P. J. GREBEL & W. J. THEIS.

AIR VALVE.

APPLICATION FILED NOV. 22, 1909.

978,579.

Patented Dec. 13, 1910.

2 SHEETS—SHEET 1.

Fig. 3

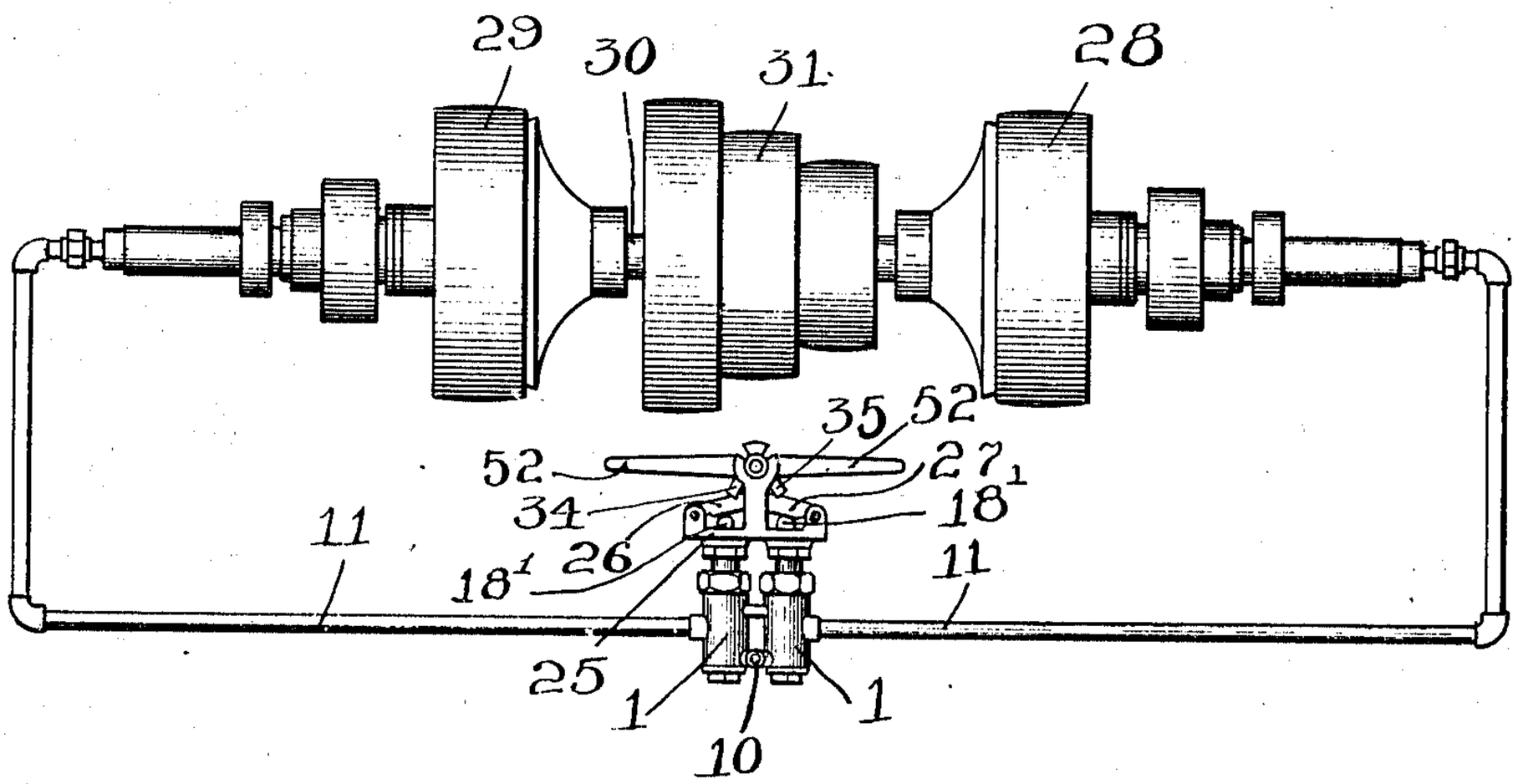


Fig. 1

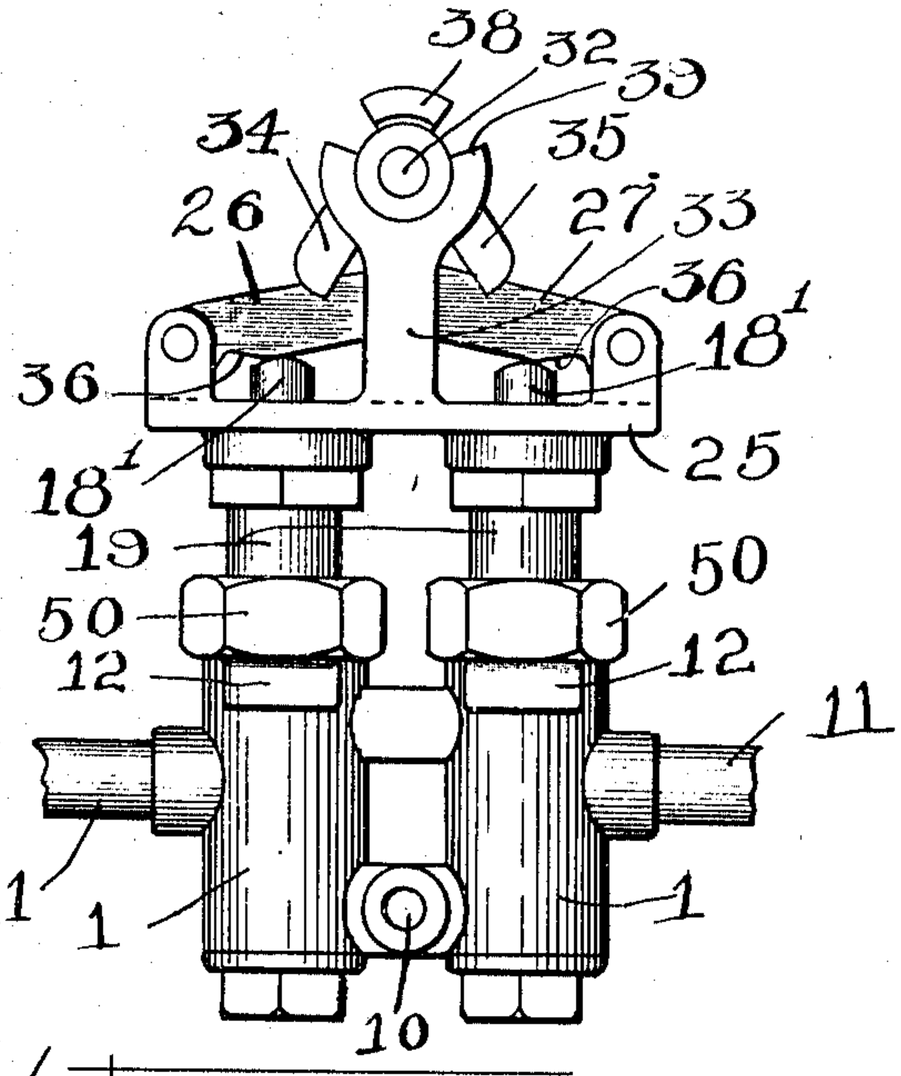
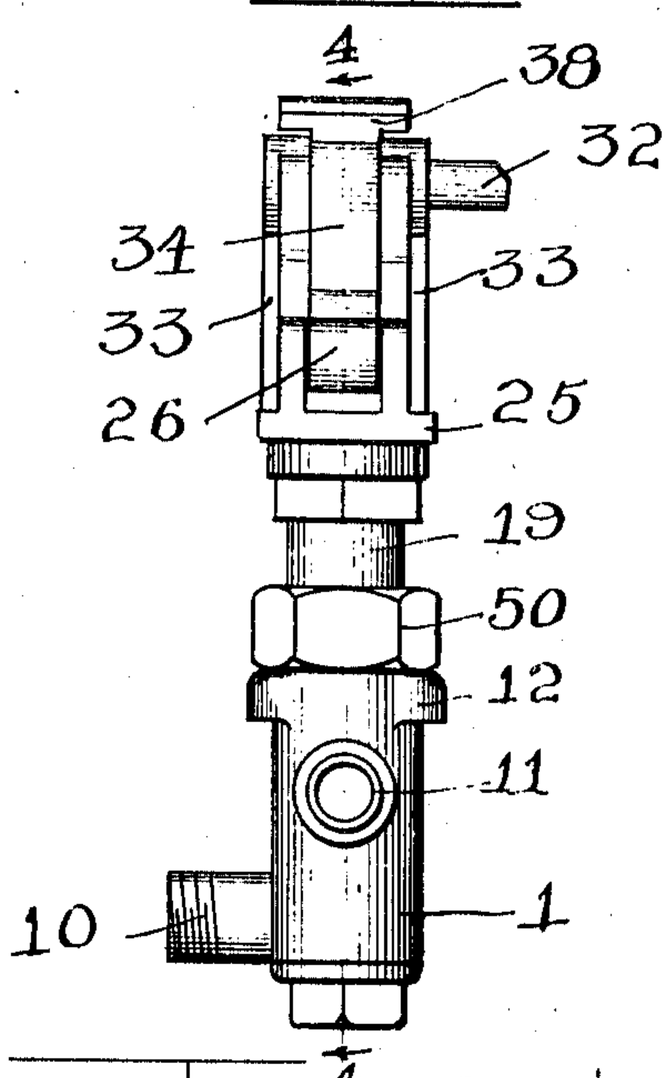


Fig. 2



Witnesses

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2 SHEETS—SHEET 2.

Fig. 4

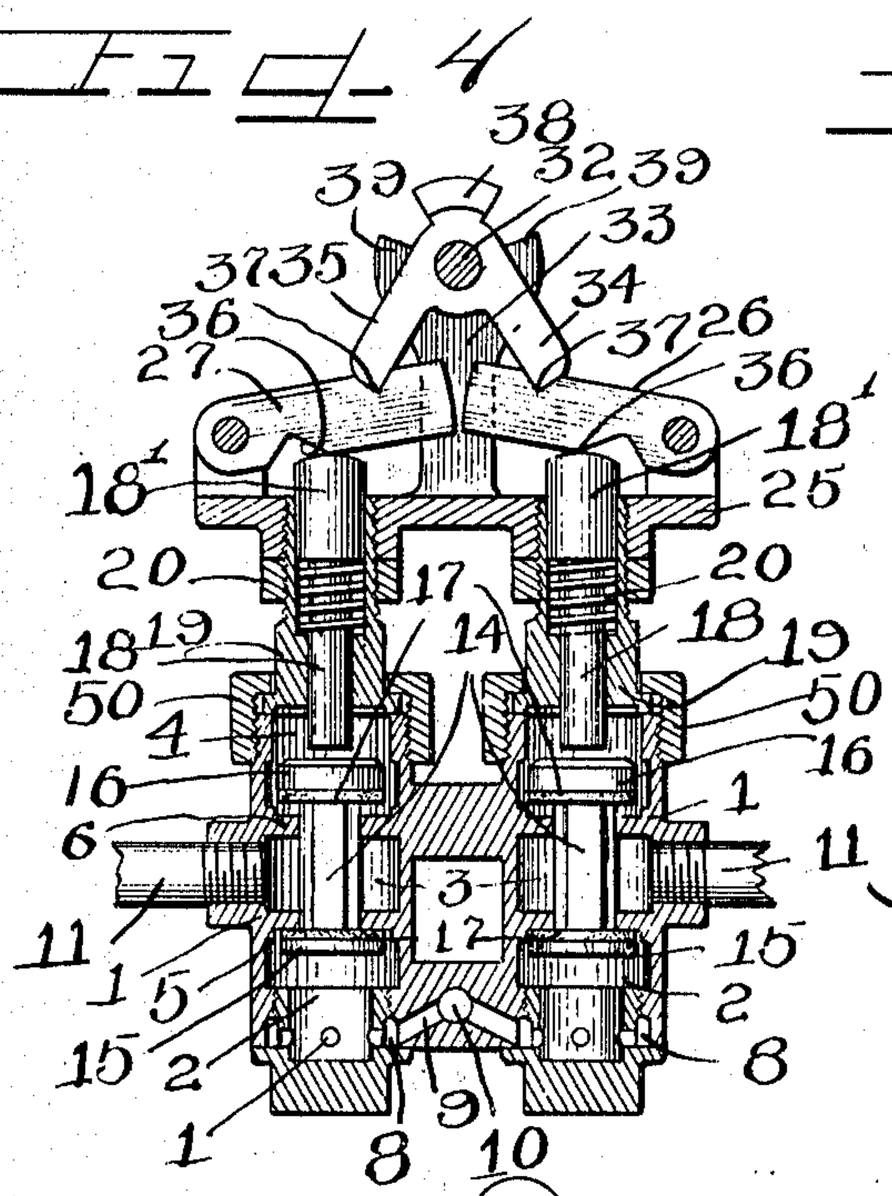

Fig. 5

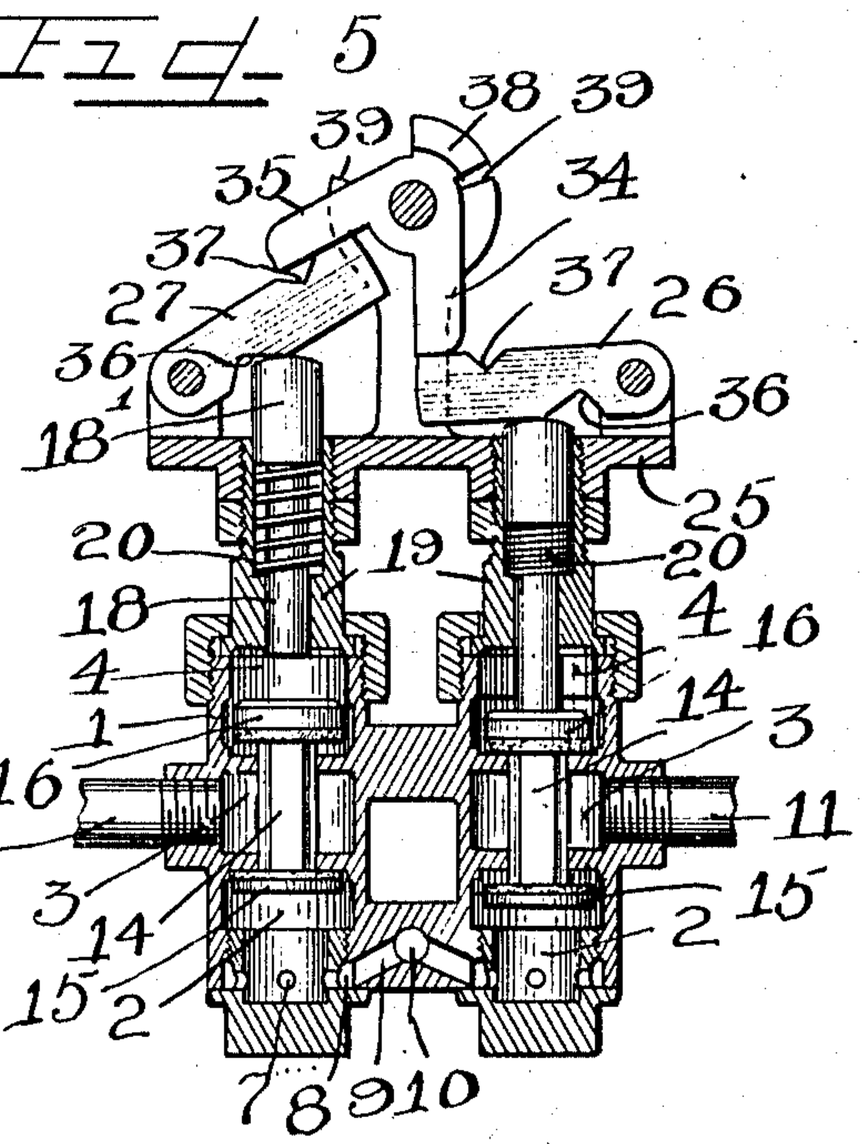

Fig. 7

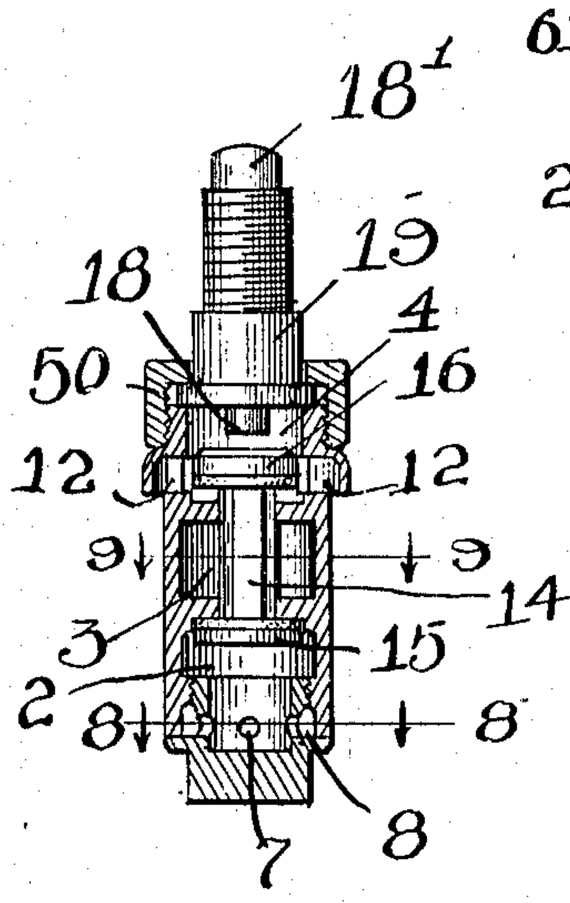

Fig. 6

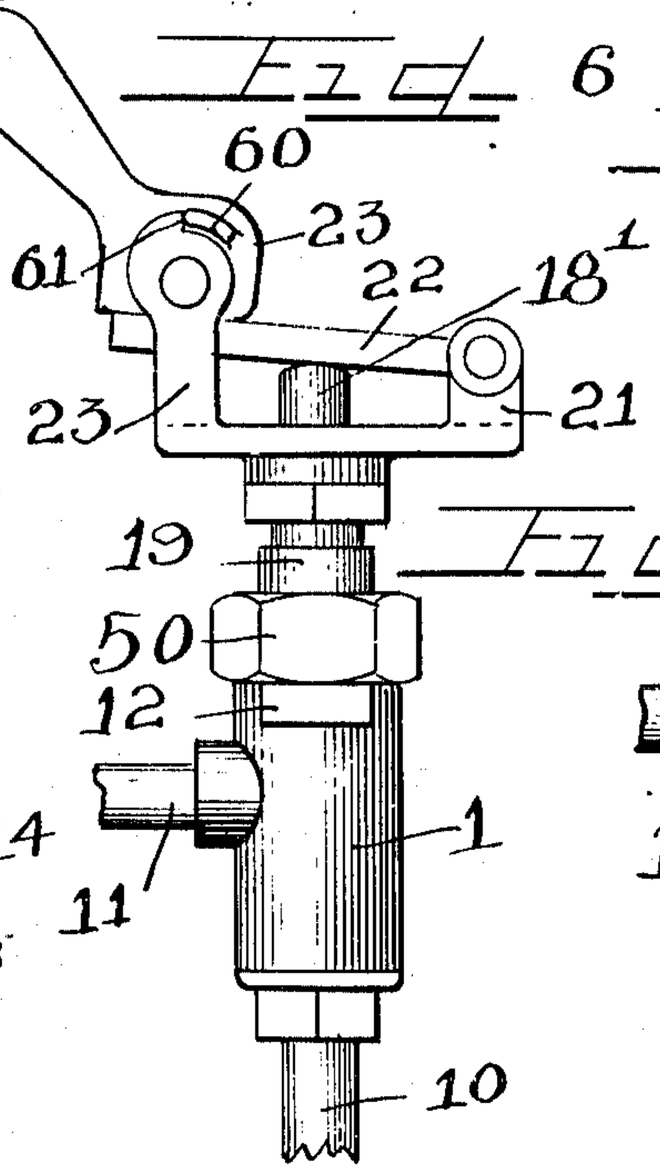

Fig. 8

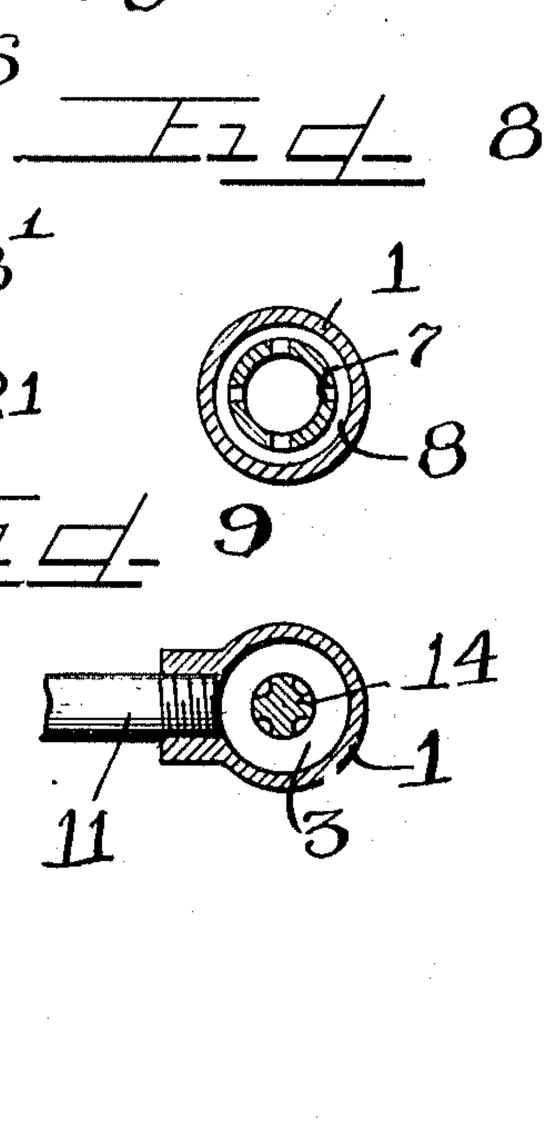

Fig. 9

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UNITED STATES PATENT OFFICE.

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AIR-VALVE.

978,579. Specification of Letters Patent. **Patented Dec. 13, 1910.**

Application filed November 22, 1909. Serial No. 529,484.

To all whom it may concern:

Be it known that we, PAUL J. GREBEL and WILLIAM J. THEIS, citizens of the United States, and residents of the city of Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Air-Valves; and we do hereby declare that the following is a full, clear, and exact description of the same, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form a part of this specification.

This invention relates to a valve for controlling the supply and exhaust of the motive fluid to and from the working cylinders.

The object of our invention is to provide a simple, durable and efficient device of the kind described, and to this end our invention consists in the matters hereinafter described and more fully pointed out and defined in the appended claims.

In the drawings: Figure 1 illustrates a side elevation of a device embodying this invention. Fig. 2 shows an end elevation thereof. Fig. 3 shows an elevation of our device operatively attached to a friction driven countershaft for controlling the operation of the friction mechanism of the same. Fig. 4 illustrates a section taken substantially on line 4—4 of Fig. 2. Fig. 5 is a view similar to that shown in Fig. 4, showing the parts in operation. Fig. 6 is a view of a modified construction embodying this invention. Fig. 7 is a section taken through one of the valve casings at substantially right angles with Fig. 4, and showing parts in elevation. Fig. 8 is a section taken on line 8—8 of Fig. 7. Fig. 9 is a section taken on line 9—9 of Fig. 7.

As shown in the drawings: 1, indicates connected casings, the interior of each of which is divided into three chambers 2, 3, and 4, by transverse partitions 5 and 6, each of which is provided with a central opening. The inlet chamber 2, is provided with a plurality of openings 7, communicating with an annular passage 8, which is in turn connected by a duct 9, to a fluid supply pipe 10. The intermediate chamber 3, is connected by a suitable pipe 11, to the working cylinder or other mechanism, the operation of which it is desired to control by the operation of my device. The outlet chamber 4, is provided with any number of suitable exhaust ports 12.

A freely movable valve stem 14, is positioned within the casing having on opposite ends thereof heads 15—16, which are adapted to seat on opposite sides of the partitions 5—6 respectively. A washer 17, of suitable packing material, such, for example, as leather or rubber is provided for the inner face of each of the valves 15 and 16, to insure a fluid tight closure when the respective valve is seated.

The valve stem 14, is corrugated longitudinally to permit free passage of air from one chamber to the other at the proper time.

Any suitable operating mechanism may be provided to force the closure inwardly to force the valve 16, on its seat to close communication between the exhaust chamber 4, and chamber 3 and to force the valve 15, from its seat to open communication between the inlet chamber 2 and chamber 3. As shown, for this purpose a stem or shank 18, is provided which extends through a sleeve 19, provided with an enlarged chamber in its outer end and which is secured to the valve casing by a cap screw 50. A spring 20, is engaged in the chamber in the sleeve around the stem and bears against the enlarged head 18′, of the stem and normally acts to force the stem to its outer limit of movement out of engagement with the valve 16.

A bracket 25, is provided integral with the casings 1, on which are pivoted levers 26 and 27, one for each stem and each of which is provided with notches or seats 36—37. A standard 33, is secured to the bracket 25, which, at its upper end, is shaped to provide stops 39, and pivotally secured to said standard 33, by means of a shaft 32, is a double acting rock member which is provided with fingers 34—35, one for each lever. A lug 38, is provided at the outer end of said member which engages the stops 39, at the limits of movement of the member in each direction and actuating levers 52, are secured to said shaft 32, by means of which the adjustment of the valve is effected.

The operation of the device is obvious from the foregoing description.

The pipes 11, communicate with the working cylinders clutch members 28—29, secured on a counter shaft 30, which is provided with a reverse pulley 31, as shown more clearly in my patent for "Pneumati-

cally operated shafts," No. 942,065, dated December 7, 1909. Rocking the shaft 32, in one direction actuates one of the fingers 34 or 35, to depress the lever 26 or 27, thereby correspondingly actuating the stem 18, to operate the respective closure to open communication between the inlet chamber and chamber 3, to admit inlet pressure to the working cylinder. By rocking the shaft to the intermediate position the spring 20, elevates the stem 18, permitting inlet pressure to adjust the valve closure to cut off communication between the inlet chamber and chamber 3, and to afford communication between exhaust chamber 4, and chamber 3, thereby exhausting the pressure from the cylinder. Rocking the shaft now in either direction of course admits pressure to the respective cylinder and actuating the shaft from one limit of its movement to the other simultaneously permits one closure to admit inlet pressure to one working cylinder and the closure in the casing to exhaust the pressure from the other working cylinder.

As shown, in Fig. 6, the mechanism for operating the stem 18, is somewhat modified and is adapted for individual operation. In this construction a lever 22, is pivoted at one end to a lug 21, and extends across the top of the head 18', of the stem 18. A cam lever 23, is pivoted to a standard 23', which, when actuated in one direction forces the stem 18, inwardly and on reverse actuation permits the spring to force the stem to normal. Coacting stops 60—61, are provided which limits the movement of the cam lever.

Numerous details of construction may be varied and we therefore do not desire to limit this application for patent otherwise than necessitated by the prior art.

We claim as our invention:

1. A controlling valve comprising a casing provided with an inlet chamber, an outlet chamber and an intermediate chamber, internal valve seats between the chambers, a movable closure provided with heads arranged to seat on the valve seats to control the passage between said chambers, and means for controlling the operation of said closure.

2. A controlling valve comprising a casing provided with an inlet chamber, an outlet chamber and an intermediate chamber, a movable closure extending into each of said chambers arranged to control the passage between said chambers, and means for controlling the operation of said closure.

3. A controlling valve comprising a casing provided with partitions forming an inlet chamber, an outlet chamber, and an intermediate chamber, a valve seat formed in each partition, a longitudinally movable closure provided with a plurality of heads, one for each seat arranged to control the passage between said chambers, and means for controlling the operation of said closure.

4. A controlling valve comprising a casing provided with an inlet chamber, an outlet chamber and an intermediate chamber, a movable closure arranged to control the passage between said chambers, a plunger extending through the wall of said casing adapted to actuate said closure, a lever adapted to actuate the plunger in one direction and a spring for actuating the plunger oppositely.

5. In a device of the class described a casing provided with an inlet chamber, an outlet chamber, and a chamber intermediate the same adapted to communicate with each, a movable closure in the casing for controlling the communication between the chambers, a plunger loosely engaging the closure for actuating it in one direction, and a spring for retracting the plunger adapting inlet pressure to reversely actuate the closure.

6. A controlling valve comprising a casing provided with an inlet chamber, an outlet chamber and an intermediate chamber, a movable valve member extending through said intermediate chamber and projecting into the other chambers, a head on each end of the member in said inlet and said outlet chambers arranged to control the passage between said chambers, and means for actuating the valve member.

7. A controlling valve comprising connected casings, each provided with an inlet chamber, an outlet chamber and an intermediate chamber, a longitudinally movable closure extending into each of said chambers of each casing arranged to control the passage between said chambers, a closure actuating stem for each casing, levers pivoted above the casings bearing on the outer ends of the stems, a rock shaft and a double acting member thereon for selectively actuating the levers.

8. A controlling valve comprising a casing provided with an inlet chamber, an outlet chamber and an intermediate chamber, a longitudinally movable closure extending into each of said chambers arranged to control the passage between said chambers, a plunger extending through the wall of said casing adapted to engage said closure to adjust the same to afford communication between the inlet chamber and intermediate chamber and to close communication between the outlet chamber and intermediate chamber, means for actuating the plunger to adjust the closure in one direction and adapted to release the plunger to permit inlet pressure actuating the closure to reverse the communications between the chambers.

9. A controlling valve comprising connected casings, each provided with an inlet

chamber, an outlet chamber and an intermediate chamber, a movable closure in each casing arranged to control the passage between said chambers, a plunger for each closure, pivoted members bearing on the plungers and means for oscillating the pivoted members in effecting the adjustments of the closures.

10. A controlling valve comprising a casing provided with an inlet chamber, an outlet chamber and an intermediate chamber, a movable closure extending through said intermediate chamber with a part positioned in said inlet chamber and a part positioned in said outlet chamber arranged to control the passage between said chambers, and a plunger extending through the wall of said casing adapted to temporarily engage said closure to control its position.

11. A controlling valve comprising a pair of connected casings each provided with an inlet chamber, an outlet chamber and an intermediate chamber, a movable closure in each casing arranged to control the passage between said chambers, a reciprocating plunger for each closure, and oscillating means for actuating the reciprocating plunger.

12. A controlling valve comprising a pair of connected casings each provided with an inlet chamber, an outlet chamber and an intermediate chamber, a longitudinally movable closure in each casing arranged to control the passage between said chambers, means common to both of said casings for mechanically actuating the closures in one direction and said closures operated by inlet pressure in the opposite direction.

13. A controlling valve comprising a pair of connected casings each provided with an inlet chamber, an outlet chamber, and an intermediate chamber, a movable closure in each casing adapted for mechanical operation in one direction, and pneumatic operation in the opposite direction and mechanisms for selectively actuating either closure in the first named direction.

14. A controlling valve comprising a pair of connected casings each provided with an inlet aperture, an outlet aperture and an exhaust aperture, a movable closure in each casing arranged to control communication between said apertures, and means common to both of said casings for actuating the closures in one direction and each closure adapted to be pneumatically operated in the other direction.

15. A controlling valve comprising a pair of connected casings each provided with an inlet chamber, an outlet chamber and an intermediate chamber, a longitudinally movable closure in each casing extending into each of said chambers and arranged to control the passage between said chambers, a plunger extending through the wall of each casing adapted to temporarily engage the closure positioned in said casing to control one of its positions, and means common to both of said casings for controlling the position of said plunger.

16. A controlling valve comprising connected casings, a pressure inlet passage opening into both casings, an outlet pipe opening from each casing, an atmosphere exhaust opening for each casing, controlling valves proper in each casing and mechanism for selectively actuating the controlling valves proper to afford communication between the pressure inlet passage and either outlet pipe.

17. A controlling valve comprising connected casings, a pressure inlet passage opening into both casings, an outlet pipe opening from each casing, an atmosphere exhaust opening for each casing, controlling valves proper in each casing, mechanism for selectively actuating the controlling valves proper to afford communication between the pressure inlet passage and either outlet pipe, and said controlling valves adapted to be operated by pressure from the inlet passage to close communication between the inlet passage and outlet pipe and to open communication between the outlet pipe and exhaust opening in the respective casing.

18. A controlling valve comprising a plurality of casings, an inlet chamber, an outlet chamber and an exhaust chamber for each casing, a closure in each casing and mechanisms for selectively actuating either closure to afford communication between the inlet chamber and outlet chamber of its casing.

19. A controlling valve comprising a plurality of casings, each casing having an inlet chamber, an outlet chamber and an exhaust chamber, a passage connecting the inlet chambers of all the casings, and valves in the casings adapted to independently connect the inlet chamber and outlet chamber in the respective casing and adapted to connect the outlet chamber and exhaust chamber and mechanism for actuating the valves.

In testimony whereof we have hereunto subscribed our names in the presence of two subscribing witnesses.

PAUL J. GREBEL.
WM. J. THEIS.

Witnesses:
LAWRENCE REIBSTEIN,
K. E. HANNAH.