(No Model.)

W. SCOTT.

SLOW CLOSING VALVE.

No. 547,505. Patented Oct. 8, 1895.

Fig. 1.

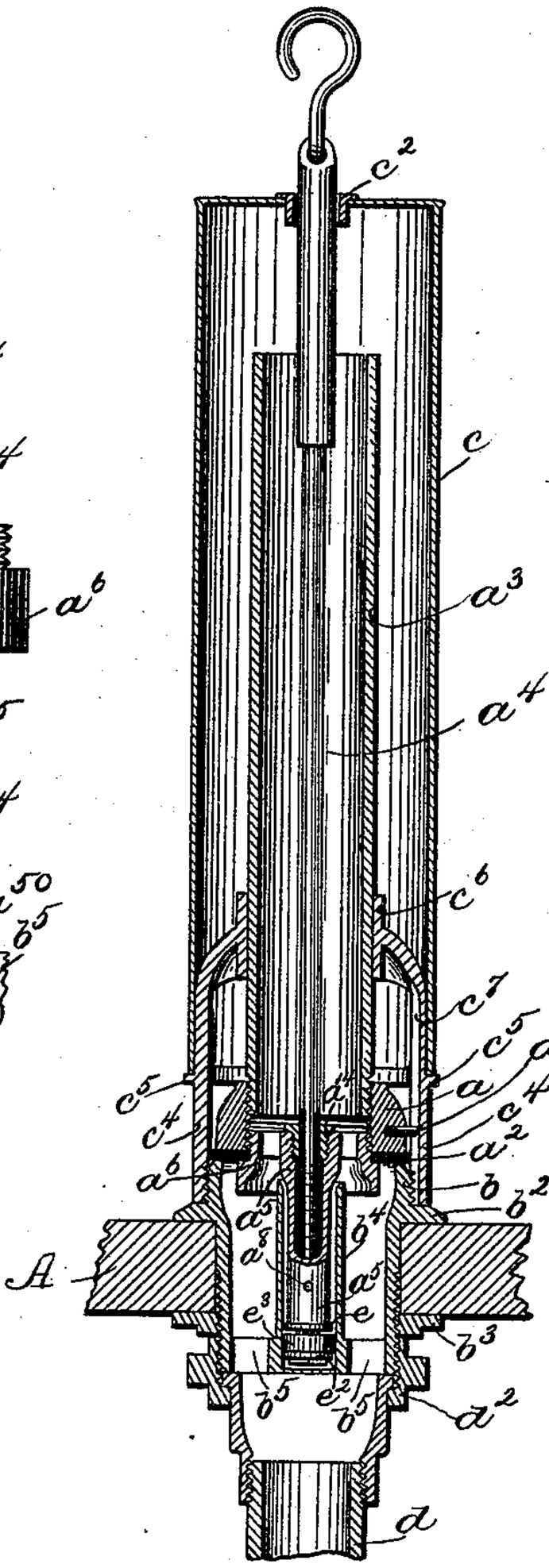


Fig. 2.

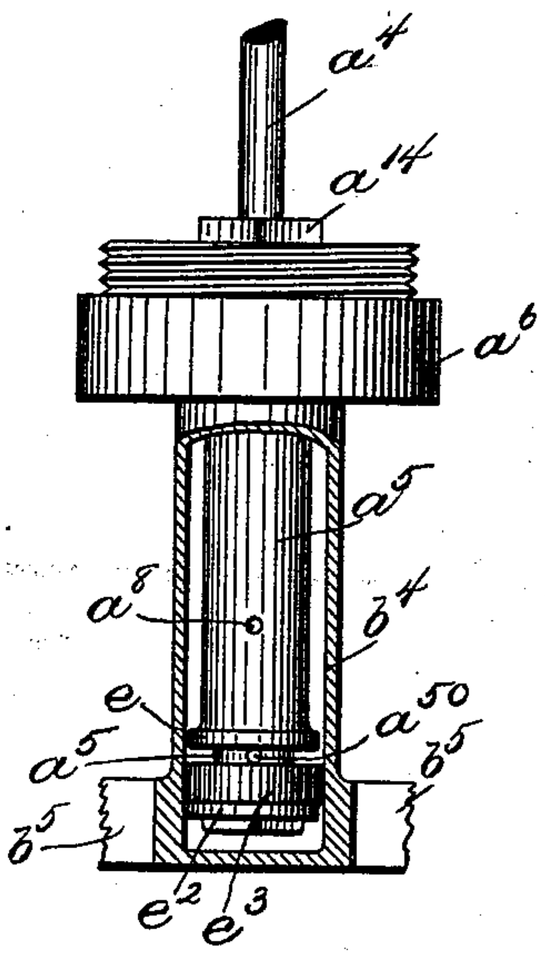


Fig. 3.

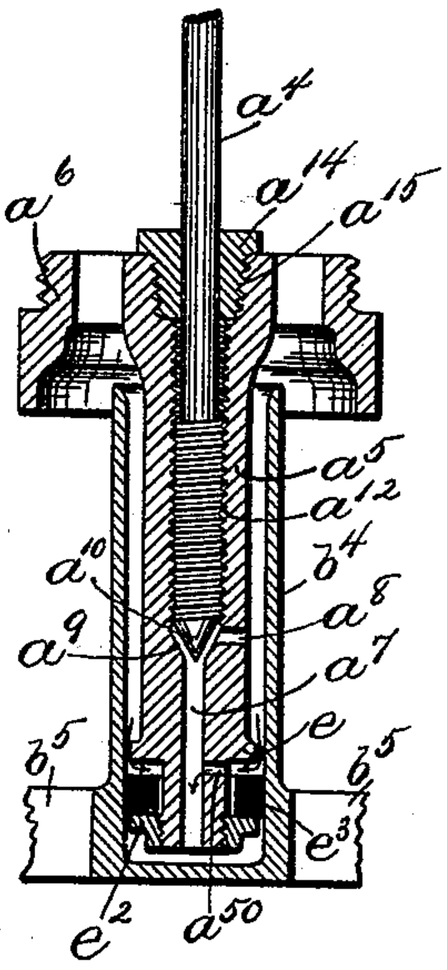
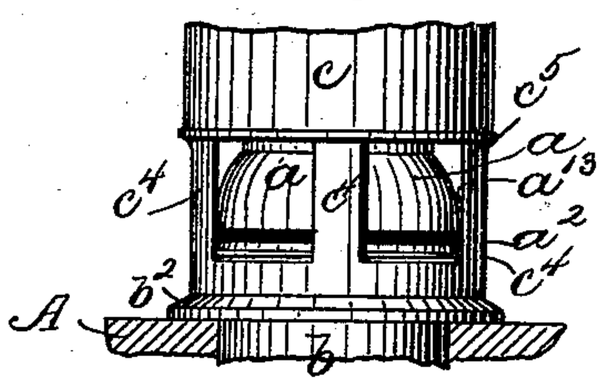


Fig. 4.



Witnesses
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UNITED STATES PATENT OFFICE.

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SLOW-CLOSING VALVE.

SPECIFICATION forming part of Letters Patent No. 547,505, dated October 8, 1895.

Application filed April 22, 1895. Serial No. 546,662. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM SCOTT, of Medford, county of Middlesex, State of Massachusetts, have invented an Improvement in Slow-Closing 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 slow-closing valve especially adapted for use in flushing-tanks where it is desirable to have the valve opened by a momentary operation and closed automatically, such closure, however, not taking place until the proper amount of water has been discharged.

The present invention is embodied in a valve of this kind having certain novel features of construction and arrangement which will be hereinafter described. The valve is of the class which is adapted to be lifted, as by a chain or lever, from a valve-seat near the bottom of the tank from which water is to be discharged, and in accordance with the present invention is provided with a plunger extending downward into a dash-pot fixed in the outlet-passage through the valve-seat and adapted to become filled with water as soon as the valve is opened, and means are preferably provided for regulating the resistance of said dash-pot in order that the length of time taken for the closure of the valve may be varied at will. The valve is provided with an upright tube or overflow-pipe extending upward to the normal level of the water in the tank, and difficulty has been heretofore experienced when a valve of this construction is provided with a retarding device, owing to the fact that when the valve approaches its seat, lessening the outlet-opening for the water, air is rapidly sucked down through the overflow-pipe, causing a disagreeable gurgling noise, which is so objectionable as to seriously impair the commercial value of the apparatus. This difficulty is overcome in accordance with the present invention by providing a stationary inclosing-case extending upward from the valve-seat piece and covering the valve and overflow-pipe, the said case having openings at the bottom through which the water reaches the valve, and also a passage at the top for the lifting-rod by which the valve is operated. The said passage is made large enough to admit some air around the lifting-rod, so as to form a vent and prevent siphon action, the air-passage, however, being so small as to preclude the rush of air, which causes the objectionable noise above mentioned. The said inclosing-case is preferably mounted on the valve-seat, and openings for the water are provided by making the lower portion of the case of an open cage-like casting, which may also extend upward and be provided with a guide for the overflow-pipe within the casing.

The casing constructed in accordance with the present invention not only obviates the difficulties above outlined, but also affords protection to the working parts of the valve and adds to the general appearance and utility of the apparatus.

Figure 1 is a vertical section of the valve embodying the present invention, shown as applied to the service-box or flushing-tank of of a water-closet; Fig. 2, an enlarged view of a portion of the valve and dash-pot, a portion of the dash-pot being in section to show the plunger in elevation; Fig. 3, a similar detail in section, and Fig. 4 a side elevation of the lower portion of the valve that appears above the bottom of the tank.

Referring to Fig. 1, the valve proper a consists of an annulus having on its lower surface a washer a^2, adapted to rest upon the seat on the valve-seat piece b, which is herein shown as a tubular fitting extending through the bottom of the tank A and held in position by a flange b^2 and a nut b^3, the said valve-seat piece containing and supporting the dash-pot b^4 in the outlet-passage, as will be hereinafter described. A tube or pipe a^3 is extended upward from the said valve to the normal level of the water in the tank, thus affording the usual overflow in connection with the valve itself, said valve, as herein shown, having an internal thread into which said pipe is screwed. The valve is operated by a lifting-rod a^4, which may be actuated by any suitable or usual mechanism to raise the valve from its seat and in order to prevent the noise caused by the rushing of air through the overflow-pipe as the valve approaches its seat, and also to protect the said valve and

overflow-pipe a^3 thereon, the said parts are inclosed in a casing c, supported on the valve-seat b. The said casing is shown as a sheet-metal cylinder, closed at its upper end and having an opening c^2, which may be provided with a bushing, the said opening serving as a passage for the lifting-rod a^4 and a vent for the casing to prevent siphon action. The lower part of said casing consists, preferably, of a casting c^3, which is mounted upon the valve-seat piece b, preferably being secured thereto by a screw-thread, and is provided with arms c^4, extending upward therefrom around the valve a, said arms being connected at a sufficient height above the valve-seat by a shouldered annulus c^5, upon which the lower end of the casing c is secured, the said arms extending up farther at the inside of the casing, so as to hold the same securely and being preferably connected at their upper ends with a ring c^6, that surrounds and forms a guide for the overflow-pipe a^3. The water from the tank thus enters the spaces or openings between the supporting arms or uprights c^4 above the valve-seat and below the lower end of the casing c, and thus when the valve is raised passes directly through the outlet-passage in the valve-seat piece and into the discharge-pipe d, connected by a coupling d^2 with the lower end of the valve-seat piece. When the valve is seated, the water entering between the arms c^4 rises inside of the case c and at the outside of the overflow-pipe a^3 to the same level as in the tank, and if the said level rises above the upper end of the overflow-pipe the water will escape through said overflow-pipe and the valve and valve-seat piece into the discharge-pipe d below the valve-seat.

In order that the valve may not close until sufficient water is discharged from the tank, means are provided for retarding the downward movement of the valve, consisting in a plunger herein shown as connected with a tubular stem a^5, extending downward from a cross-bar or bridge in an annulus a^6, which is screwed into the under side of the annular valve a, and also serves to fasten the washer a^2 thereto. The said plunger fits closely within the dash-pot b^4 above mentioned, the said dash-pot being mounted on arms b^5, extending across the lower part of the valve-seat piece b, and consisting of a cylindrical shell completely closed, except at the top where the plunger is adapted to enter. In order that the plunger may pass through the water in the dash-pot, a duct a^7 is provided leading from the bottom of said plunger to an outlet-opening a^8 in the tubular stem a^5, so that the water displaced by the downward movement of the plunger into the dash-pot will pass upward through said duct a^7 and the outlet a^8 to the upper side of the plunger, thus allowing the valve to fall more or less rapidly, according to the size of the duct and consequent freedom with which the water can escape therethrough. Suitable means are also provided for varying the effective area of the duct and consequently the length of time required for the automatic closure of the valve when released, and, as herein shown, a conical valve-seat a^9 is formed at the upper end of the duct a^7, which is adapted to co-operate with a conical valve a^{10} at the end of the lifting-rod a^4, which is secured in the stem a^5 by means of a thread a^{12}, (see Fig. 3,) the said rod a^4 extending downward toward the valve-seat a^9 and upward through the passage c^2 in the inclosing-case c to the top of the tank, where it may be secured to an operating-lever adapted to lift said stem and open the valve, which is connected thereto through the bridge-piece a^6. It is obvious, therefore, that by turning the said rod a^4 in the threaded portion a^{12} the conical valve a^{10} at the end thereof will be raised or lowered with relation to the valve-seat a^9, thus practically varying the size of the duct a^7 a^8 and affording more or less resistance to the movement of the plunger, as the case may be. In order to prevent the valve a from turning with the stem when the latter is turned to adjust the valve a^9 a^{10}, a projection a^{13} is provided, extending into a slot c^7 in one of the supporting-arms c^4 of the case c, the valve thus being held from rotation, although its longitudinal movement with relation to the valve-seat is not obstructed.

In order that the water in the dash-pot b^4 above the plunger may pass rapidly by the plunger into the part of the dash-pot below the plunger when the valve is being raised from its seat and then be caused to pass slowly through the duct a^7 a^8 in the return movement, so as to act to retard the closing movement of the valve, as before described, if it is released immediately after being opened, the said plunger is provided with a check-valve arrangement consisting, as herein shown, of two flanges e e^2, between which is a washer e^3, considerably thinner than the space between the said flanges, but of such diameter as to fit closely against the inner wall of the dash-pot and therefore adapted, when the plunger is raised or lowered, to be frictionally engaged by said inner wall and held stationary thereby until carried along by one of the flanges, and the stem a^5 between said flanges is provided with a port or opening a^{50}, adapted to be opened when the said washer is in engagement with the lower flange, as will be the case during the upward movement of the plunger, and closed when the washer is engaged by the upper flange, which will be the case when the plunger descends. The upper flange e is considerably smaller in diameter than the inner bore of the dash-pot, so that water can flow freely through the annular space thus afforded around it, and when the washer is in the position shown in Fig. 3, as it will be during the upward movement of the plunger, water flows, as indicated by the arrows, from the upper side of the plunger to the opening a^{50}, and through said opening to

the open duct a^7, leading through the plunger. When, however, the washer is seated against the upper flange, as during the downward movement of the plunger, said annular space is closed, so that the water can only pass through the plunger by the duct a^7 a^8 controlled by the valve a^{10}. It is immaterial whether the washer fits closely around the stem a^5 or not, because, even if the port a^{50} is opened to the water below the plunger during the downward movement thereof, it cannot pass to the other side of the plunger except through the passage controlled by the valve a^{10}, so that it affords the desired resistance. Thus as the valve is opened the water will pass rapidly down into the body of the dash-pot, not only through the duct a^7 a^8, but also through the unrestricted opening a^{50}, in connection with which the washer e^8 forms, as it were, a check-valve, allowing the flow of water in one direction, but not in the other. The opening a^{50} and the main portion of the duct a^7 into which it opens are large enough to afford practically no resistance to the flow of water therethrough, the said opening a^{50} being preferably formed by drilling a hole through the tubular portion of the stem between the flanges, such construction being shown in the drawings. This leaves an unrestricted passage for the water when not cut off by the washer e^8; but when said passage is closed by the washer during the downward movement of the plunger the water is forced to escape through the comparatively small annular space between the valve-seat a^9 and valve a^{10}, and thence through the port or opening a^8, as shown.

To prevent any accidental change in adjustment of the valve a^{10} which might occur if the rod a^4 were held stationary only by the frictional engagement of its threaded portion with the internal thread a^{12}, a split nut or collar a^{14} is provided, fitting closely around said stem and adapted to be screwed into the tapering threaded portion a^{15} at the top of the plunger-stem a^5, so that as said collar is screwed into said opening it will firmly grip the stem and prevent it from turning too easily.

I claim—

1. The combination with a stationary valve seat piece, of a valve provided with an overflow pipe, a dash pot in the said valve seat piece, adapted to cooperate with a plunger connected with said valve and extending into said dashpot, and an inclosing case mounted on the said valve seat piece and inclosing the said valve and overflow pipe, substantially as described.

2. The combination with an annular stationary valve-seat, of an annular valve cooperating therewith provided with an overflow pipe, and a vented inclosing case or cover mounted on said valve seat and inclosing said valve and overflow pipe; said casing having openings above the valve seat for the admission of water, substantially as described.

3. The combination with an annular valve-seat, of an annular valve cooperating therewith provided with an overflow pipe and lifting rod, and an inclosing case or cover mounted on said valve seat and inclosing said valve and overflow pipe, said casing having openings above the valve seat for the admission of water and a passage for said lifting rod, substantially as described.

4. The combination with an annular valve-seat, of an annular valve cooperating therewith provided with an overflow pipe, an inclosing case or cover mounted on said valve seat and inclosing said valve and overflow pipe, said casing having openings above the valve seat for the admission of water; and a guide for said overflow pipe, 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,
M. E. HILL.