W. G. POTTER.

STOP VALVE.

APPLICATION FILED JAN. 19, 1914.

1,139,221.

Patented May 11, 1915.

2 SHEETS—SHEET 1.

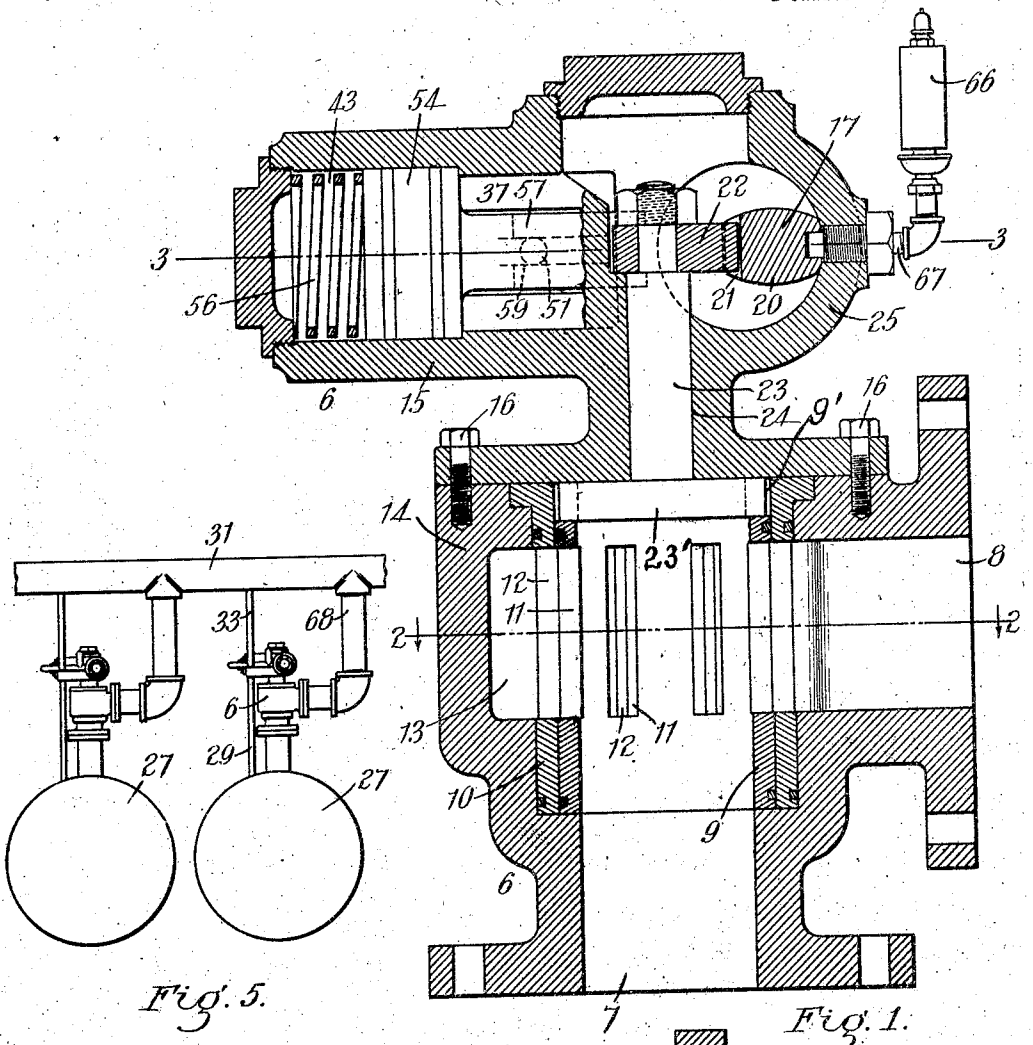


Fig. 5.

Fig. 1.

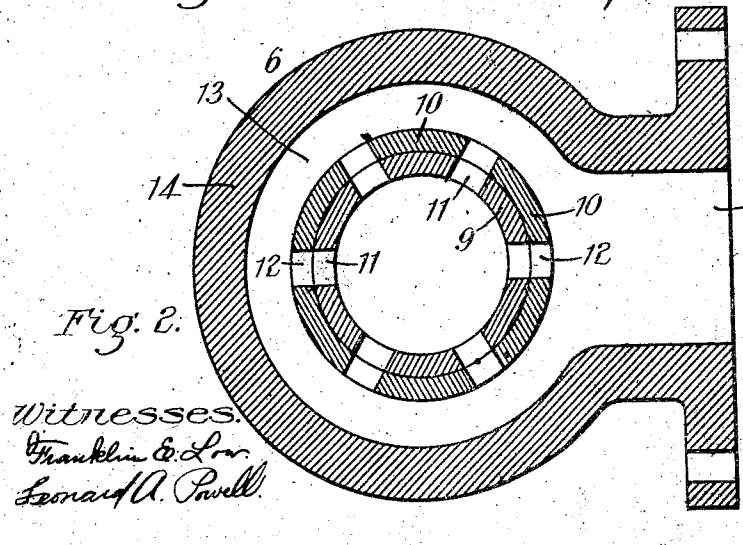


Fig. 2.

Witnesses.
Franklin E. Low.
Leonard A. Powell.

Inventor.
William G. Potter,
by his attorney
Charles S. Goodin.

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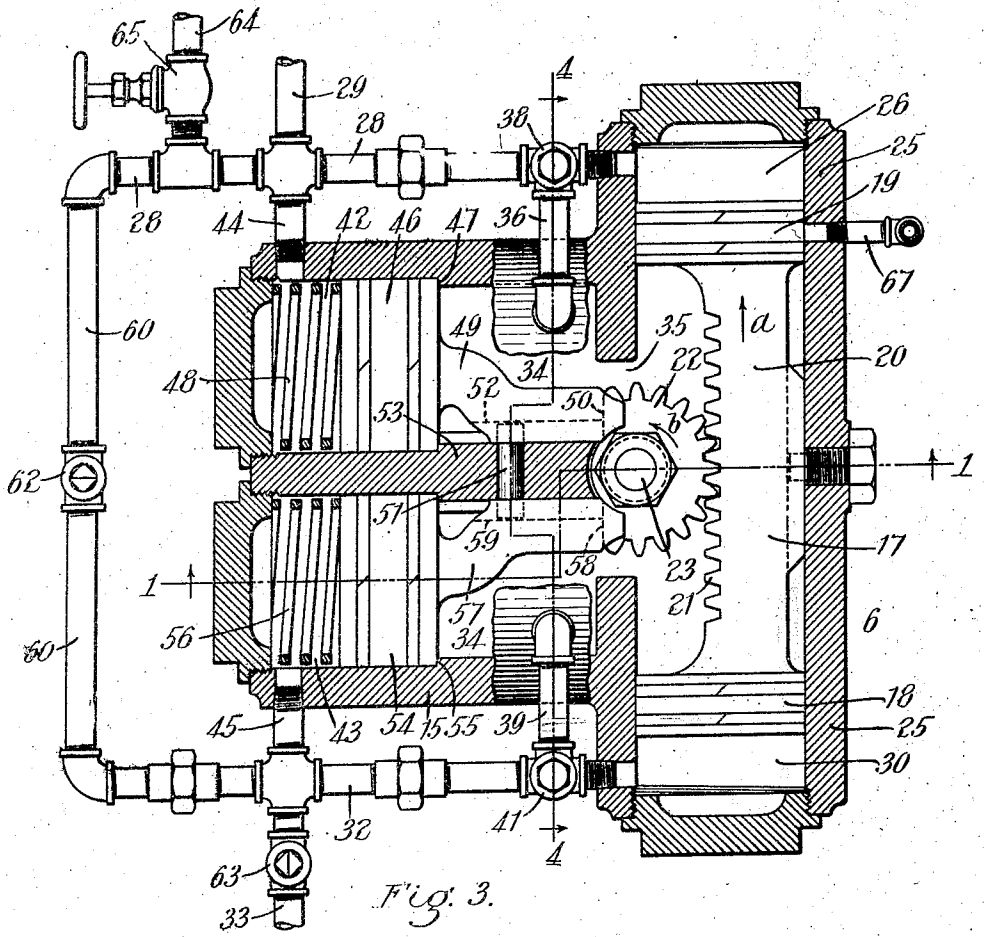


Fig. 3.

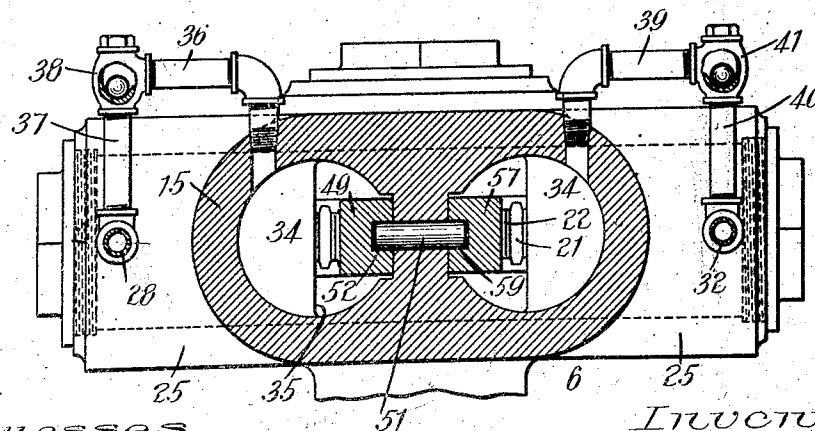


Fig. 4.

Witnesses.
Franklin E. Low.
Leonard A. Powell.

Inventor:
William G. Potter,
by his attorney,
Charles V. Goodwin

UNITED STATES PATENT OFFICE.

WILLIAM G. POTTER, OF MARBLEHEAD, MASSACHUSETTS.

STOP-VALVE.

1,139,221. Specification of Letters Patent. Patented May 11, 1915.

Application filed January 19, 1914. Serial No. 813,056.

To all whom it may concern:

Be it known that I, WILLIAM G. POTTER, a citizen of the United States, residing at Marblehead, in the county of Essex and State of Massachusetts, have invented new and useful Improvements in Stop-Valves, of which the following is a specification.

This invention relates to an improved stop valve, the same being particularly adapted to be used in connection with a series of boilers, all connected to the same main steam pipe in a manner known as a "battery" of boilers.

The stop valve of this invention is interposed between each boiler and the main steam pipe and is so constructed and connected to the said main steam pipe and its respective boiler that if, for any reason, the pressure in the boiler to which the stop valve is attached should substantially change, as for instance, if a tube blows out or if the foreman allows the pressure in the boiler to decrease substantially, or if for any reason the pressure in the main steam pipe decreases, then said stop valve will automatically act to close the pipe leading from the boiler to the main steam pipe.

It is the object of this invention, therefore, to provide a stop valve which will automatically operate to close the passage in the connections from the main steam pipe to the boiler when the pressure in the boiler or in said main steam pipe decreases and which will automatically operate to open said passage when the pressures in the main steam pipe and the boiler have again become substantially equal.

It is also the object of this invention to provide a stop valve of the character set forth and means to lock the valve in a predetermined position.

The invention consists in the combination and arrangement of parts set forth in the following specification and particularly pointed out in the claims thereof.

Referring to the drawings: Figure 1 is a sectional elevation taken on line 1—1 of Fig. 3. Fig. 2 is a sectional plan taken on line 2—2 of Fig. 1. Fig. 3 is a sectional plan taken on line 3—3 of Fig. 1. Fig. 4 is a sectional elevation taken on line 4—4 of Fig. 3. Fig. 5 is a diagrammatic plan of a "battery" of boilers and a main steam pipe connected thereto with my improved stop valves interposed between said batteries and said main steam pipe.

Like numerals refer to like parts throughout the several views of the drawings.

In the drawings, 6 is the valve casing which is provided with an inlet passage 7 and an outlet passage 8. A member 9 is mounted to rotate within said casing and within a cylindrical sleeve 10 forming a seat for said member 9. The rotary member 9 is provided with ports 11 and the sleeve 10 is provided with ports 12. A chamber 13 surrounds the sleeve 10 and opens into the outlet passage 8. The rotary sleeve 9 is open at both ends and opens at its lower end into the inlet passage 7, so that when the ports 11 register with the ports 12 the passage 7 communicates with the passage 8 and when the ports 11 are out of register with the ports 12 the passages 7 and 8 are out of connection with each other and the valve is closed.

The casing 6 is preferably made in two parts, a lower part 14 containing the rotary member 9 and an upper part 15 which is fastened to the lower part by screws 16.

The mechanism whereby the rotary member 9 is operated to close the valve is contained within the upper part 15 and consists of a piston 17 having heads 18 and 19 at opposite ends thereof, said heads being connected by a piston rod 20 which has a rack 21 thereon meshing into a segmental gear 22. The segmental gear 22 is fastened to a stem 23 which has a cross-bar 23′ thereon. The opposite ends of said cross-bar engage notches 9′ in the upper end of the rotary sleeve member 9. The stem 23 is arranged to rotate in a bearing 24 provided in the upper part 15 of the valve casing. It will be seen that by removing the upper part 15 the stationary sleeve 10 and the rotary sleeve 9 may be removed and replaced by similar new parts or repaired as the case may be.

The piston 17 is arranged to reciprocate in a fluid pressure cylinder 25, such as steam under pressure. One end 26 of said cylinder is connected to a source of fluid pressure, such as the boiler 27, by pipes 28 and 29. The opposite end 30 of the cylinder 25 is connected to an independent source of fluid pressure, such as the main steam pipe 31, by pipes 32 and 33.

The upper part 15 of the casing 6 has a fluid pressure chamber 34 therein which opens into the fluid pressure cylinder 25 through a passage 35. The upper end of the stem 23 projects into said fluid pressure chamber 34. This fluid pressure chamber is connected to the pipe 28 by pipes 36 and 37, there being a check-valve 38 interposed between said pipes 36 and 37. Said chamber 34 is also connected to the pipe 32 by pipes 39 and 40, there being also a check valve 41 interposed between said pipes 39 and 40 (see Fig. 4). Thus a check valve is interposed between each of the sources of fluid pressure, viz, the boiler 27 and the main steam pipe 31, and the chamber 34.

Two fluid pressure cylinders 42 and 43 are contained within the upper part 15 of the casing 6 and communicate with the fluid pressure chamber 34 in said casing. The cylinder 42 is connected by a pipe 44 to the pipe 29 and thus to the boiler 27, while the cylinder 43 is connected by a pipe 45 to the pipe 33 and thus to the main steam pipe 31. A piston 46 is contained within the cylinder 42 and is adapted to reciprocate therein, the movement of said piston in one direction in said cylinder being limited by an annular shoulder 47 constituting a stop. A spring 48 inclosed within the cylinder 42 bears against the piston 46 and normally holds said piston against the stop shoulder 47. The piston 46 is provided with a piston rod 49, the free end of which bears against a flat face 50 on the segmental gear 22. Said piston and rod are prevented from rotating by a guide pin 51 which projects into a slot 52 formed in the piston rod 49. The pin 51 is fast in the partition 53 which is part of the casing 6. Another piston 54 is provided in the cylinder 43 and its movement in one direction is limited by a stop shoulder 55 on the casing 6. Said piston is normally held against said shoulder by a spring 56 inclosed within the cylinder 43, and bearing against the piston 54. The piston 54 is provided with a piston rod 57 which bears at its free end against a flat face 58 on the segmental gear 22. Said piston 54 and its rod 57 are prevented from rotating by the pin 51 which projects into a slot 59 in the piston rod 57.

It will be noted that the free ends of the pistons 49 and 57 bear against the faces 50 and 58 on the segmental gear 22 and that said rods bear against said segmental gear on opposite sides of a median axial plane of said segmental gear, thus forming a lock to prevent the segmental gear 22 from rotating and thus locking the rotary member 9 of the stop valve against rotation, except under certain conditions hereinafter specifically set forth.

The pipe 28 is connected to the pipe 32 by a pipe 60 in which is provided a valve 62. The pipe 33 has a valve 63 therein which is interposed between the pipe 32 and the main steam pipe. The pipe 28 has a blow-off pipe 64 attached thereto in which is provided a shut-off valve 65.

A fluid pressure whistle 66 is connected to the cylinder 25 by a pipe 67, the same entering said cylinder, as illustrated in Fig. 3, at a point where it will be shut off from communication with said cylinder by the piston head 19, when the piston 17 is in the central position and the valve 9 is open. When the piston 17 moves in either direction, as hereinafter described, the pipe 67 will have communication with the end 26 of said cylinder or with the pressure chamber 34, as the case may be, and thus pressure will be brought to bear upon the whistle 66 and an alarm given to indicate that for some reason the valve 9 is closed.

The general operation of the mechanism hereinbefore specifically described is as follows: Assuming the pressure in the main steam pipe 31 and in the boiler 27 to be substantially the same, then the parts of the stop valve will be in the positions illustrated in the drawings Figs. 1 to 4 inclusive, and the stop valve will be open—that is, the ports 11 in the rotary member 9 will aline with the ports 12 in the sleeve 10, thus allowing free passage of the steam from the boiler through the inlet passage 7 into the chamber 13, through the outlet passage 8 and through the pipe 68 to the main steam pipe 31. Assuming, now that the pressure in the boiler 27 drops for any reason; as soon as this occurs the steam pressure from the main pipe 31, through the pipes 33 and 32, will act upon the piston head 18 to move the piston 17 in the direction of the arrow *a* (Fig. 3). The rack 21 will then cause the segmental gear 22 to be rotated in the direction of the arrow *b* (Fig. 3), thus rotating the stem 23 and sleeve 9 to move the ports 11 out of register with the ports 12 and thus close the passage 7 from the passage 8, shutting off the steam from this particular boiler to the main steam pipe 31. During this operation the pressure in the chamber 34 remains the same as that in the end 30 of the cylinder 25, being connected to the same pipe 32 by the pipes 39 and 40, and the check valve 41 being under these conditions open. The check valve 38 will at the same time be closed, by reason of the reduction of pressure in the pipe 28 and the maintaining of the same pressure in the chamber 34 and pipe 36.

The piston 54 will remain seated against the shoulder 55 by reason of the pressure in the chamber 34 and in the cylinder 43 being the same, but the pressure in the cylinder 42 having decreased, by reason of its connection through the pipe 44 with the pipe 28 and the boiler, will allow the piston 46 to be moved away from the shoulder 47 by the

pressure of the steam in the chamber 34. Thus the segmental gear will be unlocked and free to rotate as the pressure of the piston rod 49 upon the face 50 of said segmental gear will be removed.

When the piston 17 is moved to a sufficient extent so that the piston head 19 moves out of alinement with the opening in the cylinder 25 to which the pipe 67 and alarm device 66 are connected, said alarm device will be operated by the pressure of the steam from the chamber 34 through the passage 35 into the cylinder 25 between the piston heads 18 and 19 and thus outwardly through the pipe 67 and through said alarm device 66. Thus an alarm will be given notifying the engineer that the pressure in the boiler 27 has been substantially reduced for some cause. As soon as the cause of trouble in the boiler has been remedied and the pressure in the pipes 29 and 28 again becomes equal to that in the main pipe 31 and in the pipes 32 and 33 connecting therewith the pressure of the steam will become equal on opposite sides of the piston 46 and on the opposite ends of the piston 17. The piston 46 will be moved toward the shoulder 47 by the spring 48 and the free end of the piston rod 49 pressing against the flat face 50 of the segmental gear 22 which at that time will be in an inclined position relatively to the end of said piston rod, will cause the segmental gear 22 to be rotated in the opposite direction to that of the arrow *b* and the piston 17 will be moved in the opposite direction to that of the arrow *a* and thus the valve will be opened, said segmental gear coming to a stop when the face 58 abuts against the end of the piston rod 59, and the piston 46 simultaneously abuts against the shoulder 47. The parts are then in the relative positions illustrated in Fig. 3, the valve is opened and locked by the piston rods 49 and 57 and their respective pistons 46 and 54.

Assuming, now, that the pressure in the boiler 27 remains constant, but that the pressure in the main steam pipe 31 is decreased for any reason, then the pressure in the end 30 of the cylinder 25 will decrease, the piston 17 will move in the opposite direction to the arrow *a*, the check valve 41 will be closed, the check valve 38 will be opened, there will be a decrease of pressure in the cylinder 43 and the piston 17 moving in the opposite direction to that of the arrow *a* will cause the segment gear 22 to be rotated in the opposite direction to that of the arrow *b*. Said segment gear will be unlocked so as to allow the same to be rotated to close the stop valve, by reason of the fact that the pressure in the chamber 34 will cause the piston 54 to move away from the shoulder 55, thus removing the end of the piston rod 57 from the flat face 58. As soon as the pressure in the main steam pipe becomes equal to that in the boiler 27 the check valve 41 will be opened, the pressure in the chambers 34 and in the end 30 of the cylinder 25 will be equal, the pressure in the cylinder 43 will be equal to the pressure in the chamber 34 and thus the piston 54 will be moved toward the shoulder 55 and through its piston rod 57, which bears at this time against the inclined flat face 58 of the segmental gear 22, will cause said segmental gear 22 to be rotated in the direction of the arrow *b* while the piston 17 moves in the direction of the arrow *a* and thus the rotary member 9 will be moved until the ports 11 are in alinement with the ports 12 and the valve 9 is then opened and locked in its central position by the two piston rods 49 and 57 located on opposite sides of a median axial plane passing through the axis of the stem 23 and between the cylinders 42 and 43. The blow off 64 and valve 65 are provided so that the engineer can test the working of the device daily or whenever desired.

By opening the valve 65 the pressure in the pipe 28 will be decreased and the mechanism will then operate, if in proper condition, to close the stop valve. When the valve 65 is closed the pressure in the pipe 28 will return to its normal pressure and the parts will return to the position illustrated in Fig. 3, the valve being then open. Under normal conditions the valve 62 in the pipe 60 is closed and the valve 63 in the pipe 33 is open. If, however, for any reason it is desired to shut off the main steam pipe from the stop valve mechanism, the valve 63 is closed and the valve 62 opened, so that an equilibrium of pressure upon opposite ends of the piston 17 is maintained as well as an equilibrium of pressure between the cylinders 42 and 43 and the chamber 34.

Ordinarily it is not desirable to have the boiler shut off from the main steam pipe by the stop valve, unless there is a substantial difference between the pressure in the boiler and in the main steam pipe. Therefore, the springs 48 and 56 are made so as to require about five pounds pressure to compress the same and thus approximately there will be no closing of the stop valve unless a difference in pressure in the boiler and the main steam pipe amounts to five pounds. The difference in pressure at which the stop valve will operate can be regulated by means of the springs 48 and 56 to suit the user.

Having thus described my invention, what I claim and desire by Letters Patent to secure is;

1. A stop valve embodying a casing having an inlet and an outlet passage and a rotary member in said casing adapted to al-

ternately open and close said passages when rotated in either direction, mechanism adapted to rotate said rotary member in opposite directions including a reciprocatory piston and a fluid pressure cylinder in which said piston is adapted to reciprocate, independent sources of fluid pressure connected to said cylinder at opposite ends of said cylinder, respectively, and fluid pressure operated means adapted to lock said piston in a predetermined position.

2. A stop valve embodying a casing having an inlet and an outlet passage and a rotary member in said casing adapted to alternately open and close said passages when rotated in either direction, mechanism adapted to rotate said rotary member in opposite directions, including a reciprocatory piston and a fluid pressure cylinder in which said piston is adapted to reciprocate, and independent sources of fluid pressure connected to said cylinder at opposite ends of said piston, respectively.

3. A stop valve embodying a casing having an inlet and an outlet passage and a rotary member in said casing adapted to alternately open and close said passages when rotated in either direction, a gear fast to said rotary member, a piston with a rack thereon meshing into said gear, a cylinder in which said piston is adapted to reciprocate and independent sources of fluid pressure connected to said cylinder at opposite ends of said piston, respectively.

4. A stop valve embodying a casing having an inlet and an outlet passage and a rotary member in said casing adapted to alternately open and close said passages, mechanism adapted to rotate said rotary member in opposite directions including a reciprocatory piston and a fluid pressure cylinder in which said piston is adapted to reciprocate, independent sources of fluid pressure connected to said cylinder at opposite ends of said piston, respectively, and fluid pressure operated means adapted to lock said piston in a predetermined position.

5. A stop valve embodying a casing having an inlet and an outlet passage and a rotary member in said casing adapted to alternately open and close said passages when rotated in either direction, mechanism adapted to rotate said rotary member in opposite directions, including a reciprocatory member with piston heads at the ends thereof, respectively, a fluid pressure cylinder in which said piston heads are adapted to reciprocate, and independent sources of fluid pressure connected to said cylinder at opposite ends of said reciprocatory member, respectively, said casing having a fluid pressure chamber opening into said fluid pressure cylinder between said piston heads and connected to both of said independent sources of fluid pressure and a stem on said rotary member projecting into said fluid pressure chamber and a check valve interposed between each of said sources of fluid pressure and said fluid pressure chamber.

6. A stop valve embodying a casing having an inlet and an outlet passage and a rotary member in said casing adapted to alternately open and close said passages, mechanism adapted to rotate said rotary member in opposite directions, including a reciprocatory member with piston heads at the ends thereof, respectively, a fluid pressure cylinder in which said piston heads are adapted to reciprocate, independent sources of fluid pressure connected to said cylinder at opposite ends of said reciprocatory member, respectively said casing having a fluid pressure chamber opening into said fluid pressure cylinder between said piston heads and connected to both of said independent sources of fluid pressure, a check valve interposed between each of said sources of fluid pressure and said fluid pressure chamber, two fluid pressure cylinders communicating with said fluid pressure chamber and each connected to one of said sources of fluid pressure, a piston in each of said last-named cylinders, and means controlled by said last named pistons adapted to lock said rotary member in a predetermined position.

7. A stop valve embodying a casing having an inlet and an outlet passage and a rotary member in said casing adapted to alternately open and close said passages, mechanism adapted to rotate said rotary member in opposite directions, including a reciprocatory member with piston heads at the ends thereof, respectively, a fluid pressure cylinder in which said piston heads are adapted to reciprocate, independent sources of fluid pressure connected to said cylinder at opposite ends of said reciprocatory member, respectively, said casing having a fluid pressure chamber opening into said fluid pressure cylinder between said piston heads and connected to both of said independent sources of fluid pressure, a check valve interposed between each of said sources of fluid pressure and said fluid pressure chamber, two fluid pressure cylinders communicating with said fluid pressure chamber and each connected to one of said sources of fluid pressure, a piston in each of said last-named cylinders, and a spring in each of said last-named cylinders adapted to force the respective piston toward said fluid pressure chamber and means controlled by said last-named pistons to lock said rotary member in a predetermined position.

8. A stop valve embodying a casing having an inlet and an outlet passage and a rotary member in said casing adapted to alternately open and close said passages, mechanism adapted to rotate said rotary member in opposite directions, including a recipro-

catory member with piston heads at the ends thereof, respectively, a fluid pressure cylinder in which said piston heads are adapted to reciprocate, independent sources of fluid pressure connected to said cylinder at opposite ends of said reciprocatory member, respectively said casing having a fluid pressure chamber opening into said fluid pressure cylinder between said piston heads and connected to both of said independent sources of fluid pressure, a check valve interposed between each of said sources of fluid pressure and said fluid pressure chamber, two fluid pressure cylinders communicating with said fluid pressure chamber and each connected to one of said sources of fluid pressure, a piston in each of said last-named cylinders, a stop adapted to limit the movement of each of said pistons, in one direction, and means controlled by said last-named pistons adapted to lock said rotary member in a predetermined position.

9. A stop valve embodying a casing having an inlet and an outlet passage and a rotary member in said casing adapted to alternately open and close said passages, a segmental gear fast to said rotary member, a reciprocatory member with piston heads at the ends thereof, respectively, a fluid pressure cylinder in which said piston heads are adapted to reciprocate, independent sources of fluid pressure connected to said cylinder at opposite ends of said reciprocatory member, respectively, two fluid pressure cylinders communicating with said fluid pressure chamber and each connected to one of said sources of fluid pressure, a piston in each of said last-named cylinders, and a piston rod on each of said last-named pistons, said piston rods adapted to bear against said segmental gear on opposite sides of a median axial plane thereof, whereby said rotary member may be locked in a predetermined position.

10. A stop valve embodying a casing having an inlet and an outlet passage and a rotary member in said casing adapted to alternately open and close said passages, mechanism adapted to rotate said rotary member in opposite directions, including a reciprocatory piston and a fluid pressure cylinder in which said piston is adapted to reciprocate, independent sources of fluid pressure connected to said cylinder at opposite ends of said piston, respectively, means to disconnect one of said sources of fluid pressure from said cylinder and means to connect the other of said sources of fluid pressure to said cylinder at the end thereof thus disconnected from its normal source of fluid pressure.

11. A stop valve embodying a casing having an inlet and an outlet passage and a rotary member in said casing adapted to alternately open and close said passages, mechanism adapted to rotate said rotary member in opposite directions, including a reciprocatory member with piston heads at the ends thereof, respectively, a fluid pressure cylinder in which said piston heads are adapted to reciprocate, independent sources of fluid pressure connected to said cylinder at opposite ends of said reciprocatory member, respectively, said casing having a fluid pressure chamber opening into said fluid pressure cylinder between said piston heads and connected to both of said independent sources of fluid pressure, two fluid pressure cylinders parallel to each other and at right angles to said first named fluid pressure cylinder, said pair of fluid pressure cylinders communicating with said fluid pressure chamber and each of said last-named fluid pressure cylinders connected to one of said sources of fluid pressure, a piston in each of said last-named cylinders, the inner ends of the heads of said piston all being subject to the same fluid pressure in said fluid pressure chamber, a spring in each of said last-named cylinders adapted to force the respective piston toward said fluid pressure chamber and means controlled by said last-named pistons to lock said rotary member in a predetermined position.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

WILLIAM G. POTTER.

Witnesses:
CHARLES S. GOODING,
SYDNEY E. TAFT.