when it is desired to throw the entire device out of operation. The port 39 communicates at its outer end with the atmosphere, and serves as the exhaust port from the brake cylinder when the brakes are released. The three-way valve 40 above referred to, lies closely adja-

cent the last mentioned port and when rotated to the proper position permits communication between the ports 38 and 39.

The cylinder 24 is provided with an inlet port 41 of a passage on the opposite side of the piston 26 from the chamber 22, and this port communicates at all times with the conduit 20 leading into the brake pipe 10. This cylinder is also provided with a small by-pass 42 leading through the bushing and having its ends communicating with the chamber of the cylinder. The ends of the passage are at a distance apart slightly greater than the thickness of the piston 26, whereby the compressed air may pass from one side of the piston to the other when said piston is in one particular position.

Supported upon and carried by the chamber 22 is a pressure-reducing valve 43 controlling the admission of compressed air from the pipe 20 to said chamber. This pressure-reducing valve may be of any suitable character, but is shown as having a valve plate 44 carried by a valve stem 45, the movements of which are controlled by a diaphragm 46. The valve casing is provided with a conduit 47 leading from one side of the valve to the interior of the chamber 22, and with a conduit 48 leading from the opposite side of the valve and communicating with the brake pipe through the conduit 20. The movement of the diaphragm in the pressure-reducing valve is controlled by the pressure of the gas and also by the pressure of a coil spring 49. The parts constituting the pressure reducing valve are so constructed and proportioned that the pressure within the chamber 22 cannot exceed a definite predetermined limit, but even though this pressure should exceed the desired amount, it would normally blow off through the port 34, conduit 33 and exhaust valve 35 in the piston. Should the pressure within the brake pipe become reduced, as, for instance, upon the application of the brakes, the pressure-reducing valve is adapted to act also as a check valve and to close the port and prevent a reduction of pressure within the chamber.

In the ordinary air brake systems commonly employed, it is customary to maintain a pressure of approximately seventy pounds within the train pipe, which pressure is also communicated to the auxiliary reservoir. In our improved device, the pressure-reducing valve is so constructed that we maintain a materially less pressure within the chamber 22, which pressure may, for instance, be thirty pounds, although a higher or lower pressure may be found more desirable in the practical employment of our device. Assuming the pressure within the chamber 22 to be thirty pounds, it will be noted that the piston 26 is subjected to a net pressure of forty pounds, tending to move said piston toward the right, but this piston is carried by the same piston rod as is the piston 27, which latter is subjected to a pressure of seventy pounds upon one side and atmospheric pressure upon the other, the excess of pressure being in the opposite direction from the excess of pressure applied to one side of the piston 26; but as the piston 26 is materially larger than the piston 27, the parts normally remain in the positions indicated in Fig. 4, and the brake cylinders are in open communication with the atmosphere through the ports and passages indicated by the arrows in said figure.

In order to apply the brakes, the pressure within the brake pipe, and, therefore, within the pipe 20 is materially reduced and the triple valve closes to place the auxiliary reservoir in communication with the brake cylinder and to close the exhaust from said cylinder. This reduction of pressure within the pipe 20 causes a corresponding decrease in pressure in the space between the pistons 26 and 27, and the action of the compressed air within the chamber 22 instantly moves the operating parts to the positions indicated in Fig. 3, thus closing the piston 27 to close the port 39. The engineer may now instantly turn the controlling valve to the running position and the triple valve will return to a position which would ordinarily permit the brake cylinder to exhaust and the auxiliary reservoir to become re-charged; but the exhausting of the air from the brake cylinder is prevented by the closing of the port 39 by the piston 27. The pressure is thus retained within the brake cylinder and the brakes held in the desired position until the pressure within the auxiliary reservoir has been restored to within a few pounds of the normal limit, namely, seventy pounds. The increase in pressure within the brake pipe tends to move the piston 26 back to the position indicated in Fig. 4, but it will be noted that at an intermediate position between that indicated in Fig. 3 and that indicated in Fig. 4, the small by-pass 42 communicates with both sides of the piston. The pressure within the brake pipe is gradually restored and the piston 26 gradually moves to a position in which further increase in pressure is prevented by the leaking of the air through the by-pass 42. As soon as the pressure within the chamber 22 increases to a proportional amount, the piston 26 is forced back to again close the by-pass and any excess pressure is permitted to blow off through the valve 35. During this time the port 39 has remained closed and the escape of air from the brake cylinders prevented. Thus, the brake pipes and auxiliary reservoirs may be re-charged to normally seventy pounds before the brakes are released. When it is desired to release the brakes the pressure is increased to the normal limit and the piston 26 is forced rapidly past the by-pass 42 to the position

indicated in Fig. 4, and the air within the brake cylinders may readily escape to release said brakes. If it is desired to instantly re-apply the brakes after they have been released, the pressure may be again reduced, and as the auxiliary reservoirs were recharged before the brakes were released, the action of the brakes will be fully as effective upon the second application as upon the first, irrespective of the interval of time elapsing between the two applications.

Should it be desired to operate the brakes by direct pressure rather than by the pressure of air from the auxiliary reservoirs, the pressure within the brake pipe may be increased above the normal seventy pounds, and the piston 26 will be forced still further to the right and assume the position indicated in Fig. 5. The air within the chamber 22 may then escape through the port 34 leading to the conduit 33 within the piston rod and may flow through the conduit 36 within the piston 28 and directly to the air brake cylinder through the conduit 21, as indicated by the arrows in Fig. 5. As fast as the pressure within the chamber 22 decreases by this escape of air therefrom, the pressure is restored by the inflow of air through the pressure-reducing valve. A pressure may thus be created within the brake cylinder equal to the pressure within the chamber 22, and the brakes operated entirely independently of the action of the triple valve. After the brakes have been applied by direct pressure and it is desired to release the same, the pressure within the brake pipe is reduced to the normal seventy pounds, and the coil spring 31 and the pressure within the chamber 22 force the pistons back to the positions indicated in Fig. 4, and the air within the brake cylinder may readily escape to release the brakes.

Should any part of our improved device become broken or worn out, so that it no longer properly accomplishes the desired results, or if for any other reason it is desired to cut our improved device out of the system, it is merely necessary to turn the three-way valve 40 so as to bring the passages leading from the ports 38 and 39 into communication with each other. The port 37 will thus be brought into communication with the atmosphere at any and all positions which the pistons are capable of occupying, and thus when the triple valve moves to permit the re-charging of the auxiliary reservoirs, the air within the brake cylinders may escape to the atmosphere as freely as though our improved device were entirely omitted.

Having thus described our invention, we claim as new and desire to secure by Letters Patent:

1. In an air brake system, the combination with the brake pipe, brake cylinder, auxiliary reservoir and triple valve, of means for controlling the exhaust from said triple valve, said means including a chamber normally containing air at a lower pressure than that within the brake pipe, and means operated by the difference in pressure between the chamber and the brake pipe for opening or closing the exhaust from the triple valve.

2. In an air brake system, the combination with the brake pipe, brake cylinder, auxiliary reservoir, and triple valve, of means for controlling the exhaust from said triple valve, said means including a chamber normally containing air at a lower pressure than that within the brake pipe, a movable member controlled by the relative pressures within said chamber and said brake pipe, and a port closing member operatively connected to said movable member.

3. In an air brake system, the combination with the brake pipe, brake cylinder, auxiliary reservoir and triple valve, of means for controlling the exhaust from said triple valve, said means including a chamber, a conduit connecting said chamber and said brake pipe, said conduit including a pressure-reducing valve, a movable member having one surface thereof subjected to the pressure within said chamber and the other surface thereof subjected to the pressure within the brake pipe, and a port closing member carried by said movable member.

4. In an air brake system, the combination with the brake pipe, brake cylinder, auxiliary reservoir and triple valve, of means for controlling the exhaust from said triple valve, said means including a chamber, a conduit connecting said chamber and said brake pipe, said conduit including a pressure-reducing valve, a cylindrical chamber in communication with the first mentioned chamber and having one end thereof in communication with said chamber and the other end thereof in communication with said brake pipe, a piston within said cylinder, and a port closing member carried by said piston.

5. In an air brake system, the combination with the brake pipe, brake cylinder, auxiliary reservoir and triple valve, of means for controlling the exhaust from said triple valve, said means including a cylindrical chamber, means for placing one end of said chamber in direct communication with the brake pipe, means for placing the other end of said chamber in communication with the brake pipe, said last mentioned means including a pressure-reducing valve, a movable member within said cylindrical chamber, and a port closing member operatively connected to said movable member.

6. In an air brake system, the combination with the brake pipe, brake cylinder, auxiliary reservoir and triple valve, of means for controlling the exhaust from said triple valve, said means including a cylindrical chamber having portions of different diame-

ters, pistons within said chamber and operating within the different portions of said cylindrical chamber, means for placing the interior of the chamber intermediate said pistons in communication with the brake pipe, means for placing the outer surface of the smaller piston in communication with the atmosphere, and means for placing the outer surface of the larger piston in communication with the chamber at a different pressure than that normally existing within the brake pipe, one of said pistons adapted to act as a port closing means for the exhaust from the triple valve.

7. In an air brake system, the combination with the brake pipe, brake cylinder, auxiliary reservoir, and triple valve, of means for controlling the exhaust from said triple valve, said means including a chamber, a conduit connecting said chamber and said brake pipe, a movable member having one surface thereof subjected to the pressure within the brake pipe and the other surface thereof subjected to the pressure within said chamber, and means for placing said chamber in communication with the brake cylinder through the exhaust from said triple valve.

8. In an air brake system, the combination with the brake pipe, brake cylinder, auxiliary reservoir and triple valve, of means for controlling the exhaust from said triple valve, said means including two pistons of different diameters, means for delivering air from the brake pipe to the space between said pistons, means for subjecting one surface of one of said pistons to a different pressure from that existing within the brake pipe, and means for placing the outer surface of the other of said pistons in communication with the atmosphere, one of said pistons constituting a port closing means for the exhaust from the said triple valve.

9. An attachment for air brake systems, comprising a chamber, a conduit leading thereto and adapted to be placed in communication with the brake pipe, said conduit including a pressure-reducing valve, movable means having one surface thereof subjected to the pressure within said chamber and the opposite surface thereof subjected to the pressure within the brake pipe, a conduit adapted to receive air from the exhaust port of the triple valve, means operatively connected to said movable member for controlling the passage of gas through said last mentioned conduit, and means whereby air may escape past said movable member to hold the latter in a stationary position and the last mentioned conduit closed until the pressure within the brake pipe has been restored nearly to normal.

10. An attachment for air brake systems, comprising a chamber, means for maintaining said chamber filled with compressed air at a lower pressure than that existing within the brake pipe, a movable member, the position of which is controlled by the relative pressures within the brake pipe and said chamber, a conduit adapted to receive air from the exhaust port of the triple valve, shut-off means for said conduit operatively connected to said movable means, whereby the conduit is closed when the pressure within the brake pipe is reduced materially below the normal, and means whereby air within said chamber may be delivered to the exhaust port of the triple valve when the pressure within the brake pipe is raised materially above the normal.

In testimony whereof we have signed our names to this specification in the presence of two subscribing witnesses.

EVAN B. HILLMAN.
LOUIS E. ROBERTS.

Witnesses:
PARK HENSHAW,
J. A. E. SHUSTER.