(No Model.)

W. A. BABCOCK.

VALVE.

No. 404,885. Patented June 11, 1889.

Fig. 1.

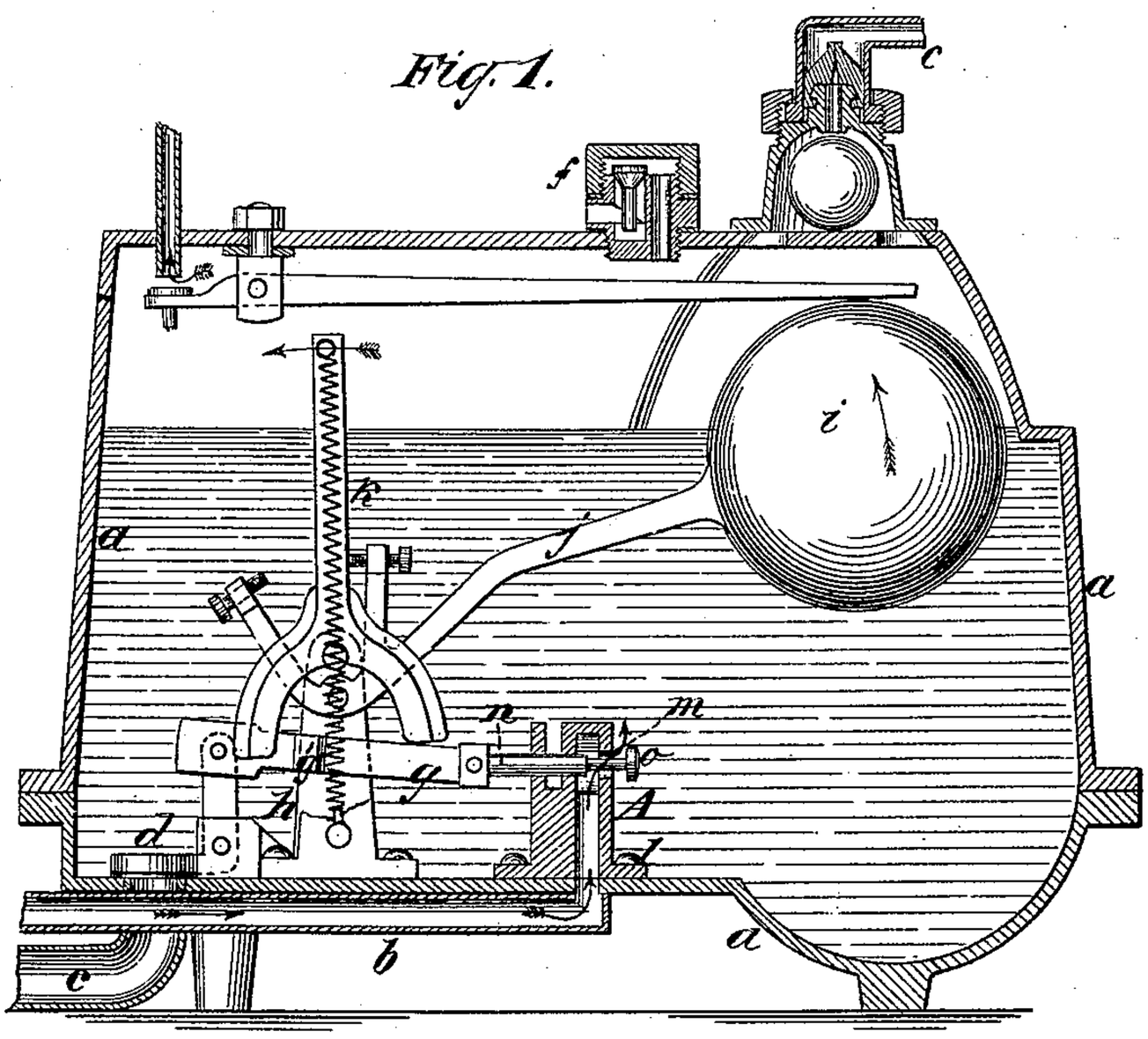


Fig. 2. *Open.*

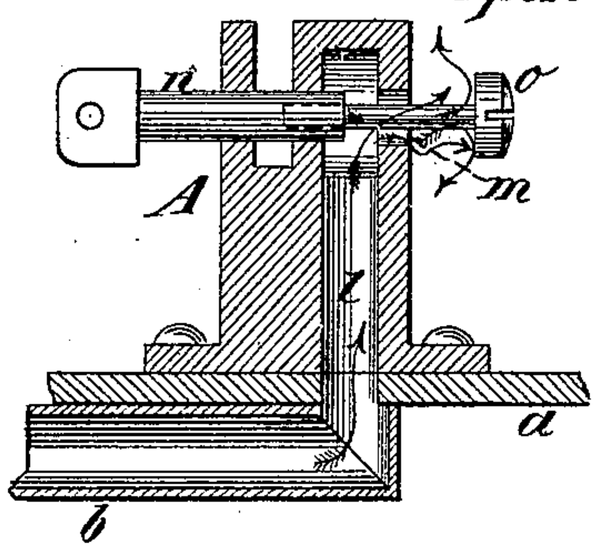


Fig. 3. *Closed.*

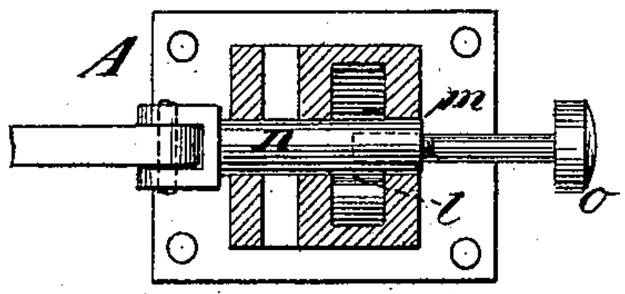
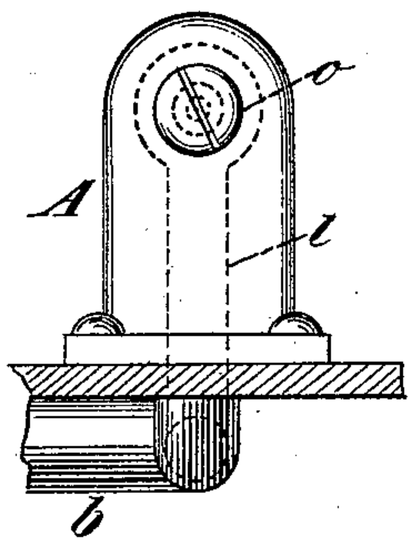


Fig. 4.



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UNITED STATES PATENT OFFICE.

WILLIAM A. BABCOCK, OF SOUTH COVENTRY, CONNECTICUT.

VALVE.

SPECIFICATION forming part of Letters Patent No. 404,885, dated June 11, 1889.

Application filed June 24, 1884. Serial No. 135,852. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM A. BABCOCK, of South Coventry, Tolland county, Connecticut, have invented certain new and useful Improvements in Air-Compressor Valves, of which the following is a specification.

My invention applies to sliding plunger or plug valves for controlling the admission of water to tanks or chambers, and operated by a float and rocking lever, which generally require an easy-working balanced valve. A good type of this form of valve is shown in the hydraulic air-compressing pump patented to me July 10, 1883, No. 280,997, on which my present invention is a special improvement. In my former valve a sliding plunger is fitted to slide in a perforated block and across a water-way therein in such a manner that when the valve is opened the plunger retires within the bore of the block and allows the water to escape in a jet from the open end of the bore, while when the valve is closed the plunger is projected out through the bore and closes the same to shut off the flow of water. When, therefore, the valve is open, the water issues in a jet from the bore in line with the plunger, and its reaction exerts a backward pressure on the end of the plunger, which opposes a resistance to the closing of the valve and renders the valve unbalanced. Now, according to my present improvement, I obviate this objection by attaching to the discharge end of the plunger a deflection disk or plate much larger than the discharge-orifice of the bore and connected with the plunger through the said orifice by a narrow stem, the plate being adjusted at a certain distance from the orifice in such a way that the jet in discharging impinges on the plate and exerts sufficient pressure thereon by its momentum or impact as to overcome the static backward pressure of the water on the plunger, and thereby renders the valve balanced in a very simple and effective manner.

My present invention therefore consists in the feature here outlined, as hereinafter fully set forth.

In the drawings annexed, Figure 1 presents a sectional view of a hydraulic air-compressor, such as figured in my former patent, equipped with my improved balanced valve. Fig. 2 is an enlarged vertical section of the valve; Fig. 3, a sectional plan on line $x\,x$, and Fig. 4 an end elevation thereof.

Referring to Fig. 1, I will first give a brief description of the air-compressor shown, in order that the action of my improved valve may be better illustrated. In this view a indicates the closed tank or chamber of the compressor. A is the water-inlet valve in which my invention is embodied, and b indicates the water-supply pipe connected therewith. c is the exhaust-pipe proceeding from the base of the chamber a, and d the exhaust-valve which controls the exhaust-outlet. e indicates the outlet from which the compressed air is delivered at the top of the chamber, and f is the air-inlet valve. The plunger of the inlet-valve A and the exhaust-valve d are operatively connected by the connecting-rod g, as shown in my former patent, so that when the inlet-valve is open the exhaust-valve will be closed, as illustrated, and vice versa. On standards h, above the connecting-rod g, is mounted a rocking spring-lever k, having a forked lower arm, which straddles a projection g' on the connecting-rod g, so that when the said lever is tilted past its dead-center in either direction it will fly over the center, and, striking the projection g' on either side, will thus reverse the valve, as will be readily understood. The lever k is thus operated by the rise and fall of the float i, the lever j of which is forked, as shown, to engage the rocking lever k, as fully set forth in my former patent. In Fig. 1 the exhaust-valve is shown closed and the inlet-valve open, with the chamber nearly full of water, the float raised nearly to the top and the tilting lever brought over the dead-center and just on the point of flying over to reverse the valve. When this movement of the rocker-lever and valve occurs, the inflow of water will of course be shut off and the exhaust-valve d opened to permit the charge to flow out. As the float descends with the outflow of water, it will finally tilt the lever k in the opposite direction and shift the valves in the opposite way, so as to shut the exhaust and again open the inlet valve and thus reproduce the action first described, as will be readily comprehended, which actions are of course common in this class of devices and form no part of my present invention.

Now, referring to the drawings, the casing of the inlet-valve A consists of a metallic block of rectangular shape with rounded top, as illustrated, or of any other suitable form. In this block is formed a vertical passage or water-way *l*, to which the supply-pipe *b* connects, as shown in Figs. 1 and 2, but which does not pass entirely through the block, as shown. In the top of the block, however, and at right angles to the water-way *l*, is formed a smooth cylindrical bore *m*, which extends transversely clear through the block, intersecting the water-way *l*, as well shown in Figs. 2 and 3, and in this bore is nicely fitted the cylindrical valve plug or plunger *n*.

At the point of intersection of the water-way *l* with the bore *m* the water-way is extended all around the plunger in the form of a circular recess or chamber, as well shown in Figs. 2 and 3, and also by dotted lines in Fig. 4, so as to admit the water-pressure on all sides of the plunger, and thus render it balanced in the casing, so as to prevent its being pressed laterally to either one side or the other of the casing, this being the same as shown in my former patent.

It will now be seen by referring to Fig. 3 that when the plunger *n* is slid fully into its socket or bore in the block, so as to cross the water-way and fill or protrude from the end of the bore, the flow of water will be shut off and the valve thus closed, as well illustrated in Fig. 3, and in this position the plunger will be entirely balanced in its socket, as no pressure is admitted against the ends of the plunger, while the pressure is admitted uniformly all around the plunger, as will be readily comprehended. When, however, the plunger is slid partly outward, so as to withdraw its end from over the water-way *l* and out of the end of the bore *m*, as shown in Figs. 1 and 2, the water will rush freely out of the open end of the bore, as shown in Figs. 1 and 2, and the valve will hence be opened. While, however, the plunger will still be balanced as regards the lateral pressure, it will be readily seen on reference to Figs. 1 and 2 that the reaction of the water in discharging from the open end of the bore *m* will exert a back-pressure on the end of the plunger *n*, which would offer a resistance to the subsequent closing movement of the plunger, and, if not neutralized, would cause the rocking lever *k*, Fig. 1, to work with difficulty and render the action of the valve unreliable. This was the objection with my former valve, but which I now obviate by attaching to the end of the plunger the deflection plate or disk *o*, which always stands in front of the discharge orifice or bore *m*, as shown well in Figs. 1 and 2, and thus receives the momentum or impact of the jet of water as it discharges thereon and becomes deflected therefrom and thus acts to neutralize the standing or static pressure of the water on the inner end of the plunger, as will be readily comprehended from Figs. 1 and 2, and therefore renders the plunger balanced in all directions in a manner which is very effective and simple, and thus greatly improves the action of the valve.

The balancing deflection-disk *o* is considerably larger than the discharge-orifice *m*, and it is made adjustable to or from the orifice, so as to secure the best position at which the balance occurs, as the balance may be regulated by adjusting the disk *o* nearer to or farther from the orifice, which adjustment regulates the dispersion or deflection of the water, and thus increases or decreases the impact or force of the jet on the disk. For this reason I prefer to make the balancing device in the form of a screw with an enlarged head, which forms the balance-disk *o*, and with a slender stem which screws tightly into the end of the plunger, as fully shown in Figs. 2 and 3, and which thus allows of the described adjustment in a perfect and simple manner.

The deflecting-face of the disk *o* might be concave or convex, instead of flat, as shown, or of any other suitable formation, according to circumstances; but flat is considered preferable. It will therefore be now seen that in my invention I balance the static or standing pressure of the water on the inner part of the valve by the impact of the discharging-jet on an outer part of the valve from which the jet is deflected, in distinction from producing a balance by the static pressure in both directions, as is commonly done. I do not, however, broadly claim this principle of balance, which is not new with me, but limit my claim to the specific novel construction, combination, and arrangement of parts set forth, as hereinafter claimed.

What I claim is—

In an air-compressor of the character described, the deflecting balancing plate or disk adjustably attached to the movable plug or plunger of the valve and disposed before the discharge-orifice, whereby the reactionary force of the discharge is regulated, substantially as shown and described.

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