Feb. 13, 1951 N. F. TOADVINE 2,541,622

AUTOMATIC WATER VALVE

Filed July 12, 1949

FIG. 1.

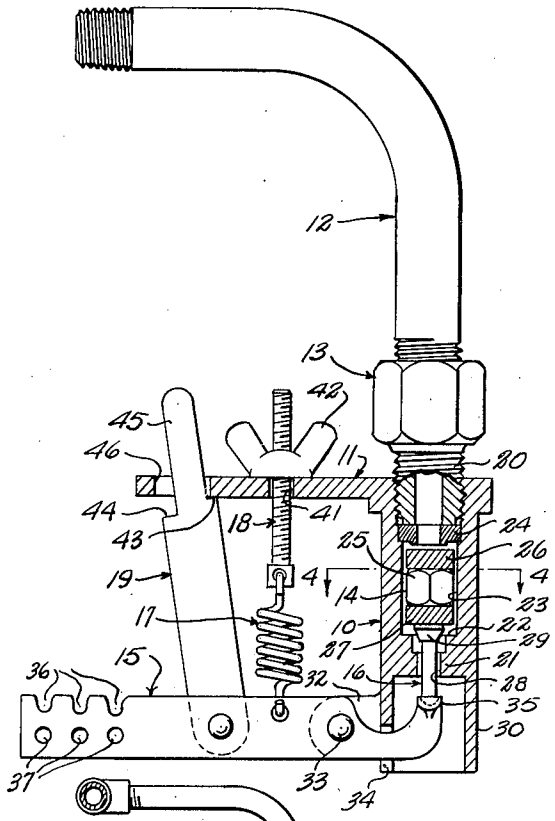
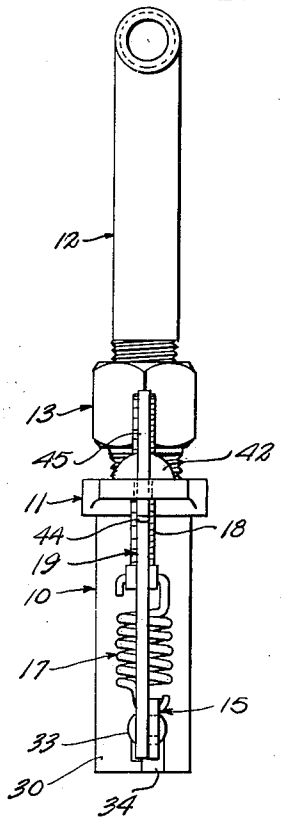


FIG. 2.



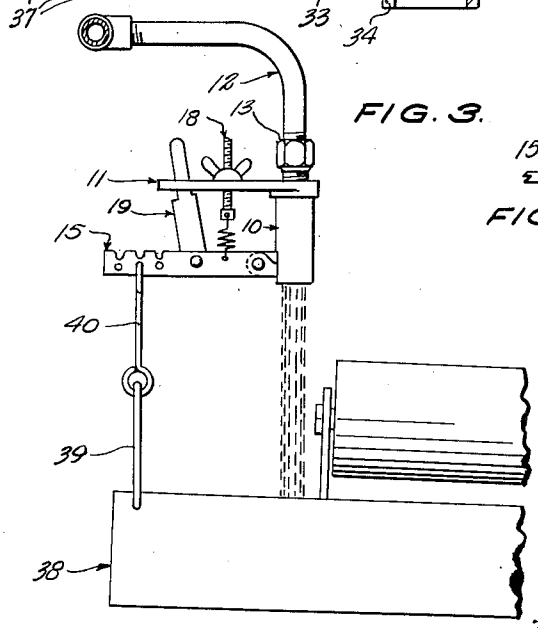


FIG. 3.

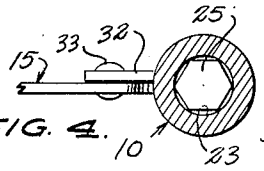


FIG. 4.

FIG. 6.

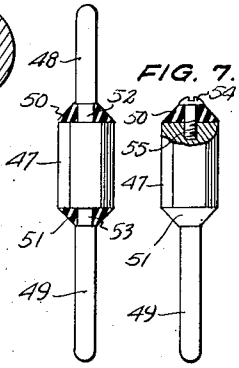
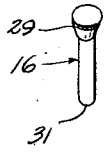


FIG. 7.

FIG. 5.



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AUTOMATIC WATER VALVE

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4 Claims. (Cl. 137—68)

1

This invention relates to automatic water valves, and more particularly to an automatic water valve for regulating the quantity of water in a receptacle, such as a watering trough.

Several automatic water valves are now available for controlling the flow of water to receptacles, such as watering troughs for poultry, but such valves as are now available or in use have certain defects and are subject to such malfunctioning in operation as to render their performance unsatisfactory. For one thing, the present valves are subject to leakage, usually caused by displacement or turning of the valve discs, and are subject to splashing and flooding of the area adjacent thereto.

It is thus among the objects of the present invention to provide an improved automatic water valve for controlling the flow of water to a receptacle, such as a poultry watering trough, which has its movable parts so arranged that the valve discs or washers cannot become displaced or disposed at an angle to the associated valve seats to cause leaking of the valve, which automatically closes if the weight of the trough is removed therefrom, whether intentionally or accidentally, to thereby avoid flooding of the area adjacent the valve, which valve includes a water outlet formation and means within such formation effective to break up the jet of water under pressure from the valve seat and direct the water downwardly to the trough at a gravity rather than at a pressure-induced rate of flow, so that the water will not splash out of the receptacle or be directed by the valve to any area outside of that portion of the receptacle directly below the valve, and which valve is extremely strong, rigid and durable in construction, simple and economical to manufacture, easy to install and use, and fully automatic and positive in operation.

Other objects and advantages will become apparent from a consideration of the following description and the appended claims in conjunction with the accompanying drawing, wherein:

Figure 1 is a side elevation of an automatic valve illustrative of the invention, a portion being broken away and shown in longitudinal, medial cross-section to better illustrate the construction of the valve;

Figure 2 is a side elevation of the valve looking at the left-hand side of the valve as illustrated in Figure 1;

Figure 3 is a diagrammatic side elevation of the valve and a fragmentary portion of a receptacle suspended therefrom illustrating the operation of the valve;

2

Figure 4 is a transverse cross-section on the line 4—4 of Figure 1;

Figure 5 is a perspective view of a valve-operating stem constituting an operative component of the valve illustrated in Figure 1;

Figure 6 is a side elevation of a somewhat modified form of movable valve element usable in the valve mechanism illustrated in Figures 1, 2 and 3, a portion being broken away and shown in cross-section to better illustrate the construction of such modified valve element; and

Figure 7 is a side elevation of a still further modified form of valve element, a portion being broken away and shown in cross-section to better illustrate the construction thereof.

With continued reference to the drawing, the valve assembly comprises, in general, an elongated valve body 10 having a rigid arm 11 extending laterally and substantially perpendicularly therefrom at one end of the body, a pipe elbow nipple 12, a pipe fitting 13 connecting the nipple 12 to the valve body 10 at one end of the latter, a movable valve element 14 in the valve body, a lever 15 pivoted intermediate its length to the valve body 10 adjacent the end of the valve body remote from the arm 11 and extending at one end into the valve body, a stem 16 operatively disposed between the end of the lever 15 within the valve body and the adjacent end of the valve element 14, a spring 17 connected at one end to the lever 15, an adjusting screw 18 connecting the other end of the spring to the arm 11 to render the spring effective to resiliently urge the lever 15 in one direction about its pivotal connection with the valve body 10, and a latch lever 19 pivotally connected at one end to the lever 15 and engaging the arm 11 to releasably hold the lever 15 in a predetermined position.

The valve body 10 is an elongated, preferably cylindrical body of suitable metal, such as brass, and has a substantially concentric bore extending therethrough. This body is provided near the end from which the lever 11 extends with internal screw threads which receive the externally screw-threaded shank 20 of the fitting 13, this fitting being provided in its end opposite the shank 20 with an internally screw-threaded socket which receives the externally screw-threaded, associated end of the elbow nipple 12. Intermediate the length of the bore therethrough the valve body 10 is provided with an internal annular formation 21 providing a restriction in the bore and providing, at the side thereof adjacent the screw-threaded end of the valve body, an annular valve seat 22. At the side of the formation 21

adjacent the screw-threaded end of the valve body, the valve body bore provides an elongated, cylindrical valve chamber 23, and a second, annular valve seat 24 is secured in the valve body at the end of the valve chamber 23 remote from the valve seat 22. The valve seat 24 is an apertured, washer-like structure and is secured in the valve body 10 between an internal shoulder in the valve body and the inner end of the shank portion 20 of the pipe fitting 13.

The valve element 14 comprises a metal spacer 25 of hexagonal or other non-circular, cross-sectional shape having a maximum diameter substantially the same as the diameter of the valve chamber 23, so that the spacer slides freely in the valve chamber and the faces thereof provide channels for the passage of water between the spacer and the wall of the valve chamber, and two discs 26 and 27 of suitable flexible material, such as natural or synthetic rubber, disposed at respectively opposite ends of the spacer 25 to cooperate with the valve seats 24 and 22, respectively.

The stem 16 is an elongated, cylindrical pin having a diameter less than the diameter of the aperture 28 in the bore-restricting formation 21, and having on one end an enlarged, flat head 29 which bears against the adjacent, lower side of the valve disc 27. The head 29 of the stem 16 has an end area sufficient to eliminate wear of the disc 27 by the stem, and also to support the valve disc in proper position in the valve chamber parallel to the annular valve seat 22, so that the disc will not become turned or cocked relative to the valve seat. This effectively prevents leakage of the valve when the valve is closed by the disc 27 cooperating with the valve seat 22. This stem 16 extends through the aperture 28 and into the cylindrical water outlet formation 30 provided by the bore of the valve body at the side of the restricting formation 21 opposite the valve chamber 23 where the stem is provided with a rounded end 31. The hollow outlet cylinder 30 has a downwardly-elongated skirt and an apertured lug 32 projects outwardly from this skirt to carry a pivot pin 33 which extends through an aperture in the lever 15 intermediate the length of the lever and pivotally connects the lever to the valve body. At one side of the pin 33 the lever 15 extends into the outlet cylinder 30 through a notch 34 provided in the skirt of the outlet cylinder, and a cup formation 35 is provided on the end of the lever 15 within the outlet cylinder 30 to receive the rounded, lower end 31 of the valve stem 16.

Near its end opposite the cup formation 35, the lever 15 is provided, in its upper edge, with a series of notches 36 and is provided below these notches with a series of apertures 37 respectively in alignment with the notches. As illustrated in Figure 3, one end of a poultry watering trough, generally indicated at 38, is provided with an upwardly-extending bail 39 to which is slidably attached a hook 40. This hook is selectively engageable with any one of the notches 36 or with any one of the apertures 37 to provide a downward force on the outer end of the lever 15.

When the trough 38 has a sufficient quantity of water therein, its downward pull on the outer end of lever 15 will overcome the force of spring 17, so that the lever 15 will pivot about the pivot pin 33 and the cup formation 35 will force the valve stem 16 and the valve element 14 upwardly until the upper disc 26 is brought into sealing engagement with the upper valve seat 24, thereby cutting off further flow of water to the receptacle or trough. When a predetermined amount of water has been used from the trough, the force of the spring 17 will overcome the weight of the trough and raise the outer end of the lever 15 permitting the valve disc 26 to move away from the valve seat 24 and water to flow from the nipple 12 through the fitting 13 and through the valve seat 24, the valve chamber 23, and the aperture 28 in the restricting formation 21 into the water outlet cylinder 30 from which it drops into the trough below the valve. As the water is supplied to the nipple 12 under relatively high pressure, the restricting aperture 28 creates a jet of considerable force, which, if unobstructed, would spurt downwardly and outwardly from the valve causing a splash in the trough which would displace a considerable quantity of water from the trough and this jet would also spray some of the water outside of the area of the trough immediately below the valve. The cup formation 35, however, is disposed directly below the aperture 28 and has a diameter at least as great as the diameter of the aperture 28, so that water flowing through this aperture will strike the cup formation 35 and be deflected outwardly against the wall or skirt of the hollow cylinder 30. On striking the wall of the outlet cylinder, the water jet gives up its pressure energy and then flows downwardly from the outlet cylinder under the influence of gravity only, into the trough creating no splash or spray.

If the trough is removed from the lever 15 for cleaning the trough or is accidentally detached, the spring 17 will immediately pull the outer end of the lever 15 upwardly and the valve disc 27 will engage the valve seat 22 to cut off the flow of water through the valve, thus avoiding any danger of flooding the area adjacent the valve by intentional or accidental removal of the weight of the receptacle from the lever 15.

The amount of water in the receptacle is controlled by the spring-tensioning screw 18 which screw extends through an aperture 41 in the arm 11, and is provided above the arm with a wing nut 42 threaded thereon. By threading the screw upwardly through the wing nut the loading on the spring 17 is increased and a greater quantity of water in the receptacle 38 will be required to close the valve, whereas, if the screw be threaded downwardly through the nut, a smaller quantity of water will close the valve. Since the force exerted by the spring 17 will, in all practical installations, be greater than that necessary to lift the valve-attached end of the trough when empty, some water will have to be in the trough before the weight of the water in the trough will operate the valve. After the trough has been cleaned and re-attached to the lever 15, it will be empty, and it is then necessary to supply some water to the trough in order for the automatic operation of the valve to resume. This is accomplished by the latch lever 19. This lever, as explained above, is pivotally connected at its lower end to the lever 15 intermediate the length of the latter. The latch lever has adjacent its upper end, two oppositely-disposed shoulders 43 and 44, and has an extension 45 of reduced width extending from the shoulders through a slot 46 in the arm 11 near the outer end of the arm. The shoulder 43 is so positioned lengthwise of the latch lever 19 that when this shoulder is engaged with the under side of the arm 11 at the inner end of the slot 46, the valve will be held open and water will be supplied to the trough. As

soon as enough water has been supplied to the trough to overcome the force of spring 17, and pull the outer end of lever 15 downwardly to close the valve, the lever 19 will fall outwardly, disengaging the shoulder 43 from the arm 11. The shoulder 44 is so positioned longitudinally of the latch lever that the valve may operate automatically without interference by the latch lever. This latch lever thus renders it unnecessary for the attendant to wait or to hold the valve open until a sufficient quantity of water has been placed in the trough to operate the valve. The function of the shoulder 44 is merely to limit upward movement of the outer end of lever 15 when the trough is removed, so that the cup formation 35 will not be disengaged from the lower end of the valve stem 16.

The modified valve element illustrated in Figure 6, and generally indicated at 47, comprises an elongated metal body of hexagonal or other non-circular, cross-sectional shape, and pins 48 and 49 extending outwardly from respectively-opposite ends of the body 47 concentrically with the body. The upper pin 48 will extend through the upper valve seat 24 and, if desired, may slidably contact fingers projecting radially into the aperture of the upper valve seat to guide the valve element in its movements in the valve chamber 23. The lower pin 49 extends downwardly through the aperture 28 in the formation 21 and constitutes the valve-operating stem equivalent to the stem 16, illustrated in Figures 1 and 5. Conically-shaped valve washers 50 and 51 surround the stems 48 and 49, respectively, at the respectively-opposite ends of the body 47 to engage the upper and lower valve seats under the same conditions in which these seats are alternatively engaged by the valve discs 26 and 27. The pins 48 and 49 are preferably reduced adjacent the respective ends of the body 47, and within the washers 50 and 51, as indicated at 52 and 53, to provide shoulders for holding the washers securely in place against the corresponding ends of the body 47, the washers being sufficiently flexible to be forced over the pins and to contract about the reduced portions of the pins.

In the somewhat further modified form of valve element illustrated in Figure 7, the construction is exactly the same as that illustrated in Figure 6, except that the upper pin 48 is omitted and a screw 54 is extended through the aperture in the upper valve washer 50 and threaded into an internally screw-threaded well 55 provided in the body 47 at the upper end of the body. As explained above, the valve element illustrated in Figure 6, or that illustrated in Figure 7 may be substituted for the valve element 14 without materially affecting the operation of the automatic valve, the form of valve elements shown in Figures 6 and 7 being of greatly simplified construction and extremely economical to manufacture and being somewhat more rigid and more positive in action.

The invention may be embodied in other specific forms without departing from the spirit or essential characteristics thereof. The present embodiments are, therefore, to be considered in all respects as illustrative and not restrictive, the scope of the invention being indicated by the appended claims rather than by the foregoing description, and all changes which come within the meaning and range of equivalency of the claims are, therefore, intended to be embraced therein.

What is claimed is:

1. In an automatic valve for controlling the flow of liquid to a receptacle suspended from the valve, an elongated valve body having a bore therethrough, means in said body constituting a restriction in said bore intermediate the length thereof and providing an annular valve seat in said bore, said bore constituting at one side of said means a valve chamber and at the opposite side of said means a liquid outlet cylinder, a valve seat in said bore at the end of said valve chamber opposite the bore-restricting means, a valve element movable in said valve chamber between said valve seats, a stem extending from said valve element through the restriction in said bore and into said outlet cylinder, and a valve-operating lever pivotally mounted intermediate its length on said valve body and having one end disposed within said outlet cylinder and provided with a cup formation receiving the adjacent end of said stem, said cup formation having a diameter at least as great as the diameter of the restriction in said bore so that liquid under pressure moving as a jet through said restricting means past said stem will strike said cup formation and be deflected outwardly against the wall of said outlet cylinder to give up its pressure energy and flow from said cylinder by gravity alone.

2. In an automatic valve for controlling the flow of liquid to a receptacle suspended from the valve, an elongated valve body having a bore therethrough, means in said body constituting a restriction in said bore intermediate the length thereof and providing an annular valve seat in said bore, said bore constituting at one side of said means a valve chamber and at the opposite side of said means a liquid outlet cylinder, a valve seat in said bore at the end of said valve chamber opposite the bore-restricting means, a valve element movable in said valve chamber between said valve seats, a stem extending from said valve element through the restriction in said bore and into said outlet cylinder, and a valve-operating lever pivotally mounted intermediate its length on said valve body and having one end disposed within said outlet cylinder and provided with a cup formation receiving the adjacent end of said stem, said cup formation having a diameter at least as great as the diameter of the restriction in said bore so that liquid under pressure moving as a jet through said restricting means past said stem will strike said cup formation and be deflected outwardly against the wall of said outlet cylinder to give up its pressure energy and flow from said cylinder by gravity alone, the weight of a receptacle suspended from said valve-operating lever being effective to move said valve element in closing contact with one of said valve seats, and resilient means connected between said valve body and said valve-operating lever to move said lever in a direction to effect contact of said valve element with the other of said valve seats to close said valve when the weight of a receptacle is removed from said lever.

3. In an automatic water valve, an elongated valve body having a bore therethrough, a substantially rigid arm projecting upwardly from said body at one end thereof and substantially perpendicular thereto, means for connecting a pipe nipple to the bore of said body at said one end of the body, a hollow water outlet cylinder disposed at the opposite end of said body and having an elongated, cylindrical skirt, a first an-

nular valve seat in the bore of said body at the inner end of said outlet cylinder, said valve seat having a restricted aperture therethrough, a second annular valve seat in said body spaced from said first valve seat at the side of the latter opposite said outlet cylinder, the portion of said bore between said valve seats constituting a valve chamber, a valve element movable in said valve chamber and having at its opposite ends valve discs of resilient material engageable respectively and alternatively with said valve seats to close said valve at the limits of movements of said valve element in said valve chamber in both directions, a receptacle-suspending lever pivotally connected intermediate its length to said valve body and projecting at one end into said outlet cylinder, a cup formation on the end of said lever within said outlet cylinder, a valve stem extending from said cup formation through said first valve seat to said valve element, and manually-adjustable, resilient means inter-connected between said lever and said arm.

4. In an automatic water valve, an elongated valve body having a bore therethrough, a substantially rigid arm projecting upwardly from said body at one end thereof and substantially perpendicular thereto, means for connecting a pipe nipple to the bore of said body at said one end of the body, a hollow water outlet cylinder disposed at the opposite end of said body and having an elongated, cylindrical skirt, a first annular valve seat in the bore of said body at the inner end of said outlet cylinder, said valve seat

having a restricted aperture therethrough, a second annular valve seat in said body spaced from said first valve seat at the side of the latter opposite said outlet cylinder, the portion of said bore between said valve seats constituting a valve chamber, a valve element movable in said valve chamber and having at its opposite ends valve discs of resilient material engageable respectively and alternatively with said valve seats to close said valve at the limits of movements of said valve element in said valve chamber in both directions, a receptacle-suspending lever pivotally connected intermediate its length to said valve body and projecting at one end into said outlet cylinder, a cup formation on the end of said lever within said outlet cylinder, a valve stem extending from said cup formation through said first valve seat to said valve element, and manually-adjustable, resilient means interconnected between said lever and said arm, said valve stem comprising an elongated pin having on one end an enlarged, flat head bearing against the valve disc at the adjacent end of said valve element.

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