W. A. PENDRY.

TRIPLE VALVE.

APPLICATION FILED APR. 12, 1909.

978,640.

Patented Dec. 13, 1910.

4 SHEETS—SHEET 1.

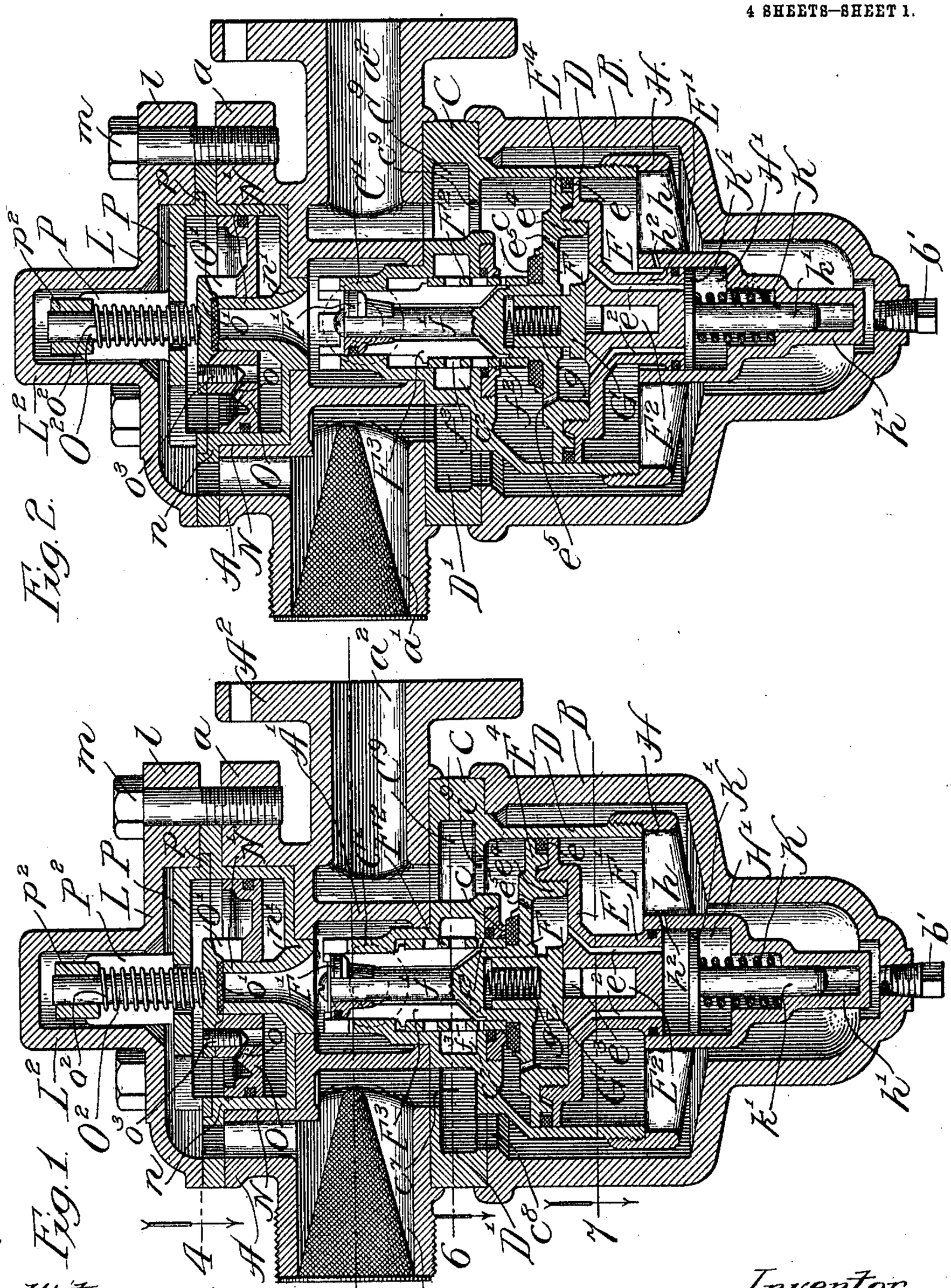

Fig. 1.

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4 SHEETS—SHEET 2.

Fig. 4.

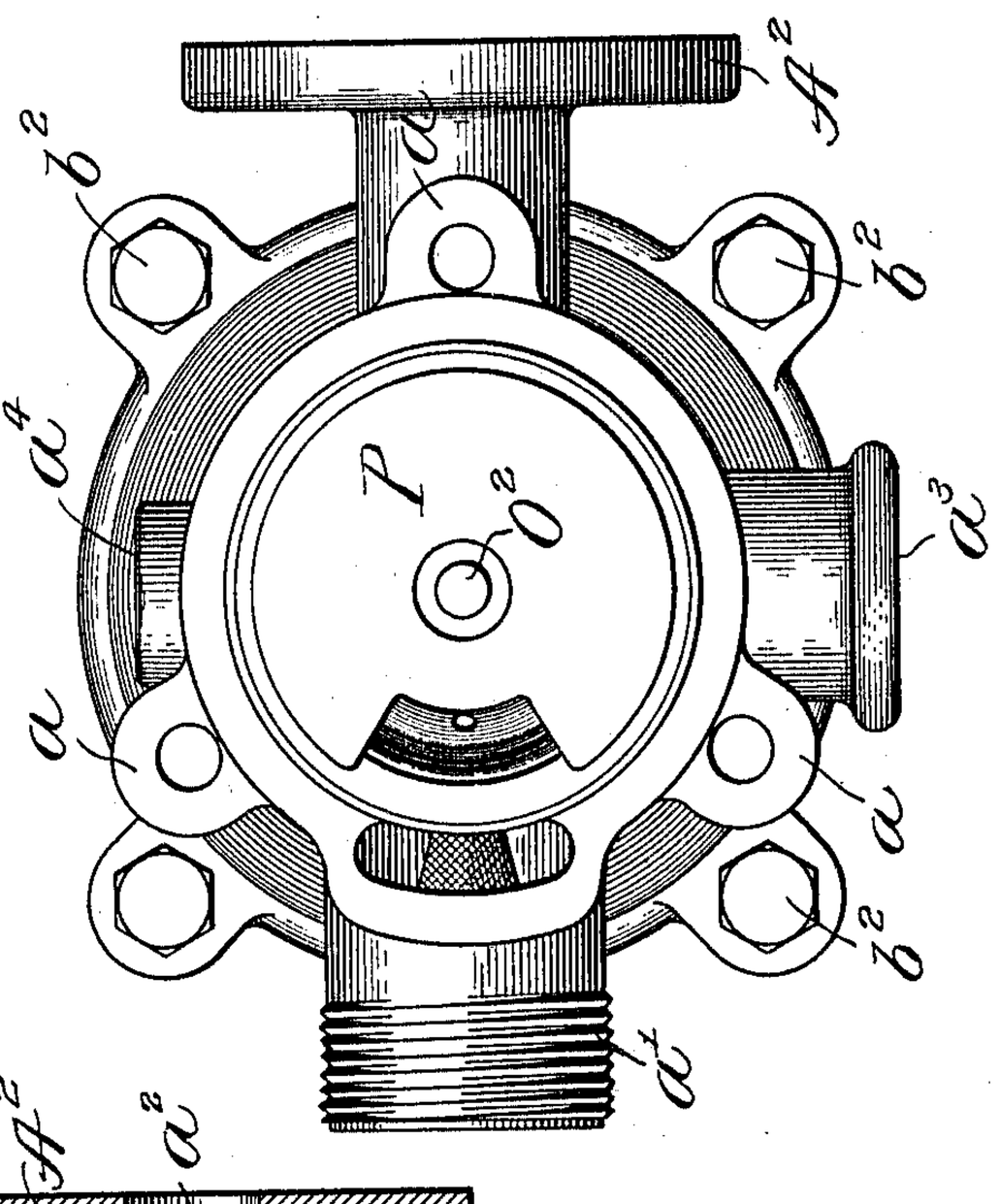
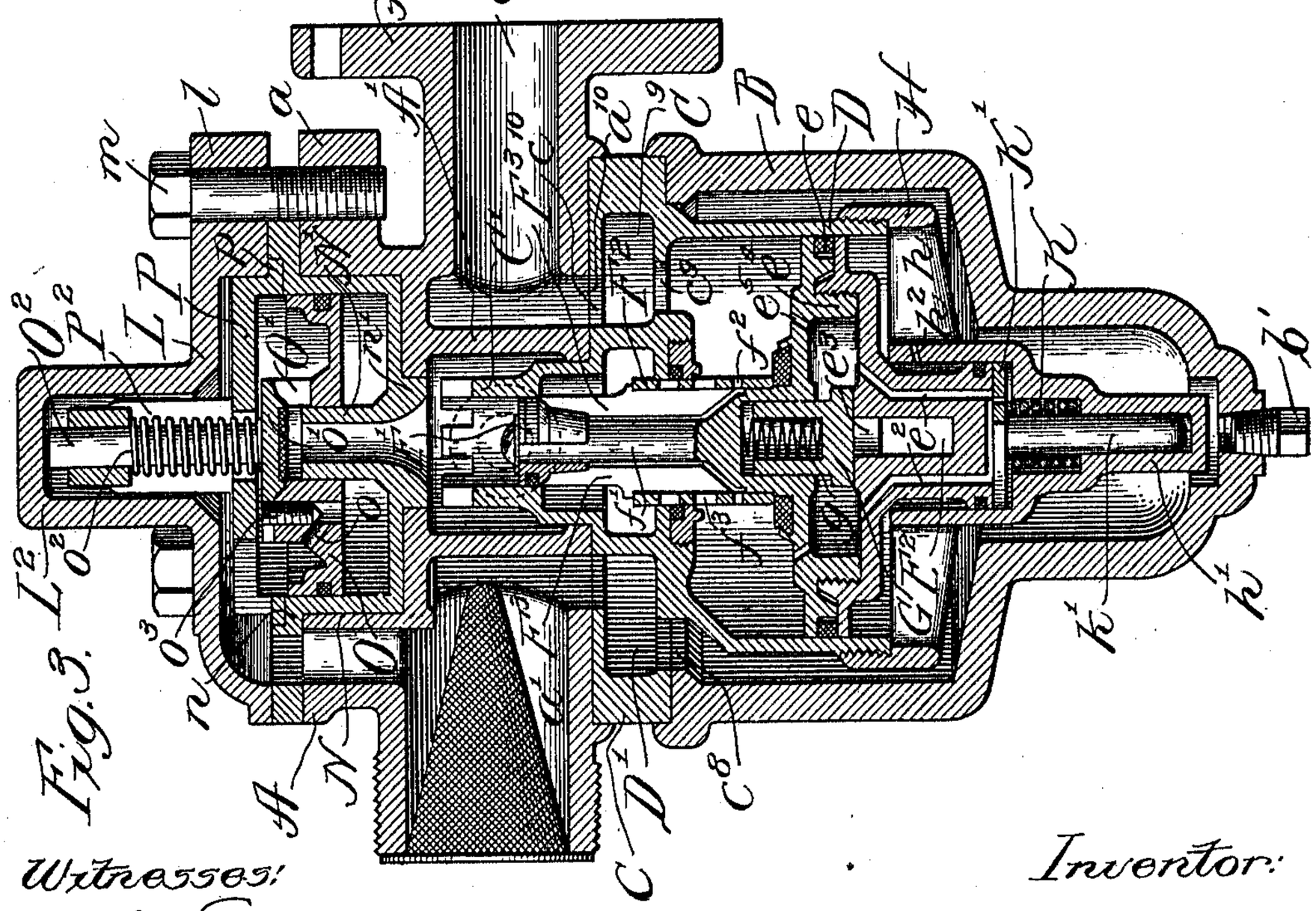


Fig. 3.



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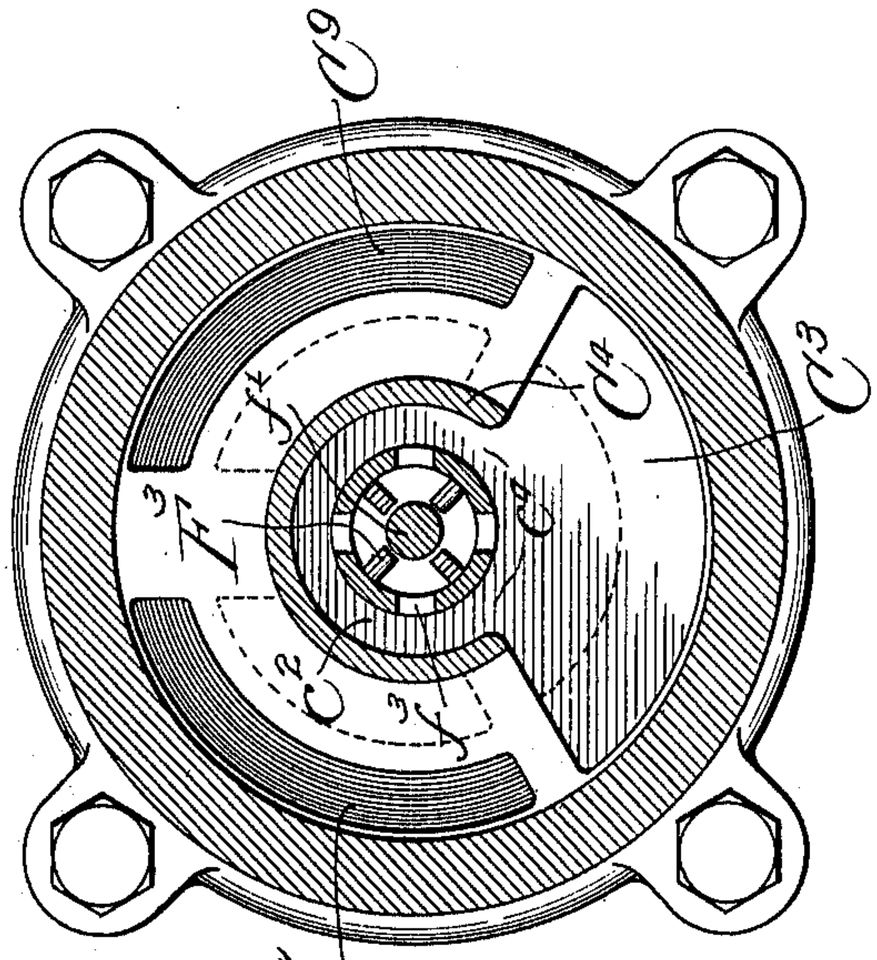

Fig. 6.

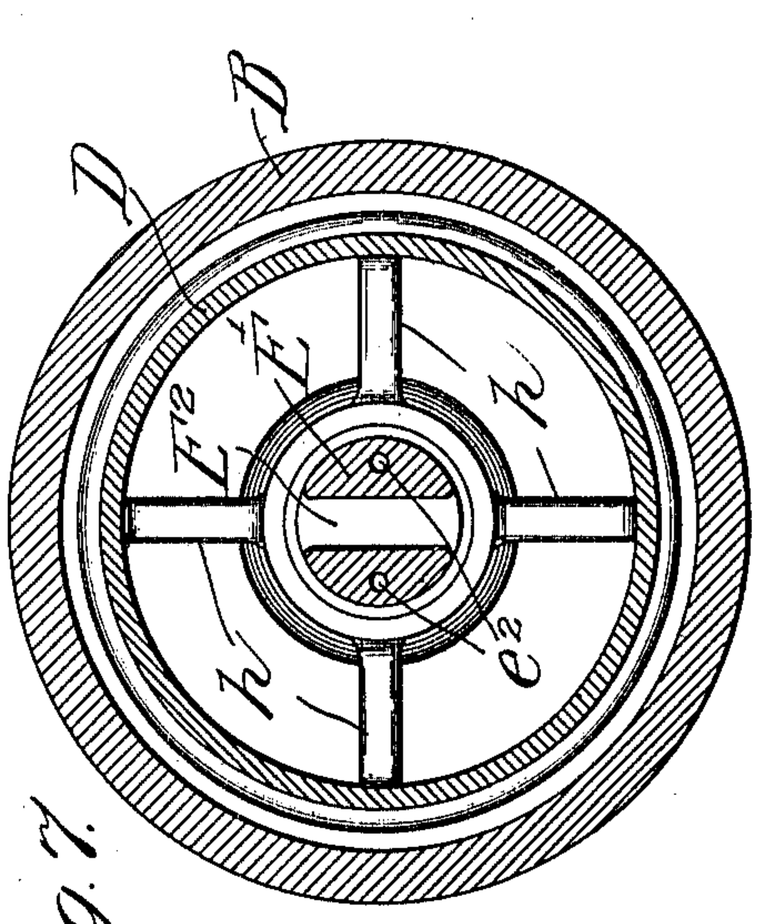

Fig. 7.

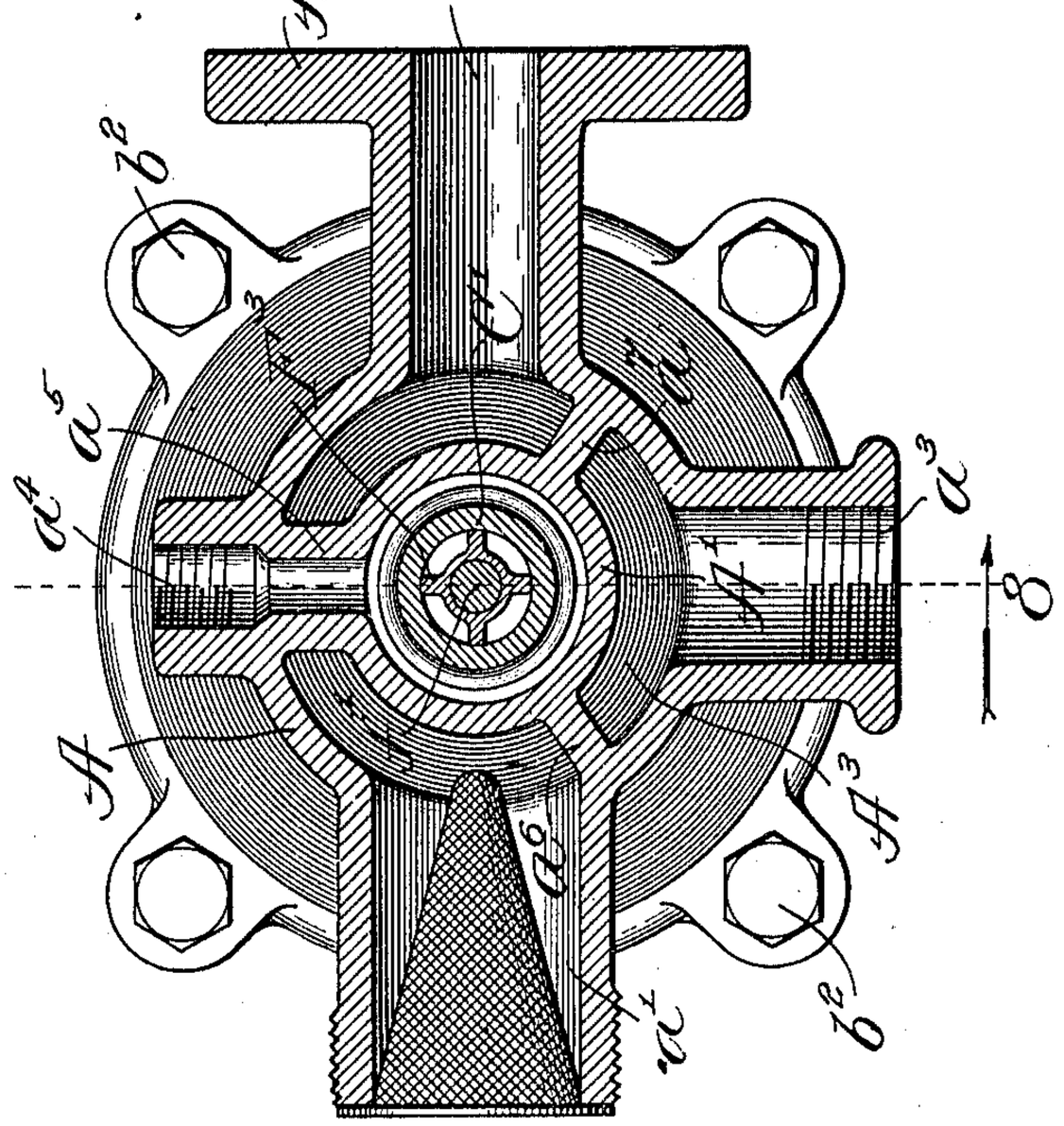

Fig. 5.

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4 SHEETS—SHEET 4.

Fig. 8.

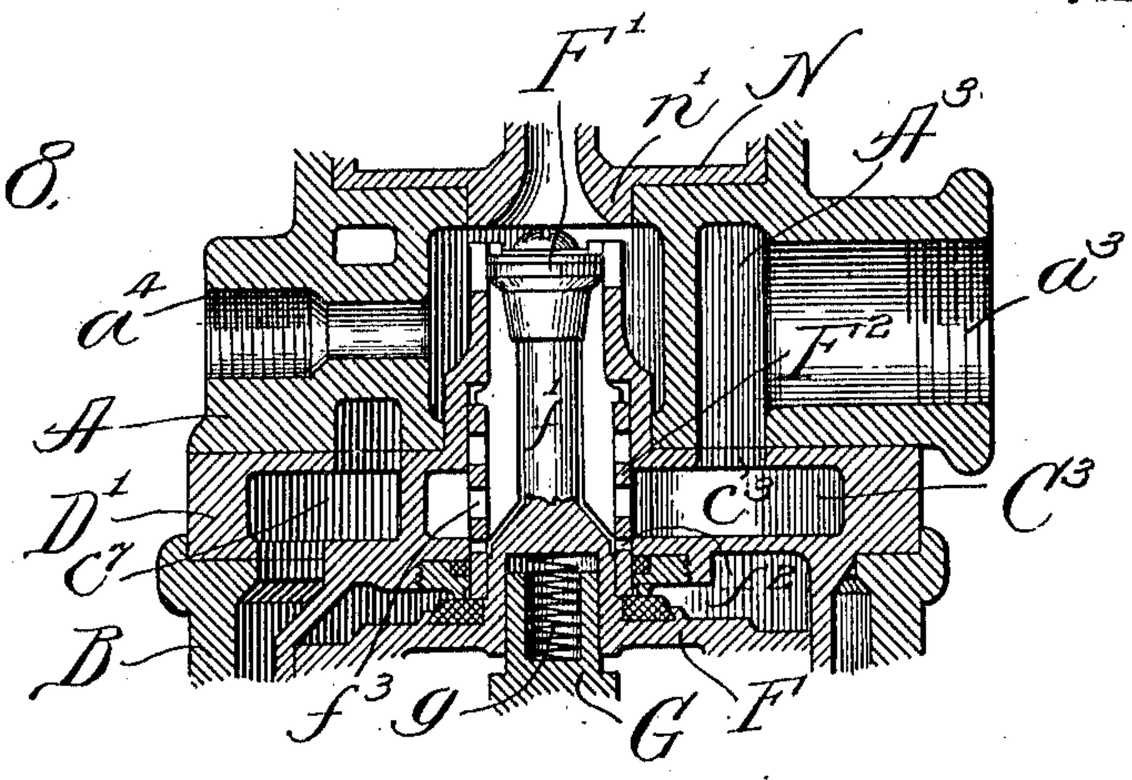


Fig. 9.

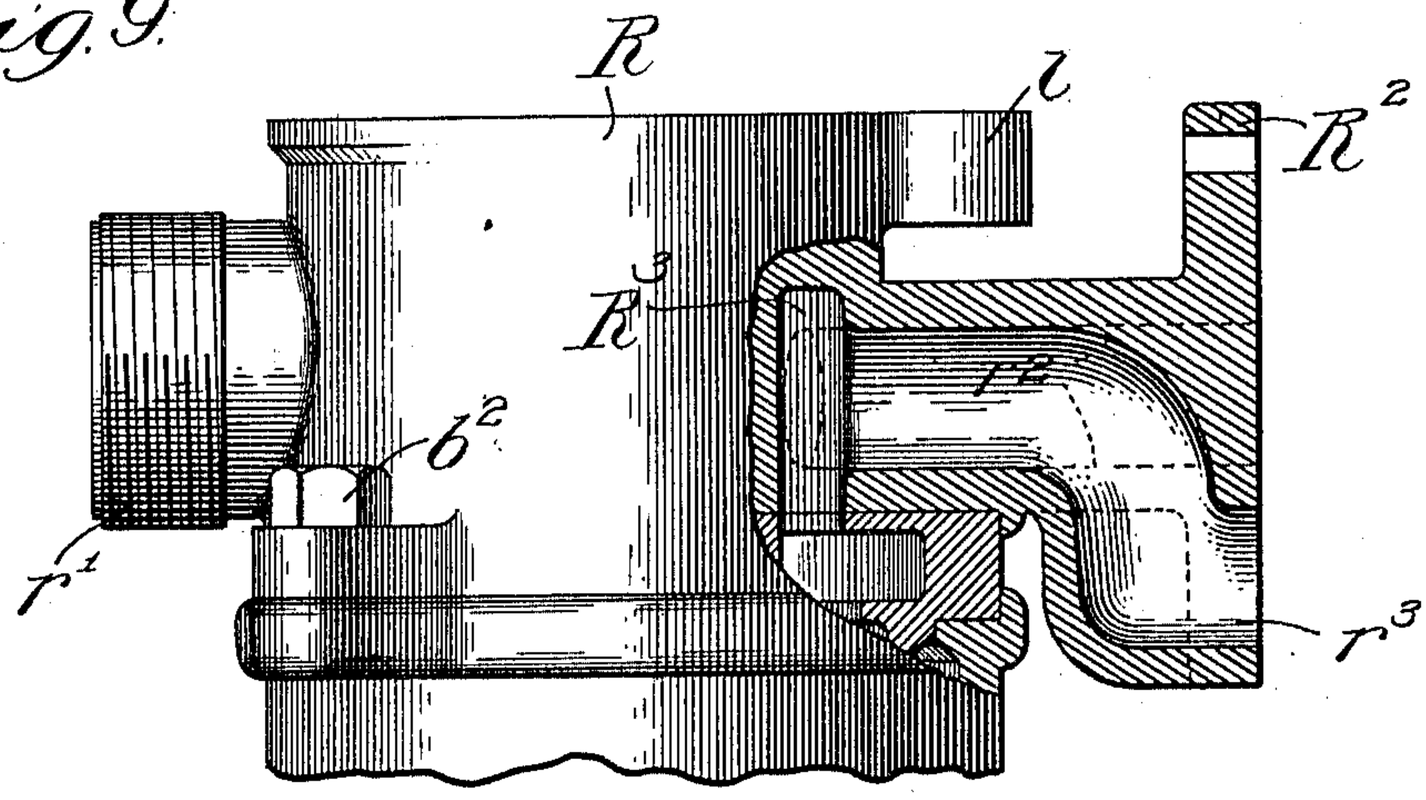
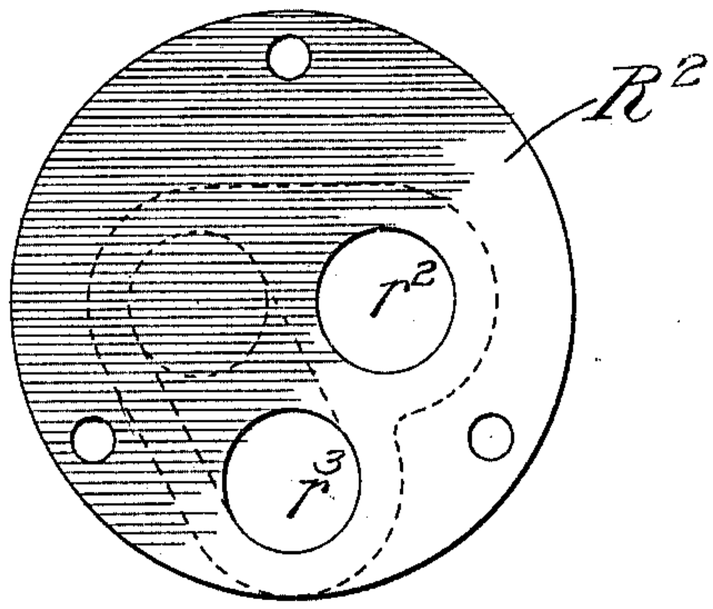


Fig. 10.



Witnesses:

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UNITED STATES PATENT OFFICE.

WILLIAM A. PENDRY, OF DETROIT, MICHIGAN.

TRIPLE VALVE.

978,640. Specification of Letters Patent. **Patented Dec. 13, 1910.**

Application filed April 12, 1909. Serial No. 489,418.

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 Triple Valves, of which the following is a specification.

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

In the use of triple valves, it is found necessary to remove the valve mechanism from the inclosing casing, in order to replace valve faces and seats and worn packing; to remove deposit of foreign matter from ports, passages, etc. In the triple valves in general use, in order to separate the parts of the casing to remove the valve mechanism therefrom, it is necessary to disconnect some of the removed parts of the casing from the cooperating parts of the brake apparatus, which requires time and labor, and delays the use of the car on which the brake apparatus is located.

One of the objects of my invention is to provide a quick acting triple valve, the entire valve mechanism of which may be removed from the casing without detaching the connections leading to the other parts of the brake apparatus.

A further object of my invention is to provide an improved triple valve in which all of the valves are piston and puppet valves, thereby obviating the wear incident to slide valves; in which the auxiliary reservoir will be quickly recharged upon the release of the brakes; in which the quick acting valve will operate instantly to vent train pipe pressure upon a predetermined lowering of the train pipe pressure independently of any movement of the triple valve proper; and in which the parts of the valve mechanism may be readily accessible and may be easily assembled or disassembled.

A still further object of my invention is to provide an improved quick acting triple valve, which will be comparatively simple in construction, inexpensive in manufacture, efficient in operation and durable in use.

My invention will be more fully disclosed hereinafter by 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 vertical section, showing the valve mechanism in "release" position; Fig. 2, a view similar to Fig. 1, showing the parts in "service" position; Fig. 3, a view similar to Figs. 1 and 2, showing the parts in "emergency" position; Fig. 4, a view looking downwardly on the plane indicated by line 4 in Fig. 1; Fig. 5, a transverse sectional view on line 5, Fig. 1; Fig. 6, a transverse section on line 6, Fig. 1; Fig. 7, a transverse section on line 7, Fig. 1; Fig. 8, a vertical section on line 8, Fig. 5; Fig. 9, a side elevational view of the central section of the casing, part being shown in section, of a modification; and Fig. 10, an elevational view looking from the left in Fig. 9.

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

Reference character A indicates the main section of the valve casing with which are united the connections with the train pipe, the auxiliary reservoir, and the brake cylinder.

a' designates the coupling with which the train pipe is adapted to be connected; a^2 the passageway leading to the auxiliary reservoir; a^3 the coupling with which the brake cylinder communicates; and a^4 the atmospheric exhaust passage.

A^2 indicates a circular flange surrounding the auxiliary reservoir passage a^2, by means of which the triple valve is adapted to be supported upon the auxiliary reservoir, but it will, of course, be evident that, if desired, the supporting flange may surround the passage a^3 so as to permit the triple valve to be supported upon the brake cylinder.

Reference character B indicates the lower end section of the valve casing. Any suitable connecting means may be provided for detachably uniting the sections A and B, as, for instance, bolts b^2 extending through perforations in laterally projecting ears on these sections—as shown in Figs. 5 and 6.

b' indicates a movable plug closing a hole through the lower end of the section B, which may be removed to permit the drainage of water which may collect within the valve casing.

Formed integrally with a supporting flange C, and projecting within the section B, is a piston cylinder D having a hollow cylinder head D', and in which is located the triple valve piston E. Projecting downwardly from the piston E is a reduced bal-

ancing piston E′, longitudinally through which extend passages e^2, e^2. A transverse large passage E^2 extends through the balancing piston E′, such transverse passage communicating with a central passage e^3 extending through the piston.

F designates a valve which is connected to move with the piston E. The valve F is preferably provided with an integral surrounding disk E^4 which is secured to the piston E by means of an exteriorly screw threaded circular flange e^4 which engages an interiorly screw threaded circular shoulder on the piston E. Circular flanges project around the piston E and disk E^4 between which the piston packing e is located. The disk E^4 is provided with passages e^5 extending therethrough so that the space between the piston and disk is in free communication with the space within the piston cylinder above the piston.

The valve F, when the valve mechanism is in release position, engages the valve seat c on the adjacent surface of the hollow cylinder head D′ of the piston cylinder D, such seat being preferably in the form of a disk screw threaded around its periphery and engaging an interiorly screw threaded shoulder formed in the cylinder head D′, a packing ring being interposed between the valve seat and cylinder head. The valve F is provided with a cylindrical portion F^2 which is shrunk upon a central shoulder thereon, such cylindrical portion being provided with two series of ports therethrough f^2 and f^3. The valve stem f' projects concentrically from the valve F and carries at its upper end a piston valve F′, the latter being located within the cylinder C′ projecting upwardly from and formed integrally with the head D′ of the piston cylinder D. Wings F^3 depend from the piston valve F′ and extend within the cylindrical portion F^2 of the valve. The cylindrical portion F^2 of the valve extends through a circular opening within the valve seat c, and thence extends concentrically through a chamber c^2 in the hollow head D′ of the piston cylinder, and then projects within and is guided by the adjacent enlarged end of the cylinder C′. The cylinder C′ is located within but spaced apart from a cylinder A′ formed at the center of the casing A.

A puppet valve G is mounted concentrically within the valve F and is normally seated by a spring g against the passage e^3 which extends through the piston E.

Mounted upon the lower end of the piston cylinder D is a ring H having a small cylinder H′ supported concentrically therein by means of radial webs h. The cylinder H′ closely surrounds the lower end of the downwardly projecting balancing piston E′, a packing being provided to make a close fit with the inner surface of the cylinder H′. A passage h^2 extends through the wall of the cylinder H′ at a point slightly below the balancing piston E′ when the valve mechanism is in release position. A plunger K′ is located within the cylinder H′ and is provided with a downwardly extending guide stem k', which latter projects within a surrounding guide tube h'' depending from the lower end of the cylinder H′. A spring K surrounds the guide stem k' and is interposed between the plunger K′ and a shoulder at the upper end of the guide tube h'.

In Figs. 9 and 10, I have illustrated a slightly modified form of the main section A of the valve casing, such section being particularly adapted for use on freight cars in which the valve mechanism is supported upon the end of the auxiliary reservoir, and the conduit leading to the brake cylinder passes through the auxiliary reservoir to the brake cylinder. In these figures, R designates generally the section, while r' indicates the train pipe coupling and r^2 the conduit leading to the auxiliary reservoir, the latter being surrounded by a circular flange R^2 adapted to be supported upon the end of an auxiliary reservoir. r^3 indicates the conduit leading to the brake cylinder which communicates with a chamber R^3 corresponding to chamber A^3 in the form of my invention as illustrated in Fig. 5. This modification consists in dispensing with the brake cylinder coupling a^3 shown in Fig. 5, and extending a passage from the brake cylinder chamber A^3 through the supporting flange around the auxiliary reservoir conduit.

Quick acting valve mechanism.—L indicates a removable cap at the upper end of the valve casing, which is detachably secured to the casing section A by any suitable means, as, for instance, screws m, which extend through alined holes in ears a and l projecting laterally, respectively, from the casing section A and cap L. A cylinder N is located within a chamber formed in the upper end of the main casing section A, and is retained therein by means of a flange n interposed between the adjacent surfaces of the casing section A and cap L. Projecting upwardly within the cylinder N is a central tube N′. Forming a continuation of the tube N′ is a collar n' projecting below the lower end of the cylinder N and fitting within a circular opening in the end wall of the cylinder A′ at the center of the main casing section A.

Fitting closely within the cylinder N is a piston O having central supporting wings O′ around the tube N′ which carry the valve o'.

o designates a port extending through the piston to permit equalization of pressure on opposite sides thereof. The size of the port o may, if desired, be varied by means of an adjusting screw o^3.

The cylinder N is provided with a spider P having a surrounding flange p interposed between the flange n around the cylinder and the adjacent surface of the valve casing cap L. The wings P^2 of the spider P are continued upwardly and extend within the cylindrical extension L^2 on the casing cover L to carry the guide p^2, through which extends a stem O^2 projecting from the piston O. A spring o^2 surrounds the rod O^2 and is interposed between the guide p^2 and the surface of the valve o' around the stem O^2. Both the stem O^2 and the spring o^2 aronnd the same extend through the central opening in the spider P. The tension of the spring o^2 retains the piston O in position for the elastic seat therein to close the top of the tube N'.

Other features of construction, such as ports and passageways, will be referred to in the following description of the operation of the valve.

Release position.—When the valve is in release position,—as shown in Fig. 1—the following connections are effected. Train pipe pressure passes through the coupling a' and thence to the space within the central section A of the valve casing around the central cylinder A' intermediate of the radial partitions a^5 and a^6, attention being directed to Fig. 5. The pressure then passes through the port and underlying passage c^7 in the adjacent wall of the hollow cylinder head D', from which it passes through ports c^8 to the annular space within the casing section B around the cylinder D. The lower surface of the piston E is in this manner exposed to train pipe pressure and forced into the position shown in Fig. 1. The train pipe pressure then passes through the transverse passage E^2 in the balancing piston E', through the central passage e^3 to the valve G which is unseated so that the pressure passes through the ports e^5 to the space within the cylinder D above the piston. The pressure then passes through the port c^9, through the space C^9 in the hollow cylinder head D', from which the pressure passes through registering port c^{10} to the passage a^2, and thence to the auxiliary reservoir. The train pipe pressure consequently quickly passes through the comparatively large passages to the reservoir and recharges the same. The pressure in the auxiliary reservoir is maintained equal to that in the train pipe, by means of the port h^2 in the cylinder H' and passages e^2 leading through the balancing piston E'.

The brake cylinder communicates through the coupling a^3 with the space A^3 between the radial partitions a^6 and a^7 (see Fig. 5) in the main casing section A, and thence through the passage c^3 (see Fig. 8) in the adjacent wall of the hollow cylinder head D' to the space C^3 therein, which communicates through the passage c^4 in the circular wall C^4 with the chamber c^2 around the cylindrical portion of the valve F. The chamber c^2 communicates through the cylinder C' with the space within the cylinder A', from whence leads the atmospheric exhaust a^4 (see Fig. 5).

Service application.—When the train pipe pressure is lowered by the engineer for a service application of the brakes, the piston E is moved by the excess auxiliary reservoir pressure to the position shown in Fig. 2, where it is stopped in its movement by the engagement of the balancing piston E' with the plunger K'. The brake cylinder is then disconnected from the atmospheric exhaust port by means of the piston valve F' moving within the surrounding cylinder C'. The reservoir pressure flows through the ports f^2 in the cylindrical portion F^2 of the valve F past the valve seat c, which is then uncovered, to the central chamber c^2 in the hollow cylinder head from which it passes through the space C^3, thence through the communicating space A^3 in the casing section A to the brake cylinder connection a^3.

When the flow of pressure to the brake cylinder has reduced the auxiliary reservoir pressure slightly below that of the reduced train pipe, the piston E will be moved sufficiently to close the ports f^2, thereby disconnecting the flow of pressure to the brake cylinder, without, however, moving sufficiently to cause the piston valve F' to open the exhaust port at the end of the cylinder C'.

Emergency application.—When the train pipe pressure is lowered by the engineer to such a degree as to effect an emergency application of the brakes, the parts of the triple valve are moved to the position shown in Fig. 3. The excess of auxiliary reservoir pressure moves the piston E with such force as to depress the plunger K' and move the cylindrical portion F^2 of the valve in such a position relatively to the valve seat c that the ports f^3 will communicate with the piston cylinder, thereby permitting the auxiliary reservoir pressure to freely pass through such ports into the chamber c^2, and thence through the communicating chambers and passages to the brake cylinder.

Coincidentally with the movement of the piston E to emergency position, the piston O is moved against the tension of the spring o^2 into engagement with the spider P, thereby uncovering the end of the tube N', so that train pipe pressure passes between the wings carrving the valve o' and also through the spider wings through the tube N' to the space within the cylinder A', and thence to the atmospheric exhaust a^4. As soon as the pressure below the piston O equalizes, through the port o, within the train pipe, the spring o^2 returns the piston

O to its normal position, thereby closing the upper end of the tube N′ and discontinuing the exhaust of train pipe pressure to the atmosphere.

After both service and emergency applications, the valve mechanism is returned to its release position upon the train pipe pressure being increased. The piston E is first returned to the position shown in Fig. 1, in which the valve F engages the annular seat *c*, after which the train pipe pressure unseats the valve G and flows to the auxiliary reservoir, the tension of the spring *g* being sufficient to insure the return of the piston to release position before the valve G is unseated.

From the foregoing description, it will be observed that I have invented an improved triple valve, the valve mechanism of which may be entirely removed without detaching from the valve casing any of the connections with the other parts of the brake apparatus. It is further evident that by the use of piston and puppet valves, to the exclusion of slide valves, that the valve mechanism will be capable of long usage without permanent wear upon the parts, whatever wear that occurs being assumed by packing and elastic valve seats, which may readily be renewed.

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 a triple valve, the combination with a casing comprising a main section and a supplemental section, of radially arranged means connecting said main section with the train pipe, the auxiliary reservoir, and the brake cylinder, and valve mechanism located in said casing and removable from the main section thereof upon the detachment of the supplemental section.

2. In a quick action triple valve, the combination with a casing comprising a main section, a supplemental section, and a cap, of radially arranged means connecting the main section with the train pipe, the auxiliary reservoir, and the brake cylinder, triple valve mechanism located in said casing and removable from the main section thereof upon the detachment of the supplemental section, and quick action valve mechanism located in said main section and removable therefrom upon the detachment of said cap.

3. In a casing for triple valve mechanism, the combination with a main section having radially arranged chambers therein communicating with the train pipe, the auxiliary reservoir, the brake cylinder, and exhaust port, of a detachable section located at one side of said main section through which the triple valve mechanism is adapted to be removed.

4. In a casing for quick action triple valve mechanism, the combination with a main section having chambers therein communicating with the train pipe, the auxiliary reservoir, the brake cylinder, and exhaust port, of a detachable section located at one side of said main section through which the triple valve mechanism proper is adapted to be removed, and a detachable cap located on the other side of said main section from said detachable section through which the quick action valve mechanism is adapted to be removed.

5. In a triple valve, the combination with a casing comprising a main section having chambers therein communicating with the triple valve, auxiliary reservoir, brake cylinder, and exhaust port, of a supplemental section located on one side of the main section, a piston cylinder located within said supplemental section, a valve cylinder formed integral with said piston cylinder and extending into the main casing section, a piston located in said piston cylinder, and a valve connected to said piston and located in said valve cylinder, said valve and valve cylinder having ports and passages, whereby said valve connects the chamber communicating with the brake cylinder with either of the chambers communicating with the auxiliary reservoir or exhaust port.

6. In a quick action triple valve, the combination with a casing comprising a main section having chambers therein communicating with the triple valve, auxiliary reservoir, brake cylinder, and exhaust port, of a supplemental section located on one side of the main section, a piston cylinder located within said supplemental section, a valve cylinder formed integral with said piston cylinder and extending into the main casing section, a piston located in said piston cylinder, a valve connected to said piston and located in said valve cylinder, said valve and valve cylinder having ports and passages, whereby said valve connects the chamber communicating with the brake cylinder with either of the chambers communicating with the auxiliary reservoir or exhaust port, a cylinder located within said main section of the valve casing opposite to said supplemental section, and a quick action valve and piston in said last mentioned cylinder, said latter piston and its cylinder having ports and passages for venting train pipe pressure.

7. In a quick action triple valve, the combination with a casing comprising a main section having a central exhaust chamber and chambers located around said central chamber communicating with the train pipe, the auxiliary reservoir, brake cylinder and

exhaust, said casing also comprising a supplemental section detachably secured to said main section, of a piston cylinder located within said supplemental section, a valve cylinder formed integrally with said piston cylinder and extending within the central exhaust chamber of said main section, a piston located in said piston chamber, a valve connected to said piston and located in said valve cylinder, said valve and valve cylinder having ports and passages, whereby said valve connects the chamber communicating with the brake cylinder with either of the chambers communicating with the auxiliary reservoir or exhaust.

8. In a quick action triple valve, the combination with a casing having an exhaust port, a valve mechanism for connecting and disconnecting the brake cylinder with said exhaust port, and independently operating quick action valve mechanism for connecting and disconnecting the train pipe with said exhaust port.

In testimony whereof, I have subscribed my name.

WILLIAM A. PENDRY.

Witnesses:
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ANNIE C. COURTENAY.