No. 622,418.

Patented Apr. 4, 1899.

S. P. CROSWELL.

VALVE.

(Application filed May 3, 1897.)

(No Model.)

2 Sheets—Sheet 1.

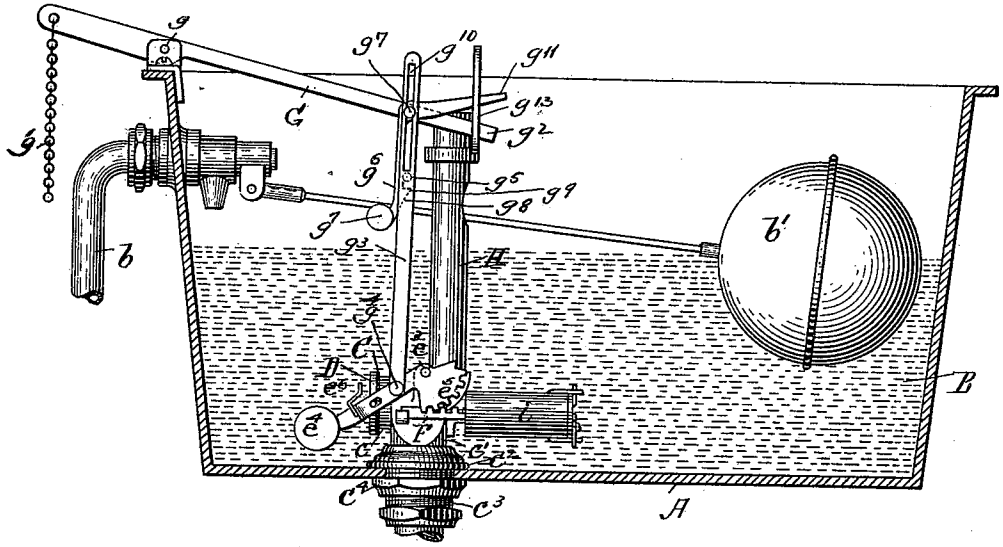


Fig. 1.

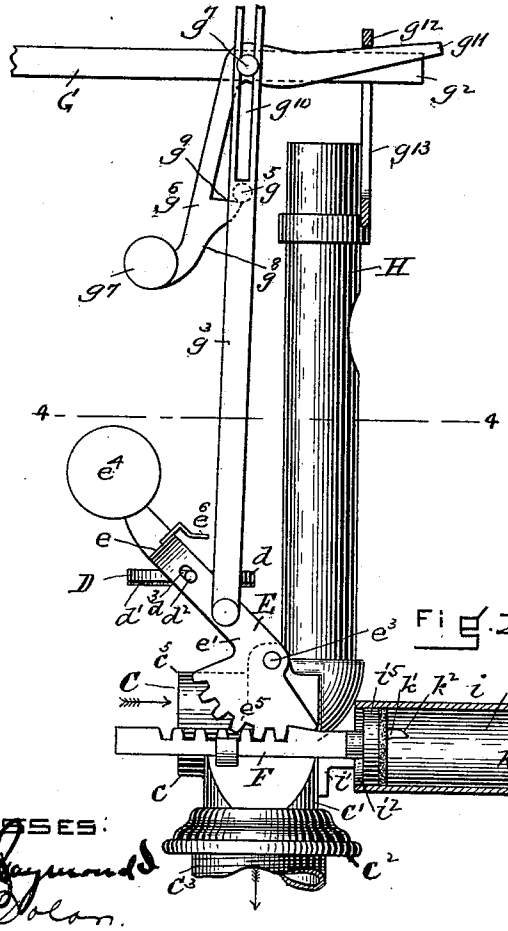


Fig. 2.

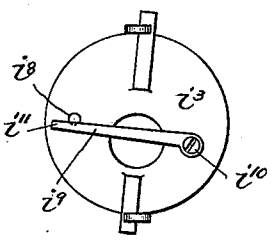


Fig. 3.

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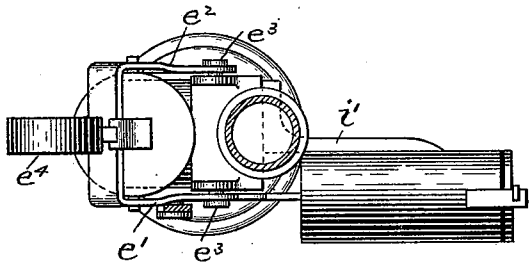


Fig. 4.

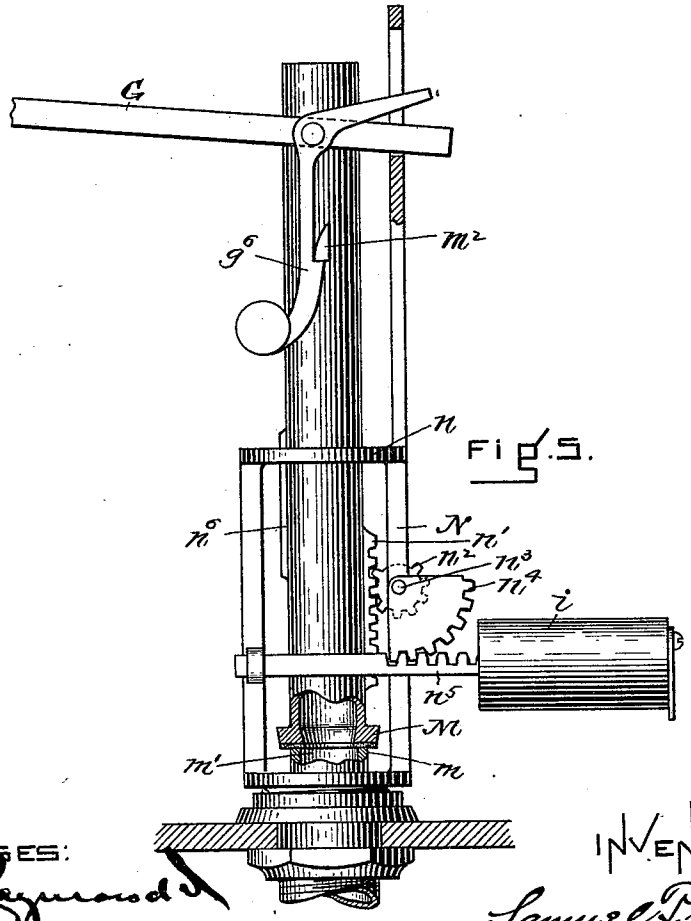


Fig. 5.

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VALVE.

SPECIFICATION forming part of Letters Patent No. 622,418, dated April 4, 1899.

Application filed May 3, 1897. Serial No. 634,886. (No model.)

To all whom it may concern:

Be it known that I, SAMUEL P. CROSWELL, a citizen of the United States, residing at Medford, in the county of Middlesex and State of Massachusetts, have invented a new and useful Improvement in Valves, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming a part of this specification, in explaining its nature.

The invention relates to an improvement in valves and means for operating them, and is especially designed for use in regulating the flow of fluids, whereby a receptacle may be rapidly discharged, the valve slowly closed, and the valve be detached from its opening device after an opening thereof. It is represented as applied to the service-box or tank of a water-closet; but I do not confine the invention to such use.

In the drawings, Figure 1 is a view, partly in vertical section and partly in elevation, of a service-box equipped with my invention. Fig. 2 is a view of my improved valve, enlarged, partly in elevation and partly in vertical section. Fig. 3 is a detail view, in end elevation, of a regulating device for regulating the action of the valve, to which reference will hereinafter be made. Fig. 4 is a view in horizontal section upon the dotted line 4 4 of Fig. 2 and in plan of parts below said line. Fig. 5 is a view principally in elevation to represent a modified form of the valve.

A represents the conventional tank or service-box. It is adapted to contain water B, which is supplied it through the supply-pipe *b*, controlled by a valve operated by the float *b'* in the usual way.

C is the outlet through which the water escapes from the box. It is at the end of the horizontal section *c* of the casting or pipe *c'*, which has a shoulder c^2 to bear against the bottom of the box, the threaded section c^3 to extend through a hole in the bottom of the box and which is adapted to receive the clamping-nut c^4, and a section of a coupling uniting it to an escape-pipe. The opening C is on a vertical plane. The end of the section *c* surrounding this opening forms the valve-seat c^5, against which the swinging valve D is adapted to close. This valve is in the form of a disk *d*, having upon its inner surface a packing or washer *d'*, of leather or other suitable material, which is interposed when the valve is closed between the disk and the valve-seat. The valve is loosely pivoted by the pivots d^2 in the slot d^3 in the lever E, the lever being forked below the point *e* to provide two arms *e' e²*, between which the valve is pivoted and each of which is pivoted at e^3 to the body *c'*. The outer end of this lever has an overbalancing-weight e^4. The inner end of the arm *e'* has an enlargement the edge of which provides the sector-gear e^5, the teeth of which are engaged by the teeth of the sliding rack F. The lever E also has a stop e^6 for preventing the valve from turning upon its pivot more than an extent sufficient to permit it to adjust itself freely to the valve-seat as it closes.

The lever E is adapted to move the valve from the valve-seat with an outward and upward swinging movement or from the position represented in Fig. 1 to that represented in Fig. 2 and to guide the valve to its seat in the closing of the valve.

The valve is removed from its seat by means of a lever G, (or any other suitable moving device,) pivoted at *g*, the outer end of which is moved by means of the pull chain or cord *g'* or any other instrumentality, and the inner end g^2 of which is connected with the valve-lever E by means of the long link g^3, pivoted at g^4 to the valve-lever and having a catch-pin g^5 near its upper end, which is adapted to be engaged by a swinging latch g^6, pivoted at g^7 to the inner end of the lever when said end is in its lowest position or as represented in Fig. 1. The pin extends from one side of the link. The latch is represented as a gravity-latch and as having an overbalancing-weight g^7, so that it is always in position to engage the pin g^5. It also has an outwardly-inclined section g^8 below the shoulder g^9, which forms the engaging part of the latch and which section rides upon the pin as the latch is moved downward, causing the latch to be moved slightly outward until it has ridden by the pin, when the shoulder g^9 closes beneath it. The link g^3 may be stayed by the lever G by extending it beyond the lever and providing the extension with a vertical slot g^{10},

through which the pivot g^7, which fastens the latch to the lever, may extend, the outer end of the pivot being headed to lap upon the link extension on each side of the slot. The latch is automatically disengaged from the link at the end of the upward movement of the inner end of the lever by means of the tripping-arm g^{11}, which forms a part of the latch-arm, extends horizontally from the pivot g^7, and is adapted to be brought into contact with the stop g^{12} at the upper end of the arm g^{13}, fastened to the overflow-pipe near its upper end, the said arm extending upwardly from the said pipe and then horizontally at its upper end to provide the stop. The upward movement of the inner end of the lever brings the tripping-arm g^{11} into contact with this stop and arrests its upward movement, thereby causing the latching-shoulder g^9 to be moved horizontally from the catch on the link g^3, thereby releasing the link and permitting the lever E to move downwardly and the valve to be closed, the connection between the lever G and the link or valve being thus absolutely broken and the valve then becoming automatic in its closing action uncontrolled by the lever G or any continued draft upon it unless the lever shall be released and its inner end permitted to fall, in order that a new engagement between the latch and the catch may be established and the inner end of the lever again raised. After the valve has thus become disengaged from the operating-lever G its closing action is controlled by means of water or fluid in the piston-chamber I in the cylinder i.

The cylinder is preferably supported by an arm i', attached to its side and connecting it with the body c' of the valve. Its end i^2 is open and of the bore of the remainder of the piston-chamber. Its end i^3 has a hole i^4, through which water flows from the tank into the piston-chamber when the piston is moved toward the open end thereof, as it is upon the opening of the valve, it being understood that the piston i^5 is attached to the end of the rack-bar F and that the upward movement of the lever E to open the valve causes the sector e^5 to move the rack F in a direction to cause the piston to be drawn to the open end of the piston-chamber or to the position represented in Fig. 2. This causes water to be drawn through the inlet i^4 into the piston-chamber and to fill the same. The inlet is then adapted to be closed by the check-valve i^6, contained in the piston-chamber, pivoted at i^7 and of a shape to close against a seat in the inner surface of the head i^3 about the inlet i^4. The water thus introduced into the piston-chamber after the release or detachment of the lever G from the valve controls the closing movement of the valve and it permits a more or less slow-closing movement thereof by the rapidity with which it is permitted to escape from the piston-chamber, provision for such escape being obtained by means of the hole i^8 in the head i^3, which connects the interior of the piston-chamber with the cavity of the tank or box and permits water to flow outward from the piston-chamber.

The size of the hole may be varied to vary the time within which the chamber may be exhausted of water by means of any suitable device. I have represented as one means an arm i^9, (see Fig. 3,) attached at one end by a screw i^{10} to the outer surface of the head i^3 and the other end i^{11} of which extends sufficiently to permit it to be moved over the hole to any desired extent, thereby varying the size of the outlet, the arm being either held with a very firm tension or by means of its holding-screw, so that it may be moved without turning the screw or being moved upon releasing the screw and fastened in its new position by tightening the screw.

In Fig. 2 I have shown a device for slightly opening the check-valve i^6 as the piston i^5 approaches the end of its inward movement and the valve D its seat and for holding it slightly open until the piston has been moved outward again in opening the valve D; and it consists in the tappet-arm k, extending from the check-valve, and the arm k', extending from the inner surface of the piston and having an inclined upper surface k^2 near its outer end, which coming into contact with the tappet-arm lifts the arm and moves the check-valve slightly from its seat. This slight opening of the check-valve serves to permit a more rapid release of the water at the end of the closing movement and does away with or makes less liable a noise otherwise incident upon the final closing of the valve.

The overflow-pipe H is supported by the casing or body c', opens into the passage therein, and has an opening at its top.

In Fig. 5 the movable valve is at the lower end of the waste or overflow pipe. It is lettered M and is movable with the waste-pipe vertically from the valve-seat m, surrounding the opening m' of the escape-pipe. The valve and waste-pipe are represented as lifted through the medium of the lever G and gravity-latch g^6, pivoted to the lever and operating as above specified, and it engages a catch m^2 on the side of the waste-pipe, which is the equivalent of the catch g^5 of Figs. 1 and 2.

The waste-pipe is practically the substitute for the link g^3 of Figs. 1 and 2, and the gravity-latch is detached from it at the end of its upward movement by the stop g^{12}, the arm supporting the stop, however, being a part of a frame N, attached to the escape-pipe. This frame forms a guide at n for the waste-pipe. The waste-pipe is connected with the piston within the piston-chamber of the cylinder i by means of the rack n' on the side of the waste-pipe by the pinion n^2, with which it engages and which is mounted upon the end of a shaft n^3, which carries at its other end a segment-gear n^4, the teeth of which are engaged by the rack n^5, attached to the piston and which is the equivalent of the rack F of Figs. 1 and 2.

The upward movement of the waste-pipe and valve M causes the rack n^5 to draw the piston forward in the piston-chamber, and upon the release of the lifting-latch the waste-pipe and valve are allowed to slowly close by the escape of water from the piston-chamber, as above specified. The waste-pipe has a guide n^6 running in a recess in the frame N to prevent its turning.

The operation of the device is as follows: The upward movement of the inner end of the lever lifts the valve controlling the escape of water from its seat and automatically detaches itself from the valve and automatically charges the piston with a valve-controlling means, which insures such a slow closing of the valve that the water in the tank or box may be allowed to entirely escape before it fully closes or to escape therefrom to any desired extent and entirely independently of the position of the actuating lever or device G. The effect of this is to cause the outlet to the escape-pipe to be quickly opened, the water to flow out from the tank through the same, the valve to the water-supply pipe to be opened, and the flow of water from the tank or box to be slowly stopped after any desired quantity has escaped from it.

In the construction represented in Figs. 1 and 2 the pressure of the water in the tank assists the closing of the valve and the holding of the valve upon its seat.

While I have described the invention as used in connection with a service-box or tank of a water-closet, I would not be understood as limiting its scope to such use, but may employ it wherever it is desirable to control the flow of a fluid in the manner above stated.

Any mechanical equivalent for the rack and segment-gear connection between the piston and the valve may be used.

It will be noticed that this valve regulates the discharge of water or liquid from the tank to any desired extent and regardless of the size of the tank or quantity of liquid in it.

Having thus fully described my invention, I claim and desire to secure by Letters Patent of the United States—

1. In a valve of the character specified, the combination of the escape-pipe, its valve-seat about the escape-outlet therein, a valve for opening and closing the said outlet in the escape-pipe, a fluid-controlling device of the character specified connected with the valve by a rack and sector and controlling the closing thereof, a valve-opening lever or device also connected with the fluid-controlling device and adapted to actuate the same simultaneously with the opening of the valve, and a tripping or releasing mechanism between the said actuating lever or device, which tripping mechanism is adapted to be actuated to release the lever from the valve and said fluid-controlling device at the end of the movement of the lever in opening the valve, as and for the purposes set forth.

2. The combination in a valve of the character specified of the outlet, a valve-seat surrounding it, a movable valve to open and close the same, a piston-chamber having the inlet i^4, a check-valve i^6, the piston i^5 in said piston-chamber, the rack F attached to said piston, a sector engaging said rack connected with the opening and closing valve and with the lever G, the link g^3, the lever G, the automatic latch carried thereby, a stop for disengaging the latch at the end of the upward movement of the lever and a catch on the link with which the latch is adapted to become engaged, all as and for the purposes set forth.

3. The combination in a valve of the character specified of the escape-pipe having the escape-opening, a valve-seat surrounding the escape-opening, a valve movable from and toward the valve-seat, an actuating-lever and an intermediate tripping connection comprising the gravity-latch pivoted to the lever, having the arm g^{11}, the link or part g^3 having the catch g^5 and the stop g^{12}, as and for the purposes described.

4. The combination in a valve of the character specified of the escape-pipe having a horizontal extension and an escape-opening at the end of said extension, a valve-seat c^5, the forked lever E, the valve D loosely pivoted upon each side to an arm of said lever.

5. The combination in a valve of the character specified of the escape-pipe having a horizontal extension and an escape-opening at the end of said extension, a valve-seat c^5, the forked lever E, the valve D loosely pivoted upon each side to an arm of said lever, and a stop carried by the lever for limiting the movement of the valve.

6. The combination of the escape-pipe having a horizontal extension provided with an outlet at its end, a valve-seat surrounding said outlet, an overbalance-lever E, a valve D attached thereto and moved thereby, the sector e^5 attached to said lever, a cylinder having a piston-chamber, an inlet i^4 and a fluid-escape hole i^8, the check-valve i^6 for opening and closing the said inlet i^4, a piston i^5, a rack F attached to the piston to be moved thereby and meshing with the teeth of the sector, as and for the purposes set forth.

7. The combination in a valve of the character specified of the escape-pipe having an escape-opening therein, a valve-seat surrounding said opening, a valve for opening and closing the same, a sector connected with said valve, a cylinder having one end open and the other end closed, and also having an inlet i^4 and an escape-hole i^8, a check-valve i^6, a piston i^5 movable in the cylinder, a rack F attached directly to the piston and meshing directly with the sector, as and for the purposes set forth.

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Witnesses:
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