(No Model.)

# W. A. TURNER.

## BALL COCK VALVE.

No. 520,148. Patented May 22, 1894.

Fig. 1.

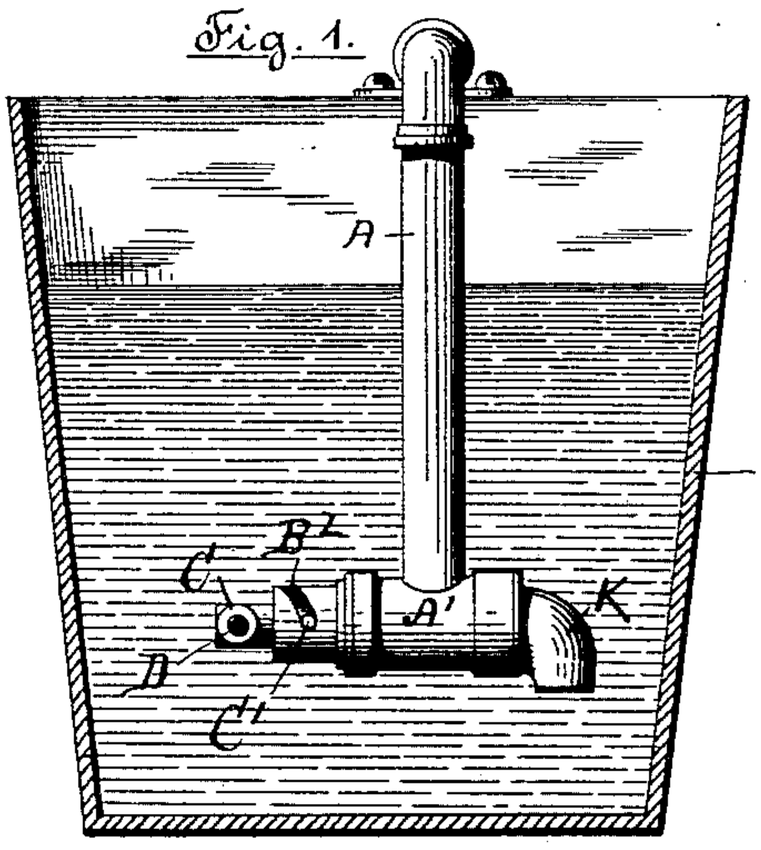



Fig. 2.

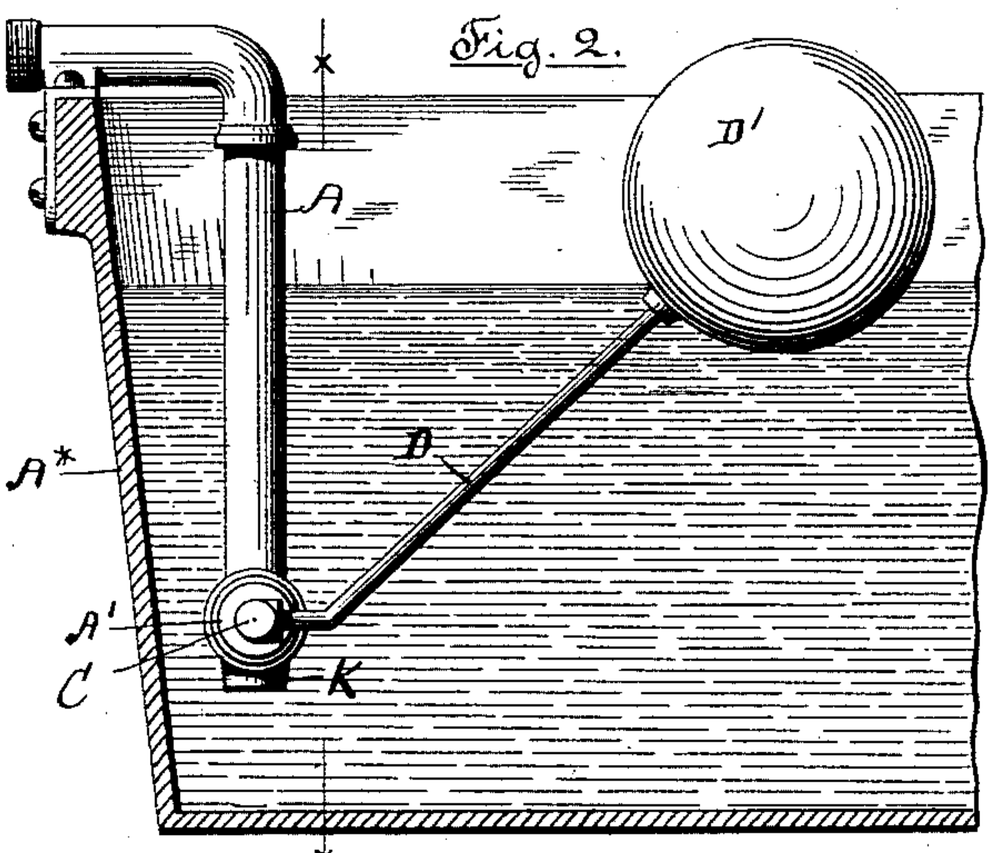



Fig. 7.

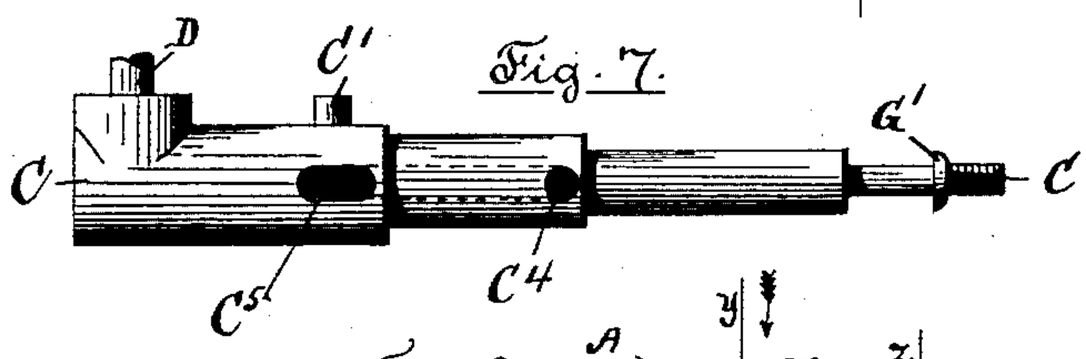
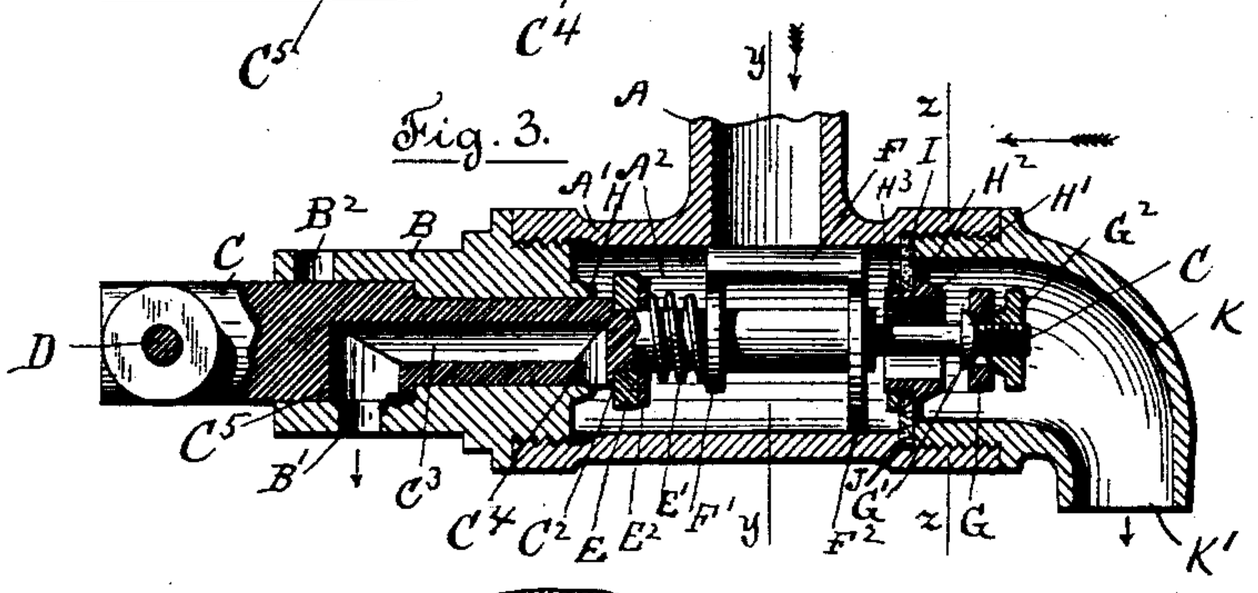



Fig. 3.



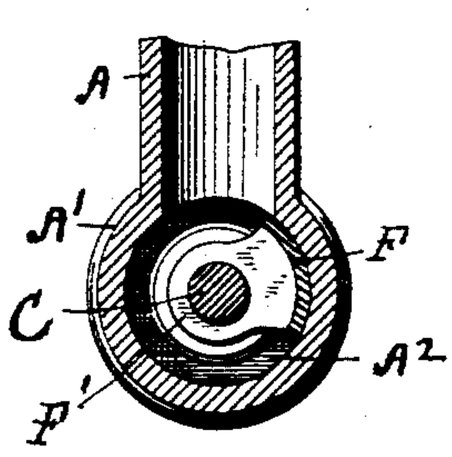




Fig. 4.

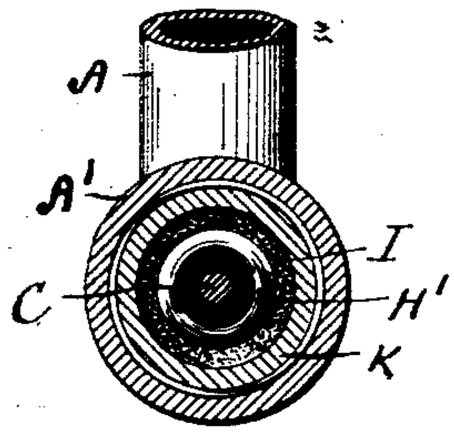



Fig. 6.

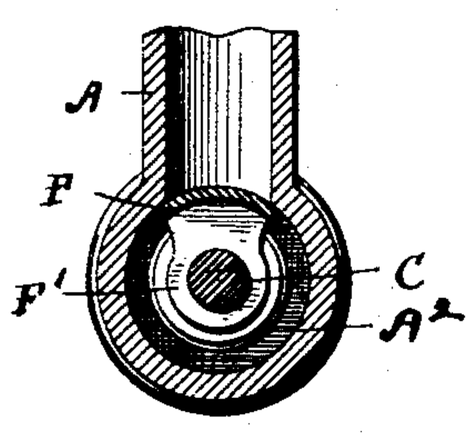



Fig. 5.

Witnesses
Chas. F. Schmelz,
Edmund Connor

Inventor
William A. Turner,
By his Attorney
Rufus B. Fowler,

THE NATIONAL LITHOGRAPHING COMPANY,
WASHINGTON, D. C.

# UNITED STATES PATENT OFFICE.

WILLIAM A. TURNER, OF WORCESTER, MASSACHUSETTS, ASSIGNOR TO EDMUND CONVERSE, OF SAME PLACE.

## BALL-COCK VALVE.

SPECIFICATION forming part of Letters Patent No. 520,148, dated May 22, 1894.

Application filed August 31, 1889. Serial No. 322,566. (No model.)

*To all whom it may concern:*

Be it known that I, WILLIAM A. TURNER, a citizen of the United States, and a resident of Worcester, in the county of Worcester and State of Massachusetts, have invented a new and useful Improvement in Ball-Cock Valves, of which the following is a specification, reference being had to the accompanying drawings, representing a ball-cock valve embodying my invention, and in which—

Figure 1 represents a sectional view of a flushing tank, with one of my improved ball-cock valves shown in elevation, with the ball and lever removed. Fig. 2 is a sectional view of a flushing tank, showing one of my improved ball-cock valves in end view. Fig. 3 is a longitudinal central sectional view of the ball-cock valve. Fig. 4 is a cross sectional view on line Y, Y, Fig. 3, and showing the vertical water way as open. Fig. 5 is a cross sectional view on line Y, Y, Fig. 3, showing the water way as closed. Fig. 6 is a cross sectional view on line Z, Z, Fig. 3, and Fig. 7 is a view of the valve spindle removed.

Similar letters refer to similar parts in the different figures.

The object of my present invention is to provide a ball-cock valve, simple in its construction, in which the buoyancy of the ball shall be applied directly without loss of power to operate the valve, and in which the valve itself shall be operated independently of the water pressure, and these objects I accomplish by means of the construction shown in the drawings and hereinafter described.

Referring to the accompanying drawings, A denotes the water supply pipe through which water is conducted to the flushing tank A* extending into the tank and preferably reaching below the water line, as represented. At the lower end of the vertical supply pipe A, is a horizontal cylindrical pipe A′, inclosing the valve chamber $A^2$, Fig. 3. Within one end of the pipe A′ is screwed the sleeve B, in which is journaled the valve stem C; the sleeve B is provided with the hole B′ forming a water way for the escape of the water from the chamber $A^2$ and also a slot $B^2$, Fig. 1, serving as a cam-slot to effect the longitudinal movement of the valve stem as the stem is rotated, by the rise and fall of the ball, by means of the pin C′ projecting from the sleeve C and entering the slot $B^2$. To the stem C I attach the lever D, extending radially from the stem and carrying at its free end the hollow ball D′, the angular motion of the lever D as the ball D′ rises and falls upon the surface of the water, causing the valve stem C to rotate in its bearing and also to move longitudinally as the pin C′ passes through the cam-slot $B^2$. The valve stem C is provided with a shoulder $C^2$ against which the valve disk E rests, and with a water way $C^3$, receiving water from the chamber $A^2$, through the hole $C^4$ and discharging it through the elongated hole $C^5$ and hole B′ into the tank.

The valve disk E fits loosely upon the valve stem and is held against the shoulder $C^2$ by the spiral spring E′ with its end resting against a flexible washer $E^2$ lying between the spring and valve disk. To the central section of the valve stem is attached the water cut-off valve, which consists of the curved plate F, attached to the valve stem by arms F′, $F^2$, the arm $F^2$ extending across the chamber $A^2$ in order to furnish a bearing upon the opposite side of the chamber $A^2$ and relieve the valve stem of the strain caused by the pressure of the water upon the plate F, when the water way in the pipe A is closed.

The inner end of the valve stem carries the valve disk G, resting against the collar G′ attached to the stem C and held in place by the nut $G^2$, the opposing faces of the nut and collar being convex, by which the valve disk is allowed to rock and thereby vary its inclination with reference to the axis of the valve stem, and adapt itself to the seat. The seats for the valve disks consist of an annular rim presenting a rounded edge to the face of the valve disk. The seat H for the valve disk E is formed in the sleeve B and is shown in Fig. 3. The seat H′ consists of a ring provided with a shoulder $H^2$ and a screw threaded section to receive the nut $H^3$, between which and the shoulder $H^2$ the inner edge of the elastic diaphragm I is held, the outer edge of the elastic diaphragm being held between the shoulder J in the pipe A′ and the screw threaded end of the elbow, K. The valve disks are set upon the valve stem so the disk E will first be brought in contact with the

valve seat H, and as the longitudinal movement of the valve stem is continued the disk E is lifted from the shoulder $C^2$ compressing the spiral sping E′ and allowing the disk G to be brought against the seat H′, and preventing the escape of water from the chamber $A^2$, the continued longitudinal movement of the valve stem causing the diaphragm I to yield.

The operation of the valve is as follows: When the tank is empty, or at the low water line, the ball D′ is lowered by its own gravity rotating the valve stem and by the action of the pin C′ in the cam-slot $B^2$ moving the valve to the right, Fig. 3 carrying the valve disks E and G off their seats H and H′ allowing the water to run from the chamber $A^2$ into the tank, through the water way K′, in the elbow K, and water way $C^3$, through the holes $C^5$ and B′. As the water flows into the tank the ball D′ rises, rotating the valve stem in the opposite direction, moving it toward the left, Fig. 3, and bringing the valve disk E against the seat H, thereby closing the hole $C^5$ to the passage of water and as the water will still continue to flow through the water way K′ the ball D′ will continue to rise and rotate the valve stem, thereby drawing the valve disk G against the valve seat H′, any further motion of the ball causing the diaphragm I to yield. The rotation of the valve stem caused by the raising of the ball D′ will carry the convex plate F from the position shown in Fig. 4 to that shown in Fig. 5, closing the passage through the vertical supply pipe.

The convex plate can be omitted if desired allowing the full pressure of the water to be exerted upon the inner side of the elastic diaphragm I, pressing the seat H′ firmly against the valve disk G.

When the yielding valve seat H′ is employed it will be obvious that the ball-cock valve will work if the spring E′ is omitted and the valve disk E be attached rigidly to the valve stem, provided the two disks E and G be so adjusted upon the valve stem as to cause the disk G to strike its seat in advance of the disk E as the seat H′ will yield sufficiently to allow the disk E to be brought against the seat H′, likewise the seat H′ can be rendered rigid and the yielding disk E employed as shown. I cause one valve to strike in advance of the other and to yield during the continued motion of the valve stem in seating the other valve, for the purpose of avoiding the necessity of making an accurate adjustment in the distance between the valve seats and the valves as it is obvious that if the valves were attached rigidly to the valve stem and the seats were likewise rigid, an accurate adjustment of the valves upon the valve stem would be necessary in order to cause the two valves to strike their respective seats at exactly the same time and rest upon them with equal pressure; such an accurate adjustment would be difficult to secure in practice. As the water flows into the chamber $A^2$ its pressure is exerted equally upon the disks E and G, provided they are of equal area, but in opposite directions, the pressure upon the disk E neutralizing the pressure upon the disk G and thereby producing a balanced valve whose stem is moved longitudinally independently of the water pressure. The valve stem C is reduced in size as it passes through the ring forming the seat H′, forming an annular water way $H^2$, Fig. 6 through which water passes from the chamber $A^2$ to the elbow K. The opposite water way is formed by the holes $C^5$ and B′ and the concentric passage $C^3$ in the valve stem, and as the valve stem is moved endwise in the operation of closing the valves as described, the hole $C^5$ is drawn into the bearing of the valve stem, thereby serving to cut off the escape of water through the passage $C^3$, independently of the closing of the valve disk E.

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

1. In a ball cock valve provided with a water chamber, said chamber having openings upon opposite sides, whereby the exit water is divided into currents as it enters the tank, the combination of a valve stem capable of an endwise movement, two valves carried upon said valve stem by which the exit openings from said water chamber are closed, two valve seats to receive said valve, one of said seats being rigid and the other of said seats being yielding, substantially as described.

2. In a ball cock valve, the combination with a water chamber provided with an opening in which the valve stem is journaled, said opening being provided with an annular valve seat, a valve stem journaled concentrically in said opening, and capable of an endwise and a rotary motion, valve disks carried on said stem and arranged to close said opening, said valve stem having a concentric water way or passage communicating with said water chamber, by an opening arranged to be drawn into the valve stem bearing as the valve is closed, thereby cutting off the water way, substantially as described.

3. In a ball cock valve, the combination with a water chamber provided with an opening forming a water way, of a valve stem journaled in a sleeve concentrically with said water way and having a central concentric passage for the water communicating with the water chamber and an elongated hole communicating with the water way, a sleeve in which the valve stem is journaled and having a hole coincident with the elongated hole in said valve stem, substantially as described.

4. In a ball cock valve, the combination with a water chamber provided with a water passage forming a water way through which water is admitted to said chamber and an opening or openings through which water is allowed to escape from said water chamber into the tank, of a valve stem capable of an endwise and a rotary motion, as described, a plate attached to said stem, and arranged to close over the passage by which water is ad-

mitted to the chamber, and disks carried by said valve stem and arranged to close the openings through which the water is allowed to escape to the tank, substantially as described.

5. In a ball cock valve, the combination with a valve stem capable of an endwise movement, whereby the valve disk is brought upon, or carried away from its seat, of a collar attached to said valve stem and provided with a convex surface against which the valve disk rests, a tightening nut screwed upon the valve stem and having a convex face, or surface resting against the valve disk and a valve disk held between said convex collar and said nut, whereby said valve disk is allowed to rock upon the opposing convex surfaces and adjust its position to its valve seat, substantially as described.

6. In a ball cock valve, the combination with a water chamber provided with openings on opposite sides forming water ways for the escape of the water from said chamber, a valve stem capable of an endwise movement, two valve disks carried by said valve stem to close said water ways, one of said disks being fixed upon said valve stem and the other of said disks being a yielding disk arranged to close its water way in advance of said fixed disk and to yield to allow the continued movement of the valve stem, said valve stem having a concentric water way, or passage, communicating with said water chamber by an opening arranged to be drawn into the valve stem bearing, as the valve is closed, thereby cutting off the water way, substantially as described.

Dated at Worcester, in the county of Worcester and State of Massachusetts, this 29th day of August, 1889.

WILLIAM A. TURNER.

Witnesses:

EDMUND CONVERSE,

RUFUS B. FOWLER.