(No Model.)

P. HARVEY.

TANK VALVE.

No. 555,861. Patented Mar. 3, 1896.

Fig. 2.

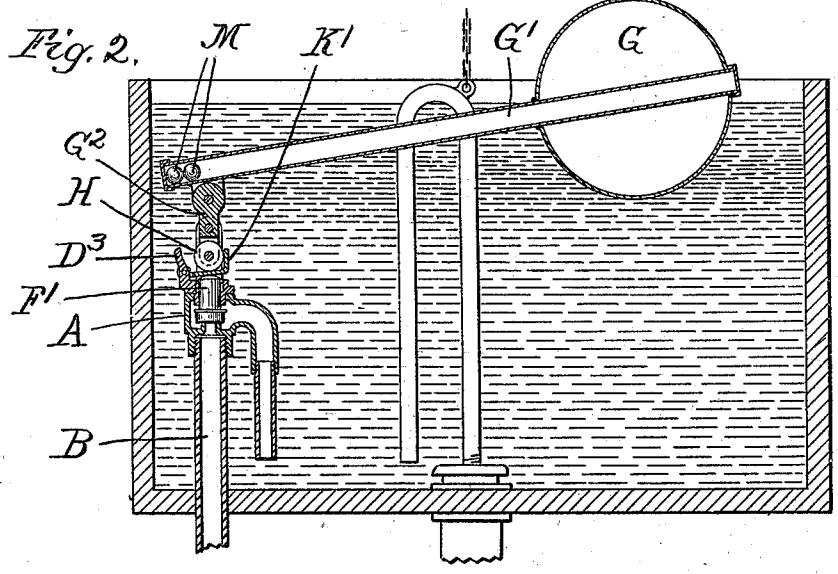


Fig. 6.

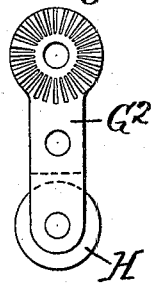


Fig. 1.

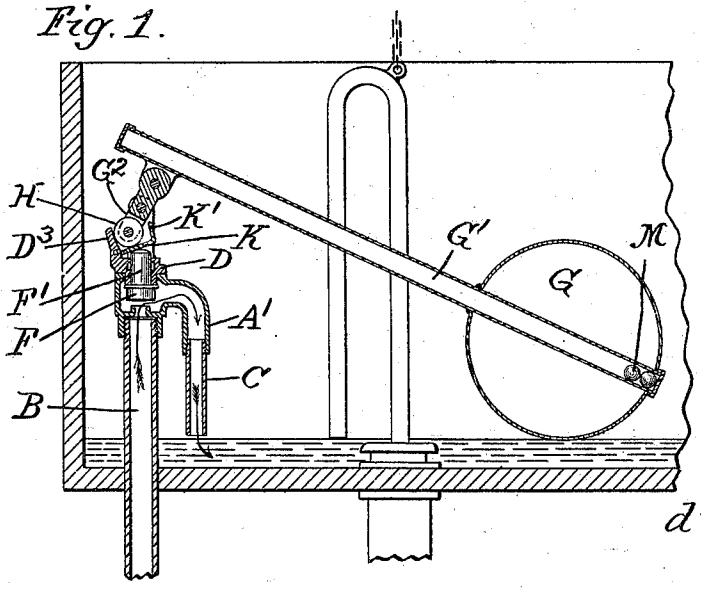


Fig. 3.

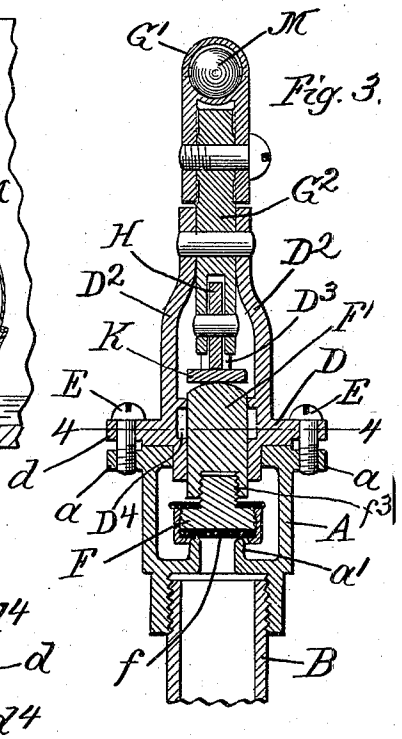


Fig. 5.

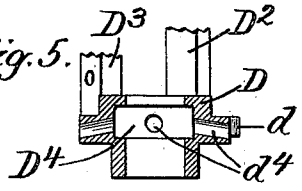
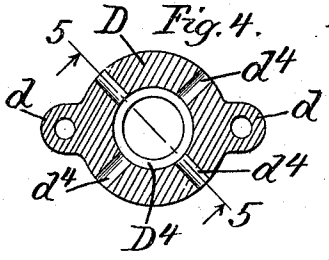


Fig. 4.



Witnesses,
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Jean Elliott.

Inventor.
Patrick Harvey

UNITED STATES PATENT OFFICE.

PATRICK HARVEY, OF CHICAGO, ILLINOIS.

TANK-VALVE.

SPECIFICATION forming part of Letters Patent No. 555,861, dated March 3, 1896.

Application filed February 2, 1895. Serial No. 537,080. (No model.)

To all whom it may concern:

Be it known that I, PATRICK HARVEY, a citizen of the United States, residing at Chicago, county of Cook, and State of Illinois, have invented certain new and useful Improvements in Tank-Valves, which are fully set forth in the following specification, reference being had to the accompanying drawings, forming a part thereof.

In the drawings, Figure 1 is a vertical section of a tank provided with my improved valve, the latter and the parts connected therewith being shown in position to admit water-supply to the tank. Fig. 2 is a similar view showing the valve and the connected parts in position to cut off the supply. Fig. 3 is a vertical section through the valve-body and parts connected therewith at right angles to the plane of the section in Figs. 1 and 2. Fig. 4 is a horizontal section at the line 4 4 on Fig. 3. Fig. 5 is a detail vertical section at the line 5 5 on Fig. 4. Fig. 6 is a detail side elevation of the part which constitutes the vertical arm of the bell-crank lever which carries the float.

The valve-body comprises the part A, adapted to be connected to the supply-pipe B, and having the elbow discharge-terminal A′ adapted to be connected with the pipe C to deliver its discharge at or near the bottom of the tank to avoid the noise of the discharging stream in filling the latter. The valve-body also comprises the cap D, secured to the part A by bolts E through the lugs *a* and *d* on said parts, respectively.

F is the valve. It is provided with a rubber head or seating-face *f* and closes upon the upraised annular seat *a′* of the valve-body. It has a cylindrical stem F′, which extends out through the cap D, obtaining longitudinal guidance in said cap, which is bored to fit the cylindrical stem closely enough for that purpose, but freely enough to avoid any danger of the valve sticking therein. From the upper end of the cap D there are formed, projecting upwardly, lugs or brackets D^2 D^2, which afford support for the pivot of the float arm or lever.

G is the float; G′, its lever-arm. This lever-arm has secured to it at the end opposite the float an arm G^2 projecting downward from the pivot, and thereby with the arm G′ constituting a bell-crank lever operated by the movement of the float. The lower end of the downwardly-projecting arm G′ is bifurcated, and a roller H is journaled between the fork-arms.

To the cap D, I pivot at one side a lever K, which extends from its pivot across the cap between the brackets D^2 D^2 and over the upper end of the stem of the valve, on which said lever normally rests. The roller H travels upon this lever K as the float raises and lowers the free end of the arm of the bell-crank lever G′ G^2, crowding the lever downward at its oscillating end as the float rises, and allowing it to swing upward as the float descends, and causing said lever to push the valve downward and allow it to return upward.

To limit the oscillating movement of the bell-crank lever at the lower limit of the movement of the float, a rigid projection D^3 is formed on the cap D, against which the roller H stops when the float is at its lowest limit, and the free end of the lever K is upturned, forming a lip K′, against which the roller stops when the float is at its highest position. The relation of the parts as to length and the position of the pivots mentioned are such that the valve is closed and permitted to open to the utmost by the movement of the roller between these two stops as the bell-crank lever rocks over its fulcrum in the brackets D^2.

The chief purpose of interposing the lever K between the bell-crank lever, roller H and the end of the valve-stem which is to be crowded downward by that roller as the bell-crank lever rocks is that thereby the pressure upon the valve-stem is rendered substantially vertical at all positions of the float, whereas, if the roller operated directly upon the valve-stem, its pressure in forcing the valve downward when the float commences to rise would be very largely a sideward pressure and would become vertical only at the finish of the movement. It will be noticed also that the bell-crank lever operates to force the valve shut with the advantage of a leverage which increases from the time the valve commences to close until it is fully closed, and that when the valve is closed the point of contact of the roller with the lever K is nearly in the line of pressure between the valve-stem and the fulcrum of the float-lever.

If it should reach that line, the pressure which might force the valve open would be resisted positively, and no amount of pressure could force the valve off its seat without stretching the metal or bending the pivot-bearings. The power exercised by the buoyance of the float operating to close the valve increases, therefore, as the pressure tending to force the valve off its seat increases by reason of the closing movement, and I am thereby able to use the smallest possible float to operate the device; or, to state the matter differently, I am able to use with a given float and a given water-pressure the largest possible supply-valve. In order that the valve may be certain to be seated by the rising of the float the parts should be so proportioned that the valve will reach its seat a little before the roller reaches the limit of the valve-closing action, and since the compression of the rubber valve-head or the wearing of the seat or of the connections tend to make a longer throw of the valve necessary to seat it, and might eventually prevent it seating, I provide for compensating these changes by adjusting the valve-head, which for that purpose is screwed to the stem at f^3, and may be screwed in or out, more or less, as required for the purpose stated.

Ordinary tank-valves being closed gradually as the water rises in the tank come to their seats with a diminishing motion, because as the supply is diminished by the partial closing of the valve the tank fills more slowly and the valve in turn closes still more slowly. The result is that the last small fraction of the full supply to the tank may occupy as many minutes in its entrance as all the preceding quantity required seconds, and the sound of filling is thus prolonged unpleasantly and the valve-seat is rapidly cut away. To prevent this defect and cause the tank to fill rapidly and the valve to close quickly and promptly instead of with the slow diminishing motion of the ordinary valve, I have made the horizontal arm G′ of the float-lever hollow, and in this hollow arm I place a solid ball or balls M adapted to roll therein from end to end of the arm, and prevented from escaping by suitable barriers at the ends, and I fix this arm at such angle to the downwardly-extending arm G^2 of the lever that when the supply-valve is fully closed the horizontal arm is inclined upwardly from the pivot to the float-carrying end. The result of this is that as the float rises with the rise of the water the ball M remains at the extremity of the arm G′, being added to the weight of the arm and float and causing the latter to be more deeply immersed in the water than if the ball were not present, and when the lever-arm has risen past a horizontal position by the rise of the water in the tank the ball rolls in the arm G′ back from the extremity to the fulcrum, relieving the arm of so much weight at the oscillating end and causing the float to rise instantly a distance equal to that by which its immersion is increased by the presence of the ball, and thereby to promptly seat the valve and stop the supply. It will be seen that the relation of the parts and the weight of the ball relatively to the buoyancy of the float may be made such that instead of the valve being brought to its seat by only just the minimum force necessary to bring it thereagainst the supply-pressure will be brought to its seat by a force definitely and positively in excess of the supply-pressure, so that it will be held on its seat notwithstanding slight fluctuations of the pressure, which are liable to be constantly occurring and which in the case of the ordinary valve may cause it to open and close frequently until it becomes seated by the inflow of water to the extent that is possible at the highest pressure reached in the intervals between consecutive emptyings of the tank.

In order to avoid the noise of the inflowing stream of water discharging from a distance above the surface of the water down into the latter, it is desirable to extend the discharge-nozzle down into the bottom of the tank or to the lowest point to which the water is liable to be drawn in use, so that the inflowing stream shall always discharge under the surface of the water in the tank. In the use of ordinary tank-valves there is an objection in this structure, however, in that whenever the supply-pipe is emptied, or whenever there is a tendency to empty it by drawing of water from a lower point in the building or by opening the stop and waste cock for the purpose of emptying the pipes to prevent freezing, as is common, the downwardly-extending discharge-nozzle of the tank-valve becomes the shorter arm of a siphon of which the longer arm is the entire length of the supply-pipe down to the point where the water is being drawn, and thereby the water is siphoned out of the tank. An obvious means of preventing such action would be to make the supply-valve of the tank practically a check-valve, so that it would be seated by the reverse movement of the water past it which would occur in the case of siphoning, whereby such check-valve would immediately close and arrest the siphoning action; but since the tank-valve is necessarily provided with means for operating it other than the mere movement of the water and must, therefore, have a stem projecting through the body to be operated upon for that purpose by the mechanism connected with the float a difficulty is encountered in making it a check-valve, because if the stem is packed the valve is not left free enough to move under the reverse action of the water, and if it is not packed the water is forced out around the stem in the ordinary filling action and discharged upward in a spray which descends outside the tank or is projected above it to the damage of the ceiling of the room. I avoid this difficulty by providing a relief-discharge from the bearing of the valve-stem, so that any water which may in case of extreme pressure be forced into the bearing, and which

might in the absence of such relief be discharged upward about the stem in the undesirable manner above described, may find an easier exit by which it will be discharged downward into the tank. For this purpose in the cap D, which has the cylindrical bearing described for the stem of the valve, I form an annular chamber D^4 about midway in the length of the bearing, and leading into that annular chamber through the surface of the cap I drill a number of holes d^4, which are inclined downward from the chamber to their emergence at the surface. The result of this is that in case of extreme pressure, when the valve is open and the tank is filling, any water which might pass the bearing of the stem and which does pass it at the lower portion finds free relief in the annular chamber and through the discharge-ports d^4 and is delivered in small jets downward obliquely into the tank instead of discharging upward about the valve-stem.

I claim—

1. In a tank-valve, in combination substantially as set forth, the body, and a valve adapted to be opened by the supply-pressure, and having a stem which protrudes from the body and is adapted to be operated by exterior devices to seat the valve against the pressure, the valve-body having relief-ports leading obliquely downward from the guide-bearing of the valve; whereby any water which passes the discharge-port or nozzle-entrance is delivered downwardly into the tank through said relief-ports.

2. In a tank-valve, in combination with the valve-body and the valve adapted to be opened by the supply-pressure and having a stem which protrudes and is adapted to be operated by exterior devices to seat the valve against the pressure, the guide-bearing of the valve-stem having an annular relief chamber or recess intermediate the ends of said bearing, and relief-ports leading downwardly therefrom to the surface.

3. In a tank-valve, in combination with the body and the valve seated therein and having its stem protruding therefrom, a lever fulcrumed on the valve-body at one side of the stem and extending past the protruding end of the latter and adapted to rest thereagainst; the float and lever which carries it fulcrumed on the valve-body and having a short arm provided at the extremity with a roller adapted to operate against the lever which extends over the end of the valve-stem as the float-lever rises and falls: substantially as set forth.

4. In a tank-valve, in combination with the valve-body comprising a cap D and the valve seated in the body and having a stem which protrudes through the cap; the lever K fulcrumed on the cap and extending across the end of the stem; the float-lever fulcrumed on the cap above the lever K, and having its short arm provided with the roller M; the cap having a lug D^3 to stop the roller at the lowest position of the float, and the lever K having its end upturned to stop the roller at the highest position of the float: substantially as set forth.

5. In a tank-valve, in combination with the body and the valve seated therein and having its stem protruding therefrom, a lever fulcrumed on the valve-body at one side of the stem and extending past the protruding end of the latter and adapted to rest thereagainst; the float and lever which carries it fulcrumed on the valve-body and having a short arm provided at the extremity with a roller adapted to operate against the lever which extends over the end of the valve-stem as the float-lever rises and falls, the valve-head being adjustable on the stem, substantially as and for the purpose set forth.

In testimony whereof I have hereunto set my hand, in the presence of two witnesses, at Chicago, Illinois, this 31st day of January, 1895.

PATRICK HARVEY.

Witnesses:
CHAS. S. BURTON,
JEAN ELLIOTT.