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ENGINEER'S VALVE.

APPLICATION FILED APR. 12, 1909.

959,802.

Patented May 31, 1910.

2 SHEETS—SHEET 1.

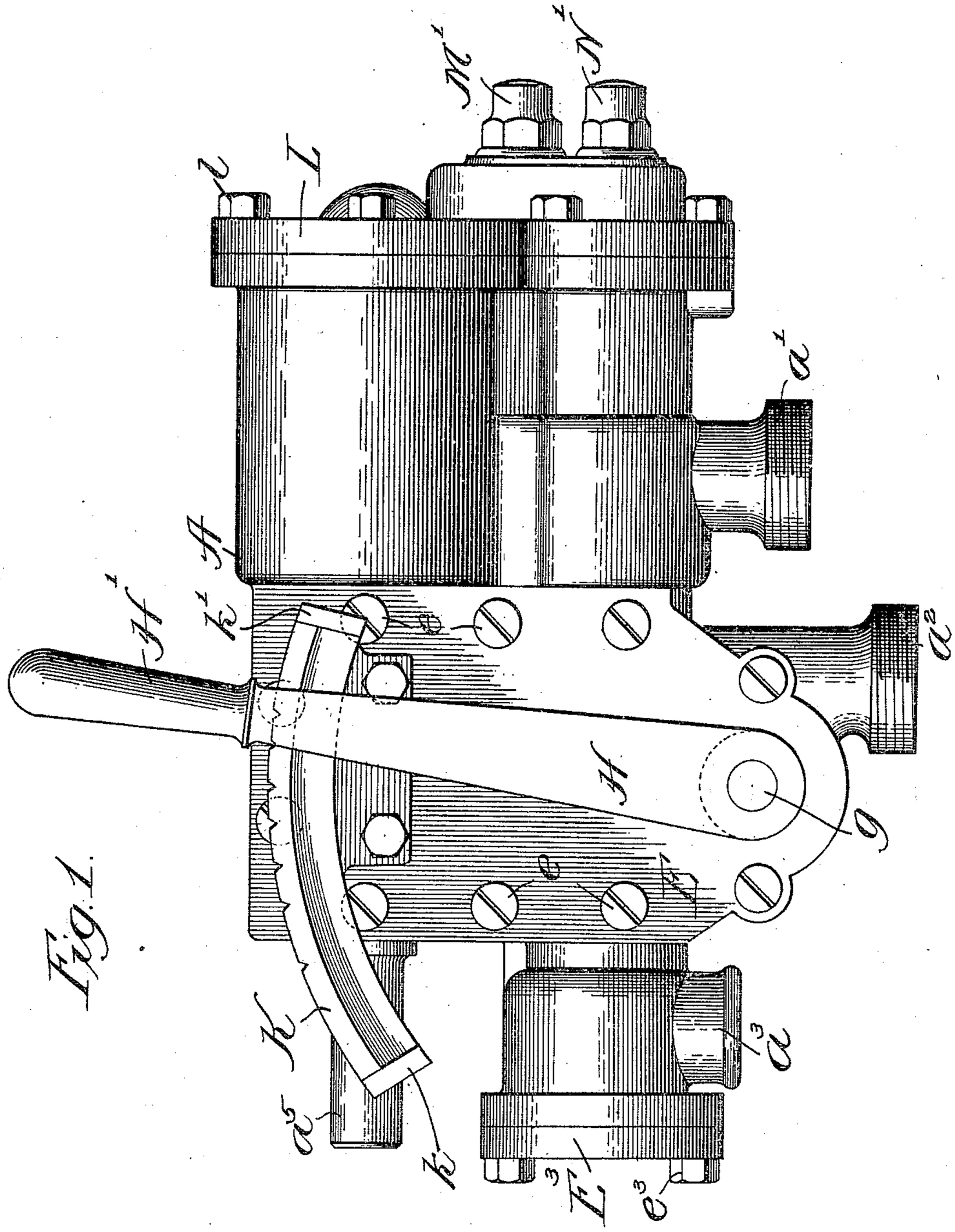

Fig. 1.

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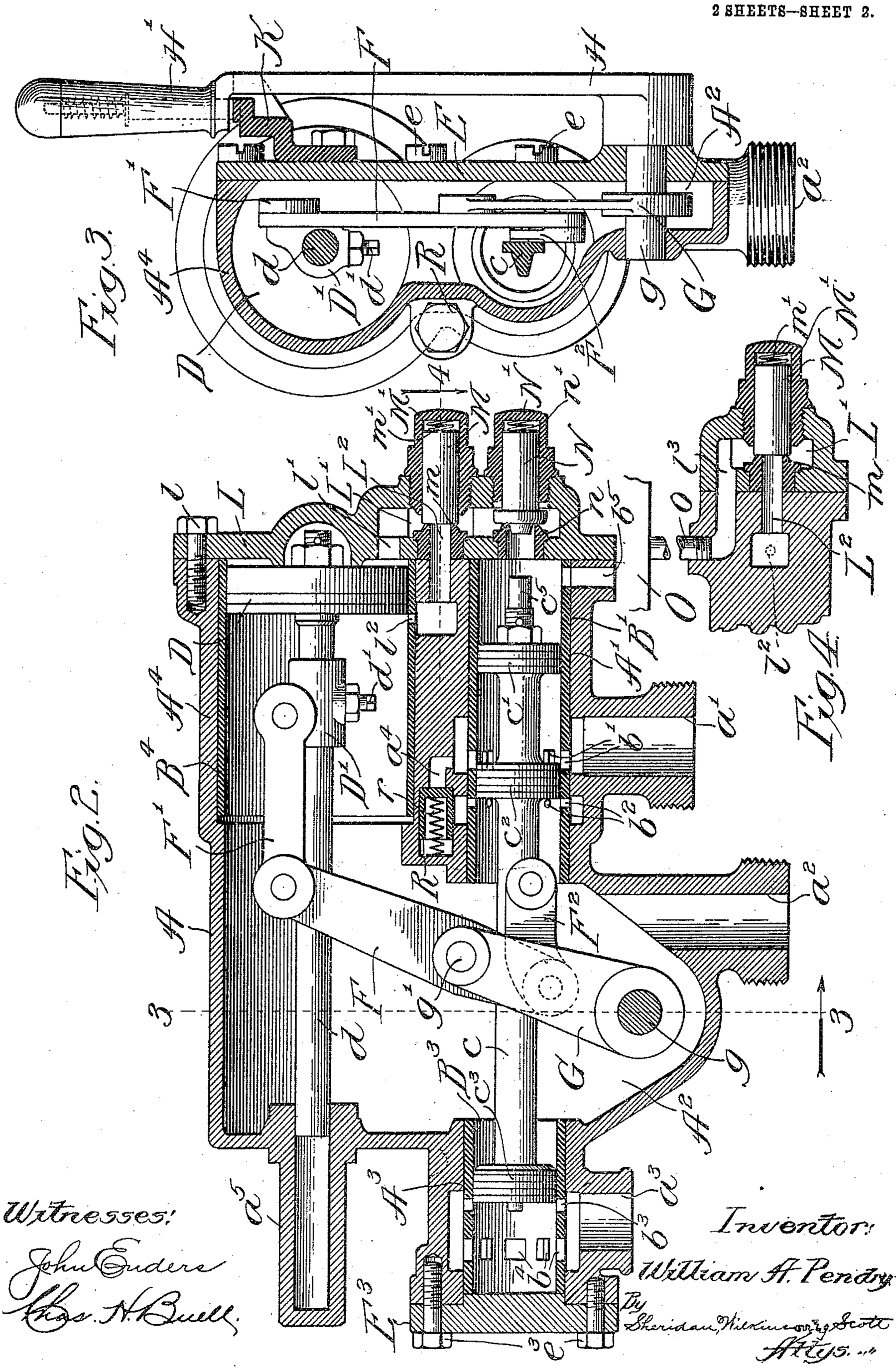

UNITED STATES PATENT OFFICE.

WILLIAM A. PENDRY, OF DETROIT, MICHIGAN.

ENGINEER'S VALVE.

959,802. Specification of Letters Patent. **Patented May 31, 1910.**

Application filed April 12, 1909. Serial No. 489,423.

To all whom it may concern:

Be it known that I, WILLIAM A. PENDRY, a citizen of the United States, residing at Detroit, in the county of Wayne and State of Michigan, have invented certain new and useful Improvements in Engineers' Valves, of which the following is a specification.

My invention relates in general to automatic air brakes, and more particularly to improvements in engineers' valves.

The primary object of my invention is to provide an improved engineer's valve which may be quickly and easily moved into its several positions to admit air from the main reservoir to the train pipe for releasing the brakes and for maintaining the normal running pressure, and also for exhausting pressure from the train pipe for service and emergency application of the brakes; which will automatically discontinue the exhaust of train pipe pressure in service applications after a predetermined quantity of compressed air has been discharged; which will comprise piston and puppet valves, thereby obviating the wear incident to slide valves; and in which the parts of the valve mechanism may be readily accessible and may be easily assembled and disassembled.

A further object of my invention is to provide an improved engineer's valve in which the train pipe will be in free communication with a chamber containing the operating means for the valve and in open communication with the valve cylinders and cylinder for the balancing piston, so that the valve mechanism will be compact and at the same time as free as possible from leakage.

A further object of my invention is to provide an improved engineer's valve which will be simple in construction, comparatively economical in manufacture, and efficient in operation.

My invention will be more fully described hereinafter with reference to the accompanying drawings, in which the same is illustrated as embodied in a convenient and practical form, and in which—

Figure 1 is a side elevational view; Fig. 2, a vertical longitudinal section; Fig. 3, a cross section on line 3, 3, Fig. 2; and Fig. 4, a detail section on line 4, Fig. 2.

The same reference characters are used to designate the same parts in the several figures of the drawings.

Reference character A designates the casing in which the valve mechanism is located and which is mainly formed of an integral casting having therein valve cylinders A′ and A^3, a chamber A^2 in free communication with the train pipe, and a balancing piston cylinder A^4. The casing is provided with a coupling a' which is adapted to be connected with the main reservoir and which communicates with the valve cylinder A′. A second coupling a^2 is adapted to be connected with the train pipe and communicates with the train pipe chamber A^2. The valve cylinder A^3 is provided with an exhaust outlet a^3.

Located in the valve cylinder A′ is a bushing B′ having a series of ports b' extending therethrough and communicating with an annular passage surrounding the bushing and with which the coupling a' communicates. A second circular series of ports b^2 extend through the bushing B′ and communicate with an annular passage surrounding the bushing. Located in a small cylinder, which communicates with the annular passage around the ports b^2, is a reducing valve R provided with a spring r which normally seats the valve against the end of a passage a^4 leading from the annular passage around the circular series of ports b'.

A bushing B^3 is located in the valve cylinder A^3, and is provided with two circular series of ports b^3 and b^4 which extend through the bushing and communicate with a surrounding annular passage from which the exhaust opening a^3 extends.

Mounted to reciprocate within the bushing B′ is a piston valve comprising two pistons c' and c^2 which are connected by means of a piston rod c with a piston valve c^3 located within the bushing B^3.

A balancing piston D is located within the cylinder A^4 and is connected to a piston rod d which extends through the train pipe chamber A^2 and into a tubular guide a^5 projecting from the end of the casing A. A collar D′ surrounds the piston rod d and is secured thereto in any suitable manner, as by means of a clamp screw d'. A link F′ is

pivotally connected at one end of the collar D′ and at its other end pivotally connected to the upper end of a floating lever F. The lower end of the floating lever F is pivotally connected to one end of a link F^2, the opposite end of such link being pivotally connected to the rod *c* of the piston valves.

A short rock shaft *g* extends transversely through the bottom of the chamber A^2, one end being supported in the adjacent wall of the casing A, while its opposite end is supported in the plate E which closes the chamber A^2, such plate E being secured to the casing A in any suitable manner, as by means of screws *e*. A crank arm G is fixed upon the rock shaft *g* and is pivotally connected to the floating lever F intermediate of its ends, as indicated at *g′*. The end of the rock shaft *g* which projects through the plate E has fixed thereon an operating lever H provided with a handle to permit it to be manually operated. The lever H is provided with a spring actuated detent H′ which engages notches formed in a sector K fixed upon the plate E and relatively to which the lever H moves in operating the piston valves.

L indicates an end plate of the casing which serves as a head for the piston cylinder A^4 and as a head for the piston valve cylinder A′. A passage L′ is provided in the head L and communicates through a port *l′* with the end of the cylinder A^4. A passage L^2 extends from the passage L′ a short distance between the valve cylinder A′ and piston cylinder A^4, such passage L^2 communicating with the interior of the cylinder A^4 through a port l^2 in the bushing B^4 within the cylinder. The port l^2 is spaced from the end of the cylinder a distance slightly greater than the width of the piston D. A valve seat *m* is located in alinement with the passage L^2 and is supported in the adjacent wall of the head L.

A valve M is mounted to reciprocate in a cap M′ removably secured within the outer wall of the passage L′. A spring *m′* is interposed between the valve M and the surrounding cap, the tension of which normally retains the valve M in contact with the seat *m*. A circular valve seat *n* extends through the head of the piston valve cylinder A′ and projects into the passage L′. A valve N is supported within a cap N′ removably supported in the outer wall of the passage L′, a spring *n′* being interposed between the valve and outer end of the cap for normally retaining the valve in contact with the seat *n*. A stud c^5 is supported by the end of the piston valve in alinement with the valve N which is adapted to unseat such valve when the valve mechanism is thrown into an extreme release position. An exhaust port b^5 extends from the end of the piston valve cylinder A′ adjacent the cylinder head L. A port l^3 extends from the passage L′ and communicates with a conduit *o* leading to a supplemental reservoir O.

The operation of my improved engineer's valve is as follows:

Running position.—When the parts are in the position shown in Fig. 2, the valve is in "running" position, in which the main reservoir is connected through the annular passage around the ports *b′*, the passage a^4, reducing valve R, and ports b^2 with the train pipe chamber A^2, and thence directly with the train pipe through the coupling a^2. The pressure in the train pipe is consequently reduced below that in the main reservoir to an extent corresponding to the reducing valve R. The piston valve c^3 occupies a position intermediate of the train pipe chamber and exhaust ports in this position of the valve.

Service application.—In order to effect a service application of the brakes, the hand lever H is moved toward the left in Fig. 1, thereby oscillating the shaft *g* and rocking the crank arm G thereon. This movement of the crank arm is transmitted to the floating lever F, and as the upper end of such floating lever is held immovable by reason of the pressure to which the balancing piston D is exposed, the lever oscillates about its upper end as a fulcrum, thereby moving the valve rod *c* toward the left through the medium of the connecting link F^2. This movement of the valve rod moves the piston valve c^2 so as to cut off the communication between the ports b^2 and the train pipe, and coincidentally moves the piston valve c^3 to a position in which the ports b^3 are uncovered. Train pipe pressure then passes from the chamber A^2 through the ports b^3 to the atmosphere until the reduction thereof is such that the pressure of the supplemental reservoir acting upon the outer surface of the piston D moves the latter against the reduced train pipe pressure toward the left. This movement of the piston D oscillates the floating lever F about its pivotal connection *g′* with the crank arm G, thereby moving the piston valves toward the right, so that the piston valve c^3 covers the ports b^3 cutting off further discharge of train pipe pressure, such movement of the valves being insufficient, however, for the valve c^2 to uncover the ports b^2. In order to apply the brakes with greater force, the hand lever is moved toward the left another notch, thereby moving the piston valve c^3 sufficiently to uncover the exhaust ports b^3 which remain uncovered until the additional reduction in train pipe pressure is such that the expansion of the pressure in the supplemental reservoir will move the piston D toward the left, and thereby again move the valve c^3 to close the exhaust ports b^3. The hand lever may be moved toward the left a number of times to effect a succession of reductions in train pipe

pressure, the necessary movement of the hand lever being indicated by the notches in the segment K. The capacity of the supplemental reservoir is of such a size that the expansion of the air therein will exert a sufficient pressure on the outer surface of the piston D to move the same against a predetermined reduction in the train pipe pressure to which the inner surface of the piston D is exposed. After each movement of the hand lever, the valve c^3 remains open until the predetermined reduction in train pipe pressure has been effected, after which the preponderance of pressure to which the outer surface of the piston D is exposed from the supplemental reservoir will move the piston D toward the left and thereby cause the piston valve c^3 to close the exhaust ports b^3.

Emergency application.—For an emergency application of the brakes, the hand lever is moved toward the left until it engages the stop k at the end of the segment K and held in such position. This movement of the hand lever moves the valve c^3 to the left of the series of ports b^4, through the medium of the rock shaft g, crank arm G, floating lever F, link F^2 and valve rod c. Train pipe pressure then quickly exhausts to the atmosphere from the chamber A^2 through the ports b^4. The position of the piston valve c' relatively to the ports b' is such that when the piston valve c^3 occupies a position to the left of the ports b^4, the valve c' will still occupy a position intermediate of the ports b' and the exhaust port b^5, thereby preventing waste of pressure from the main reservoir.

Release position.—In order to release the brakes either after a service or emergency application, the hand lever H is moved toward the right in Fig. 1, until it engages the stop k' at the end of the segment K. This return of the hand lever reciprocates the valve rod c toward the right, through the intermediate connections, until the pin c^5 engages and unseats the valve N, whereupon pressure is exhausted from the supplemental reservoir through the passage L', valve seat n' and exhaust port b^5. The pressure to which the outer surface of the piston D is exposed is consequently reduced, while the pressure to which its inner surface is exposed is increased, by reason of the free passage of main reservoir pressure through the ports b' into the chamber A^2. The piston D is consequently quickly moved to its normal position at the right-hand end of the cylinder A^4, during which the piston rod is automatically moved sufficiently toward the left to permit the check valve N to close, thereby discontinuing any further exhaust of pressure from the supplemental reservoir. After the pressure from the main reservoir has passed directly through the ports b' to the train pipe chamber A^2 and thence to the train pipe, long enough to release the brakes, the hand lever is moved toward the left a distance sufficient to move the piston valve c^2 from a position at the right of the ports b' to a position intermediate of the ports b' and b^2,—as shown in Fig. 2—thereby connecting the train pipe with the main reservoir through the reducing valve only.

From the foregoing description, it will be observed that I have invented an improved engineer's valve, in which the train pipe is in free communication with a chamber in the valve casing, in which the valve operating means are located, and with which the valve chambers and balancing piston cylinder are in direct communication.

It will be further observed that I have invented an improved engineer's valve which is exceedingly simple in construction; which comprises parts which are subjected to little wear and are readily accessible; which may be operated with little hand power; and which may be quickly moved to the several positions necessary to control the brakes.

While I have illustrated and described my invention with more or less detail, yet it is to be understood that I do not consider that my invention is restricted to any specific embodiment, but may be expressed in any physical forms coming within the terms of my claims.

I claim:

1. In an engineer's valve, the combination with a casing comprising a chamber in communication with the train pipe, of rigidly connected piston valves for controlling the connection of said chamber with the main reservoir and with the exhaust, and means for actuating said piston valves located in said chamber.

2. In an engineer's valve, the combination with a casing comprising a chamber in communication with the train pipe, of valve cylinders communicating with said chamber, valve mechanism within said cylinders for controlling the connection of said chamber with the main reservoir and with the exhaust, manually operated means for actuating said valve mechanism to connect said chamber with the exhaust, and means located within said chamber for automatically actuating said valve mechanism to discontinue the exhaust of train pipe pressure after a predetermined reduction thereof.

3. In an engineer's valve, the combination with a casing comprising a chamber in communication with the train pipe, of rigidly connected piston valves for controlling the connection of said chamber with the main reservoir and exhaust, a cylinder in free communication with said chamber, a piston in said cylinder exposed on one side to the pressure in said chamber, means for exposing the opposite side of said piston to a

balancing pressure, and means located in said chamber connecting said piston and piston valves for automatically discontinuing the exhaust of train pipe pressure after a predetermined reduction thereof.

4. In an engineer's valve, the combination with a casing comprising a chamber in communication with the train pipe, of alined valve cylinders formed in said casing on opposite sides of and in communication with said chamber, one of said valve cylinders communicating with the main reservoir and the other of said valve cylinders communicating with the exhaust, rigidly connected piston valves in said valve cylinders controlling the connection of said chamber with the main reservoir and exhaust, and mechanism located in said chamber for automatically actuating said valves to discontinue the exhaust of train pipe pressure upon a predetermined reduction thereof.

5. In an engineer's valve, the combination with a casing comprising a chamber in communication with the train pipe, of valve mechanism for controlling the connection of said chamber with the main reservoir and exhaust, a cylinder in free communication with said chamber, a piston in said cylinder exposed on one side to the train pipe pressure, a supplemental reservoir to pressure from which the opposite side of said piston is exposed, means for charging said supplemental reservoir from said chamber, manually operated means for actuating said valve mechanism to connect said chamber with the exhaust, and means located in said chamber operatively connecting said piston and valve mechanism for automatically discontinuing the exhaust of pressure from said cylinder after a predetermined reduction of the pressure therein.

6. In an engineer's valve, the combination with a casing comprising a chamber in communication with the train pipe, of valve mechanism for controlling the connection of said chamber with the main reservoir and exhaust, a cylinder in communication with said chamber, a piston in said cylinder exposed on one side to the pressure in said chamber, means for exposing the opposite side of said piston to a balancing pressure, a floating lever located in said chamber and pivotally connected at its opposite ends to said piston and to said valve mechanism, and manually operated means connected to said lever intermediate of its ends for oscillating the same about its pivotal connection with said piston as a fulcrum, such floating lever being oscillated in an opposite direction upon a predetermined reduction of pressure in said chamber to actuate said valve mechanism to discontinue the exhaust of train pipe pressure.

7. In an engineer's valve, the combination with a casing comprising a chamber in communication with the train pipe, of valve mechanism for controlling the connection of said chamber with the main reservoir and exhaust, a cylinder in communication with said chamber, a piston in said cylinder exposed on one side to the pressure in said chamber, means for exposing the opposite side of said piston to a balancing pressure, a floating lever located in said chamber and pivotally connected at its opposite ends to said piston and to said valve mechanism, a rock shaft extending through said chamber, a crank arm fixed to said shaft and pivotally connected to said floating lever intermediate of its ends, and manually operated means for oscillating said rock shaft.

8. In an engineer's valve, the combination with a valve chamber in said casing communicating with the main reservoir and train pipe, a second valve chamber in said casing communicating with the train pipe and with an exhaust port, valves in said chambers, means operatively connecting said valves for moving them simultaneously either to connect the train pipe with the main reservoir and disconnect the train pipe from the exhaust or to disconnect the train pipe from the main reservoir and connect the train pipe with the exhaust, and actuating means located intermediate of and operatively connecting said valves.

9. In an engineer's valve, the combination with a casing comprising a chamber in communication with the train pipe, of valve cylinders located on opposite sides of and communicating with said chamber, piston valves located in said valve cylinders for controlling the connection of said chamber with the main reservoir and exhaust, a rod intermediate of and rigidly connected to said piston valves, a cylinder formed in said casing and communicating at one end with said chamber, a piston in said latter cylinder exposed on one side to pressure in said chamber, a supplemental reservoir to pressure from which the opposite side of said piston is exposed, means for charging said supplemental reservoir from said chamber, and mechanism located in said chamber operatively connecting said piston and valve rod, whereby upon a predetermined reduction of pressure in said chamber said valves will be actuated to close communication between said chamber and the exhaust.

In testimony whereof, I have subscribed my name.

WILLIAM A. PENDRY.

Witnesses:
GEO. L. WILKINSON,
ANNA L. WALTON.