(No Model.)

T. R. KEYWORTH, Jr.

BALL COCK VALVE.

No. 449,351. Patented Mar. 31, 1891.

FIG. 1.

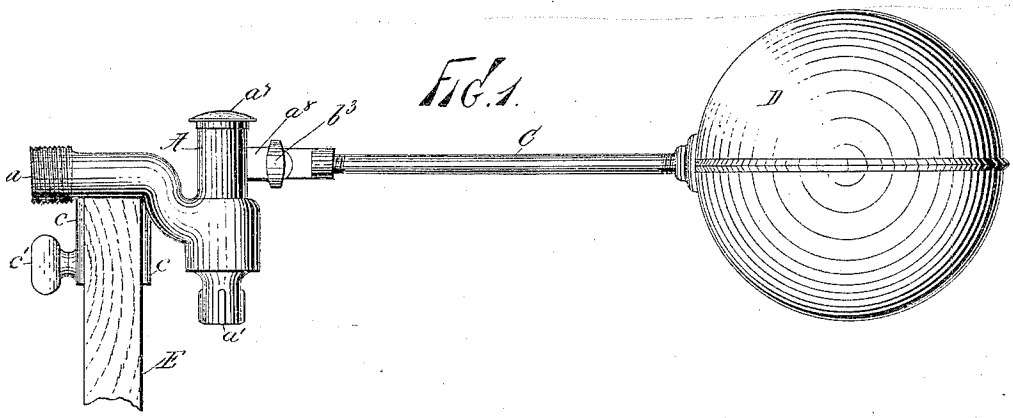


FIG. 2.

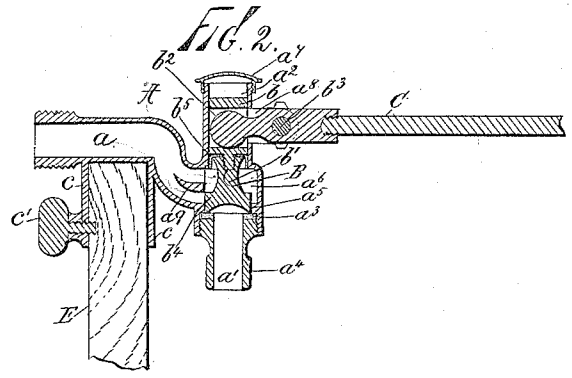
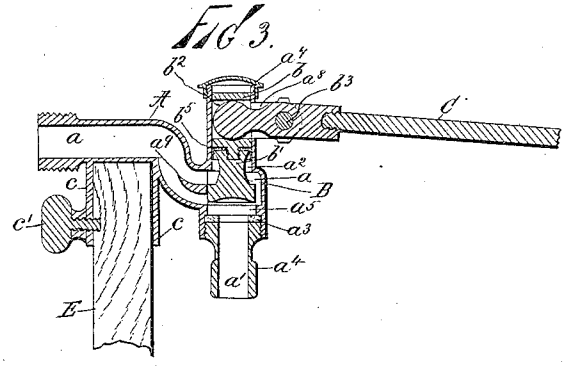


FIG. 3.



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THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

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BALL COCK-VALVE.

SPECIFICATION forming part of Letters Patent No. 449,351, dated March 31, 1891.

Application filed November 22, 1890. Serial No. 372,276. (No model.)

To all whom it may concern.

Be it known that I, THOMAS R. KEYWORTH, Jr., a citizen of the United States, and a resident of New York, county of New York, and State of New York, have invented certain new and useful Improvements in Ball Cock-Valves, of which the following is a specification.

My invention, while relating to ball cock-valves generally, has reference more particularly to that form of such devices in which a reciprocating plunger, co-operating with a stationary seat, is raised and lowered by the usual ball float through the intervention of a lever upon which such float is mounted. In valves of this class as heretofore constructed the orifice in the end of the induction-pipe adjacent to the valve has been made of substantially the same diameter as that of the remainder of the pipe, which in practice has been of approximately the same diameter as that of the eduction-pipe or that leading from the valve. As a result of this construction, the water in rushing through the induction-pipe when the valve is open acts upon the upper side of the flange on the lower end of the plunger and tends to force it downward and close the plunger upon its seat. The area of the opening below the plunger when the valve is open, however, being as large as that of the induction-pipe, if not larger, this action of the water upon the plunger is not so great but what its tendency to force the plunger downward and close it upon its seat is overcome by the weight of the ball float through which the plunger is operated. When, however, the valve is partially closed by the descent of the plunger and the area of the opening in the valve below the plunger is less than that of the induction-pipe, the water as it rushes through the valve, acting upon the upper side of the flange on the lower end of the plunger, forces it downward with an increased pressure, which gradually increases as the plunger descends, until its pressure finally becomes so great as to close the valve by forcing its plunger down upon its seat with such suddenness and shock as to not only endanger the parts, but render the valve exceedingly liable to leak between the plunger and its seat.

The object of my invention is to obviate this defect and to produce a valve which, while simple in construction, shall at the same time be more efficient in operation and more easily secured in place than those heretofore in use.

To these ends the invention consists in the peculiarities of construction of the valve itself and in the combination therewith of its operating means, all as will hereinafter more fully appear.

Referring to the accompanying drawings, which form a part of this specification, Figure 1 is a sectional elevation of the upper edge of a tank or vessel with a ball cock-valve constructed in accordance with my invention applied in connection therewith; Fig. 2, a similar elevation of the upper edge of a tank or vessel with a ball cock-valve constructed in accordance with my invention and shown in longitudinal central vertical section applied thereto, the float-carrying lever being broken away; and Fig. 3, a longitudinal vertical section of such valve, taken axially of the same, and showing the plunger and its operating-lever, which is broken away, in a slightly-different position from what they occupy in the latter figure.

In all the figures like letters of reference are employed to designate corresponding parts.

A indicates the valve shell or casing, which is provided with induction and eduction orifices a a', and also with the socket a^2, in which is fitted to slide the plunger B. Located at or near the lower end of the socket a^2 is a seat a^3, upon which the plunger rests when the valve is closed. In my preferred form of construction this seat is made of some soft or other appropriate material, and is held fixedly in place by the detachable section a^4, which, carrying the eduction-orifice a' and engaging with the threaded enlargement in the lower end of the shell or casing, forces it against the shoulder a^5 and clamps it firmly in that position. Above the seat a^3 and at the point where the induction-orifice a enters the socket a^2 this socket is enlarged to form a chamber

a^6 to permit of the water flowing through the valve at this location with greater freedom, while to the upper end of the socket is secured a screw-cap a^7, whereby to afford a convenient means for closing the same and yet permit of the ready removal of the plunger when desired.

In the construction of the plunger I find it advantageous to employ an upper and an under section b b', and to unite them end to end by means of a threaded projection upon the one entering a correspondingly-shaped threaded orifice in the other, as provision is thereby made for packing the plunger and insuring a tight joint being formed between it and the interior of the socket in which it slides. The packing which I find the most efficient and desirable to employ when this form of plunger is adopted consists of an annulus of leather, rubber, or other appropriate packing material b^5, which, surrounding the projection that unites the sections composing the plunger, is made of an exterior diameter somewhat greater than the interior of the socket a^2, and is clamped between such sections, leaving its projecting outer edge to bend down over the lower section b', as shown. Passing transversely through the upper section b is a slot b^2, into which projects the end of the short arm of a lever C, that is pivoted between two lugs a^8, projecting outwardly from the shell A, and carries at the outer end of its long arm a ball float D, by means of which the lever is vibrated around its axis and the plunger thereby raised and lowered, a screw b^3, provided with suitable means for rotating it and passing through the lugs a^8, whereby to regulate the friction upon the lever C, serving as such pivot.

The under section b' of the plunger B, instead of being made of a uniform size throughout, is reduced in diameter from a point slightly above its lower to near its upper end, in order to allow of the water flowing around the same with greater freedom, and has a flange b^4 at its lower end, against which the water acts when the plunger has descended to near its lowest limit and assists in the closing of the valve by forcing the plunger down upon its seat.

When the plunger is raised to its highest limit, the passage around its lower end will be as great, if not greater, than that of the eduction-orifice a', and its range of movement will be such as to permit of occupying this position when the valve is fully open.

With the parts constructed as thus far described the flange b^4, when the plunger is raised to its highest position, will be brought slightly above the center of the inner end of the induction-orifice a, and thereby obstruct the flow of water therethrough to the extent of the area presented to the same, leaving the water to flow above and below such flange on its way to the eduction-pipe. As the area of the opening around the lower end of the plunger when in this position is as large as that of the induction-orifice a, the water will flow through the valve without exerting any considerable pressure on the upper side of said flange. When, however, the plunger descends and its flange b^4 is carried down away from the center of the induction-orifice toward its lower surface, the area of the induction-pipe through which the water flows is gradually enlarged, while the area of the opening around the lower end of the plunger through which it is discharged is correspondingly reduced. As a result of this the water is supplied by the induction-orifice faster than it can be discharged, causing it to accumulate above the flange and exert a pressure upon the same, which, when the column from which it is supplied is high, is sufficient to force the plunger down upon its seat with such force as to endanger the valve and cause a disagreeable "hammering" therein. To obviate this objection I arrange in the neck of the valve transversely of the induction-orifices a, adjacent to the line of travel of the plunger B, a horizontal partition a^9, whereby to divide the column of water passing through the orifice into an upper and under stream, and so relate the movements of the plunger to the partition that when the plunger is raised to its highest limit its lower end will rest substantially in a line with the under side thereof. By these means, as will be seen, when the plunger is raised to its highest limit the flange b^4 on its lower end will be at such an elevation as to substantially close the upper channel in the orifice a, leaving the under channel and such portion of the upper channel as is not closed, if any, wholly open and unobstructed for the free passage of the water through the same. The areas of the channels thus left open in the induction-orifice being no greater than the area of the passage through the eduction-orifice around the lower end of the plunger, the passage of the water through the valve will be such as to avoid any considerable pressure upon the upper side of the flange b^4. As the plunger descends from this position, the upper channel in the orifice a' will be gradually opened, while the under channel will be gradually closed by the passage of the flange b^4 from the former to and over the latter. The area of the upper channel thus uncovered by this movement of the flange being less than that covered in the under channel, in consequence of the fact that the opening operation is taking place near the top of the orifice, where the cross-section is the least, while the closing operation is taking place just below the center of the orifice, where the cross-section is the greatest, the flow of the water through the induction-orifice will be gradually reduced as the area of the passage around the lower end of the plunger is reduced by the descent of such plunger, and the two areas will thus remain approximately the same until the plunger has descended so near to its seat that the

effect of the water upon the upper side of the flange b^4 will as the plunger closes upon its seat not be appreciable. As the plunger descends, the flange b^4 wholly uncovers the upper channel in the orifice a and closes the under channel therein, as shown.

In the construction of the partition a^9 various forms may be adopted. I prefer, however, to make its inner edge adjacent to the path of the plunger of some considerable thickness, (of, say, one-half the thickness of the flange b^4, or approximately so,) and to gradually taper the partition from its inner to its outer end, where it will terminate in a substantial knife-edge, the general line of the partition conforming to the curvature of the orifice in which it is arranged and its outer end terminating at a point within the neck of the valve, as shown.

To secure the valve to the upper edge of a tank or other vessel, I provide the portion of the shell or casing A, in which the induction-orifice a is formed, with two parallelly-arranged depending lugs c, through one of which is passed a threaded orifice for reception of a thumb or other screw c', which is arranged therein, whereby to form a clamp by means of which the valve may be clamped to the edge of the tank or vessel E, and the use of the ordinary screws passing through ears and into the walls of the tank or vessel is avoided.

The portion of the shell or casing in which the induction and eduction orifices are formed may be provided with screw-threads or other appropriate means through which to connect to them the usual piping; or one of such portions—as, for instance, that in which the induction-orifice is formed—may be so provided and the other portion left plain or otherwise suitably finished, as may be desired. The valve being secured to the upper edge of a tank or other vessel and the tank or other vessel filled with water, the parts will occupy the positions shown in Figs. 1 and 2 and the valve will be closed. On withdrawing the water from the tank, in whole or in part the ball float will descend, swinging the lever upon which it is supported around its axis and raise the plunger, as shown in Fig. 3, the extent to which the ball float descends and raises the plunger depending upon the amount of water withdrawn from the tank or vessel. In this position the water is free to flow through the valve, and may continue to flow through the same until the water in the tank or vessel has risen to its original height when the further flow will be stopped by the ball float being carried up by the water, swinging its carrying-lever upon its axis, and thereby closing the valve by forcing the plunger down upon its seat. It will thus be seen that I produce a valve which is not only simple in construction and efficient in operation, but one which avoids to a great extent the objectionable hammerings usually experienced in valves of this class as heretofore constructed.

In the foregoing I have described the best means contemplated by me for carrying my invention into practice; but I wish it distinctly understood that I do not limit myself strictly thereto, nor do I limit myself to its use in connection with water and other fluids alone, as it is obvious that I may modify the same in various ways and use the same in connection with gases without departing from the spirit thereof. Moreover, while I have shown and described a ball float as a means whereby the plunger and its operating-lever may be actuated, it is likewise obvious that such ball float may be dispensed with, and a handle or other appropriate means applied in lieu thereof to permit of their operation by hand.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent of the United States, is—

1. The combination, with a shell or casing having both an induction and an eduction orifice, a partition arranged in said induction-orifice transversely thereof, a plunger-socket, and a seat, of a plunger arranged in such socket and provided with a flange at its lower end, a lever for raising and lowering said plunger, and means through which such lever may be operated, said partition terminating at its outer end within the induction-orifice and forming two distinct channels, each of which communicates at its outer end with such induction-orifice, substantially as described.

2. The combination, with a shell or casing A, having an induction-orifice a and eduction-orifice a', a partition a^9, arranged in said induction-orifice transversely thereof, a socket a^2, a seat a^3, and ears a^8, of a plunger B, arranged to move in said socket and provided with a flange at its lower end and with a slot at its upper end, and a lever C, pivoted to said ears and engaging with its short arm the slot in the plunger and carrying at the outer end of its long arm a ball float, the said partition terminating at its outer end within the induction-orifice and forming two distinct channels, each of which communicates at its outer end with such induction-orifice, substantially as described.

In testimony whereof I have hereunto set my hand this 15th day of November, 1890.

THOMAS R. KEYWORTH, JR.

Witnesses:
WM. H. APPLETON,
ROBT. W. WATERBURY.