C. F. MURDOCK
Self-Closing Valve.

No. 209,503. Patented Oct. 29, 1878.

Fig. 1.

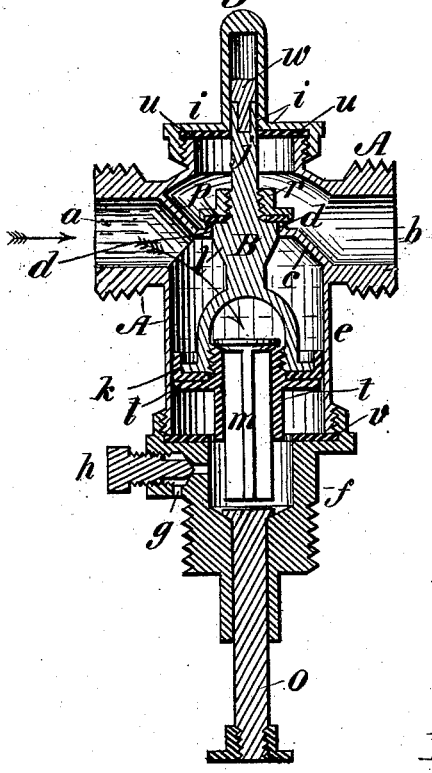


Fig. 2.

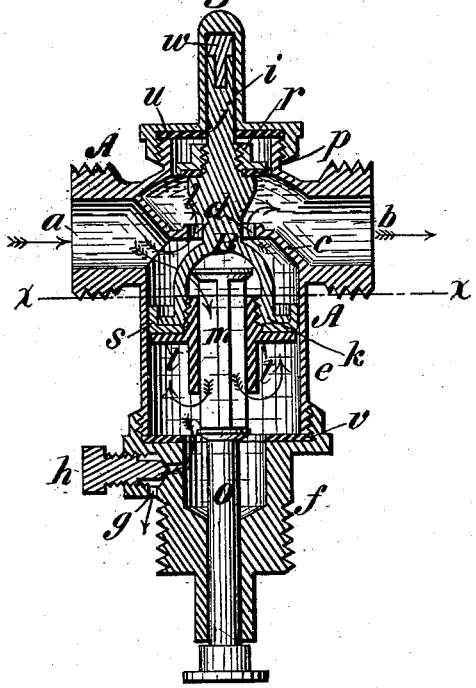
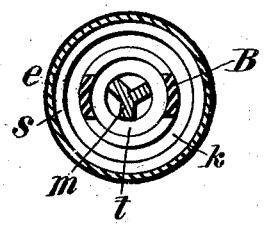


Fig. 3.



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CHARLES F. MURDOCK, OF DETROIT, MICHIGAN.

IMPROVEMENT IN SELF-CLOSING VALVES.

Specification forming part of Letters Patent No. **209,503**, dated October 29, 1878; application filed June 11, 1878.

To all whom it may concern:

Be it known that I, CHARLES F. MURDOCK, of Detroit, in the county of Wayne and State of Michigan, have invented certain Improvements in Self-Closing Valves, of which the following is a specification.

This invention relates to that class of self-closing valves the closing action of which is effected by the pressure of the water upon the piston; and the invention consists in various details of construction hereinafter described, but more particularly in a special manner of arranging the valve to be closed against the pressure or current of the water, whereby it is caused, under all circumstances, to shut down gently upon its seat.

Many valves have heretofore been constructed in which the movement of the valve proper was secured by the action of the water upon the piston; but in such valves it has been customary to arrange the valve to close with or in the direction of the flow of the water. In practice it is found that in such valves the closing of the passage was effected suddenly, in consequence of which a hammering was produced and the pipe and valves subjected to a dangerous strain, owing to the fact of the flow of water being suddenly arrested.

The object of my invention is, mainly, to cause the valve to close slowly and gradually under all circumstances, and at the same time to permit the amount of water discharged to be regulated at will.

Referring to the accompanying drawings, Figure 1 represents a transverse central section through the center of my valve in its closed condition; Fig. 2, a similar view showing the valve open; Fig. 3, a cross-section on the line *x x*.

A represents the body or shell of the valve, provided with an inlet-throat, *a*, and an outlet-throat, *b*, separated from each other by the usual angular partition *c*, in the center of which there is formed the usual valve throat or passage *d*.

The body A is also provided on one side with a cylindrical extension or body, *e*, communicating with the inlet-throat *a* and valve-throat *d*, the axis of the chamber or cylinder *e* and that of the valve-seat being coincident with each other.

The outer end of the cylinder *e* is closed by a cap or cover, *f*, containing a central chamber provided with a small outlet, *g*, and with a set-screw, *h*, by which the outlet-opening may be partially or wholly closed at will.

The upper end of the body A, above the valve-seat, is provided with a cap, *i*, having a central tube or neck to serve as a guide to the valve-stem.

B represents the valve, having at its upper end a guiding-stem, *j*, working in the neck *i*, at its lower end a piston, *k*, fitting closely within the cylinder *e*, and at its middle a plug or valve proper, *l*, to close the throat or passage *d*, said plug being of materially less diamater than the piston *k*.

In the center of the valve-piston *k* there is formed an opening for the passage of the water downward beneath the piston, and in said opening there is mounted a check-valve, *m*, arranged to open upward, as shown in Figs. 1, 2, and 3.

Through the center of the lower cap, *f*, there is inserted a sliding rod or spindle, *o*, the purpose of which is to raise the check-valve *m* when the main valve is to be opened.

The operation is as follows: The parts being at rest and the valve closed, the valve-plug *l* is seated within the valve-throat *d*, and held in place therein by the pressure of the water entering at *a* and acting on top of the piston *k*, the check-valve *m* being closed. When the valve is to be opened the stem *o* is pushed inward, whereby the check-valve *m* is opened and the water permitted to flow through the inlet-throat down past the check-valve into the lower end of the cylinder *e*, beneath the piston *k*. The pressure of the water beneath the piston, combined with the pressure beneath the plug *l*, causes the valve to rise and lift the plug *l* from the throat *d*, thereby permitting the water to flow through said throat to the outlet *b*. So long as the check-valve remains in its elevated position the main valve will remain open; but as soon as the check-valve is permitted to close the water beneath the piston is gradually discharged through the outlet *g*, and the pressure of the water on top of the piston permitted to force the same downward and again draw the plug into the seat or throat *d*.

It will be seen that the plug or valve proper is drawn to its seat against the current or movement of the water instead of being carried in the same direction as the water, as usual.

By arranging the parts as described I am enabled to secure a steady and gradual closing of the valve against the most extreme pressure of water.

In all valves the pressure of the water is gradually augmented as the valve approaches its seat, the consequence of which is that in those valves in which the valve moves with the current it is driven down very suddenly and violently after having nearly reached its seat; but by arranging the valve to move against instead of with the current I entirely overcome this difficulty, the increase in the pressure of the water offering also an increased resistance against the sudden and violent seating of the valve. In order to secure a gradual closing of the throat or seat, the valve-plug is made of a tapering or conical form, increasing in size from the lower to the upper end, preferably in a curved line. At the upper end, which is of proper size to fit closely within the valve seat or throat *d*, a shoulder is formed and provided with a leather washer, *p*, secured in place by a collar, *r*, screwed down upon it around the valve-stem. The leather washer is designed to fit down upon a lip turned upward around the seat or throat *d*, in order to secure a more perfect joint.

The close fit of the piston *k* is secured by means of a leather washer, *s*, having an upturned outer edge, which is secured to the under side of the piston by means of a plate, *t*, which latter also forms the seat for the check-valve *m*. As shown in the drawings, the plate *t* is provided with an upwardly-extending neck screwed into the piston, and also provided with a downwardly-extending neck for the purpose of affording a long bearing for the check-valve and enabling the same to work smoothly and easily. It will also be noted that the upper end or head of the spindle *o* is made of a conical form and adapted to fit in a corresponding recess in the cap *f*, the head thus constructed serving as a valve to prevent the escape of water around the spindle. At its upper end the valve-stem is provided with a detachable end piece, *w*, the purpose of which is to limit the ascent of the valve, and thereby the rapidity of the flow of the water. By introducing end pieces of different lengths the flow of the water when the valve is open may be regulated at will; but the same result may be secured by screwing the end pieces *w* into the valve-stem and adjusting it vertically as required.

It is to be noted that the above-described regulation of the flow of water through the valve when open is independent of and has no effect on the rapidity with which the valve opens and closes.

The valve-body is also provided at its upper and lower ends with leather washers *u* and *v*, respectively, to insure tight joints at these points.

It is manifest that the details of construction may be modified, if desired, provided the mode of operation of the parts is not departed from.

I am aware that a plug and a closing piston on opposite sides of a throat and a conical valve closing by hand against the pressure are, separately considered, old; but by the combination shown, using the conical plug and piston, I am enabled to effect an easy and quiet closing under great pressures—a result which cannot otherwise be attained.

Having thus described my invention, what I claim is—

1. In a self-closing valve, the combination of a plug arranged to close to its seat or throat in the opposite direction from that in which the water passes, a piston located on the opposite side of the throat from the plug and connected therewith, a closed cylinder surrounding the piston and subjecting the same to the constant pressure of the water in advance of the throat, a space in rear of the piston having a small outlet, and a secondary valve, by which the entrance of water behind the piston may be instituted or arrested at will.

2. In a self-closing valve, the combination of a conical valve-plug, arranged to enter the seat or throat in the opposite direction from that in which the water passes, and a closing-piston connected with the plug and located on the opposite side of the throat, subject to the pressure of the water.

3. The combination, in a self-closing valve, of a main valve or plug, a cylinder and piston to effect the closing of the valve by water-pressure, means for admitting water behind the piston to hold the valve open, and an adjustable device to control the discharge of the water from behind the piston in order to regulate the speed with which the valve closes, said parts being constructed and arranged substantially as shown and described.

4. The combination, in a self-closing valve, of the valve seat or throat, the piston subject to the pressure of the water in advance of the throat, and the tapering plug connected with the piston and arranged to enter the throat from the rear side against the current of water.

5. In a self-closing valve, the combination, substantially as shown, of a valve-plug, a piston for operating the same, and an adjustable or detachable stop, *w*, arranged to limit the movement of the piston, and thereby control the flow of water without affecting the speed with which the valve opens and closes, substantially as shown and described.

6. In a self-closing valve, the combination, substantially as shown and described, of a main valve-plug closing against the flow of the water, a piston and cylinder to effect the opening and closing of the valve, and a small or secondary valve arranged to admit water

into the cylinder behind the piston while the main valve is opening and to exclude the entrance of water while it is closing.

7. In a self-closing valve, the combination of a piston to cause the closing action of the main valve-plug and a cylinder inclosing said piston and provided with a small outlet-opening in rear of the same, arranged so that the valve is held open by the presence of water behind the piston and controlled in closing by the escape of the water from the cylinder through the outlet-opening, substantially as described and shown.

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