Sept. 4, 1928.

1,683,062

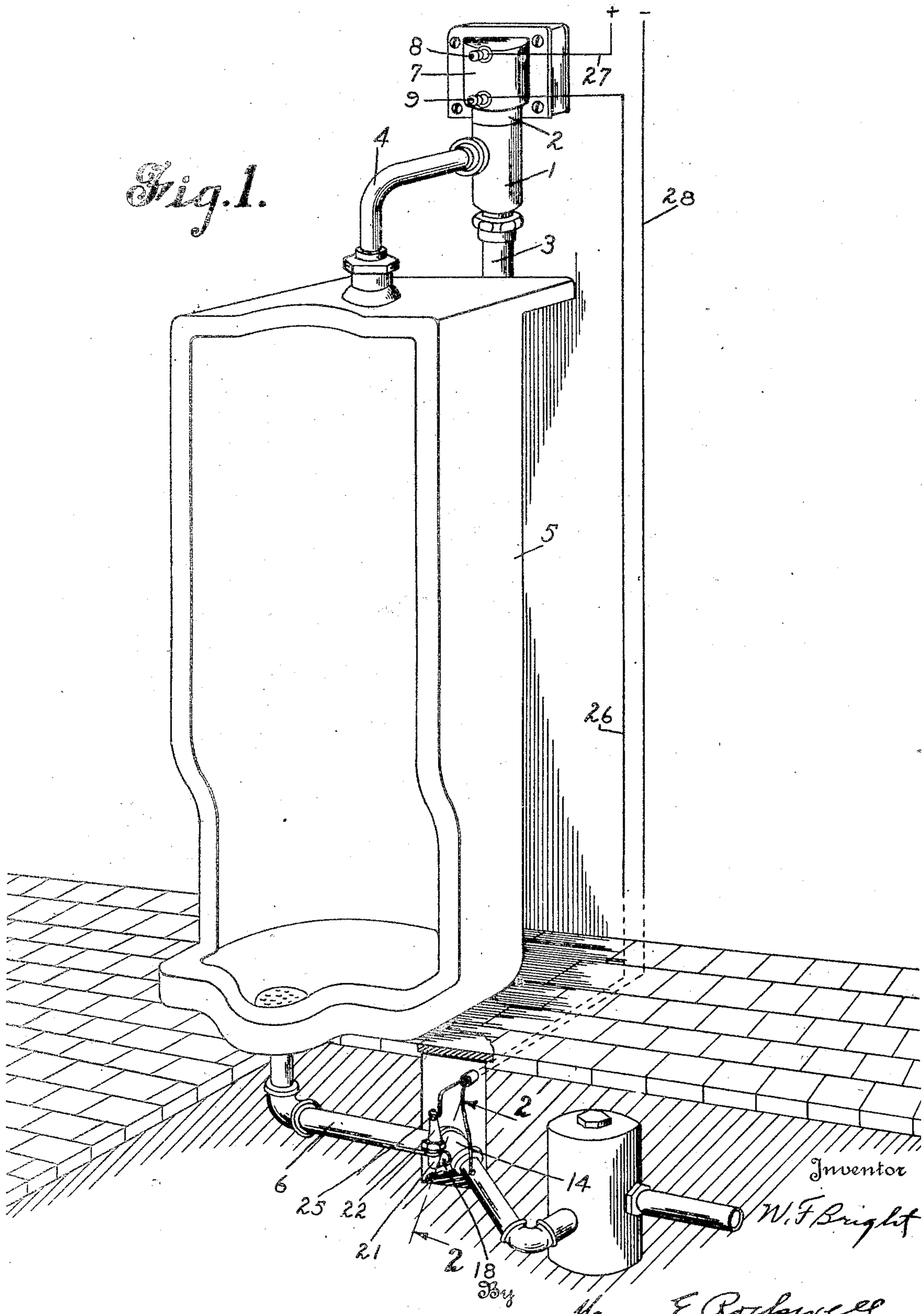
W. F. BRIGHT

AUTOMATIC FLUSHING VALVE

Filed May 8, 1925

3 Sheets-Sheet 1

Fig. 1.



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AUTOMATIC FLUSHING VALVE

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Fig. 2.

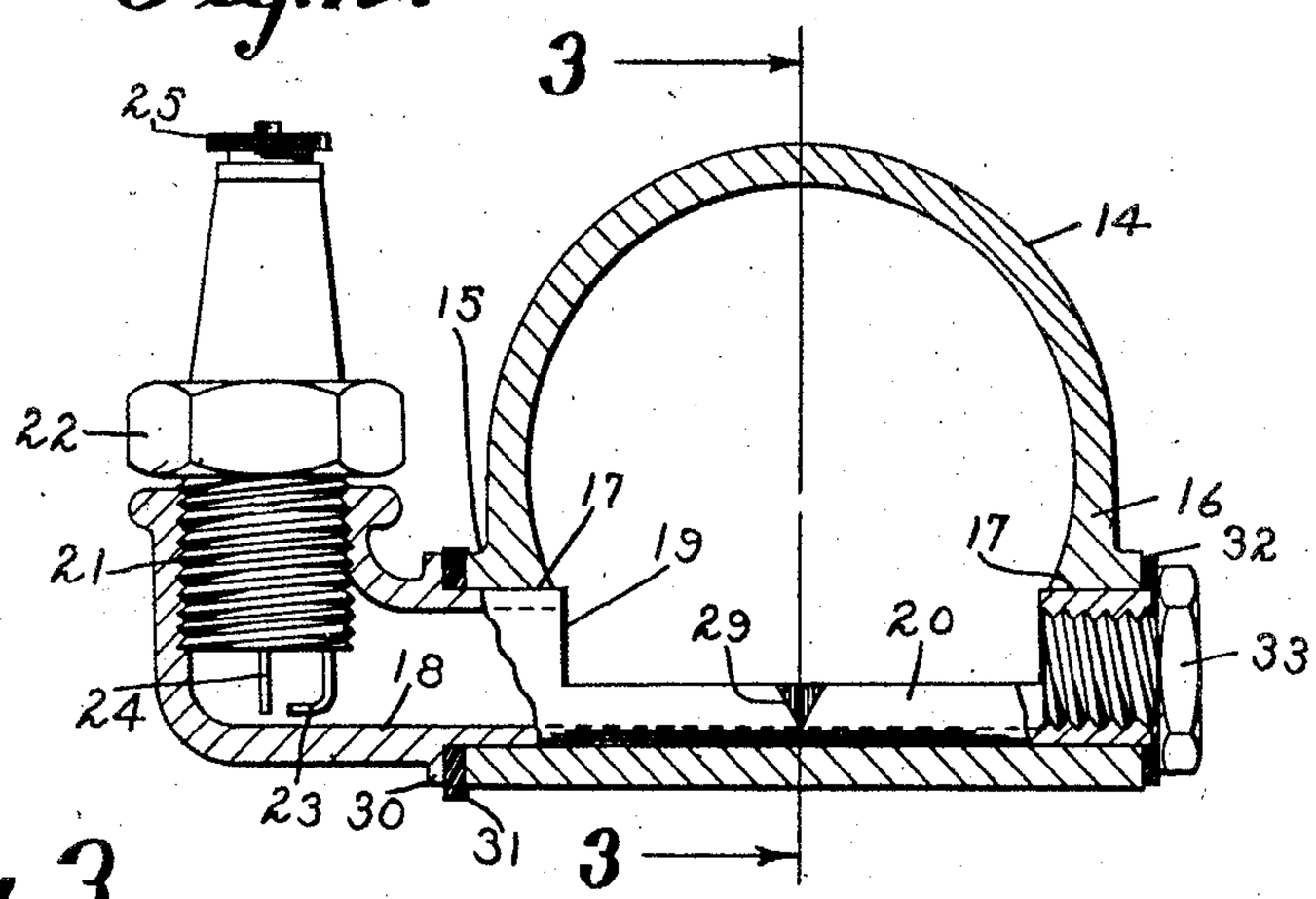
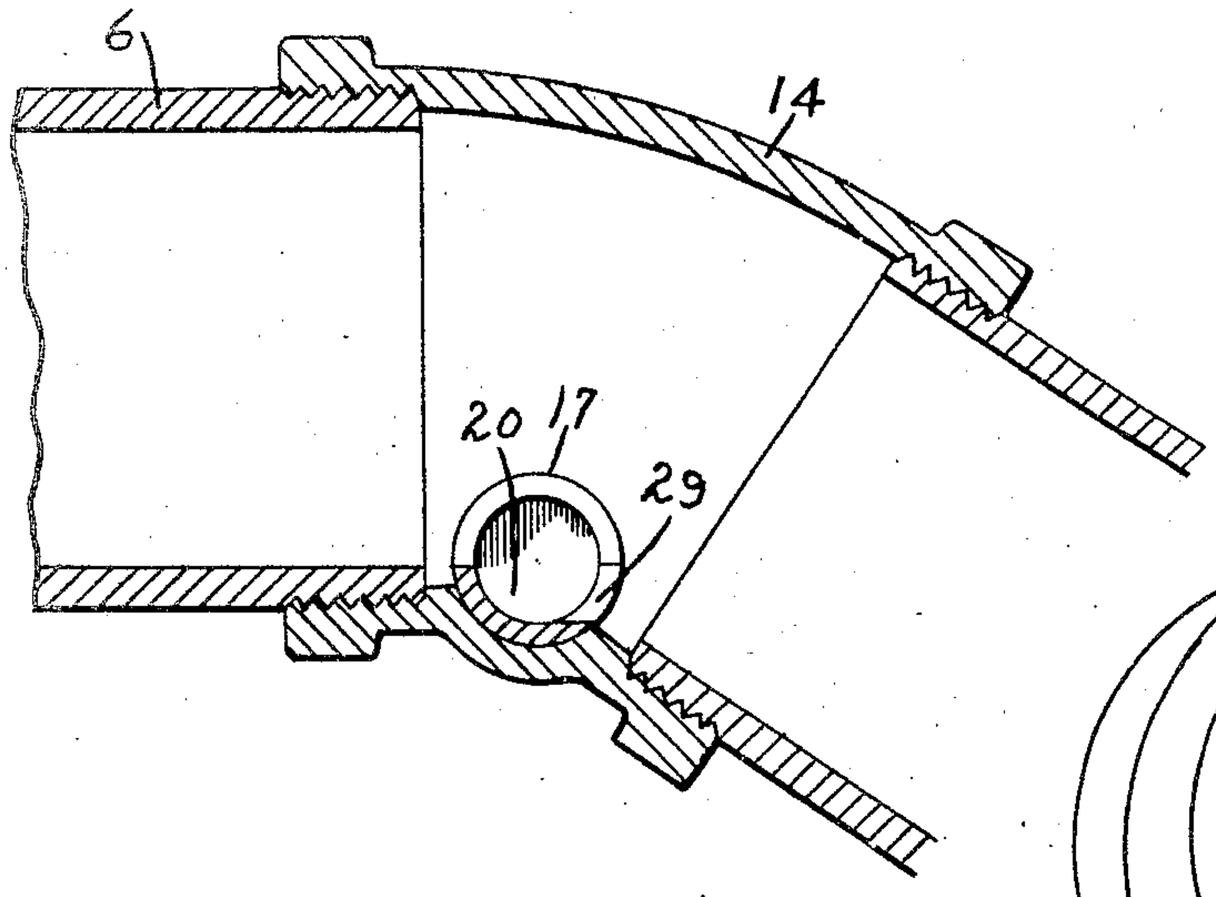


Fig. 3.



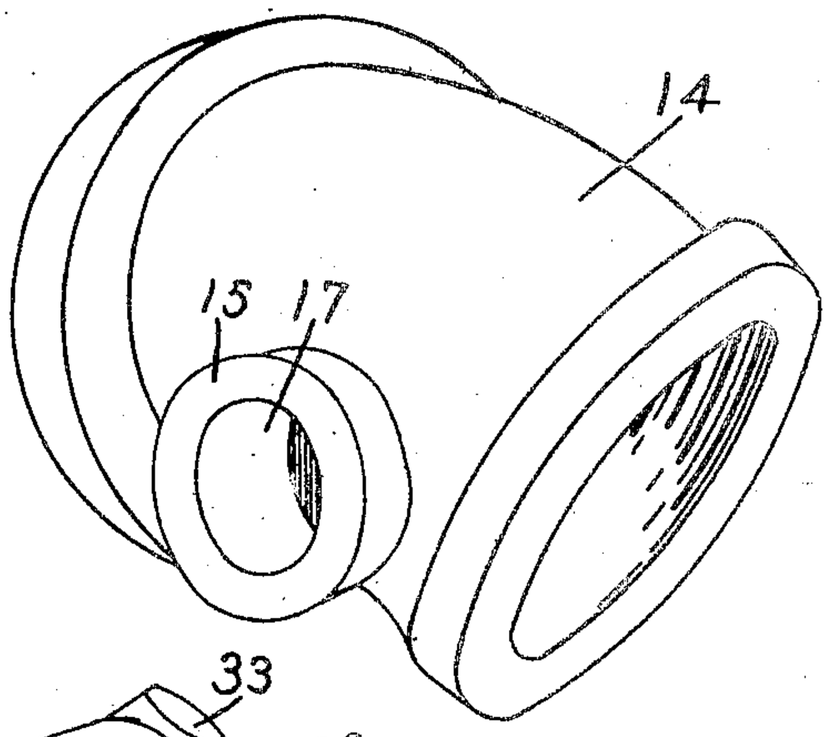


Fig. 5.

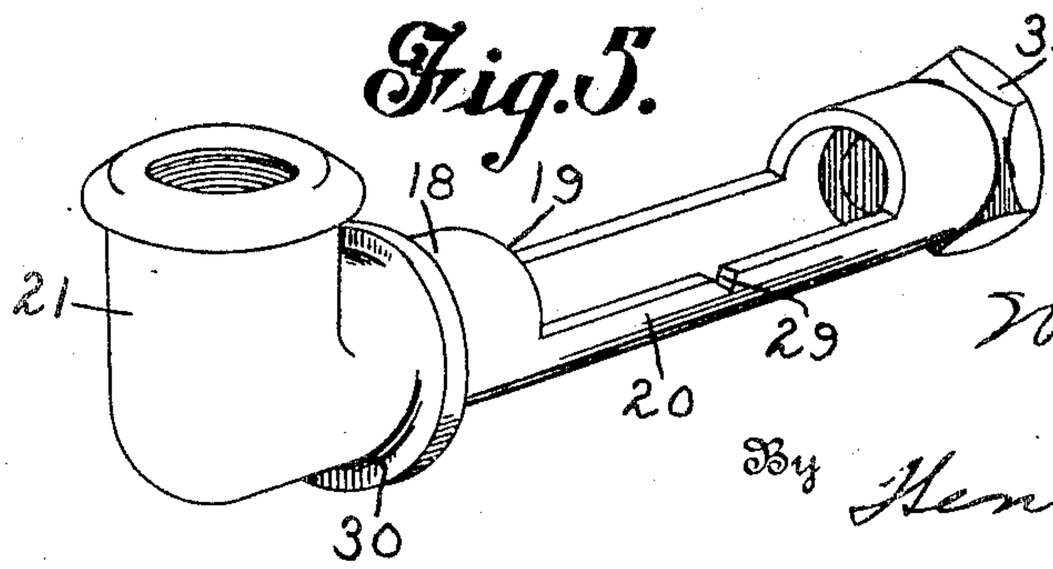


Fig. 4.

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Fig. 7.

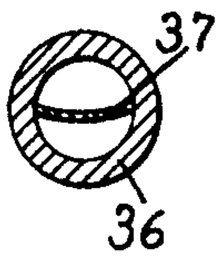


Fig. 6.

Fig. 8.

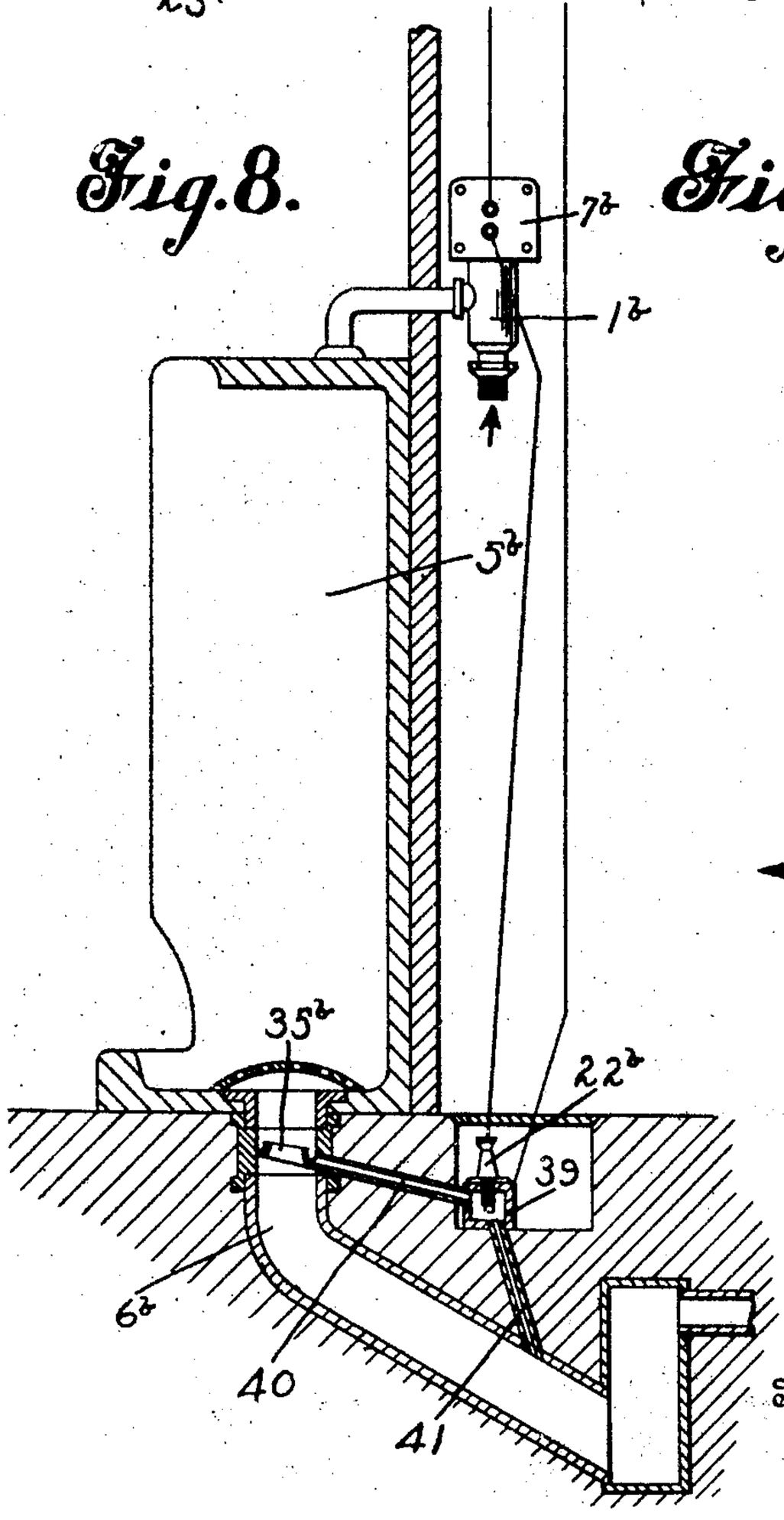
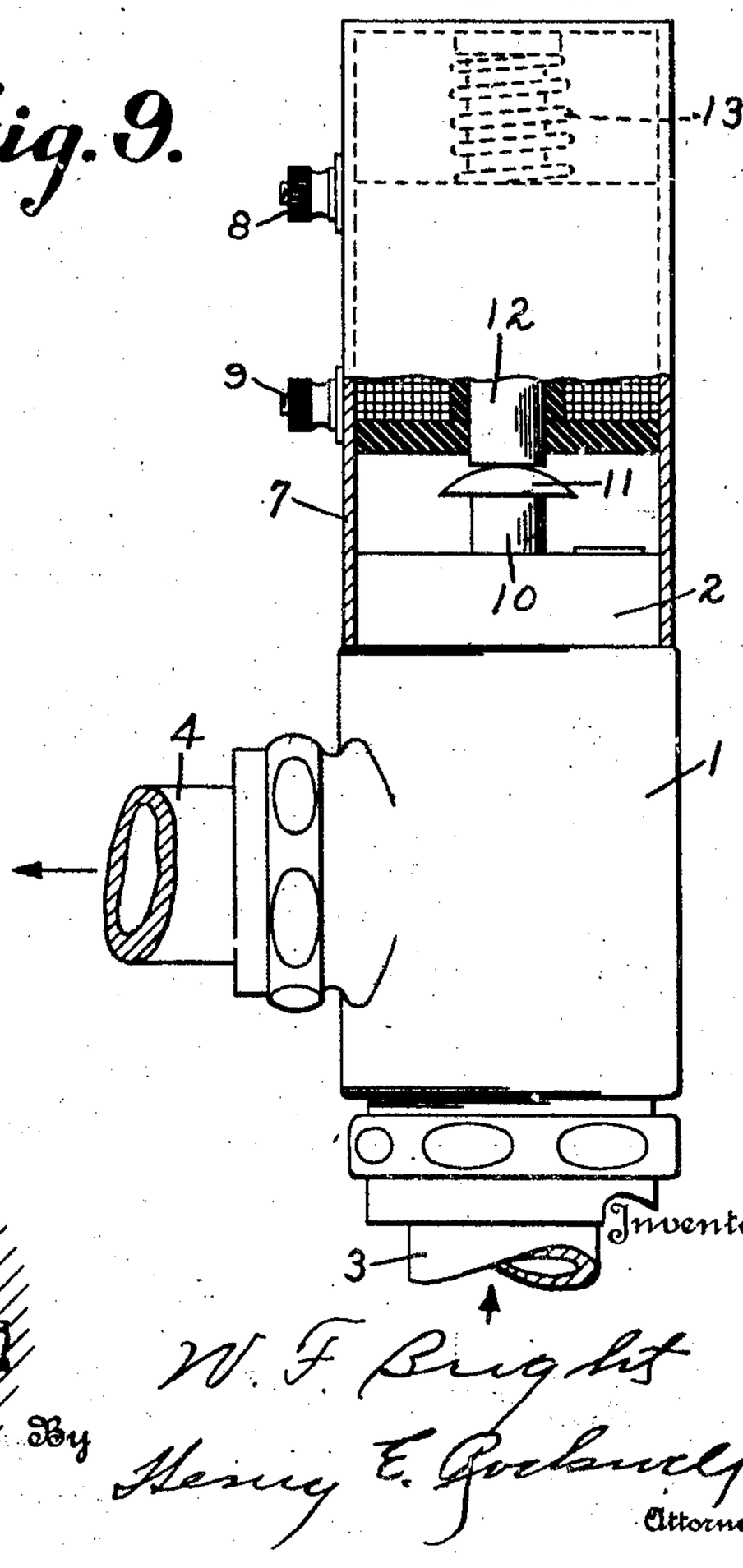


Fig. 9.



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UNITED STATES PATENT OFFICE.

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AUTOMATIC FLUSHING VALVE.

Application filed May 8, 1925. Serial No. 28,963

This invention relates to improvements in flushing valves and it consists of the constructions, combinations and arrangements herein described and claimed.

An object of the invention is to provide an apparatus for and a method of actuating an intermittently operating mechanism, said apparatus being controlled through the medium of changes in the electrical condition of a circuit caused by variations in the character or level of a fluid forming a link in said circuit, provision being made for insuring the drainage of said fluid for the breaking or opening of the circuit.

Another object of the invention is to provide a control for the electrical actuating apparatus of an intermittently operating mechanism, for example, a self-closing flushing valve, said control including a deflector intended to divert from a drain pipe to a pair of spaced circuit controlling electrodes, a portion of fluid which is subject to chemical change and consequently electrical conductivity, thereby in turn closing or opening said circuit.

Another object of the invention is to provide for the complete drainage from a deflector carrying a pair of spaced electrodes or terminals in a normally charged electrical circuit, of a fluid which is adapted to bridge the spaced electrodes and, being subject to chemical changes, constitutes a path of varying conductivity.

Another object of the invention is to provide a control for electrically operated flushing mechanisms of urinals, and the like, said control so acting as to use the fluid excrement as a conductor to close a controlling circuit, but having associated means for causing a complete drainage of the fluid excrement so that the circuit is opened at an air gap.

Other objects and advantages will appear in the following specification, reference being had to the accompanying drawings, in which

Figure 1 is a perspective view of a urinal stall, parts being shown in section so that the installation of the invention may readily be illustrated and seen.

Figure 2 is a cross section on the line 2—2 of Figure 1.

Figure 3 is a detail section on the line 3—3 of Figure 2.

Figure 4 is a detail perspective view of the elbow by which the deflector is carried.

Figure 5 is a detail perspective view of the deflector.

Figure 6 is a longitudinal section illustrating a modification in the arrangement of the deflector.

Figure 7 is a detail cross section on the line 7—7 of Figure 6.

Figure 8 is a sectional view, illustrating a second modification in the arrangement of the deflector.

Figure 9 is a side elevation of a self-closing flushing valve of the type herein contemplated, having attached thereto a solenoid by means of which the value is automatically operated, a portion of the solenoid being shown in section.

This invention is an improvement on the automatically actuated mechanisms of Edgar B. Littlefield, patented as follows: March 30, 1920, 1,335,380, January 17, 1922, 1.404,155, and January 2, 1923, 1,441,007, the invention being of an improvement of his Patent 1,404,155 in particular in which is contemplated the control of an electrically operated valve by the varying conductivity of a waste fluid path which forms a link of an electrical circuit in which said valve is situated. In this patent, and the other patents of Littlefield, the necessary electrodes are always submerged in a bath, the varying chemical character or purity of which is the controlling factor in either the conduction or formation of an electrical current. An exception is to be noted in the Patent 1,404,155 in which the pressure of gas in a certain peculiarly formed trap is intended to free an electrode from perpetual immersion in the fluid.

Cognizance is also taken of the patents to R. M. Keating for flushing valves; 1,220,856 March 27, 1917, 1,242,200 October 9, 1917, and 1,443,690 January 30, 1923. The drawings embody an adaptation of the latter of these patents. The casing of the flushing valve illustrated (Fig. 9) is made in two cylindrical sections, a body section 1 and a cap section 2 which, in practice, is screwed into the body section. The body section at its lower end has a suitable coupling for the connection of the intake pipe 3, and on its side has a suitable connection for the discharge pipe 4. The flushing valve is applicable to many kinds of plumbing appliances, for example urinal stalls, the latter being se-

lected for illustration in the present instance. The discharge pipe 4 connects with the urinal stall 5 at the top.

The drain pipe 6, which leads from the bottom of the stall 5, ultimately connects with a trap or waste disposal system of any suitable type. Mounted upon the end section 2 of the flushing valve is the casing 7 of a solenoid, the winding of which terminates at binding posts 8 and 9. The flushing valve includes a plunger 10 and a handle 11, and upon energization of the solenoid the core 12 is intended to press down upon the handle to actuate the flushing valve. The core 12 may be retracted by a spring 13 upon deenergization of the solenoid, and the solenoid may be of any type suitable for the particular purpose. The use of the spring 13 is optional. It is shown merely to illustrate a method of returning the core, but in practice the pilot valve spring (not shown) which returns the plunger 10 will answer the purpose.

The invention provides first, for the closure by fluid excrement of a normally charged electrical circuit embracing the solenoid, and second, for the complete drainage of said fluid so that said circuit is broken at an air gap. The drain pipe 6 has connection with an elbow 14 (Figs. 1, 2, 3 and 4) which, in turn, connects with the conventional trap mentioned before. The elbow 14 has complemental bosses 15 and 16 which have circular aligning openings constituting a common bore 17.

Fitted in the bore 17 is the deflector 18. This deflector is much like a short section of piping, but it has a portion cut away at 19 to leave a shallow trough 20. The length of the cut away portion 19 substantially agrees with the internal diameter of the elbow 14, although the specific dimensions of the cut away portion, as well as those of the trough 20 are immaterial. The trough 20 is located in the path of fluid flowing in the drain pipe 6. The purpose of the trough is to deflect or divert a portion of the fluid to one side of the drain pipe.

This side or end of the deflector 18 terminates in an L 21 which is internally threaded to receive the spark plug 22. The spark plug has electrodes 23 and 24 of non-corrosive material and of sufficient area to carry the required current, the first of which is grounded to a surrounding metallic part according to custom, the second of which terminates at a screw 25 to which the wire 26 of an electrical circuit is connected. The other end of this wire is connected to the binding post 9 of the solenoid (Fig. 1). The other binding post 8 provides the connection of a wire 27 from one pole of a source of current. The third wire 28, from the other pole of said source, is grounded to the metallic part of the plumbing.

Obviously, fluid flowing out of the drain pipe 6 will be diverted in part by the deflector 18 so that the electrode 24 becomes immersed. If the fluid is laden with liquid excrement so that it becomes a good conductor of electricity, that portion of the electrical circuit described in connection with Figure 1 will be bridged or closed at the electrodes; the solenoid will become energized and the handle 11 (Fig. 9) will be depressed so that the flushing valve will be operated according to the description in Patent 1,443,690. The immersion of the electrodes 23 and 24 by a non-conducting fluid, for example clean water, will result in no response by the electro-magnet.

But it is the second purpose of the invention that the electrodes 23 and 24 shall not remain immersed long. A notch 29 (Figs. 2, 3 and 5) preferably V-shaped but possibly of other shapes, in one side of the trough 20 provides for the drainage of the trough and consequently of the deflector 18 after the flow of fluid in the drain pipe 6 has ceased.

It is to be noted that the end of the electrode 24 is located between the top and bottom of the notch 29. This insures an air gap in the circuit when the apparatus is not in use and thus protects the electrical system in case of a failure of the water supply. In the latter event the conductive liquid would bridge the electrode gap and close the electrical circuit, but upon draining off of said liquid the gap would again open. The contingency of a pocket of liquid, (conductive or non-conductive) around the electrodes is well guarded against.

The deflector 18 has a circular flange 30 which engages a washer 31 next to the boss 15. A similar washer 32 is pressed against the boss 16 by a screw plug 33 which is threaded into the interior of the adjacent end of the deflector. Tightening of the screw plug 33 sets the deflector in any particular radial position, and by loosening the plug and appropriately setting the deflector 18 any desired adjustment of the notch 29 may be made. Such adjustment of the notch will regulate the rapidity of drainage of the deflector.

The modification in Figs. 6 and 7.

The T 34 corresponds with the elbow 14 because it is in connection with the T that a divergence of fluid deposited in the receptacle 5^a and the drain connection 6^a occurs, but it differs from the elbow in that it contains a gutter 35 for the interception of fluid. The pipe 36 corresponds with the deflector 18. It contains a partition 37 down which fluid flows from the gutter 35. The fluid drains into the T along the bottom of the pipe 36, thereby corresponding with the draining feature (notch 29) of the deflector 18.

The L 38 is a pipe fitting which carries the spark plug 22ª. This spark plug has electrodes 23ª and 24ª which are intended to function precisely as do the electrodes 23 and 24 in Figure 2. It is to be noted that the gutter 35 is set at an inclination, and has an outlet directly over the partition 37. The partition is inclined so that the fluid may readily run down into the L 38. The gutter 35 catches such fluid, or portions thereof, as runs down over the walls of the fitting 6ª.

The modification in Fig. 8 is an arrangement which departs somewhat from the foregoing although the fundamental principle is preserved. The spark plug 22ᵇ extends into a chamber 39 into which an inlet pipe 40 discharges and from which a very small outlet pipe is intended to be much smaller than that of the inlet pipe, the purpose being some retardation of the escape of fluid.

The inlet pipe 40 communicates with the upper part of the drain pipe 6ᵇ while the outlet pipe 41 communicates with the lower part. It is desirable to fit the drain pipe with a suitable fluid collector, for example, a trough 35ᵇ, adopting the arrangement in Figure 6. Some of the fluid flowing down over wall of the drain pipe will enter the inlet pipe 40 and reach the interior of the chamber 39. The spark plug electrodes are then immersed, and if the fluid has requisite conductivity the electrical circuit illustrated will be closed so that the solenoid 7ᵇ becomes energized and the flushing valve 1ᵇ is operated to discharge water into the urinal stall 5ᵇ.

The operation is as follows: A depression of the plunger handle 11 (Fig. 9) causes the flushing valve to operate according to the description in Patent 1,443,690. The electrical circuit 26, 27, 28 (Fig. 1) is open at the air gap between electrodes 23 and 24 (Fig. 2) until said gap is bridged by a fluid of conductive properties. Upon the discharge of such fluid into the drain pipe 6 (Fig. 1) a portion thereof will be diverted by the open trough 20 so that it flows into the deflector 18 and immerses the electrodes 23 and 24. This furnishes the link for the completion of the circuit which is otherwise normally open.

Energization of the solenoid results as follows: The core 12 (Fig. 9) moves downwardly upon the handle 11, depressing the plunger 10. This starts the operation of the flushing valve as already stated. Pressure on the handle 11 is released when the resistance of the fluid bridge is increased upon displacement of urine by the flushing water.

Minimum electrical resistance at the gap occurs while the waste fluid is in its natural state thereby insuring a maximum current flow when necessary to start the flush. The operation of the flushing valve happens in consonance with the closure of the gap whereupon an immediate dilution of the fluid and increase of the electrical resistance follows, reducing the current flow during the flush. The flushing action continues some time after the valve is released, due to the function of the valve itself. The complete drainage of all fluid from the gap ultimately occurs.

With a fluid of fixed conductivity the electrical current flow is directly proportional to the area of the immersed electrode and inversely proportional to the width of the fluid gap. Even a small air gap stops all current flow, but the impurities present in all water make the latter more or less of a conductor. It seems that the live electrode has the property of drawing or concentrating the conductive elements in the water to the gap. In actual experimentation it has been found that the addition of a few drops of conducting fluid to water at the gap provides a path that is insufficient to operate the flushing valve, but after a short time either a normal flush is produced or the circuit is again opened.

As clearly brought out, the flush is started by the flow of current through an undiluted fluid at the gap and continues until sufficient dilution by a portion of the flushing water allows the valve to make its normal closure. However, the valve is invariably released while there is still some current flow in the magnet, and this is stopped only by the reestablishment of the air gap. The periodic interruption of the circuit also serves as a protection to the electrical system in case of failure of the water supply. It is impossible for any waste fluid to so accumulate at the spark gap as to produce a permanent closure of the circuit.

Mention has been made of the adjustability of the deflector 18. This is cited merely as a possibility. It is anticipated that the required position of the deflector and consequently the proper radial position of the notch 29, when once established will do for all instances. But it is obvious that by even slightly shifting the radial position of the notch 29 by radially adjusting the deflector 18 the rapidity of drainage of fluid through the notch will either be increased or decreased.

What has been said in respect to the operation of the first form of the invention also applies to the modifications in Figures 6 and 8. The constructions are slightly different, as brought out in detailed description of these modifications, but the principle of operation is the same.

I claim:—

1. Regulating apparatus including a source of fluid, a receptacle into which waste is first introduced and which said fluid is intended to flush, means for controlling the flow of said fluid including an electric circuit,

normally non-bridged electrodes for said circuit which are situated out of the path of fluid discharged from said receptacle, and means for deflecting waste fluid discharging from said receptacle from said path directly and unadulterated to said electrodes to bridge the same and close the circuit to initiate the action of the controlling means when the character of the waste is such that it is electrically conductive.

2. A flushing device for waste receiving receptacles comprising the combination of a plunger-actuated flushing valve, an electrical circuit, spaced electrodes at which said circuit terminates, an electrical device embraced by and operated upon closure of said circuit to depress the plunger and initiate the operation of the flushing valve, means in which said electrodes are placed, means by which a portion of the waste flowing from said receptacle is diverted directly to said first named means to bridge the electrode space to close the circuit and means whereby said waste may be discharged from said first named means by gravity to leave the electrode space and circuit normally open.

3. A flushing device for waste receiving receptacles comprising an electrical circuit, spaced electrodes at which said circuit terminates, means for deflecting a portion of the wastes flowing from said receptacles to said electrodes in an unadulterated condition to bridge the space and close said circuit, electrical flushing means embraced by and operated upon closure of said circuit, and means for constantly draining the wastes from contact with the electrodes to leave the circuit normally open.

4. A flushing device for waste receiving receptacles comprising an electrical circuit, spaced electrodes at which said circuit terminates, means forming a channel through which the waste flows, means extending into said channel adapted to conduct waste to said spaced electrodes, a flushing valve, electrical means embraced by and operated upon closure of said circuit to actuate said valve, and means for draining the wastes from said electrode space to leave the circuit normally open.

5. In combination with the drain conduit of a waste receiving receptacle, a plunger-actuated flushing valve, and electrical circuit including electro-magnetic means to depress the plunger upon energization, spaced electrodes at which said circuit terminates, a normally empty branch extending to one side of the drain conduit supporting the electrodes, means to conduct fluid flowing from the receptacle and through the conduit to the branch to immerse the electrodes and thereby close the circuit if said fluid is electrically conductive and means for draining said branch.

6. In combination with a drain conduit adapted to receive waste from a receptacle, a plunger-actuated flushing valve, electromagnetic means including a solenoid for depressing the plunger to actuate said valve, a circuit including the solenoid and having electrodes at which the circuit terminates, a branch extending to one side of the drain conduit supporting the electrodes, means to collect fluid flowing from the receptacle and through the conduit for immersing the electrodes to close the circuit if the fluid is electrically conductive and energize said solenoid, and means permitting a complete drainage of the fluid into the conduit to leave the electrodes free.

7. The combination of a plunger-actuated flushing valve, electromagnetic means including a solenoid for depressing the plunger to actuate the valve, a drain conduit, a branch pipe having a trough portion to conduit fluid out of said conduit, a circuit including said solenoid and terminating at electrodes situated in said branch pipe to be immersed by said fluid, and a notch in one side of the trough permitting ultimate drainage of the fluid to leave the electrodes free.

8. Flushing apparatus for a receptacle including an electrically operable flushing valve, a waste drain conduit connected to the receptacle and having a normally empty chamber off at one side, inlet and outlet pipes respectively to conduct fluid flowing from the receptacle and through the conduit into the chamber and then to drain the chamber, electrodes situated in the chamber to be immersed by said fluid and an electrical circuit including the electrodes and valve being energized if the immersing fluid is of electrically conductive properties.

9. Flushing apparatus including a waste drain conduit, a branch extending from the conduit having a notch at which complete drainage of the branch occurs, a flushing fluid valve, an electrical circuit including electromagnetic means for operating said valve, and an electrode constituting a terminal of said circuit situated in said branch but in a position between the top and bottom of said drain notch to insure the presence of an air gap at said electrode upon drainage of the branch and thus preclude a continual immersion of said electrode.

10. A flushing device for a waste receiving receptacle comprising a drain for the receptacle, a chamber, spaced electrodes in said chamber, means for deflecting a portion of said waste to said chamber, and relatively restricted means for draining said chamber into said drain.

11. A flushing device for a waste receiving receptacle comprising a drain for the receptacle, a chamber, spaced electrodes in said chamber, means extending into said drain

adapted to deflect a portion of the waste to said chamber, and means for draining said chamber into said drain.

12. A flushing device for a waste receiving receptacle comprising a drain for the receptacle, a chamber, spaced electrodes in said chamber, means extending into said drain adapted to deflect a portion of the waste into said chamber, and means for draining said chamber into said drain, said draining means being connected to said drain below said deflecting means.

13. A flushing device for a waste receiving receptacle comprising a drain for the receptacle, a chamber, spaced electrodes in said chamber, means extending into said drain adapted to deflect a portion of the waste into said chamber, and relatively restricted means for draining said chamber, said last named means being connected to said drain below said deflecting means.

14. A flushing device for a waste receiving receptacle comprising a drain for the receptacle, a chamber, spaced electrodes in said chamber, a waste receiving channel carried on the wall of said drain and adapted to deflect a portion of the waste flowing from said receptacle to said chamber, and means for constantly draining said chamber into said drain.

15. A flushing device for a waste receiving receptacle comprising a drain for the receptacle, a chamber, spaced electrodes in said chamber, a channel carried on the wall of said drain and adapted to deflect a portion of the waste to said chamber, and means for draining said chamber, said means being connected to said drain below said channel.

16. A flushing device for a waste receiving receptacle comprising a drain for the receptacle, a chamber, spaced electrodes in said chamber, a channel carried on the wall of said drain and adapted to deflect a portion of the waste to said chamber, and relatively restricted means for draining said chamber, said means being connected to said drain below said channel.

17. Regulating apparatus including a source of flushing fluid, a receptacle into which waste is first introduced, and which said flushing fluid is intended to flush, electrical means for controlling the flow of said flushing fluid, including an electric circuit, a drain for said receptacle, normally non-bridged electrodes for said circuit which are situated out of the path of the fluid discharged from said receptacle through said drain, means for separating out a portion of the fluid passing through said drain and reducing the rate of flow of said separated portion, said separated portion being brought into contact with the electrodes to bridge the gap therebetween, whereby when the character of the waste is such that it will conduct a current of electricity the circuit will be closed to cause the flushing of the receptacle.

18. The method of automatically controlling an electrical supply circuit which consists of separating out a portion of a waste fluid flowing through a channel to bring it into contact with a gap in said circuit, and reducing the rate of flow of said separated portion, whereby current passes through said circuit when the fluid has electrically conductive properties, the flow of current through said supply circuit continuing after the waste fluid has ceased to flow through the channel.

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