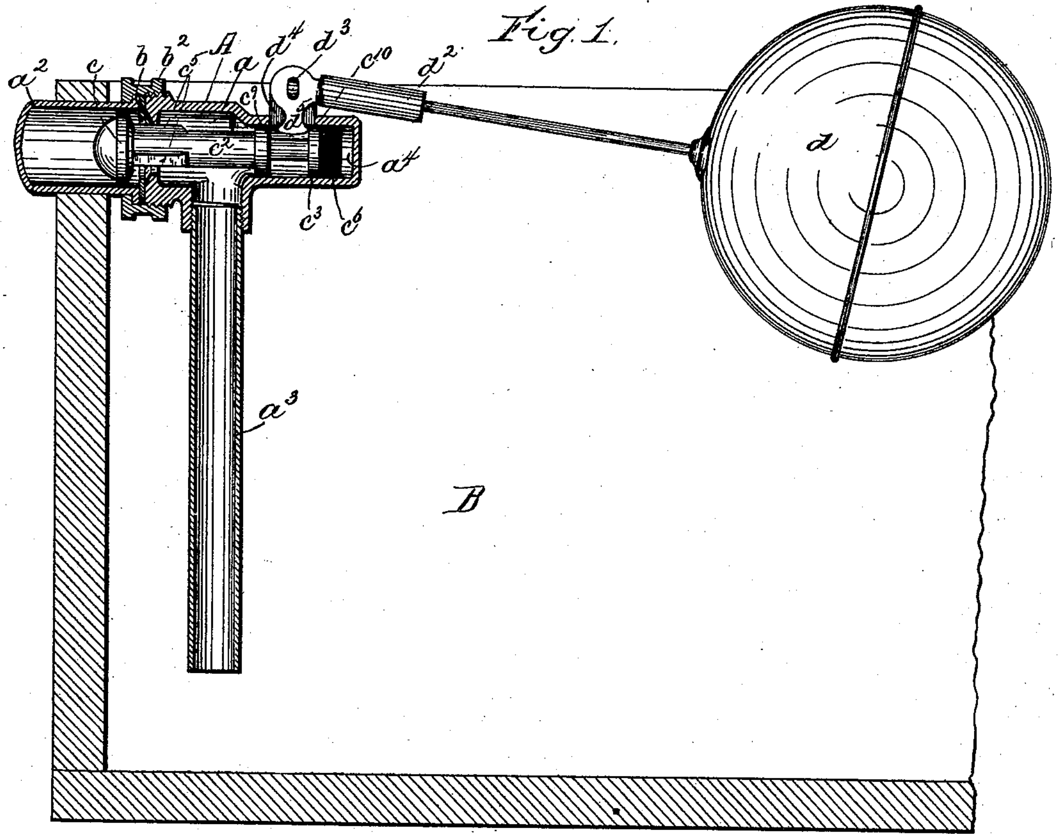
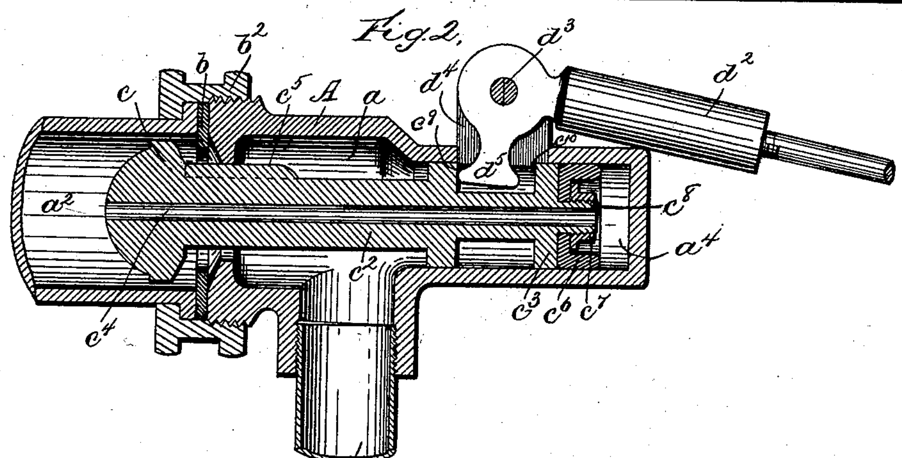
(No Model.)

W. SCOTT.

TANK SUPPLY VALVE.

No. 571,023. Patented Nov. 10, 1896.





Witnesses.
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UNITED STATES PATENT OFFICE.

WILLIAM SCOTT, OF MEDFORD, MASSACHUSETTS.

TANK-SUPPLY VALVE.

SPECIFICATION forming part of Letters Patent No. 571,023, dated November 10, 1896.

Application filed December 30, 1895. Serial No. 573,792. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM SCOTT, of Medford, county of Middlesex, and State of Massachusetts, have invented an Improvement in Tank-Supply Valves, of which the following description, in connection with the accompanying drawings, is a specification, like letters on the drawings representing like parts.

The present invention relates to a tank-supply valve or ball-cock, the object being to produce a device of this nature in which the maximum opening for the water which is to be admitted to the tank is provided soon after the water begins to discharge therefrom, the said opening remaining at its maximum until the tank is nearly refilled, while the ball is so arranged as to produce an initial closing movement of the said valve, which is arranged to complete its closure after it has been so actuated independently of the operation of the ball, the final movement in closing being prompt, and thus obviating the hissing and gurgling sound attendant upon the gradual throttling of the water flowing into the tank when controlled by a ball-cock of the ordinary construction. To accomplish this end, the valve is arranged to operate in response to differentiated pressures, the differentiation being provided for by the construction and arrangement of the valve and being due in part to the variation in the effective area of a port-opening, caused by the movement of the valve, the pressure which tends to close the valve increasing as the valve closes with relation to the pressure tending to maintain it open. Thus the final closing movement of the valve is rendered practically responsive to the pressure of the water controlled thereby, so that after an initial actuating movement has been imparted to the said valve by an external device, such as the float operating in response to the rise of liquid in the tank, such movement will be continued automatically by the fluid-pressure acting upon the valve, which completes its movement and closes promptly without requiring any further rise of the float. It is obvious, moreover, that the differentiated pressure may be so arranged that the final opening movement will also be responsive to pressure. This, however, is not essential, although the pressure tending to maintain the valve open should be sufficient to prevent closure thereof until the initial actuating closing movement is imparted.

The initial actuating movement of the valve is provided for by means of a ball or float supported upon the surface of the water in the tank and responsive to the change of level of the water as usual, and in order that the final movement of the valve may be independent of the action of the said ball a loose connection is provided, by means of which the valve is left free to move independently of the ball during its final movement. The ball is so adjusted that a small downward movement thereof will completely open the valve, and said valve will remain open until an initial closing movement is imparted by the rising of the ball in the tank, which does not occur until the water has substantially reached the desired or normal level, after which the final closing movement will be prompt, thus accomplishing the desired end. The final prompt movement, moreover, while practically instantaneous, is nevertheless cushioned by the relatively smaller pressure opposed to the pressure by which it is produced, thus preventing objectionable water-hammer.

Figure 1 is a vertical section of the valve and actuating device together with a portion of the tank to which it is applied, the valve-stem being shown in elevation and the parts being in the position occupied when the valve is fully open with the actuating device in position to produce the initial closing movement; and Fig. 2 is an enlarged sectional view of the valve-chamber and valve, the valve being fully open and the actuating device in corresponding position.

The valve-chamber a, formed in the valve-shell A, is provided with an inlet a^2, connected with the source of supply, and an outlet a^3, which opens into the tank B, the outlet-pipe preferably being extended downward toward the bottom of the tank, so that its lower end will be submerged in order to prevent the spattering and noise attendant upon the falling of a stream of water upon the surface of the water in the tank. Between the inlet a^2 and the outlet a^3 of the said valve-chamber a is the valve-seat b, herein shown as an annular washer confined between the end of the inlet-pipe a^2 and the valve-shell at the inlet-opening to the chamber a by means of a coupling-piece b^2, fitting over a flange at the end of the inlet-pipe a^2 and screwed upon the outside of an extension from the valve-chamber a. Coöperating with the said valve-seat to control the flow of liquid through the port-opening therein is the valve proper, c, consisting of a head or enlargement of the stem c^2, contained in the inlet-pipe a^2 and adapted to move longitudinally in said pipe to and from the inlet side of the valve-seat b, the said valve being enough smaller than the bore of the inlet-pipe a^2 to afford a free maximum flow of the water from said inlet-pipe to the valve-chamber a between the periphery of said valve and the inner wall of the inlet-pipe and thence through the inlet-port to the valve-chamber a. At the opposite end of the stem c^2 of said valve is a piston or plunger c^3, longitudinally movable in a chamber a^4, communicating directly with the inlet-pipe a^2, as by a duct c^4, through the stem c. The pressure of the water in the inlet-pipe a^2 therefore is exerted upon the piston c with a tendency to open the said valve. The piston c^3, however, is of smaller area than the valve c, the pressure on the latter consequently being greater, other conditions being the same, as is the case when the valve is completely closed. When the valve c is moved away from its seat, however, it is obvious that the water then standing between the said valve and its seat will cause static pressure to be brought to bear upon the inner side of the said valve, so that while the pressure upon the piston c^3, which is practically constant since the cylinder a^4 is always in direct communication with the water supply, will balance the pressure upon an equal area of the valve c, the pressure upon the remaining area of said valve is practically balanced by the static pressure brought to bear, as above described, upon the opposite side thereof. It is obvious, however, that as the said valve approaches its seat the flow of water from the main portion of the inlet a^2 to the space between the said valve and its seat is gradually throttled, the inlet-opening to the valve-shell, however, remaining unchanged in area, so that the water remaining between the valve and its seat will flow out more freely than it flows in, thus reducing the static pressure aforesaid, whereby the pressure tending to close the valve overbalances that tending to hold it open, so that the final closing movement of the valve is responsive to fluid-pressure and may be wholly independent of the external actuating device, which has produced the initial closing movement thereof.

The valve is guided and supported in its longitudinal movement by the ribs c^5 engaging with the periphery of the inlet-opening to the valve-chamber a at one end of said stem and at the opposite end by the piston c^3 in the chamber a^4. The said piston c^3 is provided, as shown, with a packing consisting of a cup-leather c^6, secured to the said piston by means of a nut c^7, screwed upon the extension c^8 from the inner end of the said valve-stem.

To open the valve and, conversely, to produce the initial closing movement thereof, the ball or float d is provided, having the arm d^2, pivoted at d^3 between lugs d^4 on the valve-shell A, and having an engaging portion d^5, engaging annular shoulders c^9 c^{10} upon the valve-stem c^2, so that the upward or downward movement of said ball rocks the arm d^2 upon its pivot and causes a corresponding reciprocating movement of the valve c, tending to open and close the same. Thus the downward movement of the ball as the water in the tank recedes will produce a movement of the valve-stem c^2 to the left and open the valve, as shown in drawings, the said valve being maintained in its open position by the opposed pressures brought to bear thereon, as above described, until the upward movement of the ball brings the engaging portion d^5 into engagement with the shoulder c^{10} upon the valve-stem c^2, causing the said stem to move to the right and carry the valve toward its seat.

As has been described, the said valve, after it has been partially closed by the actuating device, will complete its closing movement in response to the increasing relative pressure acting upon the valve itself, and in order that the final closing movement of the said valve may be completely independent of the actuating device a loose or lost motion connection is provided between the ball d and the said valve, the said connection being provided for as herein shown, by lost motion between the shoulders c^9 c^{10}, the distance between which is greater than the width of the engaging portion d^5, coöperating with said shoulders, so that when said engaging portion is in engagement with the shoulder c^{10} the valve is free to move independently before said portion comes in engagement with the shoulder c^9. As the water in the tank recedes, therefore, causing the ball d to fall, the portion d^5 will engage the shoulder c^9 and open the valve, which is so arranged that a slight downward movement of the ball will produce a complete opening of the said valve, a stop being provided to prevent the further opening thereof while the tank is discharging. As shown in Fig. 2, the valve may be stopped or limited by the engagement of the arm d^2 with the valve-shell A. As the tank refills, causing the ball d to rise, the engaging portion d^5 will first move from the shoulder c^9 toward the shoulder c^{10}, the valve, however, remaining open during such movement, owing to the pressure upon the piston c^3, so that the first upward movement of the ball produces no corresponding movement of the valve. When, however, the portion d^5 engages the shoulder c^{10}, as shown in Fig. 1, the rising water in the tank will exert an upward pressure upon the ball until it rises, causing a corresponding movement of the said portion d^5, which acts upon the shoulder c^{10} to produce the initial actuating closing movement of the valve c.

As the said valve approaches its seat, however, the increasing relative pressure thereon will begin to overbalance the pressure upon the piston c^3, finally causing a prompt closure of said valve, it being obvious that such closing movement is independent of the ball d, owing to the lost motion between the portion d^5 and the shoulders c^9 and c^{10}. Moreover, the independent movement of the valve brings the shoulder c^9 near to the portion d^5, so that the said shoulder will be engaged practically as soon as the ball begins to descend, thus causing a prompt opening of the valve, as required.

The apparatus embodying the invention is simple in construction and effectual in operation, the valve remaining open to its fullest extent during substantially the entire time required to fill the tank, thus causing the said tank to be filled promptly, while the closure of the valve is effected when the water in the said tank has reached the desired level without the objectionable noise caused by the gradual throttling of the water attendant upon the use of ball-cocks operated directly by the float. At the same time the final closing movement is cushioned so as to prevent objectionable water-hammer.

It is not intended to limit the invention to the specific construction herein shown and described, as obvious modifications might be made without departing from the invention.

I claim—

1. A tank-supply valve comprising a valve-chamber having an external valve-seat and the valve proper coöperating with said seat and arranged to operate in response to differentiated pressures, combined with an actuator for imparting an initial closing movement to said valve, and a loose connection between said actuator and valve whereby the final movement of said valve may be completed by fluid-pressure without a corresponding movement of said actuator, substantially as described.

2. In a tank-supply valve, the combination with a valve-seat, of a valve at the inlet side of said seat, a piston connected to said valve, a chamber for said piston communicating directly with the source of liquid controlled by said valve, a ball or float adapted to actuate said valve, and a loose connection between said ball and said valve, substantially as described.

3. The combination with a valve-chamber, of an inlet-opening to said chamber and an external valve-seat at said opening, a valve-stem longitudinally movable in said chamber, a valve mounted on said stem outside of said chamber and coöperating with said valve-seat, a piston on said stem movable in a chamber communicating with the source of supply controlled by the valve, the area of said piston being less than that of the valve, a ball or float adapted to actuate said valve, and a loose connection between said ball and said valve, substantially as described.

4. The combination with a valve-chamber provided with an external valve-seat, of a valve coöperating with said seat and arranged to operate in response to differentiated pressures, of a pivoted actuating arm or lever for producing an initial movement of said valve, a ball or float connected with said actuating-arm, and an engaging portion of said arm movable between corresponding engaging portions of said valve, the width of said engaging portion of said arm being less than the width of the space between the said engaging portions of said valve substantially as and for the purpose described.

5. The combination with the valve-seat b and the valve c movable to and from the inlet side of said valve-seat and having the stem c^2 provided with the piston c^3 of smaller area than said valve, and the duct c^4; of the chamber a^4; and the means for giving an initial actuating impulse to said valve, substantially as described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

WILLIAM SCOTT.

Witnesses:

H. J. LIVERMORE,

JAS. J. MALONEY.