No. 788,149. PATENTED APR. 25, 1905.

D. F. SNYDER.

AIR BRAKE.

APPLICATION FILED OCT. 8, 1904.

3 SHEETS—SHEET 1.

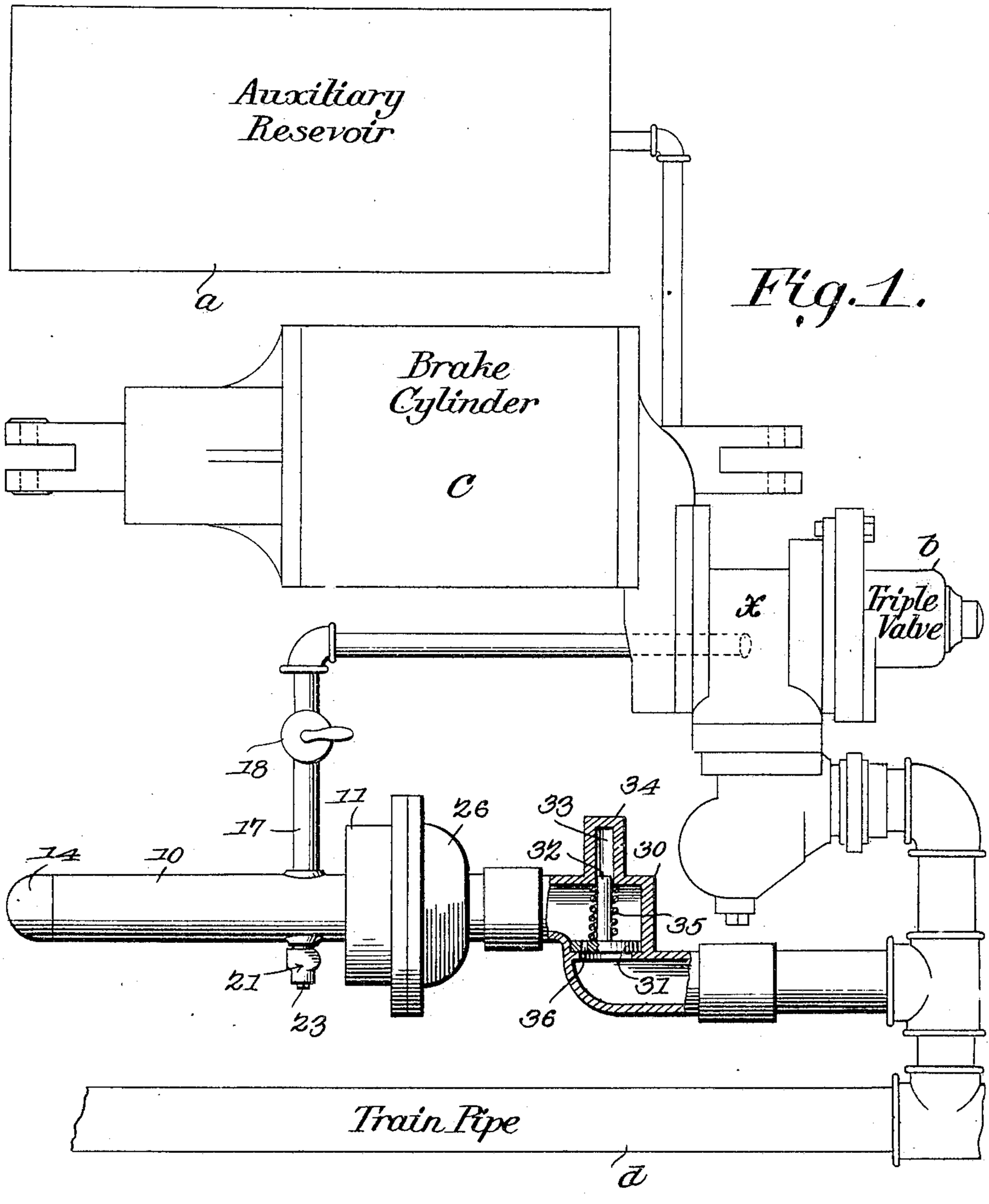

Fig. 1.

Witnesses
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Jno E. Parker

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Attorneys

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3 SHEETS—SHEET 2.

Fig. 2.

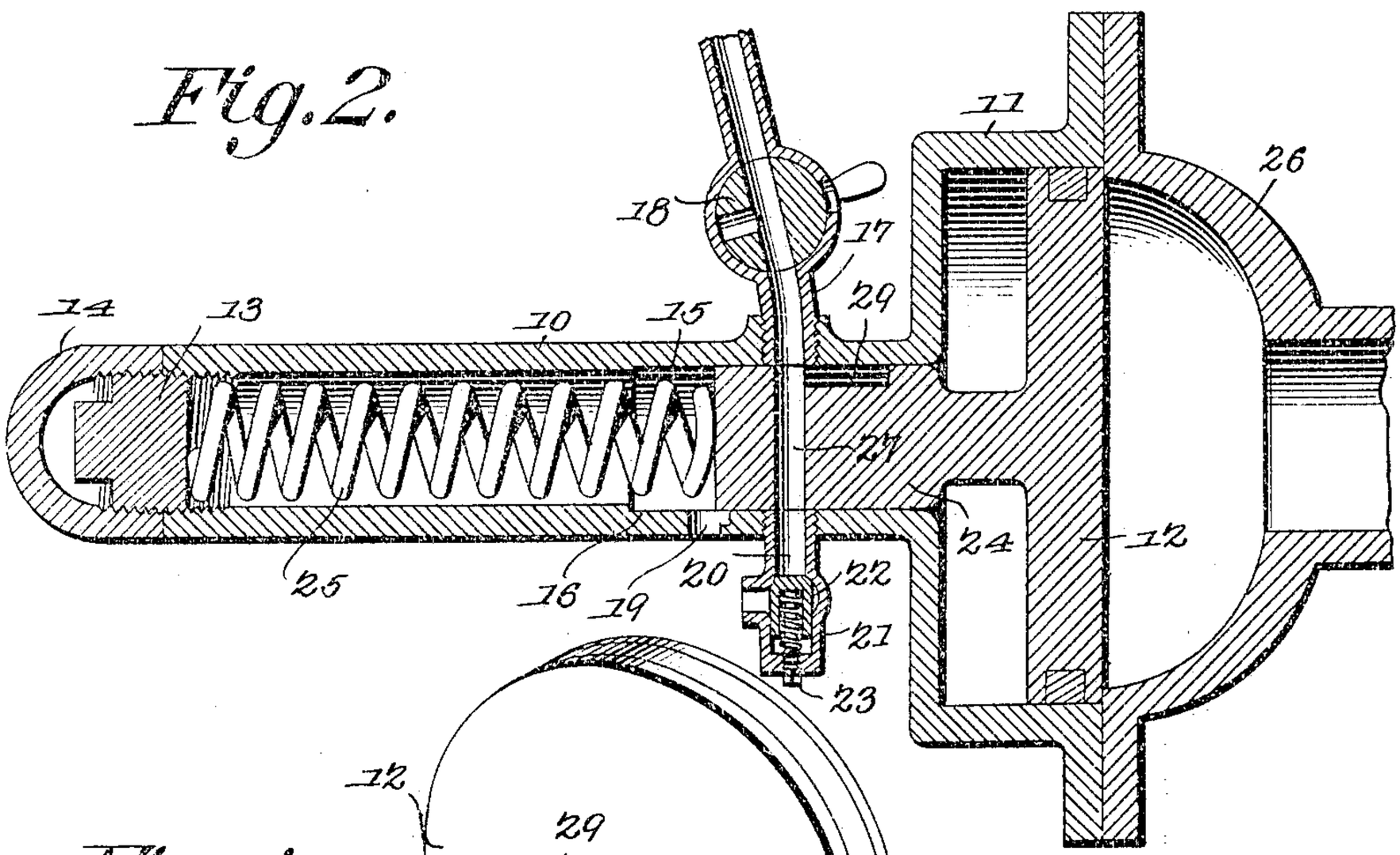


Fig. 4.

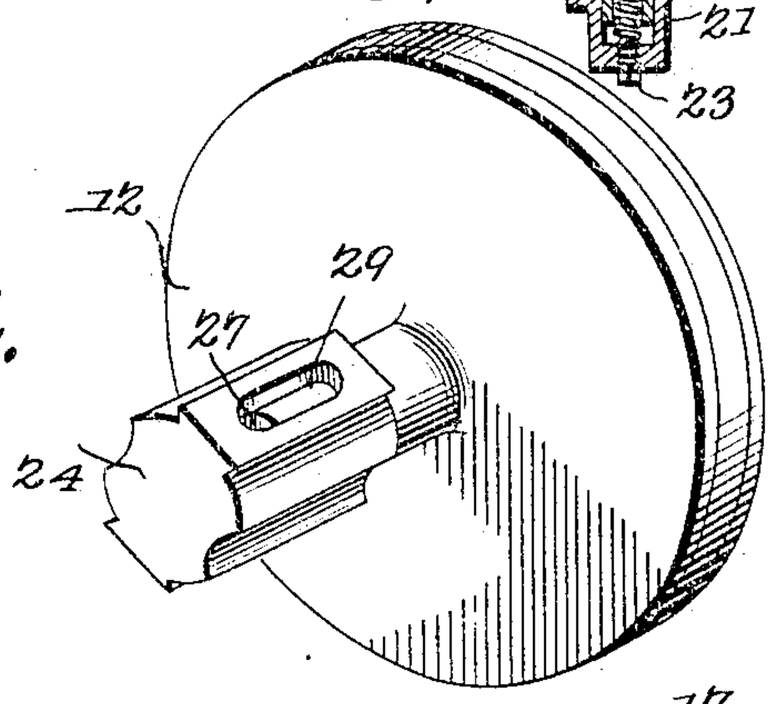
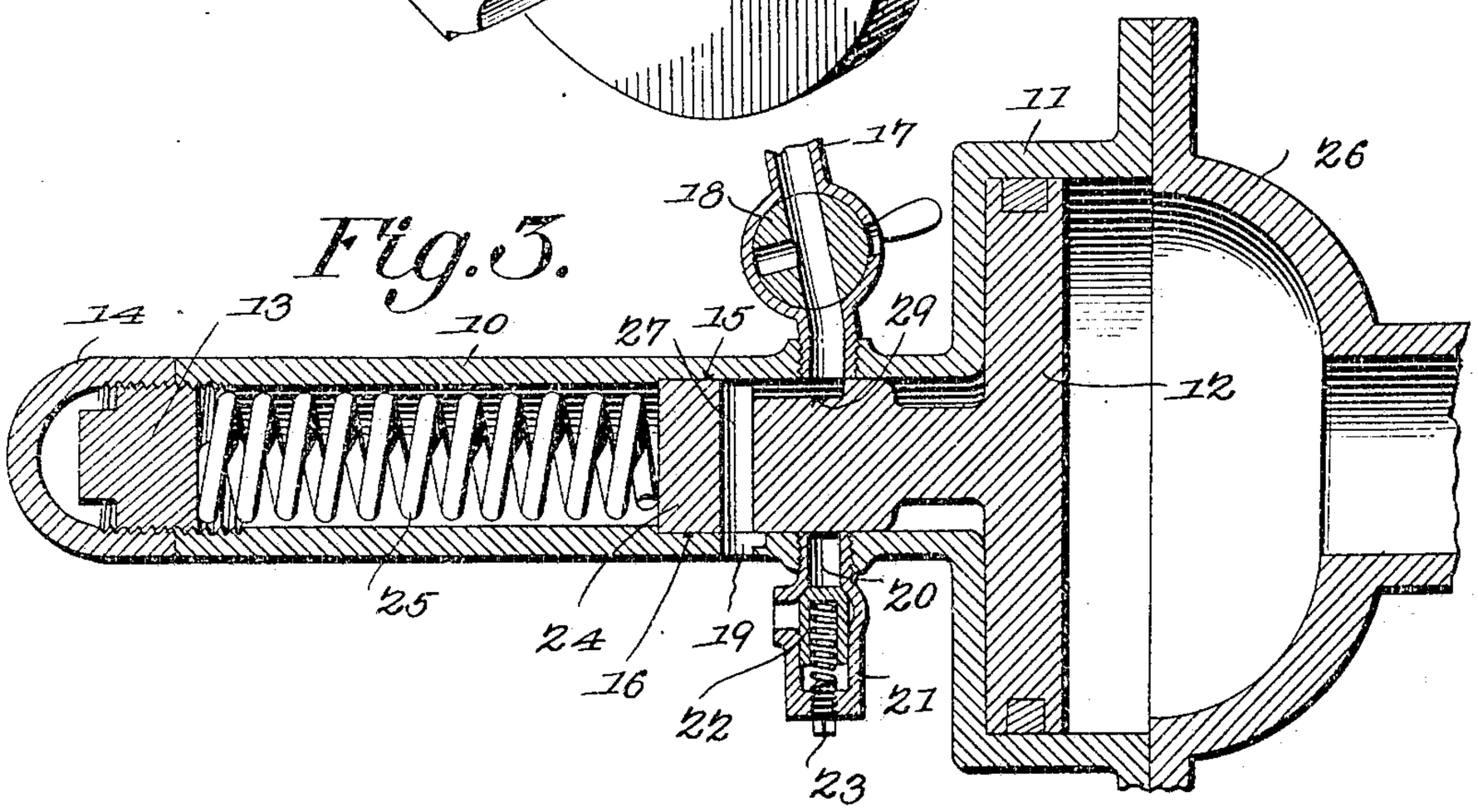


Fig. 3.



Witnesses
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3 SHEETS—SHEET 3.

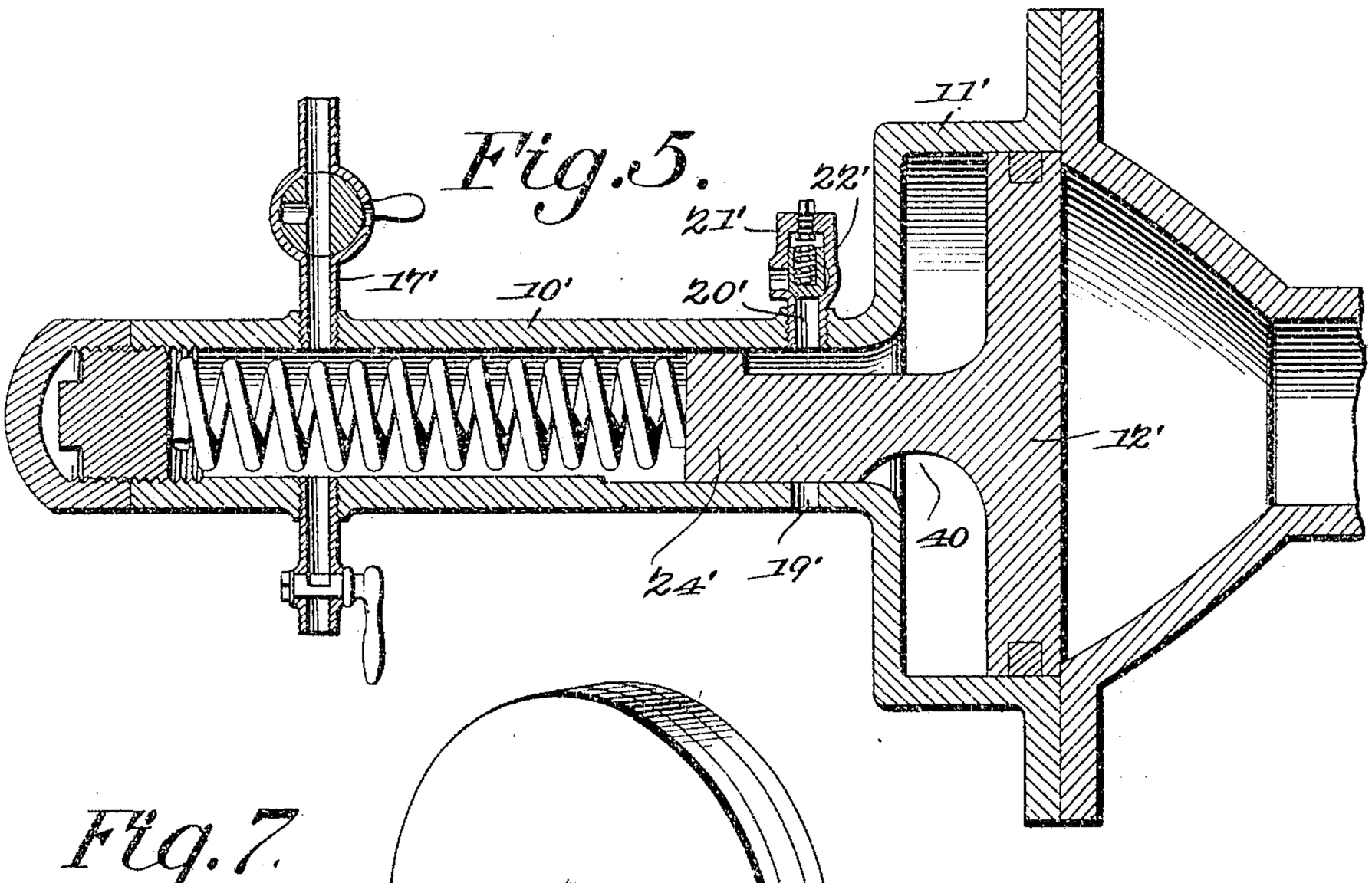

Fig. 5.

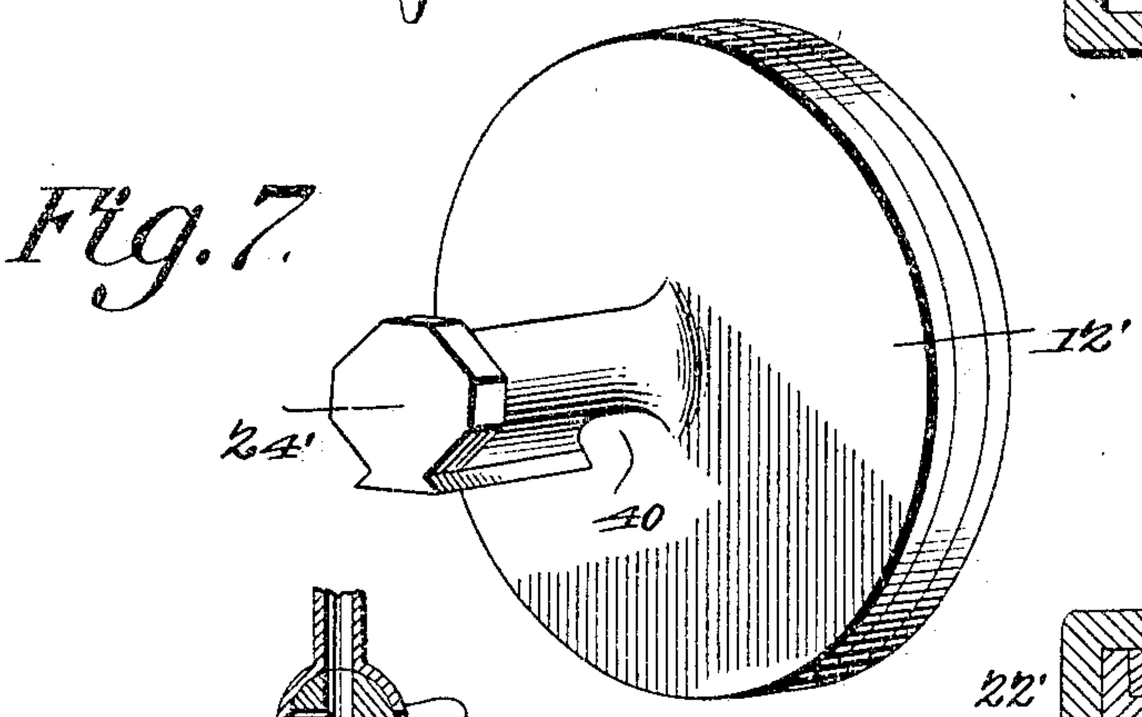

Fig. 7.

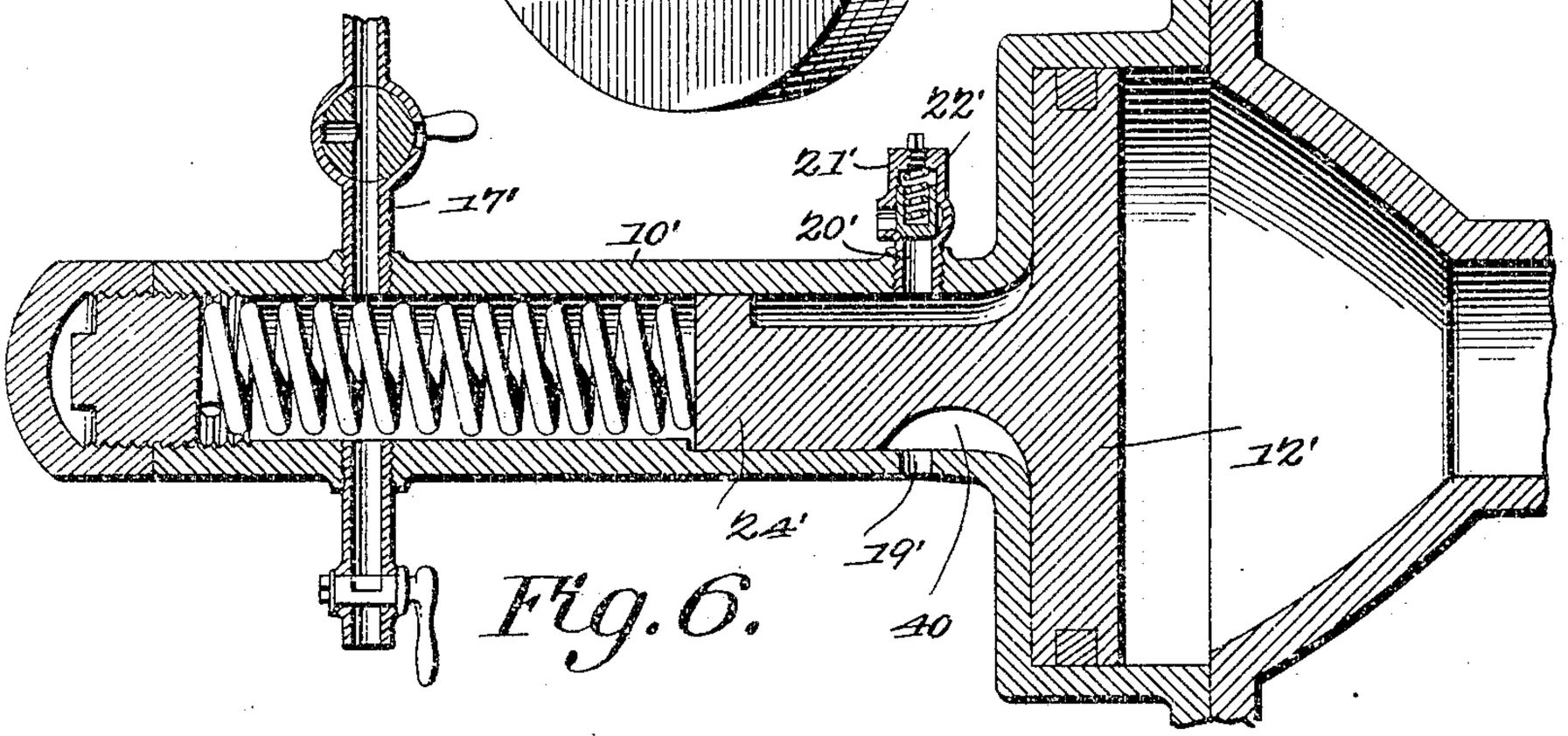

Fig. 6.

Witnesses
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No. 788,149. Patented April 25, 1905.

UNITED STATES PATENT OFFICE.

DAVID F. SNYDER, OF HARRISBURG, PENNSYLVANIA, ASSIGNOR OF ONE-FOURTH TO JOSEPH C. SMITH AND WILLIAM F. GARMAN, OF HARRISBURG, PENNSYLVANIA.

AIR-BRAKE.

SPECIFICATION forming part of Letters Patent No. 788,149, dated April 25, 1905.

Application filed October 8, 1904. Serial No. 227,678.

To all whom it may concern:

Be it known that I, DAVID F. SNYDER, a citizen of the United States, residing at Harrisburg, in the county of Dauphin and State of Pennsylvania, have invented a new and useful Air-Brake, of which the following is a specification.

This invention relates to air-brakes, and has for one of its objects to provide means whereby a certain predetermined pressure of air may be retained in the brake-cylinder in the event of accidental leakage of any of the air connections.

A further object of the invention is to provide a safety device whereby should there be any accidental movement of the triple valve to release position the brakes will not be wholly released, but will still be held under a predetermined pressure.

A still further object of the invention is to provide an air-brake mechanism in which provision is made for securing graduated reduction of the braking pressure, so that after the brakes have been applied either for graduated or emergency application they may be partly released, a certain predetermined pressure being retained in the brake-cylinder, and when the brakes are to be fully released the engineer has merely to move his brake-valve to the full-release position.

A still further object of the invention is to insure the positive release of the brakes even where the movement to full-release position is momentary, a portion of the air under high pressure being trapped or held in such manner as to insure the discharge of all of the air from the brake-cylinder.

A still further object of the invention is to provide a device whereby the auxiliary reservoir may be recharged while the brakes are set, so that there may always be a sufficient quantity of air under pressure in the auxiliary reservoir to set the brakes immediately after release.

A still further object of the invention is to provide a simple form of retaining and recharging mechanism which may be applied to existing air-brake systems without any change whatever in the construction of the triple valve, auxiliary reservoir, brake-cylinder, or the engineer's brake-valve, the operation of the latter being precisely the same as at present, and the engineer requiring no further instructions in the use of his valve.

With these and other objects in view, as will more fully hereinafter appear, the invention consists in certain novel features of construction and arrangement of parts, hereinafter fully described, illustrated in the accompanying drawings, and particularly pointed out in the appended claims, it being understood that various changes in the form, proportions, size, and minor details of the structure may be made without departing from the spirit or sacrificing any of the advantages of the invention.

In the accompanying drawings, Figure 1 is an elevation, partly in section, of an air-brake mechanism constructed and arranged in accordance with the invention. Fig. 2 is a longitudinal sectional elevation of the pressure-retaining valve and controlling-valve. Fig. 3 is a similar view with the parts in a different position. Fig. 4 is a detail perspective view of the controlling-valve and its piston. Figs. 5 and 6 are views corresponding to Figs. 2 and 3, illustrating a slightly-modified construction. Fig. 7 is a detail perspective view of the valve and piston shown in Figs. 5 and 6.

Similar characters of reference are employed to indicate corresponding parts throughout the several figures of the drawings.

In the drawings the auxiliary reservoir *a*, triple valve *b*, brake-cylinder *c*, and train-pipe *d* are all of the usual construction and are connected in the usual manner.

To the train-pipe is connected a casing 10, having at one end a cylinder 11, in which fits a piston or diaphragm 12, that is exposed on one side to train-pipe pressure. The casing 10 is in the form of an elongated cylindrical shell closed at its outer end by an adjustable plug 13, over which fits a cap 14, that is removed when the plug is to be adjusted. At the cylinder end of the casing the interior of the latter is faced to form two valve-seats 15

and 16, and to the seat 15 extends a pipe 17, leading from the triple-valve exhaust *x*, a suitable cut-off valve 18 being arranged in the pipe when it is desired to cut out the device forming the subject of the present invention, this valve being movable to permit direct communication between the brake-cylinder exhaust and the outer air when necessary. The lower valve-seat 16 contains two ports 19 and 20, one of which, 19, leads directly to the outer air, while the other is in communication with a casing 21, containing a spring-pressed retaining-valve 22, the tension of the spring being adjusted by a suitable nut 23, and under ordinary circumstances this valve is set to open at a pressure of, say, twenty pounds, although this may be increased or diminished in accordance with circumstances. Between the two valve-seats is arranged a slidable valve 24, that is secured to or formed integral with the piston 12 and is acted upon by a helical compression-spring 25, the outer end of which rests against the plug 13, so that the latter may be used for adjusting the stress of the spring. The outward stroke of the valve and piston 12 is limited by the head 26 of the cylinder 10, said head being so arranged that the edge of the piston comes directly into contact therewith and is positively stopped.

The port of the pipe 17 and the port 20, leading to the retaining-valve, are in direct alinement diametrically of the casing, and the port 27 of valve 24 normally assumes a position in direct alinement with said pipe and port, so that the brake-cylinder exhaust is normally in communication with the casing of the retaining-valve. The valve is retained in running position by the spring 25, the latter being set at a pressure corresponding to the pressure of air normally carried in the train-pipe. For instance, on freight-trains a pressure of seventy pounds will be used, and the piston 12 and valve 24 would retain the normal position, the piston yielding only when the pressure exceeds the normal train-pipe pressure.

In the upper face of the valve is arranged a port or passage 29, that communicates with the port 27, and when the piston 12 is moved by excess train-pipe pressure the exhaust-pipe 17 will be placed in direct communication with the port 27 and exhaust-port 19, so that the brake-cylinder exhaust of the triple valve will be placed in direct communication with the outer air and may reduce the brake-cylinder to atmospheric pressure. The valve 22 may be of the character ordinarily employed as reducing-valves and set to yield under any desired pressure.

While the train-pipe may be connected directly to the head 26, it is preferred to introduce in the connection an auxiliary-valve casing 30, having a seat for a check-valve 31. The check-valve is provided with a stem 32, extending into a guiding-recess 33, formed in a boss 34 in the casing 30, and normally held against its seat by a helical compression-spring 35. The valve opens in the direction of the cylinder 11 and when exposed to train-pipe pressure will be forced upward and permit the air to pass to the cylinder 11. When the pressure on the train-pipe side of the check-valve is reduced to less than that within the casing 30, the check-valve will promptly close, the movement being assisted by the spring, and then if reduction continues the air in the chamber 30 will gradually reduce toward the train-pipe through a leakage-port 36, formed in the valve or in the valve-seat.

The device may be set to operate under any pressure and employed in connection with the existing brake systems for either freight or passenger service. Taking as an instance a seventy-pound train-pipe pressure, as used on many roads for freight-service, the plug 13 is adjusted in order to prevent movement of the piston 12 from the position shown in Fig. 1 when exposed to a pressure of seventy pounds or less. The position shown in Fig. 1 is the running position, and the triple valve is moved to such position that the brake-cylinder is in communication with the exhaust-port and the pipe 17 and thus through the port 27 of valve 24 with the retaining-valve casing 21, and at this time the brake-cylinder pressure does not exceed the natural atmospheric pressure. When the brakes are to be applied either for a graduated application or for an emergency stop, the engineer moves his valve to either the service or the emergency position and train-pipe pressure is reduced. This moves the triple valve in the usual manner, and air reduces from the auxiliary to the brake cylinder, the amount of such reduction depending on the reduction of the train-pipe pressure and the length the engineer's brake-valve is opened. The engineer will then usually place the brake-handle on lap and when it is desired to release the brakes will move the brake-handle to release position in order to place the main reservoir in communication with the train-pipe. This is the ordinary procedure, and the brakes will be released in the usual manner by moving the triple valve back to its normal position and placing the brake-cylinder in communication with the exhaust-port of the triple-valve casing. In carrying out the present invention, however, the engineer's brake-valve is placed in running position and the train-pipe is gradually recharged, so that there will be no violent movement of the piston 12, the latter retaining the position shown in Fig. 1, inasmuch as the train-pipe pressure will not exceed that to which the spring 25 is set. The triple valve will be moved back to recharging position and the brake-cylinder will be placed in communication with the exhaust-port and exhaust-pipe 17, the latter communicating, as before described, with the port 27 of valve 24 and the retaining-valve casing 22. This

permits reduction of the brake-cylinder pressure to an extent determined by the adjustment of the spring 23 of the retaining-valve, this being usually set to resist twenty-pounds pressure, and when brake-cylinder pressure has been reduced to this point the valve will close and the brakes will still be held under the twenty-pounds pressure. At the same time the auxiliary reservoir is recharging through the leakage-groove in the usual manner, and in a short time the engineer has on hand a sufficient quantity of air for an immediate reapplication of the brakes. To fully release the brakes, the engineer then moves his brake-handle to full-release position, and the main reservoir being placed in direct communication with the train-pipe a sudden surge of air under pressure will occur through the pipe, and the pistons 12 thoughout the train will be moved to the position shown in Fig. 2, thus placing the exhaust-pipes 17 in communication with the exhaust-port 19 through the medium of the diametrical port 27 of valve 24 and allowing the brake-cylinder to reduce to atmospheric pressure, thus releasing the brakes. The discharge of air from the brake-cylinder may occupy some little time, and the main-reservoir pressure may not be sufficient to hold the pistons 12 in the position shown in Fig. 2 for a length of time sufficient for the purpose. The check-valve 31 here comes in play. The excess train-pipe pressure passing beyond the check-valve is trapped in the casing 30, and as soon as the train-pipe pressure is reduced the valve closes and the pressure is retained in the casing 30 and gradually reduces through the leakage-port 36 and permits the piston to reassume the position shown in Fig. 1, but the movement of said piston and valve being so gradual that there is opportunity for all of the air under pressure in the brake-cylinder to escape.

One of the principal advantages gained from the employment of a device of this character is that in the event of any accidental leakage of any of the parts after the brakes have been set the brakes are still held under a predetermined pressure—twenty pounds—and will not be fully released. Leakage may at times occur through the rotary of the engineer's brake-valve to an extent sufficient to recharge the train-pipe and move the triple valve to release position, and in ordinary service the brakes would be fully released. In the present case, however, the brakes would still be held under a pressure of twenty pounds, more or less, and leakage is also likely to occur in a plain triple from the four-way cock or from faulty piston-packing; but in all cases where there is a tendency to accidentally release the brakes after being set the device forming the subject of the present invention will still hold the brakes under the previously-determined pressure.

In Figs. 5 and 6 is illustrated a slight modification of the invention wherein the piston 12′ is subjected to air-pressure on both sides. In this case the casing 10′ carries at one end a cylinder 11′ in communication on one side with the train-pipe and on the opposite side with the casing 10′. The brake-cylinder exhaust-pipe 17′ communicates directly with the interior of the casing, and when the triple valve is moved to exhaust position the air flowing through the pipe 17′ will exert some pressure on that face of the piston opposite to the face exposed to train-pipe pressure. In the casing is a port 20′, communicating with a casing 21′, that contains a retaining-valve 22′, that may be adjusted in order to open at twenty pounds, more or less, as desired, and the brake-cylinder cannot reduce below this pressure when the parts are in normal position. In the casing is a port 19′, that is normally closed by a valve 24′, carried by and moving with the piston 12′. This valve is of such construction as to permit the free passage of air between the casing and the cylinder, and in its under side is a port 40, which may at times assume the position shown in Fig. 5. When it is desired to fully release the brakes, the engineer's brake-valve is moved to full-release position and the piston 12′ moves to the position shown in Fig. 6, thus uncovering the port 19′ and permitting the brake-cylinder to exhaust to the atmosphere.

The device is of especial value in case of leakage of the auxiliary reservoir, where a triple valve always moves to release position under the train-pipe pressure. Under ordinary circumstances this would immediately release the brakes; but in the present case the brakes will still be held under the previously-determined pressure.

Having thus described the invention, what is claimed is—

1. In air-brake mechanism, a cylinder, one side of which is connected to the train-pipe, a piston arranged in the cylinder and exposed to train-pipe pressure, a valve-casing connected to the cylinder at that side opposite the train-pipe connection, and having ports, one of which is in communication with the exhaust-port of the triple valve, and another with the outer air, a valve normally closing the latter port, a pressure-retaining valve connected to the casing and normally in free communication with the interior thereof, and with the port leading from the exhaust-port of the triple valve, a valve arranged in the casing, a spring also arranged in the casing and acting to prevent any movement of the piston under ordinary train-pipe pressure, said spring also maintaining the valve in a position to prevent communication between the interior of the casing and the outer air.

2. In air-brake systems, a valve for controlling the exhaust of air from the brake-cylinder, a piston connected to said valve, a casing in which said piston is contained, said cylin-

der being connected to the train-pipe, and a check-valve arranged in the train-pipe connection and opening in the direction of the cylinder, there being a leakage-port for permitting gradual reduction of pressure between the check-valve and the cylinder.

In testimony that I claim the foregoing as my own I have hereto affixed my signature in the presence of two witnesses.

DAVID F. SNYDER.

Witnesses:
JOS. C. SMITH,
EMORY H. BAGLEY.