(No Model.) 2 Sheets—Sheet 1.

F. J. FERRELL.

VALVE.

No. 428,671. Patented May 27, 1890.

Fig. 1.

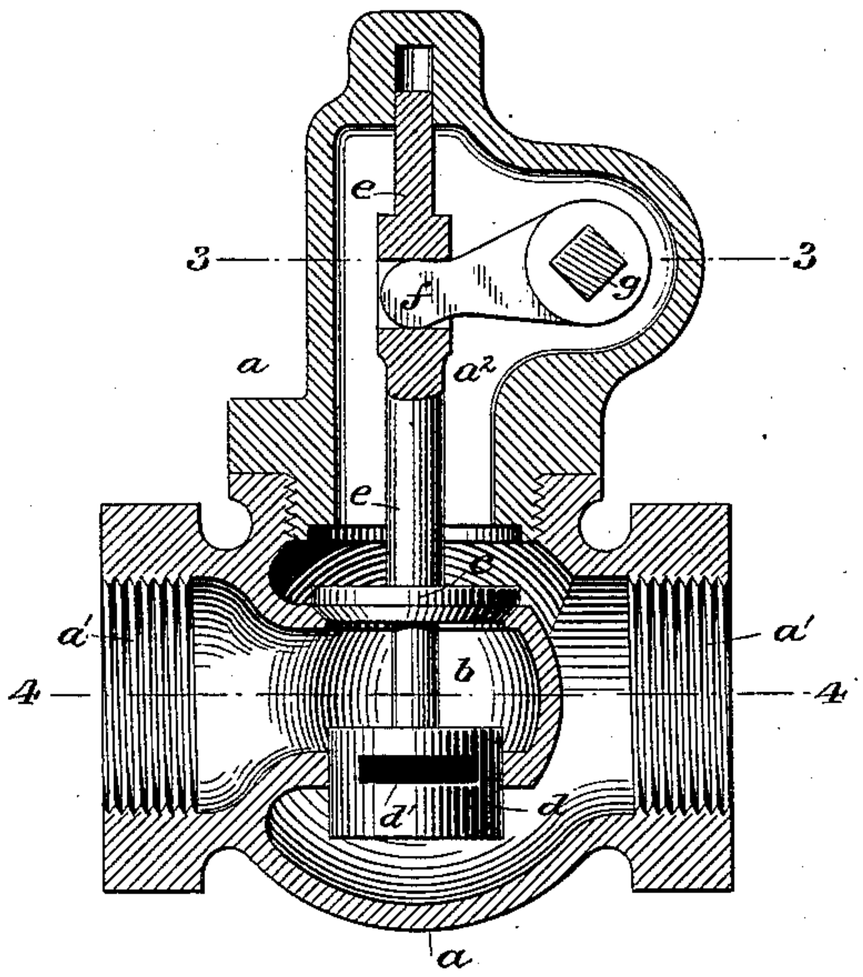


Fig. 2.

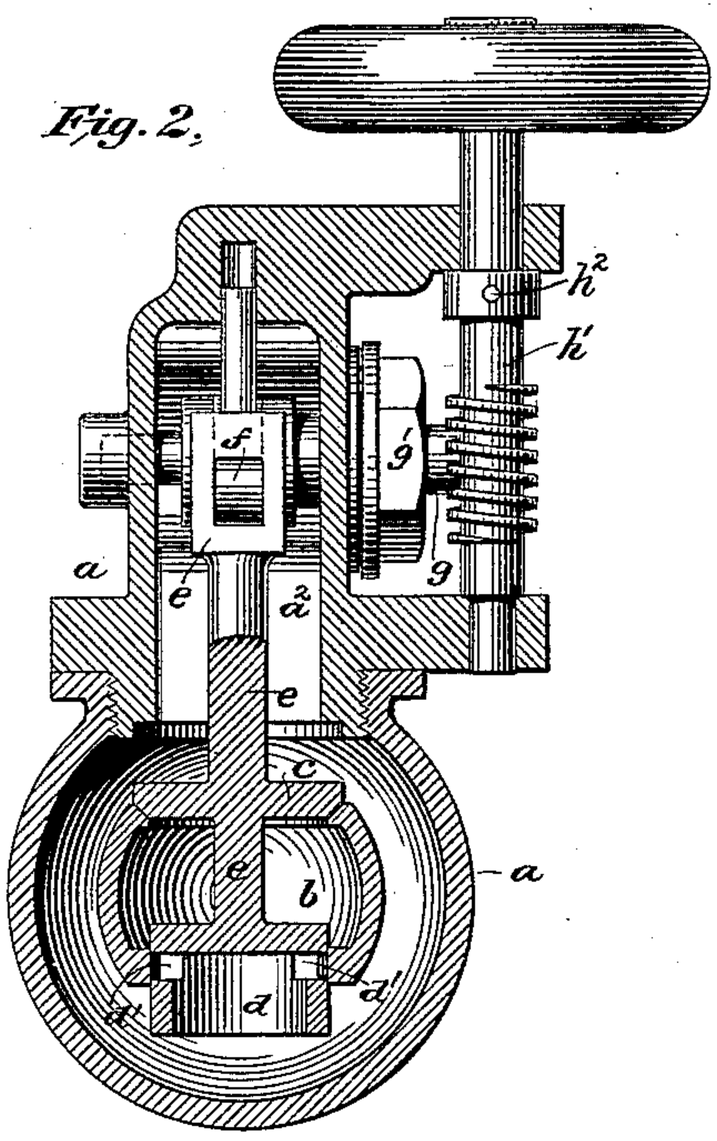


Fig. 3.

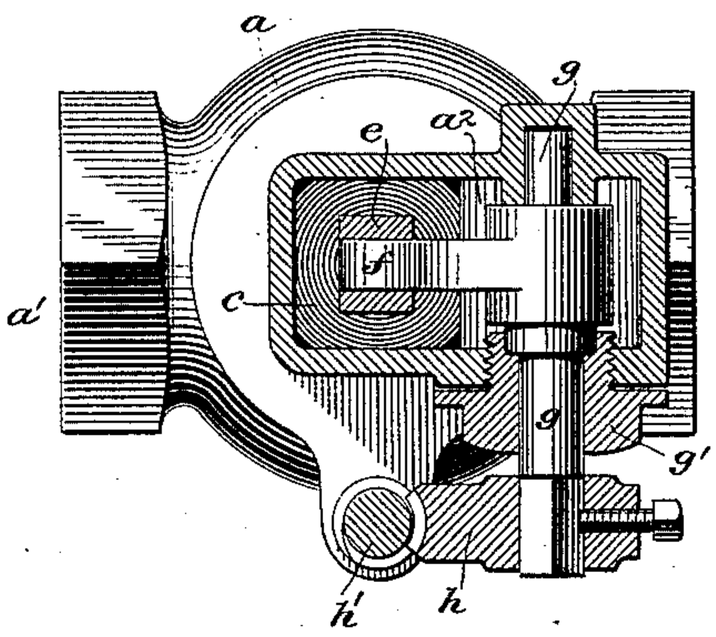
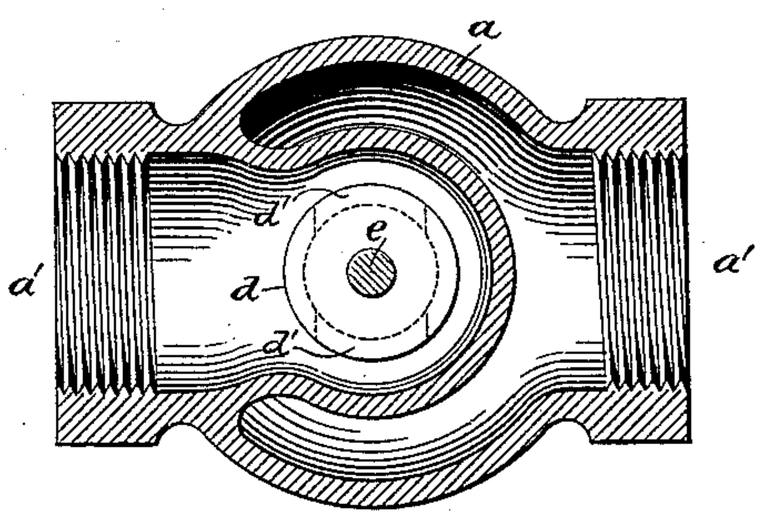


Fig. 4.



Witnesses
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Inventor
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By his Attorney
Henry D. Williams

(No Model.) 2 Sheets—Sheet 2.

F. J. FERRELL.

VALVE.

No. 428,671. Patented May 27, 1890.

Fig. 5.

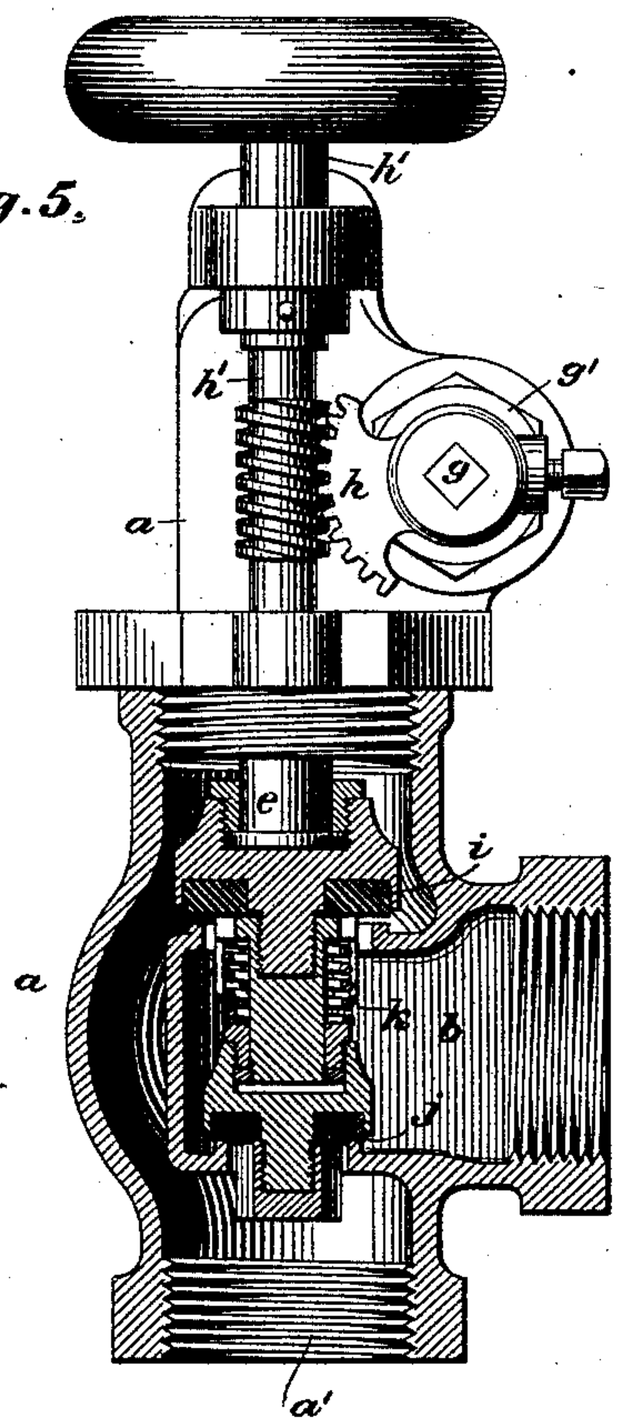
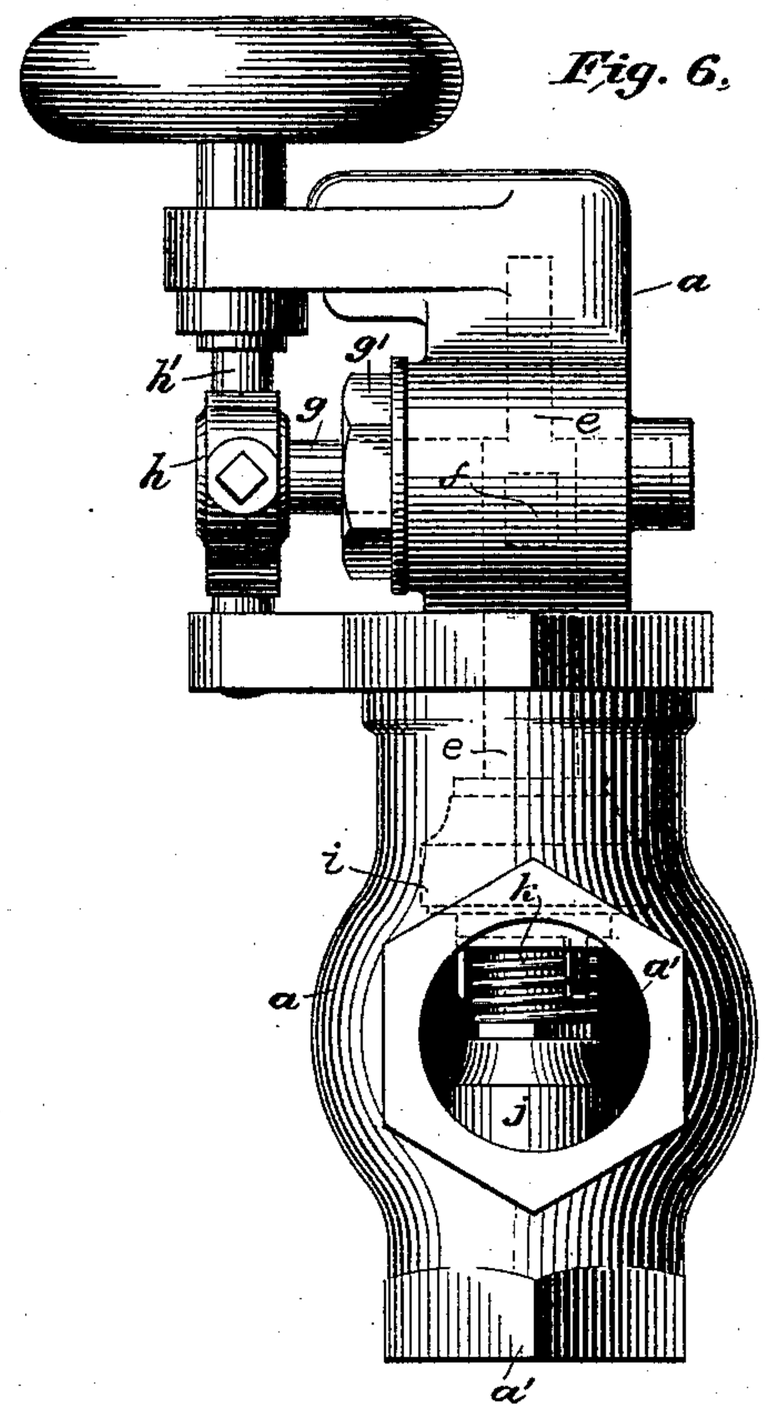


Fig. 6.



Witnesses
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UNITED STATES PATENT OFFICE.

FRANK J. FERRELL, OF NEW YORK, N. Y.

VALVE.

SPECIFICATION forming part of Letters Patent No. 428,671, dated May 27, 1890.

Application filed February 12, 1890. Serial No. 340,159. (No model.)

To all whom it may concern:

Be it known that I, FRANK J. FERRELL, a citizen of the United States, and a resident of New York city, State of New York, have invented certain new and useful Improvements in Valves, of which the following is a specification, reference being had to the accompanying drawings, forming part of this specification.

This invention relates to valves for checking and controlling the passage of fluids, and has for its object to improve the construction of such valves.

My invention consists in a new device for operating such valves, in a novel construction of double valve, whereby absolute tightness under all ordinary conditions of wear and in all temperatures is insured, and in various improvements in the construction of the various parts of the valve.

In the accompanying drawings, Figure 1 is a vertical longitudinal section of a globe double valve embodying my improvements, and Fig. 2 is a transverse vertical section of the same. Fig. 3 is a plan view in section on the line 3 3, Fig. 1. Fig. 4 is a plan view in section on the line 4 4, Fig. 1. Fig. 5 is a front elevation, partly in section, showing various modifications in construction; and Fig. 6 is an end elevation of the same.

The casing or outer shell a of the valve shown is of spherical or globe form, with two internally-threaded openings a' a' for receiving the ends of the fluid-conveying pipes, and with an upper chamber a^2, containing the valve-operating devices. One of the openings leads into an inner chamber b, formed within the casing a, and the other opening leads into an outer chamber between the casing and the walls of the inner chamber b. The only connection between the inner chamber b and the outer chamber is by means of two openings formed in the top and bottom walls of the chamber b, and these two openings are shaped to form valve-seats. The upper valve-seat is conical and the lower valve-seat cylindrical in form. Two valves c and d are fitted to work in these valve-seats. The upper valve c is of ordinary conical form and the lower valve d of cylindrical form, and is fitted as a steam-tight piston within the lower cylindrical valve-seat. The diameter of the lower valve d and its seat is exactly equal to the smallest diameter of the upper conical valve c and its seat, so that the pressures from the interior chamber b upon the upper and lower valves are exactly balanced. The passages of the lower cylindrical valve d consist of the ports d' d', preferably placed diametrically opposite to balance the pressures therethrough, and these ports d' d' lead into a cavity in the valve, which is open at its lower end.

The two valves c and d are secured to the stem e, which passes upward and is guided at its upper end, where it is fitted to slide in a depression in the upper wall of the chamber a^2. The cylindrical valve d, which in all positions of the stem remains within its seat, guides the lower end of the stem. A slot is formed in the upper portion of the stem e, and an arm f fits and works in this slot, but has no vertical movement therein. This arm f is secured to the rock-shaft g, which rock-shaft is fitted in bearings in the portion of the casing a forming the side walls of the upper chamber a^2. One end of the rock-shaft projects out through the casing, and the bearing at this part of the shaft is made steam and water tight by means of the threaded sleeve g' bearing against an anti-friction metal collar on the rock-shaft g. As this rock-shaft has no longitudinal movement, but only turns slightly in its bearing, such joint can be made perfectly tight by the contact of metallic surfaces, either with the construction shown or similar means, and without necessitating the use of any stuffing-box or packing. The outer end of the rock-shaft g is provided with a worm-toothed arm or sector h, meshing into a worm on a shaft h'. The worm-shaft h' is fitted to rotate without end-play in lugs projecting from the casing. It is provided with a hand-wheel when the valve is to be directly operated by hand, as in the case of check-valves, radiator-valves, and other similar valves. When the valve-stem is raised, the upper conical valve c is lifted up clear of its seat and the lower cylindrical valve d slides upward in its seat and exposes the ports d' d', and thus the fluid is allowed to escape through both the upper and the lower valves. When the stem is depressed, the valves are closed. It will be observed

that slight variations in the closing-point of the upper valve will not cause either valve to leak, as the closing-point of the lower valve can be varied considerably without impairing its efficiency. The upper valve *c* has a fixed point of closure with relation to the stem, while the lower valve *d* can pass beyond its closing-point and permit the upper valve to move after it has been closed; hence the valve will always be tight, notwithstanding wearing away of the upper valve or slight changes in the length of the stem. It will also be observed that the lower edge of the opening for the upper conical valve is of exactly the same area as the upper edge of the lower cylindrical valve. This insures perfect equality of pressures from the fluid in the passage *b* upon the two valves, and therefore perfect balancing of the valves.

In the modification shown in Figs. 5 and 6 the upper and lower valves are both disk-valves having annular seats. The upper valve *i* is rigidly secured to the stem, while the lower valve *j* has a slight longitudinal or vertical play thereon, but is held in lower position in relation thereto by the spring *k*. The positions of these valves are so adjusted that the lower valve first reaches its seat, as shown, and then permits the stem to be moved down and the spring *k* to be compressed until the upper valve is tightly pressed to its seat. Thus both valves can be tightly seated and their tightness will not be affected by slight variations in the closing-point of the upper valve.

The valve-operating mechanism in Figs. 5 and 6 is the same as shown in Figs. 1, 2, and 3.

My improved construction of valve and worm-gear operating mechanism permits the valve to be completely opened or closed by a single revolution of the operating worm-shaft *h'*; hence the valve can be readily and quickly operated, and the position of the valve will be indicated to the eye by the position of some point of the worm-shaft or hand-wheel—such as the pin h^2, located directly under the upper bearing of the shaft. (See Fig. 5.)

It is evident that parts of my invention may be used independently of other parts—as, for instance, my improved valve-operating mechanism may be applied to work the stem of an ordinary valve, or my improved double valve may be used in conjunction with an ordinary operating mechanism.

The construction of valve herein claimed is similar to that shown and described, but not separately claimed, in my application for Letters Patent filed October 7, 1889, Serial No. 326,233.

What I claim, and desire to secure by Letters Patent, is—

1. A valve provided with a stem fitted to move longitudinally, in combination with a rock-shaft fitted in the valve-casing and projecting outside the same, and having an arm within the casing connected to the stem and a toothed arm outside the casing, and a worm-shaft meshing with the toothed arm, substantially as set forth.

2. A double valve provided with a casing having an outer chamber extending to one end of the valve and an inner chamber extending to the other end of the valve, two openings in opposite walls of the inner chamber, each connecting the inner chamber with the outer chamber, two valve-seats, one arranged about each opening, and two valves on the same stem, one of which has a fixed point of closure and the other of which is constructed to permit the stem to move to close the first valve after it has been closed, in combination with a rock-shaft fitted in the valve-casing and projecting outside the same, and having an arm within the casing connected to the stem and a toothed arm outside the casing, and a worm-shaft meshing with the toothed arm, substantially as set forth.

3. A double valve provided with a chamber, two openings in the walls of the chamber, two valve-seats, one conical and the other cylindrical, one arranged about each opening, and a conical and a cylindrical valve on the same stem, substantially as set forth.

4. A double valve provided with a chamber, two openings in the walls of the chamber, two valve-seats, one conical and the other cylindrical, one arranged about each opening, and a conical and a cylindrical valve on the same stem, in combination with a rock-shaft fitted in the valve-casing and projecting outside the same, and having an arm within the casing connected to the stem and a toothed arm outside the casing, and a worm-shaft meshing with the toothed arm, substantially as set forth.

5. A double valve consisting of the casing *a*, the inner chamber *b*, and an outer chamber between the inner chamber and casing, a conical and a cylindrical valve-seat in the walls of the chamber *b*, and the conical valve *c* and the cylindrical valve *d* on the stem *e*, the cylindrical valve having ports *d'* therein, substantially as set forth.

6. A double valve consisting of the casing *a*, the inner chamber *b*, and an outer chamber between the inner chamber and the casing, a conical and a cylindrical valve-seat in the walls of the chamber *b*, and the conical valve *c* and the cylindrical valve *d* on the stem *e*, the cylindrical valve having ports *d'* therein, in combination with a rock-shaft fitted in the valve-casing and projecting outside the same, and having an arm within the casing connected to the stem *e* and a toothed arm outside the casing, and a worm-shaft meshing with the toothed arm, substantially as set forth.

7. A valve provided with a stem fitted to move longitudinally, in combination with the rock-shaft *g*, fitted in the valve-casing, with one end projecting outside the casing and provided with the arm *f*, connected to the stem, and the worm-toothed sector *h* outside the

casing, and the worm-shaft h', meshing with the sector h, substantially as set forth.

8. A double valve consisting of the casing a, the inner chamber b, and an outer chamber between the inner chamber and the casing, a conical and a cylindrical valve-seat in the walls of the chamber b, and the conical valve c and the cylindrical valve d on the stem e, the cylindrical valve having ports d' therein, in combination with the rock-shaft g, fitted in the valve-casing, with one end projecting outside the casing and provided with the arm f, connected to the stem e, and the worm-toothed sector h outside the casing, and the worm-shaft h', meshing with the sector h, substantially as set forth.

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Witnesses:
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WYLYS HODGES.