W. A. PENDRY.

ENGINEER'S VALVE.

APPLICATION FILED APR. 12, 1909.

959,799. Patented May 31, 1910.

2 SHEETS—SHEET 1.

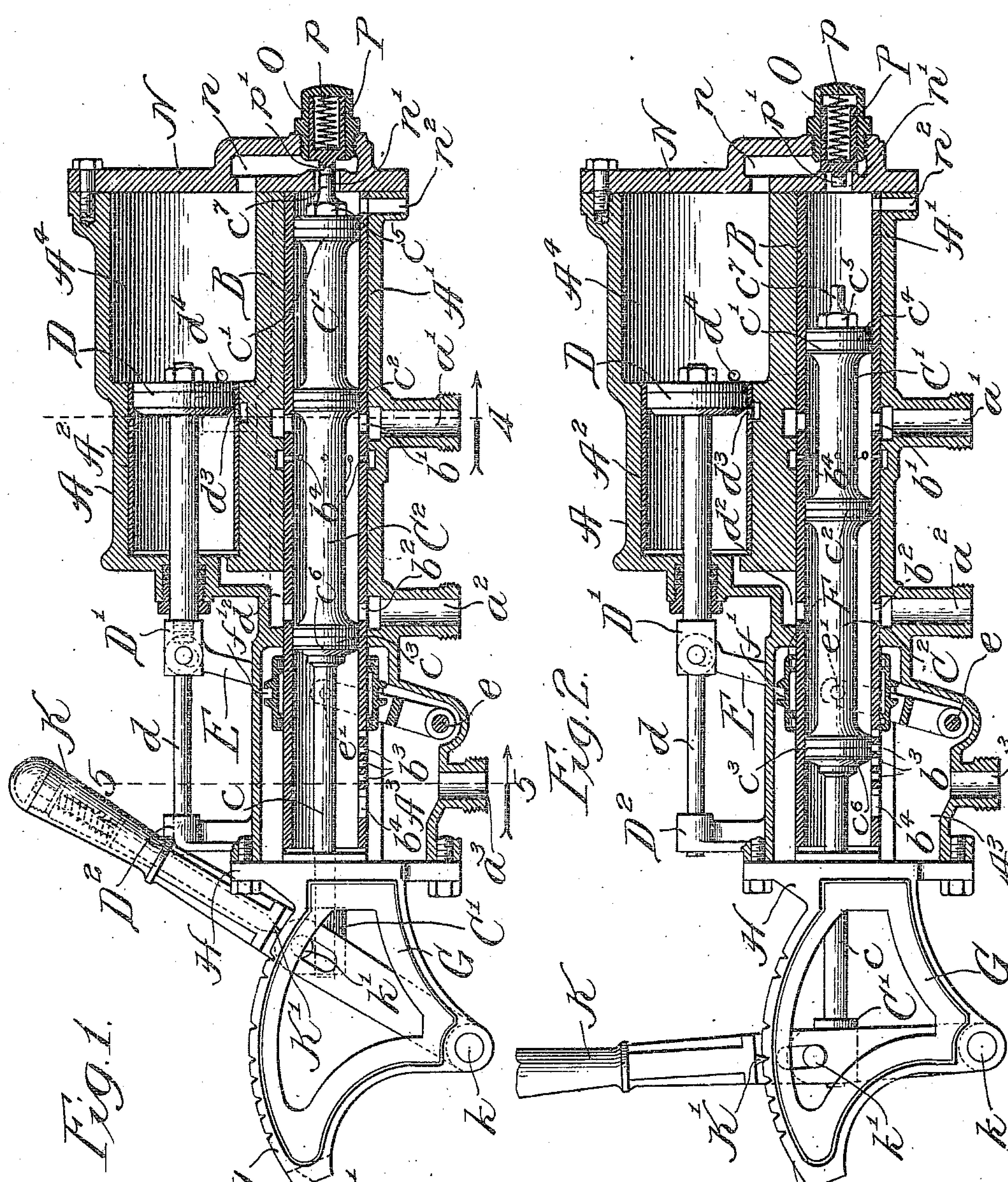

Fig. 1. Fig. 2.

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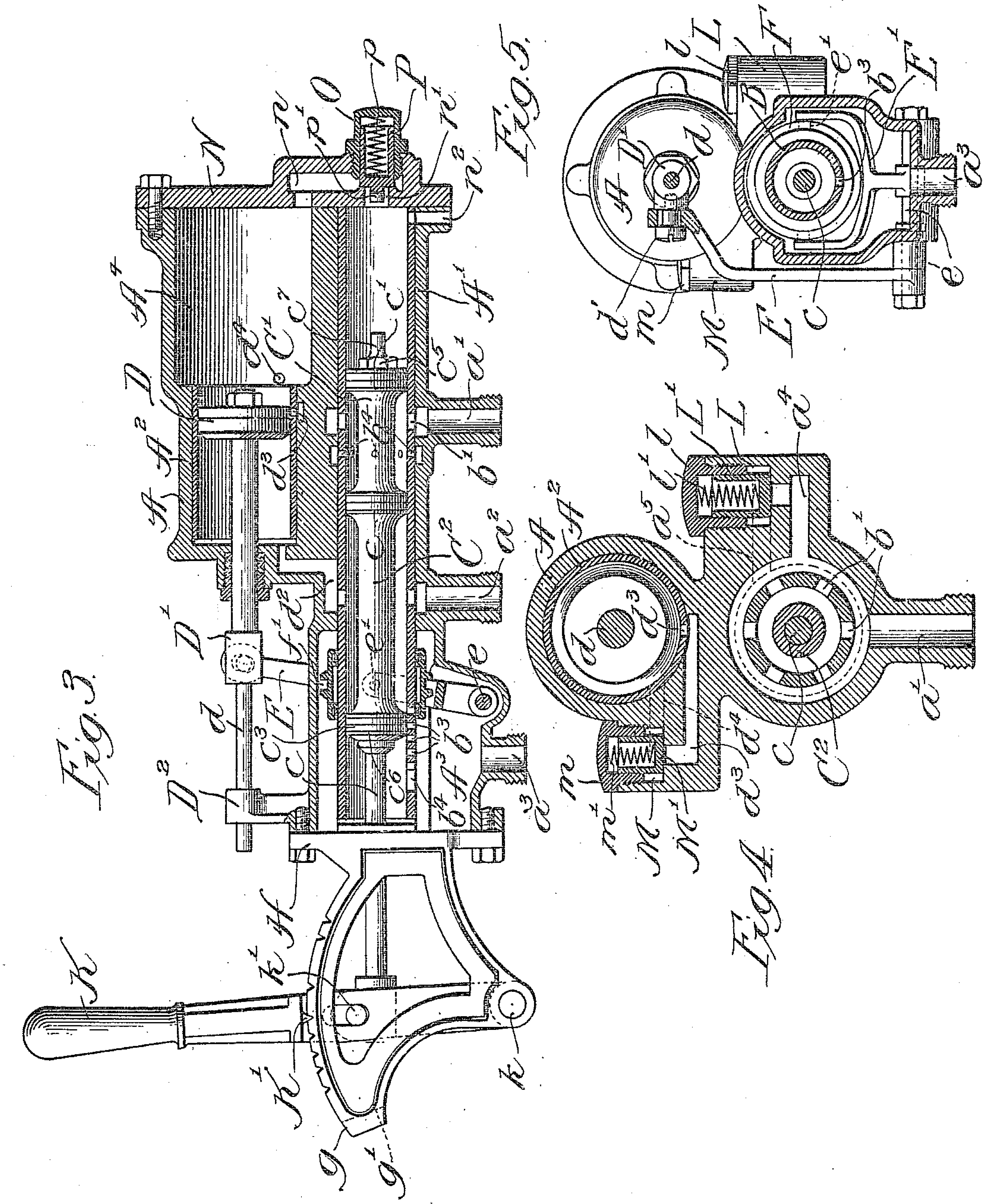

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UNITED STATES PATENT OFFICE.

WILLIAM A. PENDRY, OF DETROIT, MICHIGAN.

ENGINEER'S VALVE.

959,799. Specification of Letters Patent. Patented May 31, 1910.

Application filed April 12, 1909. Serial No. 489,420.

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 control the admission of compressed air from the main reservoir to the train pipe and the exhaust of compressed air from the train pipe; which will automatically discontinue the exhaust of train pipe pressure in service applications after a predetermined reduction of pressure; which will comprise piston and puppet valves, thereby avoiding the wear incident to slide valves; which will be compact so as to occupy little space in the engine cab; and in which the parts of the valve mechanism may be accessible.

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

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 central longitudinal section, showing the parts of the valve mechanism in the extreme position to which they are initially moved in releasing the brakes; Fig. 2, a view similar to Fig. 1, showing the valve mechanism in position for service application of the brakes; Fig. 3, a view similar to Fig. 2, showing the valve mechanism in the position which the parts assume after a reduction in train pipe pressure for service application; Fig. 4, a transverse section on line 4, Fig. 1; and Fig. 5, a transverse section on line 5, Fig. 1.

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

Reference letter A indicates the casing in which the valve mechanism is located, and which is preferably formed of an integral casting having formed therein a valve cylinder A′, a piston cylinder A^2, an exhaust chamber A^3, and a small reservoir A^4. The casing A is provided with couplings a', a^2 and a^3 which communicate with conduits leading to the main reservoir, the train pipe, and the atmosphere, respectively. Located within the valve cylinder A′ and extending longitudinally through the exhaust chamber A^3 is a bushing B provided with circular series of ports b' and b^2 which communicate with annular passages surrounding the bushing and in which terminate the conduits extending through the respective couplings a' and a^2. The portion of the bushing within the exhaust chamber A^3 is provided with a longitudinal series of ports b^3 through which train pipe air is adapted to be successively exhausted for service applications of the brakes, and with a larger port b^4 for exhausting train pipe pressure in emergency applications of the brakes.

Mounted to reciprocate within the bushing B is a balanced piston valve C consisting of a series of pistons c', c^2 and c^3. The piston valve C may be conveniently formed by placing two spools C′ and C^2 upon the piston rod c, the adjacent heads of the spools having suitable packing interposed between them to form the intermediate piston c^2, while the right end piston c' is formed by inserting suitable packing between the adjacent head of the spool C′ and a disk c^4 which is retained in position upon the end of the piston c by a nut c^5. The left piston c^3 is formed by inserting packing between the adjacent head of the spool C^2 and a disk c^6 which surrounds the piston rod c and engages a shoulder thereon.

D indicates a piston mounted to reciprocate within the cylinder A^2 and with which is connected a piston rod d extending through the cylinder head and supported by a guide bracket D^2 mounted upon the end of the exhaust chamber A^3. A collar D′ is secured around the piston rod d outside of the cylinder A^2. A stud d' projects from one side of the collar D′ and extends through an elongated slot in the upper end of a lever E. A bifurcated lever E′ straddles the bushing B. Both of the levers E and E′ are fixed at their lower ends upon a rock shaft e journaled in the bottom of the exhaust chamber A^3. The arms of the lever E′ are provided with inwardly extending studs e' at opposite sides of the bushing which engage within an annular groove f' formed in the outer surface of a cylindrical valve F, the latter surrounding the portion of the bushing B which extends within the exhaust chamber A^3.

The end of the rod c of the piston valve is provided with a collar C′ which is pivotally connected with a hand lever K in any suitable manner, as by means of a stud k' on the collar C′ which projects through an elongated slot in the lever. The lower end of the lever is pivotally supported at k upon a bracket G, the latter being preferably formed integrally with the head H of the exhaust chamber A^3. The bracket G carries a sector g provided with notches in the upper curved surface thereof which are adapted to be engaged by a spring actuated detent K′ carried by the lever K.

A circular series of ports b^4 extend through the bushing B at a distance from the ports b' slightly greater than the width of the piston c^2. The ports b^4 communicate with a surrounding annular passage from which extends a short passage a^5 to a reducing valve cylinder L, as shown in detail in Fig. 4. The cylinder L is provided with a cap l within which is located a reducing valve L′, a spring l' being interposed between the valve and the cap l. The spring l' tends to seat the valve L against a port communicating with a passage a^4 leading from the annular passageway around the ports b'. A passage d^2 leads from the annular passage around the ports b^2 to the end of the piston cylinder A^2. A passage d^3 communicates at one end with the interior of the cylinder A^2 at a point adjacent the inner end of the cylinder, such passage d^3 leading to a check valve chamber M.

m indicates a cap for the chamber M in which is guided a check valve M′, a spring m' being interposed between the valve and the cap m, the tension of which tends to seat the valve against and close the adjacent end of the passage d^3. A passage d^4 extends from the check valve chamber M to the interior of the reservoir A^4.

N indicates the end of the casing A which also serves as a cylinder head for both the cylinder A′ and the reservoir A^4. A passage n is formed in the head N and extends from the reservoir A^4 to a port n' leading to the adjacent end of the valve cylinder A′. n^2 is an exhaust port leading to the atmosphere from the same end of the cylinder A′. Surrounding the port n' is a valve seat which is engaged by a valve P mounted in a cylinder O, the latter extending through and being supported by the exterior wall of the passage n. A spring p is interposed between the valve P and the cylinder O, the tension of which forces the valve against the seat around the port n'. A stud p' projects from the end of the valve P and is engaged by a stud c^7 on the end of the piston valve C.

The operation of my improved valve is as follows: In order that the position which the parts of the valve mechanism occupy when in normal release position may be understood, it should be assumed that the hand lever has been moved toward the left from the position shown in Fig. 1 until the detent has engaged the first notch in the sector g, as such movement of the hand lever permits the valve P to close the port n'. The movement of the piston valve incident to such movement of the hand lever is not sufficient to cover the ports b' by the piston c^2. In this assumed position of the valve mechanism, the main reservoir is directly connected with the train pipe to release the brakes and recharge the auxiliary reservoirs. The main reservoir pressure passes through the coupling a' into the annular passageway with which such coupling communicates, thence through the ports b' to the interior of the bushing B between the pistons c^2 and c^3, thence through the series of ports b^2 and surrounding air belt to the coupling a^2, and thence to the train pipe. The flow of pressure to the main reservoir also passes through the passage d^2 to the interior of the cylinder A^2, thereby forcing the piston D toward the right and then exposing the passage d^3, so that the pressure unseats the check valve M′ and passes to the passage d^4 and to the reservoir A^4. In this position of the valve mechanism, the valve c^3 occupies a position between the ports b^2 and the exhaust ports b^3 so as to prevent the escape of pressure to the atmosphere. After the brakes have been released and the auxiliary reservoirs on the cars of a train recharged, the hand lever F is moved toward the left until the detent engages the second notch. This movement of the lever moves the piston valve so that the piston c^2 occupies a position intermediate of the series of ports b' and b^4. In this position of the valve the main reservoir pressure passes through the ports b', passage a^4 to the reducing valve L, unseating the latter and passing through the passage a^5 and ports b^4 to the space within the bushing B between the pistons c^2 and c^3, the pressure then passing through the ports b^2 to the train pipe. The main reservoir pressure is consequently reduced by the valve L to the normal train pipe pressure.

When it is desired to make a service application of the brakes, the hand lever is moved toward the left to the position shown in Fig. 2. This movement of the lever moves the valve toward the left so that the piston c^2 interrupts the connection between the main reservoir and train pipe, while the piston c^3 uncovers the first of the exhaust ports b^3. The train pipe air then passes through the ports b^2 to the interior of the bushing, thence through the uncovered port b^3 to the exhaust chamber A^3, and thence through the coupling a^3 to the atmosphere. As the piston cylinder A^2 forms in effect a part of the train pipe, owing to its connection through the passageway d^2 with the annular passageway with which the coupling a^2 communicates, the pressure in the cylinder A^2 is reduced coincidently with, and to the same degree as, the reduction in the train pipe pressure. The excess pressure in the reservoir A^4 consequently moves the piston D to the left, thereby rocking the bifurcated lever E′ and moving the cylindrical valve F to the position shown in Fig. 3, in which it covers the exhaust port b^3 which has been previously uncovered by the piston c^3. The exhaust of pressure from the train pipe is, therefore, discontinued. In order to apply the brakes with greater power, the hand lever K is moved another notch toward the left, thereby moving the piston valve to a position to uncover the second exhaust port b^3. A further exhaust of train pipe pressure then occurs until the reduction in the pressure is such that the excess pressure in the reservoir A^4 moves the piston D still farther toward the left, thereby moving the cylindrical valve F into position to close the second exhaust port b^3. The brakes may be applied with gradual increasing pressure by moving the hand lever step by step toward the left, thereby successively uncovering the several ports b^3, the ports b^3 being successively closed after the successive reductions in train pipe pressure.

It will, of course, be understood that the area of the piston D and the size of the reservoir A^4 are so related that a predetermined reduction in train pipe pressure will occur after each port b^3 is uncovered before the piston D will be moved to the left to discontinue the exhaust of train pipe pressure by closing the uncovered port through the medium of the cylindrical valve F.

In order to make an emergency application of the brakes, the hand lever F is moved to the extreme left into engagement with the stop g' at the end of the sector g. Such movement of the hand lever moves the piston valve to the extreme left so that the piston c^3 uncovers the large exhaust port b^4 in the bushing. The train pipe pressure is quickly and continually reduced inasmuch as the movement of the piston D to its extreme left hand position is insufficient to close the port b^4 by the cylindrical valve F.

In order to release the brakes after either service or emergency application, the hand lever is moved to the extreme right-hand position shown in Fig. 1, thereby also moving the valve C so far to the right that the stud c^7 on the end thereof engages the stud p' upon the valve P and lifts the valve from its seat. The pressure then passes from the reservoir A^4 through the passage n, port n' and exhaust port n^2, to the atmosphere, and is quickly lowered so that the piston D will be moved to its extreme right-hand position by the main reservoir pressure passing into the piston cylinder A^2. The hand lever is held in the extreme position shown in Fig. 1 only momentarily and then moved toward the left until its detent engages the first notch in the sector, thereby permitting the valve P to seat and discontinue the exhaust of pressure from the reservoir A^4.

From the foregoing description, it will be observed that my improved engineer's valve is exceedingly compact, especially as it is so constructed as to permit the balancing reservoir A^4 to be formed in the valve casing instead of requiring such reservoir to be made separate from the casing and to be connected therewith by a conduit. 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 cylindrical valve chamber having ports communicating with the train pipe and exhaust, of a piston valve controlling said ports to exhaust train pipe pressure, and means for automatically closing the exhaust port after a predetermined reduction in train pipe pressure.

2. In an engineer's valve, the combination with a cylindrical valve chamber communicating with the train pipe and having a series of exhaust ports, of a piston valve for connecting the train pipe successively with the several exhaust ports, and means for automatically successively covering the several exhaust ports after predetermined reductions in train pipe pressure.

3. In an engineer's valve, the combination with a valve chamber communicating with the train pipe and having a series of exhaust ports, of a valve for connecting the train pipe successively with the several exhaust ports, a cut-off valve located exterior to said chamber for closing the exhaust ports, and means operatively connected to said cut-off valve for automatically moving

the same to successively cover the several exhaust ports after predetermined reductions in train pipe pressure.

4. In an engineer's valve, the combination with a cylindrical valve chamber communicating with the train pipe and having an exhaust port, of a piston valve in said chamber for connecting the train pipe with the exhaust port, an annular valve surrounding the valve chamber for closing the exhaust port, and means operatively connected to said annular valve automatically actuated upon a predetermined reduction in train pipe pressure to move said valve into position to close the exhaust port.

5. In an engineer's valve, the combination with a cylindrical valve chamber communicating with the train pipe and having a series of exhaust ports, of a piston valve in said chamber for connecting the train pipe successively with the several exhaust ports, an annular valve surrounding said chamber controlling the exhaust ports, and means for automatically actuating said annular valve to successively close the several exhaust ports.

6. In an engineer's valve, the combination with a valve chamber communicating with the train pipe and having an exhaust port, of a valve in said chamber for connecting the train pipe with the exhaust port, a cut-off valve for closing the exhaust port, a piston exposed to train pipe pressure on one side and to a balancing pressure on its other side, and means operatively connecting said piston and cut-off valve for moving the latter into position to close said exhaust port after a predetermined reduction in train pipe pressure.

7. In an engineer's valve, the combination with a valve chamber communicating with the train pipe and having an exhaust port, of a valve in said chamber for connecting the train pipe with the exhaust port, a cut-off valve for closing the exhaust port, a piston exposed to train pipe pressure on one side, a supplemental reservoir to which the opposite side of said piston is exposed, means for charging said reservoir from the train pipe, and means operatively connecting said piston and cut-off valve for moving the latter into position to close said exhaust port after a predetermined reduction in train pipe pressure.

8. In an engineer's valve, the combination with a cylindrical valve chamber having ports communicating with the train pipe and exhaust, of a piston valve in said chamber controlling said ports to exhaust train pipe pressure, means for actuating said valve, a cut-off valve located exterior to the chamber for closing the exhaust port, a piston exposed on one side to train pipe pressure and on its other side to a balancing pressure, and a lever operatively connecting said piston and cut-off valve to move the latter into position to cut off the train pipe exhaust after a predetermined reduction in train pipe pressure.

9. In an engineer's valve, the combination with a cylindrical valve chamber communicating with the train pipe and having a series of exhaust ports, of a piston valve in said chamber, means for moving said valve to connect the train pipe successively with said exhaust ports, an annular valve surrounding said chamber and controlling said exhaust ports, a piston exposed on one side to train pipe pressure and on its other side to a balancing pressure, and a lever operatively connecting said piston and annular valve to actuate the latter to successively close the several exhaust ports.

10. In an engineer's valve, the combination with a casing comprising couplings adapted to be connected with a main reservoir and train pipe and also comprising an exhaust chamber, of a cylindrical bushing within said casing and extending within the exhaust chamber, said bushing having ports communicating with said couplings and exhaust chamber, a piston valve located within said bushing and controlling the ports therethrough, and means for operating said valve to connect the train pipe port with the main reservoir and exhaust ports.

11. In an engineer's valve, the combination with a casing having formed therein a valve chamber, a piston chamber and a supplemental reservoir, said valve chamber having ports communicating with the train pipe and exhaust, of a valve in said chamber controlling said ports, a piston in said cylinder exposed on one side to train pipe pressure and on its other side to the pressure in said supplemental reservoir, and means operated by said piston for automatically discontinuing the exhaust of train pipe pressure upon a predetermined reduction thereof.

12. In an engineer's valve, the combination with a valve chamber communicating with the train pipe and having a series of service exhaust ports and an emergency exhaust port, of a valve in said chamber for connecting the train pipe successively with said exhaust ports, and cut-off means for automatically successively covering said service exhaust ports after predetermined reductions in train pipe pressure.

In testimony whereof, I have subscribed my name.

WILLIAM A. PENDRY.

Witnesses:
GEO. L. WILKINSON,
ANNIE C. COURTENAY.