A. W. CASH.

REDUCING VALVE.

APPLICATION FILED AUG. 23, 1909.

956,283. **Patented Apr. 26, 1910.**

FIG. 2.

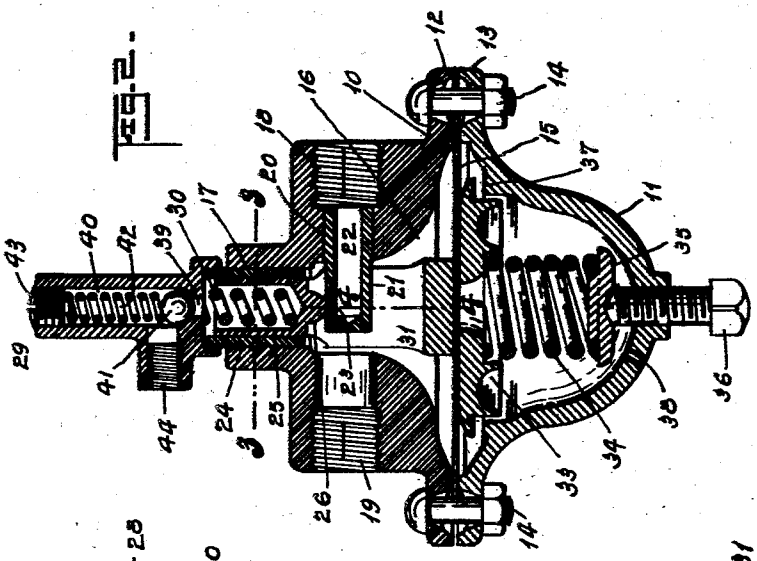


FIG. 3.

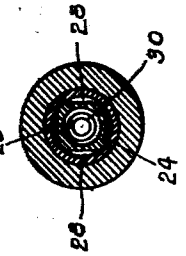


FIG. 4.

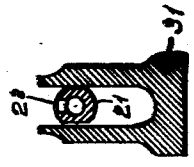
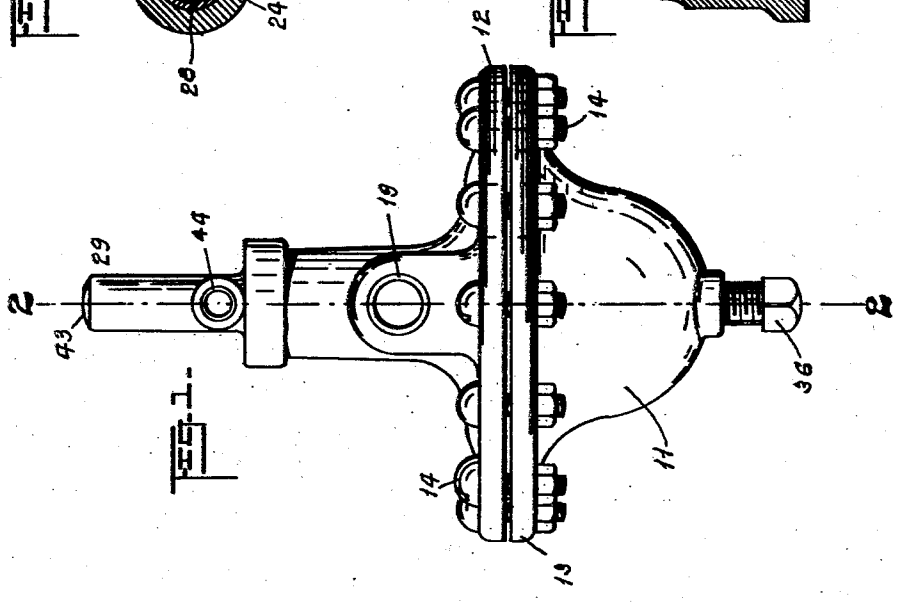


FIG. 1.



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REDUCING-VALVE.

956,283. Specification of Letters Patent. Patented Apr. 26, 1910.

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To all whom it may concern:

Be it known that I, ARTHUR W. CASH, a citizen of the United States, residing at Newark, in the county of Essex and State of New Jersey, have invented certain Improvements in Reducing-Valves, of which the following is a specification.

The objects of this invention are to provide a reducing and regulating valve which shall be simple both in construction and operation; to secure a positive closure of the valve and thus reduce the liability of leakage; to provide positive limiting stops for the movement of the diaphragm in either direction, and to do this without impeding or interfering with the action of the valve proper; to enable the different parts to be separable, both from each other and from the diaphragm; to provide a construction in which only small parts are liable to have their action affected by corrosion, and thus enable the valve to be made mainly of cast iron or the like; to safeguard against any possible leakage to the valve-proper, and to obtain other advantages and results as may be brought out in the following description.

Referring to the accompanying drawings, in which like numerals of reference indicate corresponding parts in each of the several figures, Figure 1 is a side elevation of my improved reducing and regulating valve, looking at the end of the discharge duct or outlet; Fig. 2 is a central vertical section taken longitudinally of the flow passage, as on line 2—2 of Fig. 1; Fig. 3 is a detail cross section on line 3—3 of Fig. 2, Fig. 4 is a detail vertical section, taken on line 4—4 of Fig. 2, and at right angles to the plane of the section shown in said Fig. 2.

In said drawings, 10 and 11 indicate the upper and lower portions or halves, respectively, of the body of the valve, said portions 10 and 11 having at their adjacent ends peripheral flanges 12 and 13, adapted to fit flatwise together and be secured by bolts 14. A diaphragm 15 is preferably laid between the two halves or portions 10 and 11, and clamped at its edges between the annular flanges 12 and 13 thereof. The upper portion 10 of the valve provides an interior chamber 16 which tapers upwardly into a cylindrical neck 17. On opposite sides of said upper portion 10, below the top of the said neck 17 are inlet and outlet openings 18 and 19, respectively, each interiorly threaded to receive a suitable duct or pipe. Into the inner end 20 of the inlet 18 is driven a nipple 21 which projects into the chamber 16 of the upper portion 10 and has an interior passage 22 leading near the extremity of the nipple out through an aperture 23 at the upper side of the nipple, said aperture forming an outwardly facing valve seat. In the neck 17 of the valve portion 10, above the said nipple 21, is a bushing 24 which provides a vertical slideway for a valve 25 whose lower end 26 is fitted to the valve seat 23. The barrel 27 of the valve-proper is hollow from its rear end, and the exterior of said barrel is shown in the drawings as flattened at four opposite sides, as at 28, so as to permit flow from its front end to its rear end through the bushing 24. Obviously other equivalent means of permitting this flow or venting could be employed, such as longitudinally grooving either of the surfaces of the valve barrel and bushing which are in sliding contact, boring through the end of the valve adjacent to its end 26, or the like.

Upon the end of the neck 17 or its bushing 24 is screwed cap 29 and between said cap and the valve 25, and lying within the chamber of said valve 25, is a helical spring 30 which is adapted to seat the said valve into the aperture 23 with a force far in excess of the flow pressure to the reducing valve or initial pressure. Between the valve 25 and the diaphragm 15 is a centrally disposed post 31 which sets at its closed end upon the said diaphragm, and straddling the nipple 21 engages at its two prongs or bifurcated ends the lower end of the valve 25 around its lower portion 26. The upper end of said post fits loosely in the guideway formed by the contracting upper portion of the chamber 16, and thus the said post is kept in proper alinement with the valve 25.

In the chamber 32 of the lower portion or half 11 of the valve body is a circular plate 33 adapted to rest centrally against the diaphragm 15 and at its opposite or under side to receive the end of a heavy helical spring 34, the other end of said spring receiving a follower 35 against which presses an adjusting screw 36 threaded through the wall of the valve casing portion 11. Obviously by adjusting said screw 36 the tension of the spring 34 upon the plate 33 can be varied as desired. The marginal edges of said plate 33 are adapted to rest upon an annular stop 37 on the interior of the

body portion 11, as said shoe moves downward, and this feature provides a limit to downward flexion of the said diaphragm. A vent or aperture 38 in the wall of the body portion 11 serves to equalize the air-pressure inside and outside of the lower valve portion 11.

It will be understood that the spring 34 is set to overcome the spring 30 by an amount of pressure less than the delivery pressure required, and thus said pressure of the spring 34 will be transmitted through the shoe 33, diaphragm 15, and post 31 to unseat the valve 25 and permit inflow through the nipple 21. Obviously when said flow has continued, however, until the pressure in the chamber 16 of the upper portion 10 of the valve casing exceeds the difference between the pressures of the springs 34 and 30, said pressure exerted upon the diaphragm 15 will depress the same until the valve 25 is allowed to close under the action of the spring 30. Undue bending of the diaphragm 15 downward is prevented by the shoe 33 engaging the stop 37, as above stated, and undue movement of the diaphragm in the opposite or upward direction is prevented by the valve 25 seating against the cap 29.

The cap 29 is preferably perforated as at 39 and provided with an outer chamber 40 in which is a ball valve 41 pressed by a spring 42 against the aperture 39, the end of the chamber 40 being closed by a plug 43. The said spring 42 exerts a pressure upon the ball 41 very slightly in excess of the delivery pressure of the valve, and thus said ball acts as a safety valve to relieve the delivery end of the reducing valve in case its pressure should from any reason become too high. Connection is provided, as at 44, for the attachment of an escape pipe (not shown) for any such overflow.

My improved valve is especially designed for reducing and regulating the pressure of water, as from a supply pipe to the service pipes of a building or the like, but it is equally well adapted for steam, gas, air or other fluids. Furthermore, the nipple 21 and valve 25 and its bushing 24, being separable can be made of high-priced non-corrosive metal as is necessary for their proper operation, while all the rest of the valve can be made of cast iron or other low-priced material, and great economy obtained.

Having thus described the invention, what I claim is:

1. In a reducing valve, the combination of upper and lower interiorly-chambered casing portions, said upper portion providing a slideway, an imperforate diaphragm between said casing portions, an inlet nipple projecting into the chamber of the upper portion and having a lateral aperture providing an outward valve seat, a valve for said seat mounted in said slideway of the body portion, a spring normally seating said valve, a post abutting loosely at its extremities said valve and diaphragm, a spring in the lower casing portion adapted to exert pressure upon said diaphragm, and means for adjusting the tension of said spring.

2. In a reducing valve, the combination of a chambered casing portion having a slideway at one end, a movable member closing the other end of said casing portion, means for exerting adjustable pressure on said member, a nipple projecting into the chamber of the casing portion intermediate of its ends and having therein a lateral aperture providing an outward valve seat, a valve for said seat mounted in said slideway of the casing portion, a spring normally seating said valve, and a post abutting loosely at its extremities said valve and movable member.

3. In a reducing valve, the combination of a chambered casing portion having a slideway at one end and having its walls adjacent to said slideway forming a guideway, a movable member closing the other end of said casing portion, means for exerting adjustable pressure on said member, a nipple projecting into said guideway through its side and having therein a lateral aperture providing a valve seat facing the said slideway, a valve for said seat mounted in said slideway, a spring normally seating said valve, and a post slotted to receive said nipple abutting loosely at its extremities the said movable member and valve and held by said guideway in alinement with said valve.

4. In a reducing valve, the combination of a casing portion providing an interior chamber and a neck at its upper end, a movable member closing the other end of said casing portion, means for exerting an adjustable pressure upon the side of said movable member away from the casing portion, an inlet nipple projecting into the chamber of said casing portion and having therein a lateral aperture providing an outward valve seat, a valve adapted to slide in said neck of the casing portion and close said valve seat, said valve being hollowed at its end away from the valve seat, and providing communication between its two opposite ends, a spring in said valve, a cap for said neck of the casing portion and a post seated at its closed end on the diaphragm and straddling said nipple with a forked end in engagement with said valve.

5. In a reducing valve, the combination of a casing portion providing an interior chamber and a neck at its upper end, a movable member closing the other end of said casing portion, means for exerting an adjustable pressure upon the side of said movable member away from the casing portion, an inlet nipple projecting into the chamber of said casing portion and having therein a

lateral aperture providing an outward valve seat, a valve adapted to slide in said neck of the casing portion and close said valve seat, said valve being hollowed at its end away from the valve seat, and providing communication between its two opposite ends, a spring in said valve, a cap for said neck of the casing portion having an aperture in itself, a safety valve for said aperture, and a post between said valve and movable member.

ARTHUR W. CASH.

In the presence of—
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