

No. 700,434.

Patented May 20, 1902.

G. W. LORD.
REDUCING VALVE.

(Application filed Aug. 10, 1901.)

(No Model.)

Fig. 1.

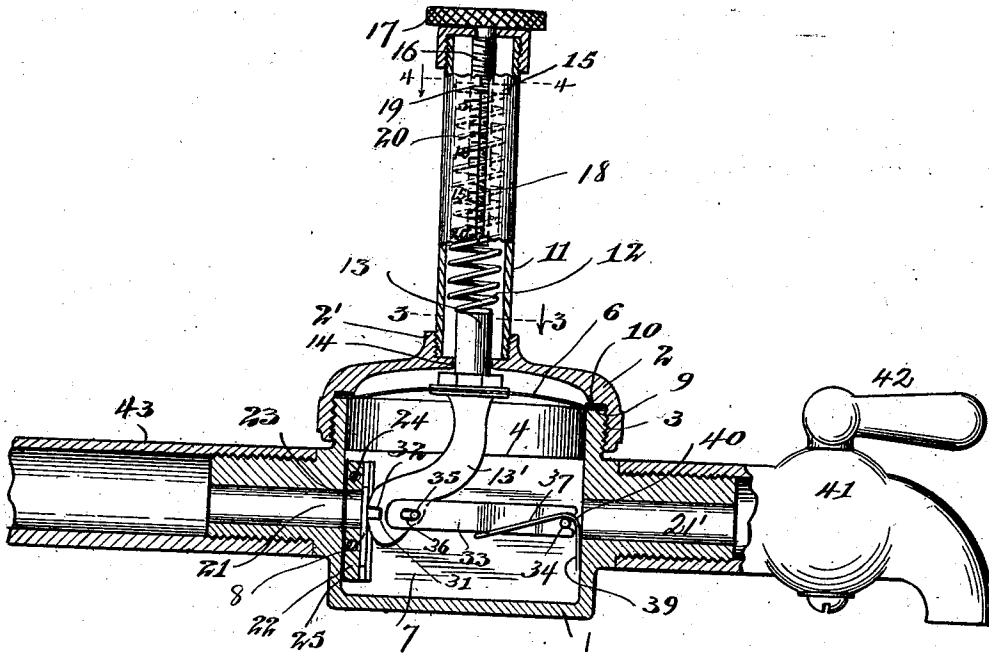


Fig. 2.

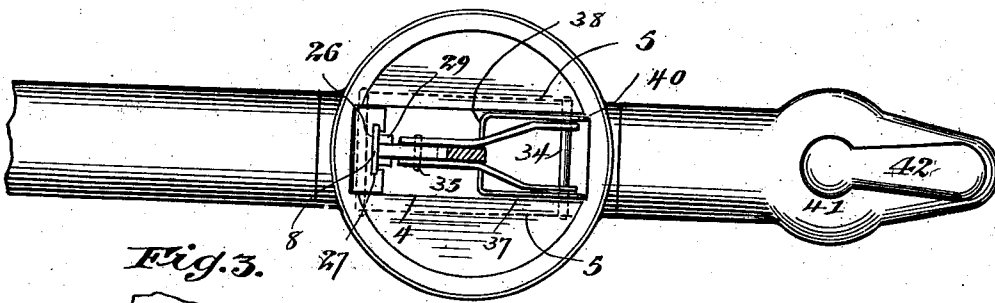


Fig. 3.

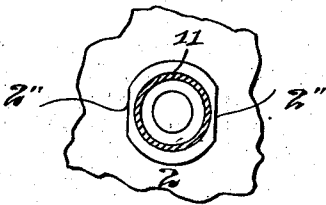
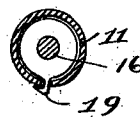


Fig. 4.



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UNITED STATES PATENT OFFICE.

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REDUCING-VALVE.

SPECIFICATION forming part of Letters Patent No. 700,434, dated May 20, 1902.

Application filed August 10, 1901. Serial No. 71,561. (No model.)

To all whom it may concern:

Be it known that I, GEORGE W. LORD, of Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Reducing-Valves, of which the following is a specification.

This invention relates to improvements in reducing-valves, and refers more especially to improvements in means whereby the closing of the valve under high pressure is rendered more certain and positive, the invention being embodied in the present instance in the form of a combined reducing-valve and faucet.

Among the salient objects of the invention are to provide in a valve of the character referred to a simple mechanism in the nature of a toggle mechanism combined with the usual pressure-diaphragm and operating to force the valve-closure positively and accurately against its seat under high pressure, to provide in a device of this character a simple and improved construction whereby the toggle mechanism is connected with the pressure-diaphragm, to provide an improved construction and arrangement whereby the weight of the operative mechanism is carried or counterbalanced by a simple spring, thereby enabling the valve to be set at any required pressure with accuracy and with certainty of its operating properly at the given pressure, and in general to provide simple and improved details of construction contributing to the economy of manufacture and durability and efficiency of the device.

To the above ends the invention consists in the matters hereinafter described, and more particularly pointed out in the appended claims, and the same will be readily understood from the following description, reference being had to the accompanying drawings, in which—

Figure 1 is an axial sectional view taken in the plane of the stem of the valve. Fig. 2 is a view of the lower parts of the valve mechanism in plan, the top casing member being removed and the stem of the pressure-diaphragm being shown in cross-section at a point below the diaphragm. Fig. 3 is a fragmentary sectional view taken on line 3 3 of Fig. 1 and

looking downwardly, and Fig. 4 is a similar transverse sectional view taken on line 4 4 of said Fig. 1.

Referring to said drawings, 1 designates as a whole the lower or main body of the casing of the valve, and 2 the top member thereof, the latter being made in the form of a cap internally threaded, as indicated at 3, and fitting upon the correspondingly-threaded upper end of the valve-body. The main body 1 is cylindric at its upper end, but merges from a cylindric shape into a flat-sided form midway of its height, as indicated at 4, Fig. 1, and also in dotted lines at 5 5, Fig. 2, the object of this construction being to provide a circular chamber for the pressure-diaphragm 6 in the upper portion of the casing and a relatively narrow elongated chamber 7 in the lower part of the casing, within which are mounted the sliding valve 8 and the mechanism for operating same.

The pressure-diaphragm may be of any usual or preferred construction, being in the present instance secured at its periphery between the end margin 9 of the valve-casing and the meeting internal shoulder 10 of the cap member 2. With the central part of the cap member 2 is connected the usual barrel or tubular housing 11, within which is arranged a coiled expansion-spring 12, bearing at its lower end upon the upper end of a stem 13, connected with the pressure-diaphragm and reciprocating through a suitable guide 14, formed in the lower end of said barrel, the upper end of said spring being engaged by an adjustable bearing-block 15, which has screw-threaded engagement with an adjusting-screw 16, threaded therethrough and rigidly connected at its upper end with a thumb-nut 17, rotatably journaled upon the upper end of the barrel 11. One side of the barrel 11 is provided with a longitudinal slot 18, through which protrudes a pointer 19, (see detail Fig. 4,) rigid with the block 15, said pointer serving the double purpose of indicating the position of the block and also of preventing it from rotating with the adjusting-screw 16. 20 designates a scale formed to extend along one side of the slot 18, over which said pointer travels and whereby the degree of pressure

exerted upon the stem 13, connected with the diaphragm by the spring 12, is indicated in any suitable units.

Referring now more particularly to the construction of the valve mechanism which controls the flow through the valve, 21 designates the inlet-port leading into the valve-casing from the high-pressure side, 21' an outlet-port through the opposite side of the casing, and 22 a valve-seat block mounted against the inside wall of the casing, through which said port 21 opens and itself provided with a port or passage 23, arranged to register with the port 21. The valve-seat block may be secured in position in any suitable manner, being in the present instance secured by means of a pair of through bolts or screws 24, inserted through the opposite side walls of the casing and through said block, as indicated best in Fig. 2, a suitable packing of slightly-compressible and fluid-proof material being interposed between the block and the casing, as indicated at 25, to insure an accurate and fluid-proof joint.

Within the inner face of the valve-seat block is formed a way 26, arranged to extend upwardly parallel with the direction of movement of the stem 13, connected with the pressure-diaphragm, said way being desirably as herein shown of undercut form in cross-section, as indicated clearly at 27 in Fig. 2. Within the way 26 is mounted to slide a slide-valve 8, which desirably has the form of a plate fitting at its edges the undercut portions 27 of the way and at its outer face fitting accurately against the valve-seat formed around the port-opening 23. Upon its inner side said valve member is provided with a transversely-extending rib or block 29, which is engaged by the notched lower end 31 of an extension 13' of the stem 13, connected with the pressure-diaphragm. As shown clearly in Fig. 1, the extension 13' is deflected from its point of connection with the central portion of the diaphragm radially outward and is rounded at its end adjacent to the notch 32 thereof, so as to bear firmly against the inner side of the slide-valve when the latter is in its fully-closed position. In order to force and hold said extension in firm bearing with the slide-valve when the latter is shifted into a fully-closed position, a toggle member 33 is provided, which is arranged to extend substantially at right angles to the direction of movement of the slide-valve, one end of said toggle member being pivotally connected with the valve-casing by means of a through-pivot 34, while its opposite end is likewise pivotally connected with the extension 13' by means of a transverse pivot-pin 35, extending through said parts. As a preferred construction the toggle member 33 is bifurcated or provided with arms at each of its ends, one pair of arms being arranged to engage the pivot 34 at points relatively distant apart, while the opposite pair of arms is arranged to embrace the opposite sides of the extension

13', thereby insuring an accurate movement of the parts in a vertical plane. The pivot 35, whereby the toggle member and extension are flexibly united, extends through a slot 36 in one of said members, arranged to extend longitudinally of the toggle member, so as to afford the necessary movement of the pivot relatively to the toggle incident to the movement of that end of the toggle member in an arc concentric with the pivot 34 during the movements of the valve. In order, however, that the extension member 13' may be forced positively against the inner side of the slide-valve as the latter approaches its fully-closed position, which in the present instance is its uppermost position, the inner end of the slot 36 or that remote from the slide-valve is so located as to engage the pivot 35, which is rigid in the extension 13', and thereby force and hold the latter in positive bearing engagement with the valve.

In order to counterbalance the weight of the toggle member, the slide-valve, and the stem and extension 13 and 13', a counterbalance-spring 37 is provided, consisting in the present instance of a wire spring bent in the form of a rectangular loop, the central portion 38 of which underlies the toggle member at a point intermediate the length of the latter, while the downturned end portions 39 bear against the inner face of the rear side of the valve-casing, and the intermediate angle portions 40 rest upon the pivot 34. This spring is so formed that its tension will just counterbalance the weight of the parts mentioned, thereby leaving the tension of the pressure-regulating spring 12 unaffected by the weight of the operating parts. In order to facilitate the removal of the top cap member 2 of the valve-casing, it is provided upon its central extension 2', with which the barrel 11 is connected, with a plurality of facets 2'', adapted for the engagement of a spanner.

The reducing-valve is herein shown as combined with a faucet, (designated as a whole 41,) such a combined faucet and reducing-valve being especially well adapted for use in drawing beer or other beverages, which are ordinarily drawn under considerable pressure and, desirably, with varying pressure to suit the fancy or requirements of different persons or conditions. The faucet-body 41 may be of any suitable or preferred construction, that shown herein being of usual form and provided with the usual turn-cock 42. The high-pressure side of the valve is connected with a stem or pipe 43, which may be connected with any receptacle or other source of supply.

The operation of the device is probably entirely obvious from the foregoing description, but may be briefly set forth as follows: Assuming that the inlet side of the reducing-valve be connected with any suitable source of liquid under pressure—as, for example, through the pipe 43—upon turning the cock 41 so as to permit the liquid to flow through,

the position of the controlling-valve 8 will be determined by the back pressure or resistance to the escape of the liquid through the outlet-passage 21'. If the cock be only partly
 5 opened, the greater resistance to the escape of the liquid will create a greater internal pressure in the valve-chamber, and this, acting upon the diaphragm 6, will raise the slide-valve correspondingly, and thus restrict the
 10 inlet-passage, while, on the other hand, if the escape from the valve-chamber be relatively free—as, for example, when the cock be entirely open—the internal pressure will be less and the diaphragm correspondingly forced
 15 downwardly by the spring 12 and the slide-valve thus opened to a greater extent, so that in either case the liquid will issue from the faucet under substantially the same pressure. This pressure may be readily regulated with-
 20 in the limits of control afforded by the spring 12 by simply manipulating the thumb-nut 17 so as to increase or decrease the pressure of the spring exerted upon the diaphragm 6.

It is to be particularly noted that it follows
 25 from the construction described that the movement of the slide-valve is entirely free and as nearly as possible devoid of friction during the ordinary working of the valve, thereby rendering the regulation of pressure
 30 certain and uniform, while at the same time whenever the internal or back pressure exceeds that pressure at which the valve is set to close the valve will be forced positively against its seat and held there by the wedg-
 35 ing action of the toggle mechanism described. The result is that any looseness of fit between the slide-valve and the ways, either such as is provided to insure sufficient freedom of
 40 movement between the parts or such as follows from wear, will not affect the complete, accurate, and positive closing of the valve under excessive pressure. The several parts of
 45 the construction are all simple and capable of being cheaply made, while at the same time they are extremely durable and not apt to
 50 readily get out of repair or adjustment. Moreover, the construction is such that the working parts of the valve may be withdrawn from the casing with the utmost facility either for
 the purpose of cleaning, repair, or renewal.

While I have herein described a preferred embodiment of my invention, yet it will be understood that the details thereof may be
 55 modified to a certain extent without departing from the invention, and I do not, therefore, wish to limit myself to these exact details, except to the extent that they are made subject of specific claims.

I claim as my invention—

60 1. In a reducing-valve the combination with the valve-casing and pressure-diaphragm arranged therein, of a slide-valve arranged to control the admission of liquid to the valve-casing, an operating member operatively con-
 65 necting said slide-valve with the pressure-diaphragm and a toggle mechanism arranged

to force the valve positively against its seat as it approaches its closed position.

2. In a reducing-valve the combination with the valve-casing and pressure-diaphragm ar-
 70 ranged therein, of a slide-valve arranged to control the admission of liquid to the valve-casing, an operating member directly connecting the pressure-diaphragm with said
 75 slide-valve so that said parts move together positively, and an oscillatory member pivotally mounted within the valve-casing and operatively connected with said slide-valve to
 80 move with the latter; the location of the pivotal axis of said oscillatory member and its operative connections with the slide-valve being arranged to force the slide-valve posi-
 85 tively toward its seat as it approaches its closed position in its movement with the pressure-diaphragm.

3. In a reducing-valve, the combination with the valve-casing, of a pressure-diaphragm arranged to extend across the interior of the
 90 same, an inlet-port opening into the casing through a valve-seat arranged in a plane substantially at right angles to the plane of the diaphragm, a slide-valve mounted in ways to
 95 reciprocate across said port in a direction parallel with the direction of movement of the diaphragm in its vibration, an operating-stem operatively connected with the central
 100 portion of said diaphragm and directly engaging at its opposite end said slide-valve, a toggle member pivotally mounted at one end within the valve-casing and flexibly con-
 105 nected at its opposite end with the valve-operating mechanism, the pivotal axis of said toggle member being so located relatively to its point of connection with the valve-oper-
 110 ating mechanism that said latter point moves through an arc which approaches the valve-seat as the valve is brought to its closed position, and a spring arranged to normally
 115 force said valve into opening position.

4. In a reducing-valve the combination of a
 120 valve-casing provided with a removable end wall having the form of a screw-cap, a pressure-diaphragm arranged to extend across the interior of the casing at the point of juncture
 125 between the screw-cap and body of the casing, an inlet-port opening through a part of the side wall of the casing below the diaphragm and extending substantially at right
 130 angles thereto, a valve-seat block mounted upon the interior of the casing and provided with a port arranged in register with said in-
 135 let-port, ways formed in said valve-seat block, a slide-valve arranged to slide therein and provided upon its side remote from the valve-seat with a lug or projection, an operating-
 140 stem connected with the central portion of the diaphragm and having a recessed end portion operatively connected with the projection of the slide-valve, and a spring-barrel connected with said end cap within which
 145 the upper end of said operating-stem is arranged to project, a coiled spring arranged

within said barrel to act upon the operating-stem, means for adjusting the tension of said spring, and a toggle mechanism operatively connected with said slide-valve and acting to
 5 force the latter positively against its seat as it approaches its closed position, substantially as described.

5. In a reducing-valve the combination with the valve-casing provided with an inlet-port
 10 opening through one side thereof of a slide-valve arranged to reciprocate across said port, and a toggle-lever pivotally mounted at one end within said casing at a point remote from, and substantially opposite said inlet-
 15 port and having its vibrating end operatively connected with said slide-valve by means of a slot-and-pin connection, whereby the valve is free to move away from its seat during its opening movement, but is forced positively
 20 to its seat as it approaches a closed position, and means for reciprocating said valve endwise, substantially as described.

6. In a reducing-valve the combination with the valve-casing provided with an inlet-port
 25 opening through one side thereof of a slide-valve arranged to reciprocate across said port, and a toggle-lever pivotally mounted at one end within said casing at a point remote from, and substantially opposite said inlet-
 30 port and having its vibrating end operatively connected with said slide-valve by means of a slot-and-pin connection, whereby the valve is free to move away from its seat during its opening movement, but is forced positively
 35 to its seat as it approaches a closed position, and a spring arranged to act upon said toggle member to counterbalance the weight of the latter, and connected parts moving therewith, substantially as described.

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Witnesses:

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