

A. W. HENKEL.  
 AUTOMATIC FLUSHING VALVE.  
 APPLICATION FILED AUG. 29, 1907.

945,038.

Patented Jan. 4, 1910.

Fig. 1.

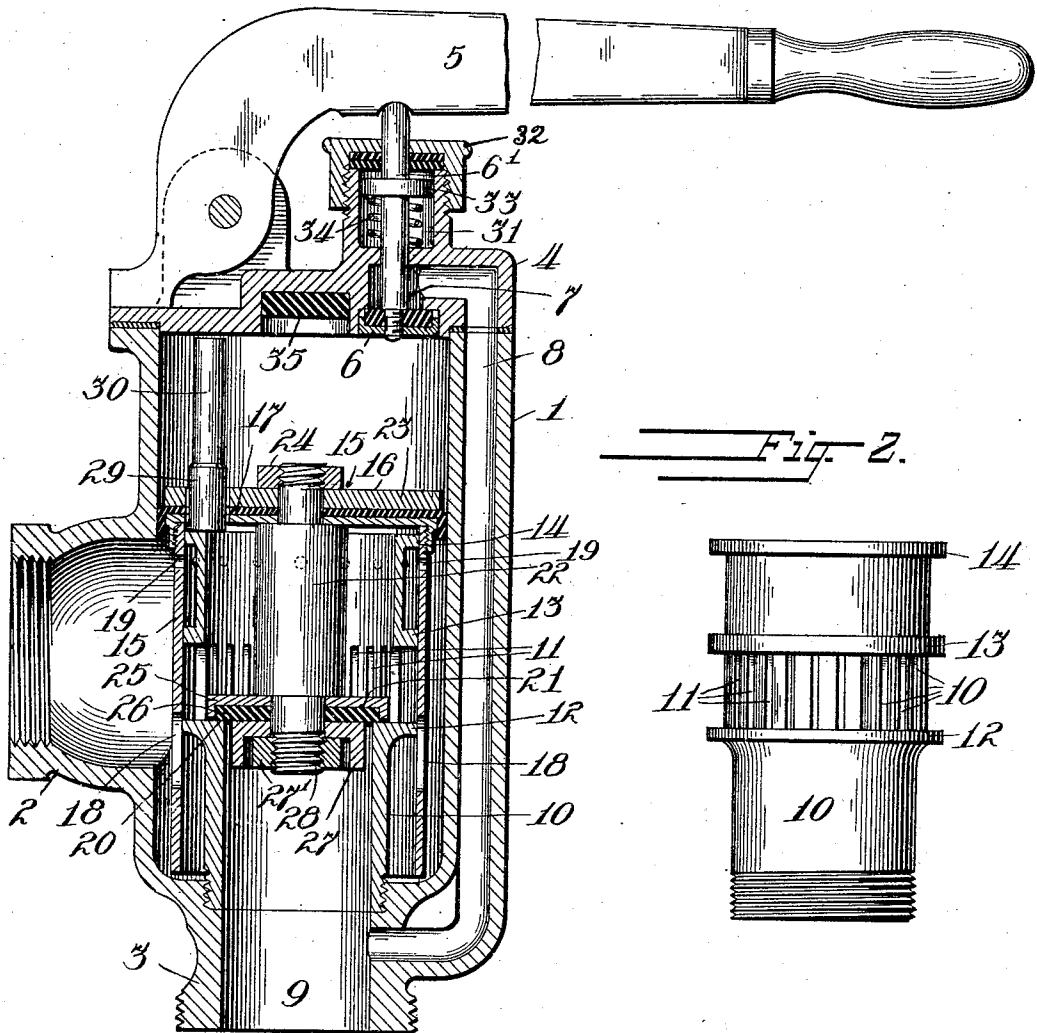


Fig. 2.

Witnesses  
 Milton Lenoir  
 Frank L. Belknap

Inventor,  
 Adolph W. Henkel,  
 By Albert H. Graves,  
 Attorney

# UNITED STATES PATENT OFFICE.

ADOLPH W. HENKEL, OF KENOSHA, WISCONSIN, ASSIGNOR TO THE FROST MANUFACTURING COMPANY, OF KENOSHA, WISCONSIN, A CORPORATION OF WISCONSIN.

## AUTOMATIC FLUSHING-VALVE.

945,038.

Specification of Letters Patent.

Patented Jan. 4, 1910.

Application filed August 29, 1907. Serial No. 390,588.

*To all whom it may concern:*

Be it known that I, ADOLPH W. HENKEL, a citizen of the United States, residing at Kenosha, in the county of Kenosha and State of Wisconsin, have invented certain new and useful Improvements in Automatic Flushing-Valves, of which the following is a specification.

This invention relates to improvements in automatic flushing valves, and refers more particularly to improvements in valves of that type in which the flushing action is inaugurated by moving a manually controlled member which starts the flushing, and this action is automatically terminated at the end of a predetermined interval.

Among the salient objects of the invention are to provide a simplified construction devoid of objectionably small ports or passages liable to become clogged; to provide a construction in which that port which is necessarily of restricted capacity is provided with a cooperating member which effectually prevents clogging of this passage; to provide a construction in which the initial movement of the main valve member which follows the movement of the handle or tripping device does not result in bringing about the flushing action but follows upon the release of the handle or tripping member, thus avoiding careless or unnecessary waste of water; to provide a construction in which the interruption of the flushing action is accomplished in a gradual and automatic manner which avoids "water hammer" and also secures an after fill of the bowl, and in general to provide a simplified and improved construction of the character referred to.

The invention consists in the matters hereinafter described, and more particularly pointed out in the appended claims.

In the drawing, Figure 1 shows an axial sectional view of the device, certain parts, however, being shown in elevation. Fig. 2 is a side elevation of the valve sleeve.

Referring to the drawings, 1 designates as a whole the main valve body or casing having a generally cylindric interior, provided at one side with a connection 2 for the inlet pipe, at its lower end with a connection 3 which leads to the basin, and at its upper side with a removable end-closure 4 upon which is mounted the trip handle 5 which actuates the trip valve 6 controlling the port 7. The port 7 leads into a by-pass conduit

8 which is formed in the valve casing exteriorly of the main chamber thereof and leads downwardly to, and delivers into, the main discharge passage 9.

Seated in the lower end of the valve casing and arranged concentrically with the axis of the main chamber of the valve and in register with the outlet passage 9, is a sleeve or tube extension 10 which rises to a point about mid-height of the main valve chamber. Through the sides of this sleeve are formed a series of inlet ports 11, and exteriorly both above and below these ports are annular ribs, as 12, 13 and 14, the outer faces of which cooperate with a hollow reciprocating plunger which telescopes upon the sleeve, as will now be described. The plunger 15 has a closed upper end 16, over and upon which is fitted a cup leather 17; the diameter of the upper end of the plunger being such that in conjunction with the cup leather telescoped thereon it closely fits the interior of the cylindric main chamber. The upper end of the plunger therefore serves to in effect divide the main chamber into upper and lower pressure chambers. Through the side walls of the trunk-like plunger are formed an annular series of inlet ports 18, which ports are so located with reference to the ports 11 of the sleeve that in the lowermost or normal position of the plunger, the ports 18 are nearly but not quite cut off or closed by the rib 12, and when the plunger is at its uppermost limit of movement said ports 18 will be opposite that part of the sleeve between the ribs 13 and 14 and will therefore be completely closed. Near the upper end of the plunger is formed through the side wall thereof smaller starting ports 19.

The stationary sleeve 10 is provided interiorly with an annular valve seat or shoulder 20, and the plunger carries a piston valve or stopper 21 which cooperates with this valve seat; said piston being mounted upon the lower end of a stem 22 connected with the central part of the upper end of the plunger. As a convenient construction the stem 22 extends through the end of the plunger and forms the bolt upon which are mounted the confining plate 23 and lock-nut 24 which hold the cup leather in position. The piston 21 comprises a valve plate 25, valve leather 26, confining plate 27 and lock-nut, 27' these parts being united to the stem by a screw 28, as shown clearly in the draw-

ing. It is to be noted that the confining plate 27 of the piston 21 is at its periphery of considerable thickness and fits within, and is of slightly smaller diameter than, the outlet passage 9, when the plunger is in its normal lower position. This construction performs a special function, as will hereinafter appear.

Through the upper end wall of the plunger is formed an equalizing port 29, and in order to avoid the objections incident to a small aperture, and the tendency of such apertures to clog, this port is made of relatively large size and a pin 30 is arranged to extend through this port and thus restrict the passage therethrough to the desired extent. The lower end of this pin 30 rests on the upper end of the stationary sleeve 10, while its upper end extends into proximity to the upper end-closure 4 of the valve-casing so that the pin is confined against substantial endwise movement during the rising and falling movements of the plunger. The upper half of the pin 30 is of reduced diameter for the double purpose of affording a somewhat more free passage through the port 29 when the plunger is at its uppermost limit and also of facilitating the dislodgment of any dirt or foreign matter tending to lodge in its passage.

The vent valve 6 opens inwardly and has a stem 6' which extends into a spring chamber 31 and through the screw-cap 32, which closes the spring chamber and engages the under side of the trip handle 5. On the stem 6' is formed a flange 33 fitting the spring chamber closely enough to prevent water from escaping. Between this flange and the bottom of the spring chamber is interposed a coiled expansion spring 34 which normally holds the handle up.

The operation of the valve is as follows: Water under pressure entering through the inlet 2 passes through the slightly opened ports 18 and through the open ports 19, filling the interior of the plunger, and also passes on through the equalizing port 29 and fills the pressure space above the plunger. This would in itself equalize the pressure above and below the plunger, but the discharge passage 9 being unfilled, the pressure acting upon the upper side of the piston 21 of the plunger obviously holds the valve closed under a considerable pressure. If, now, the trip handle be depressed, and the vent valve 6 opened, the pressure above the plunger is at once relieved by the outflow of water through the by-pass conduit 8, whereupon the plunger will commence to rise, and will continue to rise until it is arrested by its upper end encountering the upper end wall or closure of the casing. It continues to rise notwithstanding the valve piston 21 leaves its seat and thus opens the discharge passage 9 directly to the interior of the

plunger, because substantially the whole area of the under side of the upper end of the plunger remains under effective pressure and inasmuch as the outlet passage 9 is considerably smaller than the inlet 2 a differential pressure results which raises the plunger. During the main part of the rising movement the ports 18 are open so that there is a free inflow from the inlet pipe 2 through the ports 18 and 11, but as the plunger approaches its upper limit of movement the ports 18 are cut off or closed by the rib 13. The object of this construction is to prevent the flushing action from continuing during the time the operator may hold the trip handle depressed and the vent valve open, which would result in an unnecessary waste of water. Subsequent to the closing of ports 18, the rise of the plunger is effected by the pressure on its external enlarged upper end. As the plunger approaches the upper limit of its movement, its upper end encounters a buffer 35 seated in the upper end closure 4 and thus prevents violent collision between the plunger and the upper end of the valve casing. As soon as the operator allows the vent valve to close, the water entering through the vent or equalizing passage 29 creates a pressure in the valve chamber above the plunger greater than that below it, whereupon the valve plunger descends gradually, as determined by the rate of inflow through the equalizing passage, but powerfully, nevertheless. As the plunger approaches its lower limit of movement the confining plate 27 enters the upper end of the outlet passage 9 and thus very materially restricts the outflow or flushing action, and at the same time as the ports 18 pass into register with the cut off rib 12 the outflow is still further restricted, so that the combined effect of these several factors is to cut off the outflow gradually. The restricted flow during the latter part of the plunger movement checks the flushing action and refills the bowl.

From the foregoing description it will be obvious that a valve embodying the construction described attains the several objects of the invention hereinabove stated and constitutes a simple, practical and durable construction, all of the parts of which are readily accessible for repair or renewal and are not easily susceptible to clogging or dis-  
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It will be obvious that the construction may be somewhat modified without departing from the invention.

I claim as my invention:

1. In a flushing valve, the combination with a suitable valve casing having an inlet opening, and a discharge passage, a ported sleeve within the casing, a ported trunk plunger telescoping said sleeve, a valve seat, a piston valve connected to move with the

plunger and cooperating with the valve seat, the lower end of said piston being provided with a reduced portion which enters the main passage in advance of the seat of the piston valve to effect a gradual constriction of the outflow.

2. In a flushing valve, the combination with a suitable casing having an inlet and a discharge passage, of a relatively stationary ported sleeve within the casing, a reciprocatory ported trunk plunger telescoping over said sleeve, a valve seat, and a piston valve within the plunger, connected thereto and adapted to engage said seat.

3. In a flushing valve, the combination of a main outer casing having an inlet and a discharge opening, a ported sleeve rising from the discharge end of said casing within the latter and arranged concentrically with said main discharge port, a ported trunk plunger telescoping upon said valve sleeve, the ports of the telescoping part of said plunger being arranged to pass into register with the imperforate part of the sleeve as the plunger arrives at its limit of movement, an annular valve seat surrounding said main discharge passage, a piston valve connected to move with the trunk plunger and cooperating with said annular valve seat, a by-pass conduit leading from the upper part of the interior of the main casing to the main discharge passage at a point below said annular valve seat, a vent valve controlling the inlet to said by-pass conduit, and means for manually actuating said vent valve.

4. In a flushing valve, the combination of a main outer casing interiorly substantially cylindric, closed at its upper end and provided at its opposite end with an axial main discharge port, a ported sleeve rising from the discharge end of said main outer casing within the latter and arranged concentrically with said main discharge port, a ported trunk plunger telescoping upon said valve sleeve, the upper end of said plunger fitting the cylindric interior of the main casing, and the trunk portion thereof being of smaller diameter exteriorly than the main valve chamber, an annular valve seat formed upon the interior of said sleeve, a piston valve connected to move with the trunk

plunger and cooperating with said annular valve seat, a by-pass conduit leading from the upper part of the interior of the main casing to the main discharge passage at a point below said annular valve seat, a vent valve controlling the inlet to said by-pass conduit, means for manually actuating said vent valve, said trunk plunger being provided through its upper end wall with an equalizing passage of restricted capacity, and the main valve casing being provided with a lateral inlet communicating with the main chamber at a point below the trunk plunger.

5. In a flushing valve, the combination with the main casing provided with an axially disposed discharge port, of a stationary ported sleeve arranged concentrically with said discharge port and extending within the valve casing, a trunk plunger fitting the interior of the main casing and telescoping upon said ported sleeve, the side walls of said plunger being also ported, an annular valve seat surrounding the main discharge passage at a point below the inlet ports of the stationary sleeve, and a piston valve connected to move with the plunger and cooperating with said annular valve seat, the lower end of said piston valve being provided with an extension which enters the main passage in advance of the seat of the piston valve to effect a gradual restriction of the outflow.

6. In a flushing valve, the combination with the main casing and its cylindric interior, of a plunger arranged to reciprocate therein and provided with an equalizing port extending therethrough parallel with the direction of reciprocation of the plunger, a pin extending loosely through the port of said plunger, and stops holding the pin against substantial endwise movement, that end of the pin which normally protrudes outside of the port of the plunger being of lesser cross sectional area than the portion normally within the port.

ADOLPH W. HENKEL.

Witnesses:

F. J. FINKLER,  
C. M. VAN SIERE.