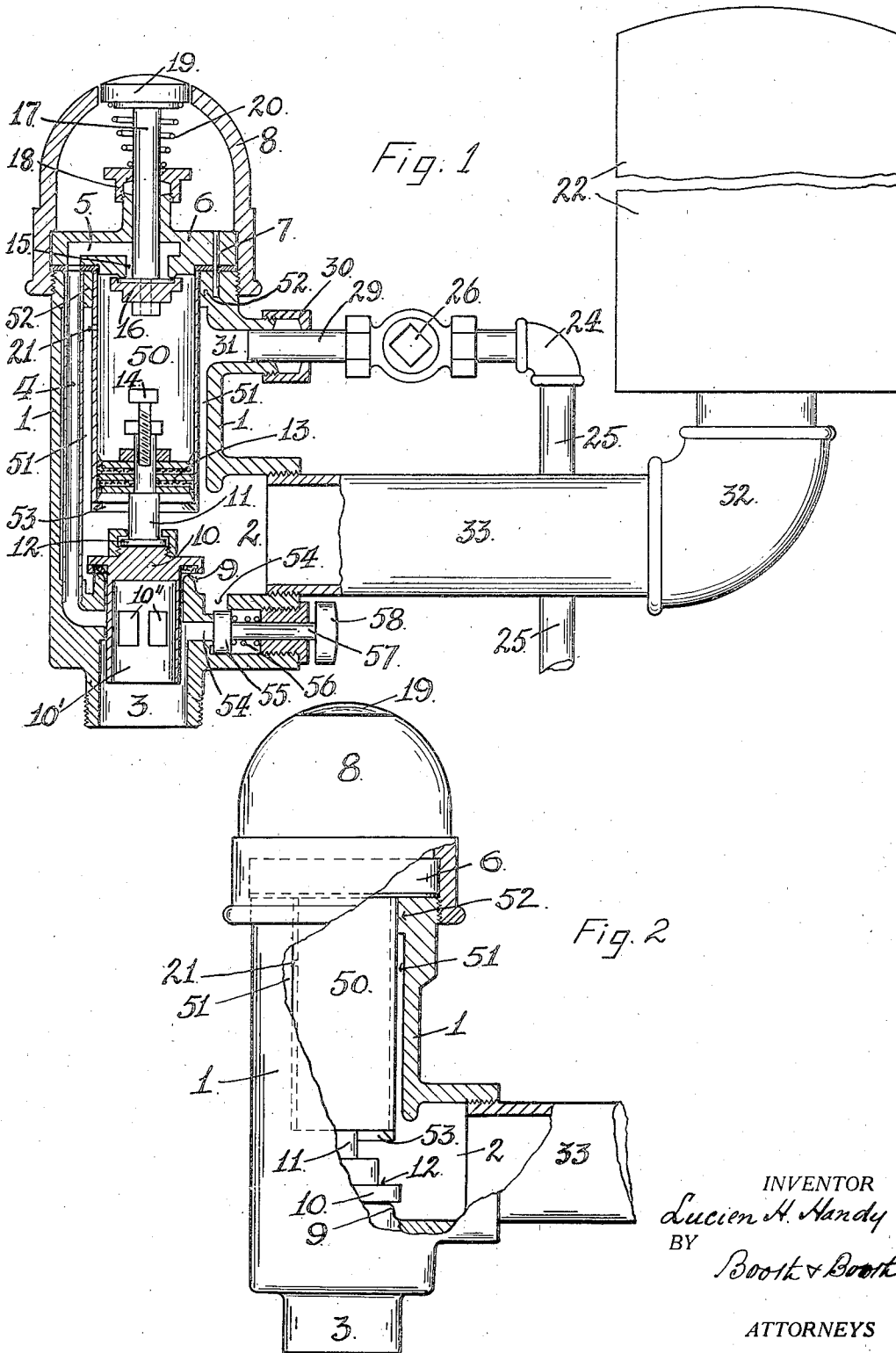


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FLUSHING APPARATUS.
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FLUSHING APPARATUS.

Application filed January 17, 1921. Serial No. 437,702.

To all whom it may concern:

Be it known that I, LUCIEN H. HANDY, a citizen of the United States, residing at Oakland, in the county of Alameda and State of California, have invented certain new and useful Improvements in Flushing Apparatus, of which the following is a specification.

My invention relates to the class of toilet flushing-apparatus of that type which comprises a valve mechanism with a balancing fluid chamber, upon the relief of the pressure in which the outlet valve opens for the flushing operation, and gradually closes again, thereby determining the period of flush, which is ended by the restoration of the fluid pressure in the balancing chamber.

In flushing devices of this type, it is common to provide for the gradual closing of the outlet valve by readmitting the water to the pressure chamber, through a constricted port. This necessarily involves a tendency, which experience shows to be ever present, to clog, due to impurities in the water, and if and when clogging occurs, the balance of pressure is not restored, so that the outlet valve remains open and there is a continual flow and loss of water until the supply is manually shut off and the apparatus taken apart and cleaned.

The principal object of my invention is, by a novel environment and location of the relatively small or constricted port which readmits water to the pressure chamber, to overcome any tendency to clog said port, and thus to provide a flushing valve never liable to get out of order from this cause.

Another object of my invention, when the flushing valve is used in connection with a closed tank or enlargement of the water supply conduits, in which tank there is air under pressure, is to avoid what may be termed an air-bound or water logged condition in said tank. This is due to the gradual absorption of the air in the tank when the device remains out of use for a considerable time, so that there is not enough air pressure in the tank to cause the valve to function properly. Such a condition I am able to remove by a simple and practical means of restoring the air to the tank without shutting off the water supply and taking down the apparatus to allow the water in the tank to drain out.

My present invention will better be understood by a reference to my previous Patent No. 1292313, of January 21, 1919. In the

present case I shall illustrate my improvements in connection with the general type of flushing apparatus disclosed in said patent, though it is to be understood that said improvements are not confined to this apparatus as they are equally applicable to any flushing valve employing a constricted port leading into a pressure balancing chamber, without regard to the special inclusion of the valve member in the general flushing system. Consequently I shall also illustrate my invention in a system in which the air-pressure tank is omitted.

Referring to the accompanying drawings—

Fig. 1 is a sectional view partly in elevation of my flushing apparatus as disclosed in a system employing an air-pressure tank.

Fig. 2 is an elevation, partly in section, of the same, with the air-pressure tank omitted.

1 is a shell, which at one side, near its lower portion, has an inlet 2, and at its bottom, an outlet 3. In the wall opposite that in which the inlet lies is fitted a by-pass 4, the lower end of which communicates with the outlet 3, while its upper end registers with a passage 5 in a head 6, fitted to the top of the shell 1, and held in registering relation by a dowel pin 7.

A cap 8 screwed to the upper end of the shell covers the head 6.

In the lower portion of the shell 1 is formed a seat 9 for the main valve 10, which controls the outlet 3 and normally cuts off said outlet from communication with the inlet 2. The main valve 10 has a stem 11 which is connected with the valve by a swivel joint at 12 and said stem carries a piston 13.

Within the bore of the shell 1 is fitted a cylinder 50, which is sufficiently smaller in diameter than the shell bore to leave an annular space, indicated by 51, between the exterior of the cylinder and the wall of the bore. The cylinder 50 is centered by a rib 52 in the top of the shell bore and is supported upon an arcuate shoulder 53 in the shell bore below, in the vicinity of the inlet 2. The cylinder is held down by the head 6. The annular space 51, thus opens below, past the arcuate shoulder 53, into the lower portion of the shell bore. The piston 13 of the main valve 10 operates within the lower portion of the cylinder 50, above the inlet 2.

To the top of the piston 13 is fitted an adjustable screw stop 14, the function of which

is to define the length of stroke of the piston, which by the displacement of the water above the piston, determines the period of flush.

5 In the head 6 is a port 15 with which the passage 5 of the head communicates. This port opens into the cylinder 50 and is controlled from below by a pressure relief valve 16, the stem 17 of which passes upwardly
10 through a packing gland 18 and terminates in a push button head 19 exposed for operation in the top of the cap 8. The lower extremity of the relief valve stem forms a stop opposing the adjustable stop 14 of the
15 piston 13.

To effect a quick return of the relief valve 16 there is provided a spring 20. Through the wall of the cylinder 50 is made a constricted port 21 affording communication
20 between the annular space 51 and the interior of the cylinder 50, above the piston 13, and located with relation to entering water connections in a manner and for a purpose to be presently described. The capacity of
25 this constricted port is predetermined by the requirement of filling the cylinder with water between the piston 13 and the pressure-relief valve 16.

In the form shown in Fig. 1—22 is a closed
30 flushing tank, forming an enlarged part of the pipe system. The bottom of this tank is fitted with an elbow 32 from which leads a pipe 33 to the inlet opening 2 of the shell. The closed tank 22 is used only in cases
35 where the main water supply is through a relatively small pipe, such as the pipe 25, in which case the tank pipe 33 can be large enough to effect the flushing. In Fig. 1, the main water supply pipe 25 is connected by
40 an elbow 24 with valve supply pipe 29, the latter being controlled by a cock 26. The valve supply pipe 25 communicates in full capacity through a packing connection 30 with a port 31 leading preferably flaringly,
45 through the wall of the shell 1 into the annular space 51.

It will be noted that the constricted port 21 in the cylinder 50 is located remotely from the port 31, and is above the direct effect of any current in the water entering said
50 port 31. This is for a purpose which will presently appear.

The main valve 10 has a downwardly projecting sleeve 10' fitting in the outlet 3 of the shell 1 and provided with large openings 10'' in its wall. In the lower portion of the shell 1 is made a passage 54 which affords a second communication between the inlet 2 and the outlet 3 of the shell. This passage is
60 controlled by a valve 55 which is normally closed by a spring 56. The stem 57 of this valve 55 has a head 58 by which the valve may be readily unseated by manually pulling it outwardly.

65 The operation of the apparatus shown in

Fig. 1, is in general the same as flushing devices of this type, and may be described as follows. Assume the system to be supplied with water under the pressure in the supply pipe 25. In such normal condition, the out- 70 let valve 10 is closed by the balanced pressure above and below the piston 13 of said valve, and this balance is preserved by the fact that the relief valve 16 is also closed. There is also the same pressure of air com- 75 pressed in the top of the closed tank 22.

Now, upon pushing down the button 19 the relief valve 16 opens the port 15, and the balancing pressure above the piston 13 is relieved through said port, the passage 5 in the 80 head 6, and the by-pass 4, so that the air pressure from the tank 22, through the flushing pipe 33, lifts the piston 13 and the valve 10 to open the outlet 3; whereupon the flushing volume of water from the tank 22 and 85 pipe 33 passes through the large ports 10'' in the depending sleeve 10' of valve 10 and into the outlet 3, to the toilet bowl, to which said outlet is connected.

Pressure on button 19 being then released, 90 the valve 16 is quickly closed by its spring 20, and the space in the cylinder 50 between said valve and the lifted piston 13 having been deprived of a portion of its contents, the pressure from the inflowing water from 95 the supply pipe 25, through the pipe 29, port 31, annular space 51 and constricted port 21 into the cylinder 50 gradually forces the piston 13 down again and closes the main valve 10, thereby stopping the flushing flow and 100 restoring the normal condition, the water from the supply pipe meanwhile again entering the tank 22 and compressing the air therein.

While, now, this is the general operation, 105 especial attention is directed to the novel features and their purpose, which constitute my present improvements. The first of these comprise the provision of the annular space 51 in the shell and the location of the con- 110 stricted port 21 with respect to the point of entrance of the incoming water from the pipe 29 of the main supply 25.

The drawback to flushing devices of the balanced-valve constricted port type is the 115 stoppage or clogging of the small ports, the latter, in some cases being as fine as a #70 drill; and the consequent shutting off of the water supply. The outlet valve, in such case, does not close, and the water then runs 120 to waste, until shut off and the valve taken apart and cleaned.

In my present construction it will be seen that the constricted port 21 is remote from the entrance point of the water through pipe 125 29, and is relatively high up in the annular space 51 through which said port 21 is reached. The effect of this is not only to create a sort of whirling action or current in the entering water tending to clear away 130

any sediment, but also to provide for the fall or settling by gravity of the impurities in the water, away from the plane in which the constricted port 21 lies, thus preventing clogging. Moreover, the impurities thus settling through the annular space 51 collect around the seat 9 of the outlet valve 10 and are washed away by the next flushing into the bowl. The device is thus self-cleaning, and will not get out of order, as far as clogging is concerned. It may be noted also that the entering water on its way to the constricted port advances through an increasing area, thereby obviating noise.

Another improvement lies in connection with the controllable supplementary communication or passage 54 between the inlet 2 and outlet 3. This is applicable only in connection with a flushing apparatus of the form of Fig. 1, in which a closed tank, such as 22, is employed, in order to provide for installing the apparatus in cases where relatively small supply pipes are used. If the apparatus remains out of use for a considerable time, as for example during the absence of the householder, the air in the tank 22 is gradually absorbed by the water, and there is then insufficient pressure to lift the outlet valve 10. Such a condition is indicated by the decrease in the volume of flushing water. Heretofore, there has been no way to restore the air to the tank except by shutting off the water supply and taking down the valve to allow the water in the tank to drain out. This is a plumber's job and is inconvenient. By my improvement, however, when the flushing water seems to be growing less, all that has to be done is to shut off the cock 26 in the supply pipe and then pull out the valve 55 by its stem-head 58. This opens the passage 54 so that air from the outlet 3 passes into the inlet 2 and up into the tank 22. As the air enters, the water from the tank drains out by the same route. When the tank is empty, the valve 55 is released and returns to its seat.

Referring now to Fig. 2, I show my improved device as installed in buildings having a large supply pipe, either direct from the main or from an ordinary storage tank on the roof. In this Fig. 2, like numerals are used as in Fig. 1, and it will be seen that the closed tank 22 and the small supply pipe 25 with its connections, of Fig. 1, are omitted. Also the tank relief valve 55 of Fig. 1 is omitted. In Fig. 2 there is only the entering large flushing pipe 33, and a portion of the water from this pipe, rises in the annular space 51, to the constricted port 21, with the same self-cleansing effect heretofore described.

I claim:—

1. A flushing apparatus comprising a shell having an inlet and an outlet communicating with said inlet; a cylinder within the shell

so disposed as to leave a circumferential space between its outer surface and the inner surface of the shell wall, said space being closed at one end and open at the other end to the shell interior, and said cylinder having in its wall a relatively small port through which the circumferential space communicates with the interior of the cylinder; a supply pipe communicating with the shell interior; a main-valve within the shell controlling the communication between the shell inlet and outlet; a piston connected with and operating said main valve, said piston being fitted in the cylinder and exposed below to the fluid pressure from the inlet; a by-pass leading from the interior of the cylinder above the piston to the shell outlet below the main valve; and a relief valve controlling the communication of the by-pass with the interior of the cylinder.

2. A flushing apparatus comprising a shell having an inlet and an outlet communicating with said inlet; a cylinder within the shell so disposed as to leave a circumferential space between its outer surface and the inner surface of the shell wall, said space being closed at one end and at the other end open to the shell interior, and said cylinder having in its wall a relatively small port through which the circumferential space communicates with the interior of the cylinder; a main-supply pipe leading into said circumferential space at a point out of register with the small port; a main-valve within the shell controlling the communication between the shell inlet and outlet; a piston connected with and operating said main valve, said piston being fitted in the cylinder and exposed below to the fluid pressure from the inlet; a by-pass leading from the interior of the cylinder above the piston to the shell outlet below the main valve; a relief valve controlling the communication of the by-pass with the interior of the cylinder; a closed flushing tank; and a flushing pipe leading from the tank to the inlet of the shell.

3. A flushing apparatus comprising a shell having an inlet and an outlet communicating with said inlet; a cylinder within the shell so disposed as to leave a circumferential space between its outer surface and the inner surface of the shell wall, said space being closed at one end and at the other end open to the shell interior, and said cylinder having in its wall a relatively small port through which the circumferential space communicates with the interior of the cylinder; a main-supply pipe leading into said circumferential space at a point out of register with the small port; a main-valve within the shell controlling the communication between the shell inlet and outlet; a piston connected with and operating said main valve, said piston being fitted in the cylinder and ex-

posed below to the fluid pressure from the inlet; a by-pass leading from the interior of the cylinder above the piston to the shell outlet below the main valve; a relief valve 5 controlling the communication of the by-pass with the interior of the cylinder; a closed flushing tank; a flushing pipe leading from the tank to the inlet of the shell; and a valve controlling a supplementary passage between the shell inlet and outlet for draining the closed flushing tank at will. 10

In testimony whereof I have signed my name to this specification.

LUCIEN H. HANDY.