No. 797,648. PATENTED AUG. 22, 1905.

J. B. WARING.

VALVE.

APPLICATION FILED JAN. 2, 1901. RENEWED JAN. 21, 1905.

2 SHEETS—SHEET 1.

Fig. 1.

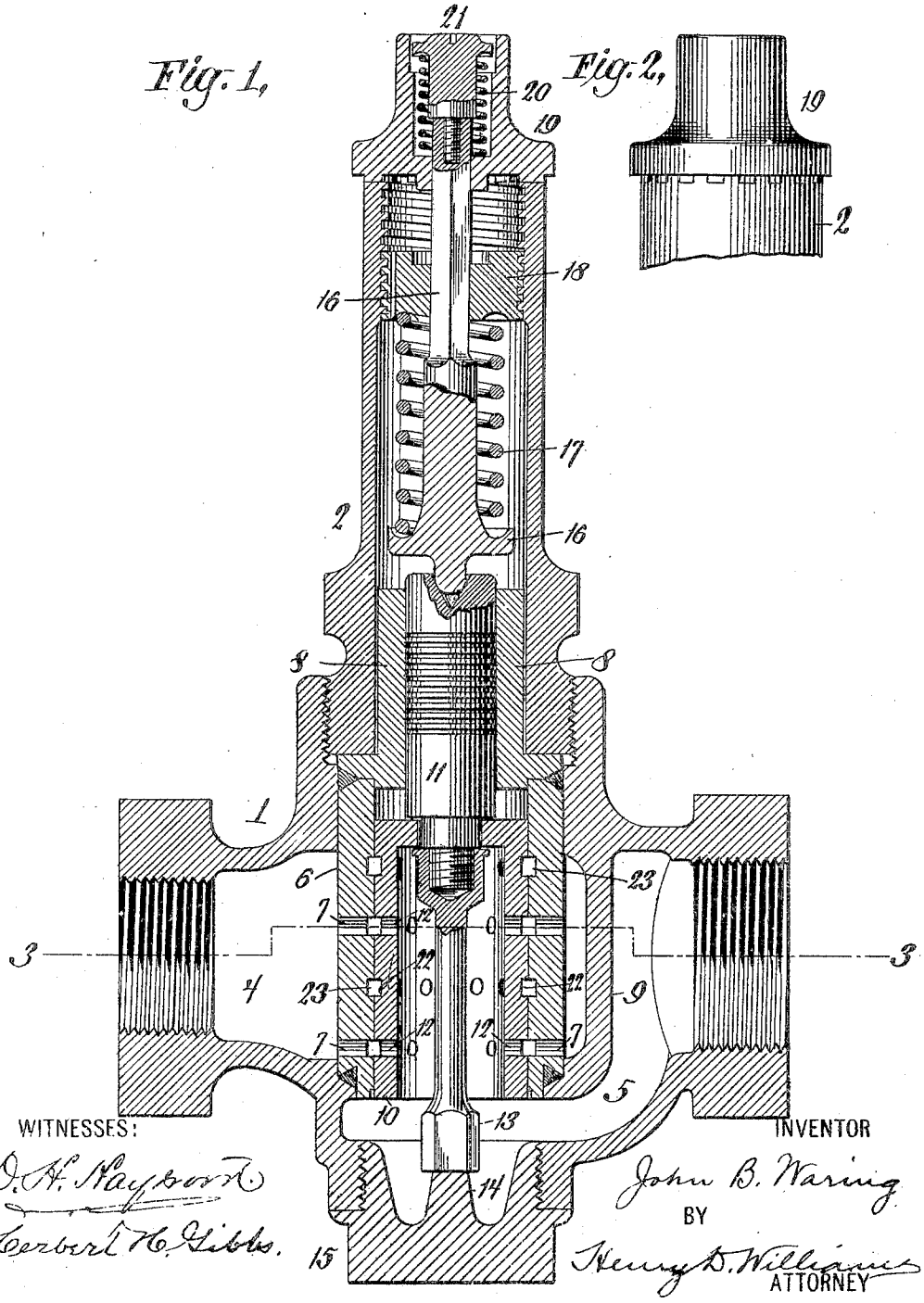


Fig. 2.

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Fig. 3.

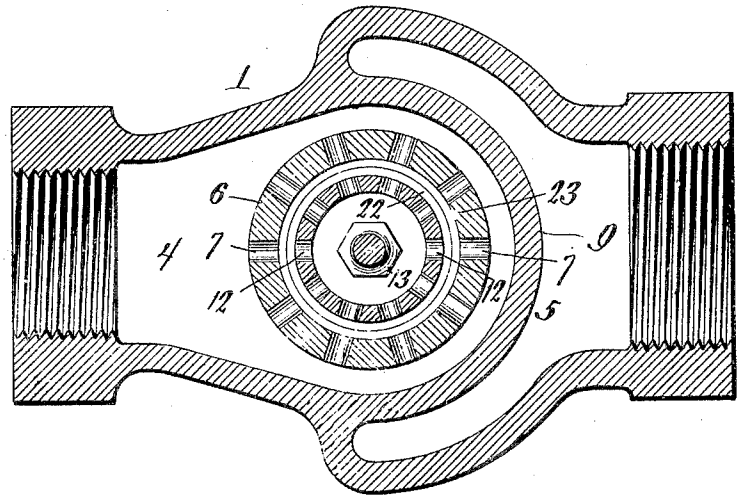
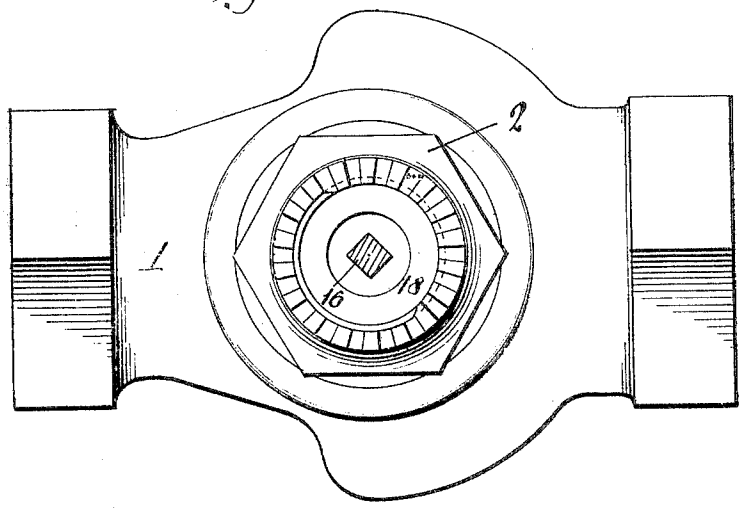


Fig. 4.



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UNITED STATES PATENT OFFICE.

JOHN B. WARING, OF NEWARK, NEW JERSEY, ASSIGNOR TO THE WARING & FOX VALVE COMPANY, OF NEW YORK, N. Y., A CORPORATION OF NEW YORK.

VALVE.

No. 797,648. Specification of Letters Patent. Patented Aug. 22, 1905.

Application filed January 2, 1901. Renewed January 21, 1905. Serial No. 242,104.

To all whom it may concern:

Be it known that I, JOHN B. WARING, a citizen of the United States, and a resident of Newark, Essex county, State of New Jersey, 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 hereof.

This invention relates to valves adapted for controlling the flow of fluids, and particularly for controlling the flow of fluid from a high pressure to a low pressure, so as to produce a regulated predetermined low pressure.

This invention has for its objects the balancing of the pressures upon the movable part or valve, the minimizing of the effects of wiredrawing and wear, and the prevention of injury to the valve or seat from wiredrawing, the ready adjustment of a resisting device so that the valve may be easily and quickly set to produce the predetermined low pressure, and generally to simplify and improve the construction and increase the effectiveness of devices of this description.

The accompanying drawings illustrate a reducing-valve embodying my invention.

Figure 1 is a vertical central longitudinal section of the valve. Fig. 2 is a side elevation of the upper part thereof. Fig. 3 is a horizontal section on planes indicated by the line 3 3, Fig. 1. Fig. 4 is a plan view with the adjusting-cap removed.

The valve-casing shown comprises a body 1 and a bonnet 2. The body is divided into two chambers—a high-pressure chamber 4 and a low-pressure chamber 5. These chambers are separated by a horizontal and a vertical partition, shown as formed in the body, and by a tubular wall 6 with a plurality of ports 7 therein, this wall being shown as a separate open-ended tube fitted tightly in the valve-body and clamped therein between the horizontal partition or bottom of the high-pressure chamber 4 and the lower portion of the valve-bonnet 2, a bearing-sleeve 8 being interposed between the bonnet and upper edge of the tubular wall 6 and suitable packing of lead or other soft metal or material being located in annular grooves at the upper and lower ends of the tubular wall, whereby a tight joint is effected. The side walls of the high-pressure chamber 4 are clear of the tubular wall 6, these side walls partly comprising the semitubular vertical partition 9 between the high-pressure chamber 4 and the low-pressure chamber 5, this semitubular partition partly surrounding the tubular wall 6, but with a clear space all around the tubular wall, and the portion of the tubular wall 6 within the high-pressure chamber is thus open all around or on all sides thereof to the high pressure, and the ports 7 are located all around or on all sides of the tubular wall.

The movable valve 10 is shown in the form of a cylindrical tube open at its lower end to the low-pressure chamber and having a perforated head receiving the valve-stem 11 and fitted to slide within the tubular wall 6 and provided with a plurality of ports 12 corresponding in number and position to the ports 7 of the tubular wall. The ports are shown as arranged in horizontal rows, and the valve-ports 12 terminate outwardly in annular grooves 22, extending around the outer cylindrical surface of the valve 10, and the fixed or tubular wall ports 7 terminate inwardly in annular grooves 23, extending around the inner cylindrical surface of the tubular wall 6. These annular grooves are thus contiguous to the ports and serve to connect the ports laterally and also to receive and discharge any foreign material that may enter between the valve 10 and the tubular wall 6. Should the valve 10 rotate to a position in which its ports are not in line with those of the tubular wall or be set originally in such position, the annular grooves will afford ample connecting-passages between the ports. As shown, no means are provided to positively hold the valve against rotation.

It will be seen that the movable valve receives the high pressure as well as the low pressure equally on all sides thereof, and the lateral pressures thereon are balanced. The pressure in the low-pressure chamber is, however, exerted upwardly against the movable valve and resisted by suitable means hereinafter described, so as to close the ports sufficiently to permit only the predetermined low pressure in the low-pressure chamber.

The valve-stem 11 passes downward through the head of the valve 10 and has a stop-stem 13 secured at its lower end and extending down through the tubular part of the valve

and coming in contact in the lower position of the movable valve, as shown, with a stud 14 on a nut 15, this nut 15 being secured into the bottom of the valve-casing and closing an opening therein large enough to permit the removal of the movable valve 10.

The valve-stem 11 passes upward from the head of the valve 10 through the bearing-sleeve 8, being preferably provided with a number of annular grooves to retain water of condensation or other lubricant, and is provided at its upper end with a depression receiving the lower end of the pressure-plunger 16. The depression at the top of the valve-stem 11 is shown as of conical form, and the lower end of the pressure-plunger 16 is shown as rounded, so that it will seat itself freely therein, the connection of these parts being thus self-seating, and the connection of the valve and stem is slightly loose, so that the resistance of the pressure-plunger will be freely opposed to the upward pressure of the valve without side strains or binding. The resisting device in the construction shown is a spring 17 of helical form pressing at its lower end against a cup near the bottom of the pressure-plunger 16 and at its upper end against the adjusting-nut 18, this adjusting-nut 18 working in an internal thread formed in the upper part of the valve-bonnet 2. The adjusting-nut 18 slides freely axially or longitudinally upon the pressure-plunger 16, but is compelled to rotate therewith, the upper portion of the pressure-plunger being shown as a stem of square cross-section and passing through a corresponding perforation in the adjusting-nut. An adjusting-cap 19 is provided, movable axially relatively to the stem of the pressure-plunger, but rotatively movable therewith, which is shown as fitted upon the squared upper end of the pressure-plunger and having a limited axial or longitudinal movement thereon under control of a light spring 20, such spring being located within the adjusting-cap and pressing at its lower end against the adjusting-cap and at its upper end against the head of a stud 21, secured to and shown as screwed into the upper end of the pressure-plunger. The adjusting-cap 19 is locked to prevent rotation thereof when in lower normal position by interlocking projections and depressions on the cap and casing and is shown as provided at its lower face with locking-teeth engaging counterpart locking-teeth in the upper edge of the valve-bonnet 2.

The upward movement of the adjusting-cap 19 is limited by contact of the head of the stud 21 with an internal shoulder in the adjusting-cap and need be only sufficient to enable the teeth of the cap to work clear of the teeth on the bonnet. When the adjusting-cap is thus lifted, it may be freely rotated and will rotate the adjusting-nut 18, and thereby adjust the downward pressure of the resisting-spring 17 upon the pressure-plunger 16, and this adjustment may be readily effected while the valve is in use to bring about the regulation of the valve-openings to produce the desired low pressure.

It frequently happens that valves are but slightly open, so that the fluid rushes through the opening at very high velocity, and this is particularly true of reducing-valves. The high velocity of the fluid usually produces a cutting action on the valve and seat. According to my invention the direction of flow of the fluid is across the direction of movement of the valve, and the cutting action, if any, does not materially affect the valve-seat, and if this cutting action enlarges the valve-openings it does not impair the efficiency of the valve, as it merely elevates the closing-point. Moreover, the fluid passes through a plurality of openings, and therefore the volume passing through any opening is greatly reduced.

The balancing of the lateral pressures upon the valve insures greater accuracy and a more delicate action than is possible with a valve pressed against its seat by the high pressure, by reason of the reduction of friction to a minimum.

It is evident that various modifications may be made in the construction shown and above particularly described within the scope of my invention.

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

1. A valve comprising a casing having two chambers and a tubular wall between such chambers, and a longitudinally-moving tubular valve working in contact with such wall, the wall having one or more ports communicating with the valve and one or more annular grooves contiguous to such ports and in the surface of the wall adjacent to the valve, substantially as set forth.

2. In a valve, the combination with a casing having two chambers and a tubular wall between such chambers, of a longitudinally-moving tubular valve working in contact with such wall, such valve having one or more ports and one or more annular grooves contiguous to such ports and in the surface of the valve adjacent to the tubular wall, substantially as set forth.

3. In a valve, the combination with a casing having two chambers and a tubular wall between such chambers with a plurality of ports therein, of a longitudinally-moving tubular valve working in contact with such wall and having a plurality of ports therein, such tubular wall and valve having annular grooves contiguous to their ports and on the adjacent surfaces thereof, substantially as set forth.

4. In a reducing-valve the combination with a casing having a high-pressure chamber and a low-pressure chamber, of a longitudinally-moving valve controlling the communication

between such chambers through a plurality of ports arranged laterally therein, and one or more annular grooves contiguous to said ports such valve being open to the low pressure at one end thereof, and a resisting device opposed to such pressure, substantially as set forth.

5. A reducing-valve comprising a casing having a high-pressure chamber and a low-pressure chamber, a longitudinally-moving valve controlling the communication between such chambers, the casing having a wall laterally surrounding the valve with ports and annular grooves contiguous to the ports in such wall leading to the valve and so arranged that the lateral pressures upon the valve will be substantially balanced, such valve being open to the low pressure at one end thereof, and a resisting device opposed to such pressure, substantially as set forth.

6. A reducing-valve comprising a casing having a high-pressure chamber and a low-pressure chamber, a longitudinally-moving valve having a plurality of ports and grooves contiguous to the ports arranged laterally therein, the casing having a wall laterally surrounding the valve with a plurality of ports and grooves contiguous to the ports in such wall leading to the valve, such valve being open to the low pressure at one end thereof, and a resisting device opposed to such pressure, substantially as set forth.

7. The combination with a valve-casing, a valve therein and a spring resisting device controlling the valve, of an adjusting-nut for such resisting device and an adjusting-cap controlling the rotary movement of such nut but movable axially relatively thereto and to the casing, the adjusting-cap and the casing being provided with one or more interlocking projections and depressions by the engagement of which the cap and nut are locked against rotary movement, substantially as set forth.

8. The combination of a valve-casing, a valve-stem, a pressure-plunger engaging the valve-stem, an adjusting-nut, a spring resisting device pressing against the pressure-plunger and the adjusting-nut, and an adjusting-cap controlling the rotary movement of the adjusting-nut but movable axially relatively thereto and to the casing, the adjusting-cap and the casing being provided with one or more interlocking projections and depressions by the engagement of which the cap and nut are locked against rotary movement, substantially as set forth.

9. The combination of a valve-casing, a valve therein, a valve-stem loosely secured to the valve, a pressure-plunger engaging the valve-stem with a self-seating connection, an adjusting-nut, a spring resisting device pressing against the pressure-plunger and the adjusting-nut, and an adjusting-cap controlling the rotary movement of the adjusting-nut and movable axially relatively thereto and to the casing, the adjusting-cap and casing being provided with one or more interlocking projections and depressions by the engagement of which the cap and nut are locked against rotary movement, substantially as set forth.

10. The combination with a valve-casing, a valve therein, and a spring resisting device controlling the valve, of an adjusting-nut for such spring resisting device, an adjusting-cap connected to the adjusting-nut so as to compel the nut to rotate with the cap, but so as to be movable independently thereof, the adjusting-cap being also movable relatively to the casing and the adjusting-cap and casing being provided with one or more interlocking projections and depressions by the engagement of which the cap and nut are locked against rotary movement, and a spring tending to hold the cap against the casing, substantially as set forth.

11. The combination of a valve-casing, a valve and a valve-stem, a pressure-plunger engaging the valve-stem, an adjusting-nut, a spring resisting device pressing against the pressure-plunger and the adjusting-nut, an adjusting-cap, the pressure-plunger having a stem passing through an aperture in the adjusting-nut and entering an aperture in the adjusting-cap so as to connect the cap and nut and transmit rotary movement from the cap to the nut, and means for locking the cap against rotary movement, substantially as set forth.

12. The combination of a valve-casing, a valve-stem, a pressure-plunger engaging the valve-stem, an adjusting-nut, a spring resisting device pressing against the pressure-plunger and the adjusting-nut, an adjusting-cap, the pressure-plunger having a stem passing through an aperture in the adjusting-nut and entering an aperture in the adjusting-cap so as to connect the cap and nut and transmit rotary movement from the cap to the nut, the adjusting-cap and the casing being provided with one or more interlocking projections and depressions by the engagement of which the cap and nut are locked against rotary movement, and a spring tending to hold the cap against the casing, substantially as set forth.

13. The combination of a valve-casing, a valve therein, a valve-stem loosely secured to the valve, a pressure-plunger engaging the valve-stem with a self-seating connection, an adjusting-nut, a spring resisting device pressing against the pressure-plunger and adjusting-nut, an adjusting-cap, the pressure-plunger having a stem passing through an aperture in the adjusting-nut and entering an aperture in the adjusting-cap so as to connect the cap and nut and transmit rotary movement

from the cap to the nut, the adjusting-cap and casing being provided with one or more interlocking projections and depressions by the engagement of which the cap and nut are locked against rotary movement, and a spring tending to hold the cap against the casing, substantially as set forth.

Signed in the borough of Manhattan and city of New York, State of New York, this 31st day of December, 1900.

JOHN B. WARING.

Witnesses:
HERBERT H. GIBBS,
HENRY D. WILLIAMS.