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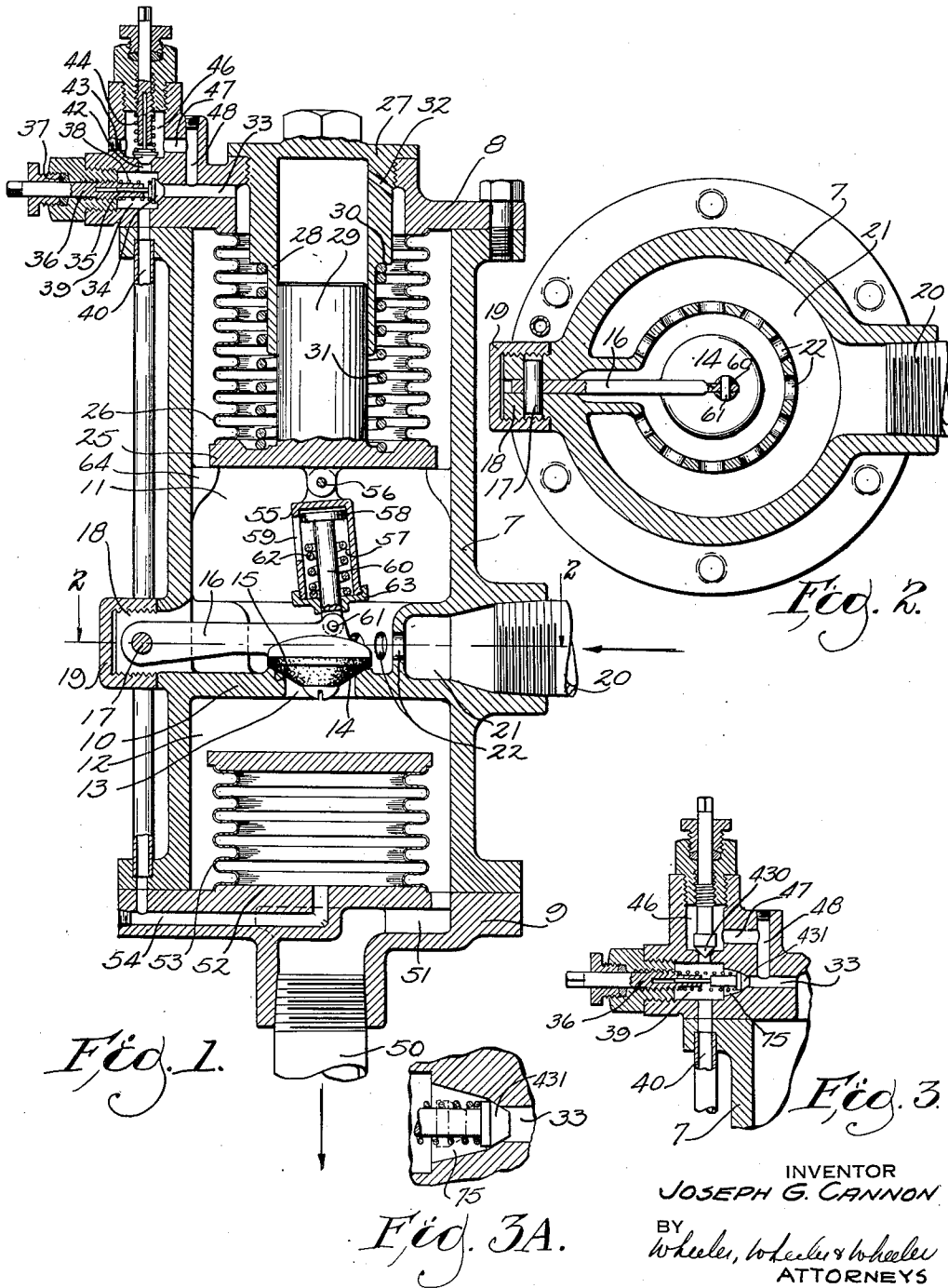
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AUTOMATIC CYCLING VALVE

Filed Sept. 25, 1943

2 SHEETS—SHEET 1



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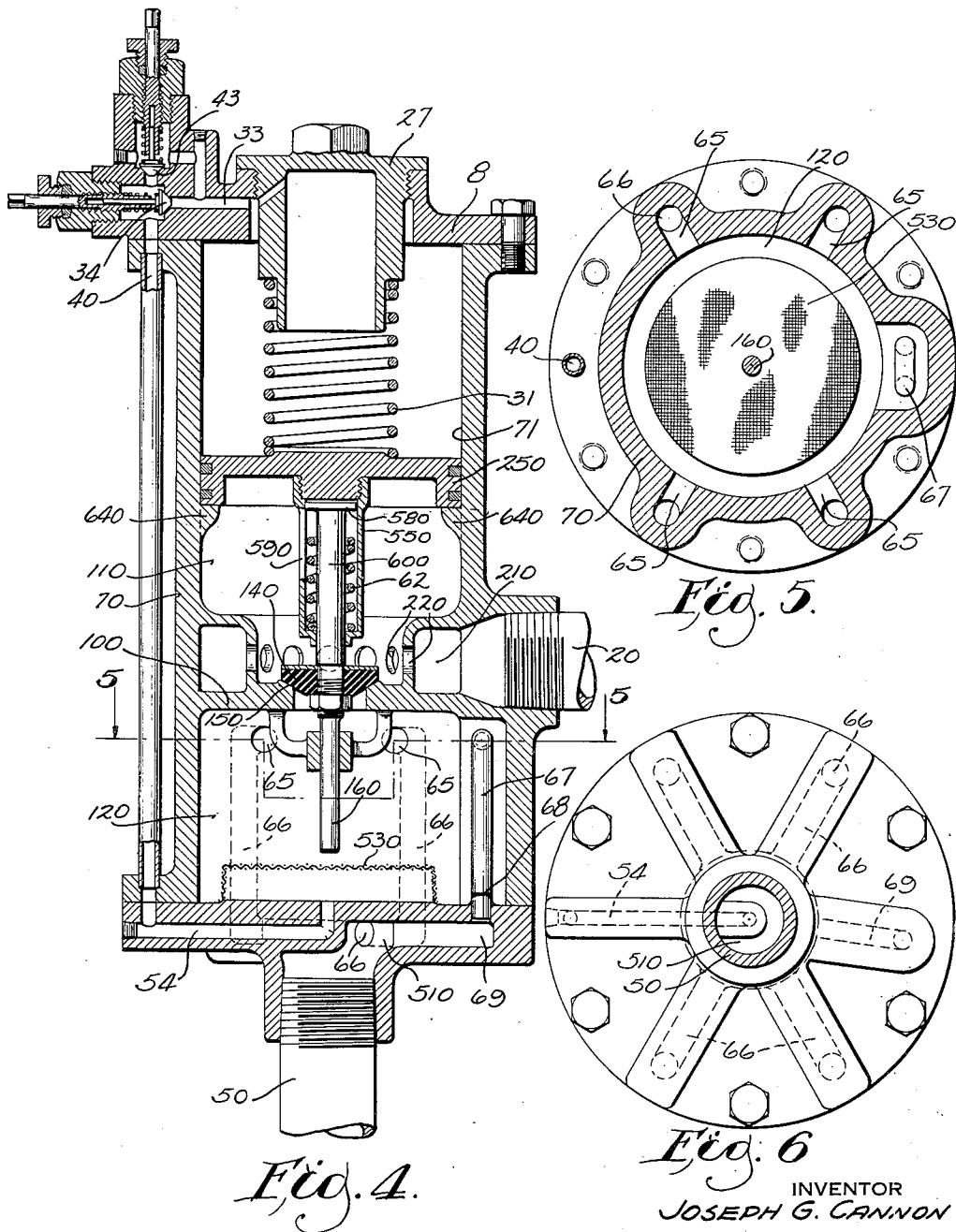
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2 SHEETS—SHEET 2



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AUTOMATIC CYCLING VALVE

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13 Claims. (Cl. 137-640)

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This invention relates to improvements in automatic cycling valves.

It is the primary object of this invention to provide a self-contained automatic means for obtaining intermittent discharge and stoppage of a fluid from a pressure source in predetermined cycles, the periods of discharge and of stoppage being preferably independently controllable. I propose to accomplish these results by utilizing the variations in pressure differential consequent upon the opening and closing of a valve to regulate valve movement between full open and fully closed positions, and by regulating the time interval required for variations in pressure to become effective.

The achievement of valve movements in which the valve operates decisively from a fully opened position to one in which it is fully closed, and vice versa, is a feature of the invention. It is a further important objective to be able to control the two parts of the cycle individually so as to regulate the period for which the valve remains closed independently of regulation of the period for which it remains open.

Other objects of the invention will appear more particularly from the following disclosure thereof.

In the drawings:

Figure 1 is a view in vertical axial section showing a cycling valve embodying the invention.

Figure 2 is a detail view in transverse section in the plane indicated at 2-2 in Figure 1.

Figure 3 is a detail view of a slightly modified control valve organization, shown in section in the same plane in which the control valve is illustrated in Figure 1.

Figure 3a is an enlarged detail of part of the valve structure shown in Figure 3.

Figure 4 is a view similar to Figure 1, showing the modified embodiment of the invention.

Figure 5 is a view taken in section on the line 5-5 of Figure 4.

Figure 6 is a bottom plan view of the valve casing shown in Figure 4, the discharge pipe being illustrated in section.

Like parts are identified by the same reference characters throughout the several views.

The valve casing comprises a barrel 7 having a top closure at 8 and a bottom closure 9. The transverse partition 10 divides the casing into an upper chamber at 11 and a lower chamber 12. The aperture 13 in partition 10 is normally closed by a valve 14 which is guided to and from the valve seat 15, about the aperture, by means of a mounting lever 16 fulcrumed upon a transverse pin 17 disposed in a slotted boss 18 and accessible upon removal of the cap 19.

Water or other fluid supplied from a pressure source reaches the valve barrel through the supply pipe 20, which opens into a passage 21 having numerous orifices at 22 communicating with

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chamber 11 immediately above the plane of the center of member 14. The valve preferably tapers in form, at least downwardly from this central plane, the arrangement being such that when the valve initiates its opening movement the jets of water delivered through the several orifices 22 impinge upon the bevelled under surface of the valve in such a manner that the kinetic energy of the liquid tends to force the valve toward its full open position.

Reciprocable in chamber 11 is a displacement member 25, which, in the construction shown in Figure 1, is sealed by a flexible bellows 26, rather than by frictional engagement with the wall of the barrel or cylinder 7. The plug 27 threaded into the top closure 8 of the valve casing has a sleeve-like extension at 28 which guides the piston rod 29 and the displacement member 25 connected therewith. An external shoulder at 30 on the sleeve 28 provides a seat for a compression spring 31 which seats at its lower end against the displacement member 25 to resist the upward movement thereof. The interior of the sleeve 28 may, if desired, be vented in any suitable manner, as by duct 32.

Communicating with the space above the displacement member 25 sealed by bellows 26 is a duct 33 leading to the regulating valve assembly.

No alternative form known to me will give as good regulation as the preferred construction incorporating check valves working in opposition, and individually adjustable as to their respective extent of opening, as will now be described.

Seated in the end of duct 33 is a check valve 34 having a stem 35 guided in a suitable socket in screw 36, which passes through a packing gland 37 and has its end squared to receive a wrench, whereby it may be adjusted. This screw provides a seat for compression spring 38 which acts against the valve 34 to urge the valve toward its seat to close duct 33.

The screw also provides at its end a stop determining the extent to which the valve may open in a given screw adjustment. By adjusting the screw 36 the operator may regulate the flow through the open valve and thus regulate the time interval required to establish a net given force required to open the main valve. Slight variation in bias may result due to the fact that the stop screw 36 also serves as a spring seat. While this variation in bias may contribute to the control, the stop effect is primarily relied upon.

When the valve is open the duct 33 communicates with chamber 39 from which the passage 40 leads downwardly to the control chamber hereinafter to be described as the bottom of the main valve casing. When the pressure in duct 40 is upwardly, as viewed in Figure 1, the check valve 34 will seat, but such check valve 34 may be by-

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passed by means of a duct 42 opening from chamber 39 and normally closed by check valve 43, urged to its seat by compression spring 44. The chamber 46 into which check valve 43 opens communicates with the interior of bellows 26. In the specific embodiment illustrated such communication is effected via ducts 47, 48 and 33. In any case the ducts controlled by the respective valves are in shunt. Then, when pressure in a given direction seats one of the valves 34 or 43 it opens the other one. By regulating the degree of opening permitted to the respective valves it is possible to control fluid transmission selectively in both directions through pipe 40.

Chamber 12 in the bottom of the main valve casing receives the entire flow through the main valve orifice 13 when the valve 14 is open. The effluent through valve orifice 13 is drained through discharge pipe 50 through passage 51. Forming a part of the bottom closure 9 is a boss 52 which carries a displacement member 53 expansible and contractible according to relative pressure variation as between chambers 11 and 12. The pipe 40 leading downwardly from the control valve assembly above described communicates through duct 54 with the interior of displacement member 53.

As will hereinafter be explained, the displacement member may be dispensed with and the duct 54 may communicate directly with the interior of chamber 12. The purpose of the displacement member is to make duct 54 and pipe 40 subject to pressure existing in chamber 12 without exposing such ducts to foreign matter, which, entrained with the fluid supply handled through the valve, might otherwise cause a stoppage of ducts 54 and 40, wherein the only flow is that incident to the control.

For communicating motion between the displacement member 25 and the valve 14 I provide a combination dashpot and spring-loaded lost motion device which includes a chamber 55, pivoted at 56 to the displacement member 25, and having an interior cylinder 57 in which displacement member 58 is reciprocable. The cylinder 57 has a somewhat restricted communication with chamber 11 through one or more slots 59. A piston rod 60 extending downwardly from displacement member 58 is pivotally connected at 61 to the valve lever 16. A compression spring 62 seated against the bottom closure 63 of the casing 55 tends to support the displacement member 58 in the closing movement of the valve and to accumulate energy in the upward movement of displacement member 25 for ultimately effecting the opening movement of valve 14 with snap action.

Relative movement of the displacement member 58 downwardly respecting casing 55 will compress spring 62 and will ultimately result in the displacement member 58 moving toward the lower end of the escape slot 59, thereby establishing a dashpot action in the lower end of the cylinder 57. As shown, the spring 62 may be regarded as substantially fully expanded so that with the main displacement member 25 resting against the stops 64 in the casing barrel 7 there is little or no spring pressure acting upon the valve 14 in an unseating direction.

The relative values of the several springs are such that the spring 31 tends to move valve 14 into sufficient proximity to its seat so that it may be seated tightly by the force differential to which it is subject, while the spring 62 allows the valve 14 to remain seated for a substantial

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period after the displacement member 25 has commenced its upward movement, as will hereinafter be described. The operation is as follows:

The liquid under pressure supplied through pipe 29 holds valve 14 to its seat, chamber 12 being drained through the pipe 50 and valve 14 being initially biased (by gravity) to its seat. As pressure builds up in chamber 11 the piston 25 is caused to move upwardly, thereby displacing liquid from the interior of the bellows 26 through duct 33, subject to the control of the variably opening check valve 34. If the check valve 34 is set to open wide the displacement of displacement member 25 will be rapid. If the valve 34 is so adjusted as to open but slightly, the displacement of displacement member 25 will be correspondingly retarded.

The liquid displaced from the interior of bellows 26 through the spring loaded check valve 34 reaches the interior of bellows 53 (assuming such bellows to be used). In any event, the liquid enters the chamber 12 below the main valve 14, such chamber being empty or substantially empty at the time.

In the course of the upward movement of the displacement member 25 in chamber 11 the compression spring 62 will be compressed and will exert increasing force on the valve 14 in a valve opening direction. Ultimately the force exerted by spring 62 will exceed the pressure differential holding valve 14 to its seat and the valve will open.

As soon as the opening movement of valve 14 is initiated, the valve will spring to its fully opened position for three reasons. In the first place, the pressure differential forcing the valve to its seat is relieved; in the second place, the compressed spring 62 acting on the valve unseating plunger 58 is now free to lift the valve; and in the third place, the jets of water admitted through the orifices 22 impinge upon the bevelled under surfaces of the valve so that their kinetic energy acts to thrust the valve open.

The valve now being wide open, full flow through the orifice 13 occurs.

However, the escape passage 51 from the chamber 12 is preferably, though not necessarily, somewhat restricted as compared to the capacity of the orifice 13 so that, regardless of the capacity of the discharge pipe 50, the pressure will tend to equalize throughout the interior of the valve casing. With the pressure nearly equalized in the valve casing the spring 31 would immediately re-seat valve 14 were it not for the control effected through the regulating valve system. The spring 31 cannot force displacement member 25 downwardly any faster than the vacuum can be relieved above the displacement member within the bellows 26.

The liquid to relieve this vacuum must come from chamber 12 where bellows 53, the top of which constitutes a displacement member, is now under pressure. Accordingly, the liquid flows from bellows 53 through duct 54 and pipe 40 to the valve chamber 39. Here, finding check valve 34 seated, the liquid must unseat check valve 43 to the extent permitted by its adjustable set screw. Having forced its way past this adjustably opening check valve, the liquid flows through the by-pass ducts 47 and 48 back to duct 33 and thence to the interior of bellows 26, allowing displacement member 25 to move gradually downwardly.

As the displacement member 25 moves downwardly the closure 63 of casing 55 pivoted thereto

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engages valve lever 16 to urge valve 14 in closing direction. Under some circumstances the closing pressure may be communicated from the top of casing 55 to the displacement member 58. In any event, the spring 62 is fully expanded, and thence there is nothing holding the valve 14 open other than the kinetic energy of the jets directed against the bevelled under surface of the valve from the orifices 22.

As soon as the bevelled under surface of the valve passes below the plane of these jets, the valve becomes subject to forces, the net of which act on the valve in a direction tending immediately to seat the valve, and the valve thereupon seats rather abruptly, usually slightly compressing spring 62 in so doing, as the valve tends to seat before the displacement member 25 is fully lowered. The closing movement is further cushioned by the dashpot action. The cycle above described now repeats itself.

Figure 3 suggests how one or both of the variably opening regulating valves 34—43 may be replaced by an ordinary needle valve 430, if desired. If one needle valve and one check valve are used, as shown in Figure 3, some regulation in each direction will still be possible since the needle valve will allow restricted flow in both directions, variable according to the position of the valve, while in one direction the flow through the variably opening check valve will supplement flow through the needle valve. Without either of the variably opening check valves the flow would be alike in both directions, and it would be impossible to regulate flow in one direction without at the same time regulating flow in the other.

Figures 3 and 3a further suggest how any of the check valves may more easily be adjusted to regulate flow, without requiring an extremely fine adjusting screw. The valve 431 shown in Figure 3, and illustrated in enlarged detail in Figure 3a, seats at the bottom of a tapered pocket 75. The flow past the valve will not be determined merely by the clearance between the valve and its seat but rather by the clearance between the valve and the tapering wall of the pocket 75, which deviates only slightly from the path of the valve. Consequently the valve will have to move for a very substantial distance from its seat before it will afford full opening. Thus a relatively coarse adjusting screw for the stop 36 will suffice to give very accurate adjustment of flow. Needless to say, this arrangement may be used wherever my combination check valve and flow regulating valve is desired.

Using the construction disclosed in Figure 1, the cycle may be varied as desired, the period of flow being regulated independently of the period of rest, and the period of rest being regulated independently of the period of flow.

In Figures 4, 5 and 6, I have shown a modified construction in which either control valve organization may be used, the operation being similar to that already described. The modified structure is as follows:

As in the construction previously described, the fluid supplied under pressure through pipe 20 is admitted to a distributing chamber 210 having orifices 220 immediately above the plane of the valve 140. Although this valve is reciprocable, being guided by a stem 160 instead of by a lever, as in the construction previously described, the valve nevertheless may have a bevelled lower surface against which the jets admitted by the orifices 220 may impinge to tend to force the valve wide open when its opening movement has been initiated.

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The valve has a seat at 150 in the partition 100 which divides the casing 70 into an upper chamber 110 and a lower chamber 120.

In lieu of the bellows-sealed displacement member of the device previously described, I provide in the present embodiment a pressure responsive device 250 which has a sliding fit upon the cylindrically finished wall 71 of casing 70, such wall terminating in stop shoulders 640. The spring 34 which urges displacement member 250 downwardly is the same as the spring used in the embodiment first described.

A cylinder casing 550 is connected with displacement member 250. Because the displacement member reciprocates rectilinearly there need be no pivotal connection between these parts and the casing 550 may be screwed in place. Within it operates a displacement member 580 with a displacement member rod 600 directly connected with the valve 140 as a projection of the stem 160 of such valve. Confined between the displacement member 580 and the lower end of cylinder casing 550 is a compression spring 62 which may correspond identically with the spring of corresponding number in the previously described embodiment. The slot 590 in the cylinder wall controls the functioning of the cylinder casing 550 as a dashpot in the manner already described.

The duct control valve organization is identical with that already described and the same reference characters are applied to the parts. However, since the use of a packed displacement member 250 presupposes that the liquid controlled by the apparatus will be relatively free of foreign matter, the outlet of duct 54 where it communicates with chamber 120 is protected, if at all, by a screen 530, the liquid displaced from above the displacement member 250 being delivered directly into chamber 120.

Under many circumstances it is undesirable for a valve of this kind to be discharging any liquid whatever through the discharge pipe 50 during that portion of the cycle when the valve is supposed to be closed. If chamber 120 were drained directly into the discharge pipe 50, as in the previously described construction, the omission of the bellows 53 would mean that the liquid displaced from above displacement member 250 during the closed interval of the valve would trickle directly down the discharge pipe 50. I may avoid this, if desired, by locating the discharge outlets 65 near the top of chamber 120 communicating with vertical ducts 66 leading to the chamber 510 which communicates with discharge pipe 50. The capacity of chamber 120 below the outlet ports 65 will enable it to receive all of the liquid displaced by the rising displacement member 250 without discharging any of such liquid through pipe 50.

However, as soon as the valve 140 opens, chamber 120 will become completely filled with liquid, due to the fact that the orifices 65 have an aggregate capacity such as to tend to equalize pressures in chambers 110 and 120 in accordance with the operation previously described. When chamber 120 is completely filled, liquid will be discharged therefrom not only through the orifices 65 but also through the U-shaped siphon tube 67 which has its inlet end 68 slightly above the bottom of chamber 120, and its outlet end communicating through duct 69 with the discharge chamber 510. After the valve 140 has re-seated the siphon 67 will continue to function in a conventional manner until chamber 120 is sub-

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stantially completely drained of liquid and the siphon is vented. Thereupon the chamber will be left practically empty to receive liquid displaced by the rising displacement member 250 through the regulating valve.

While the construction shown in Figure 1 has a bellows both in its upper and lower chambers, and the construction shown in Figure 4 has no bellows, it will be understood that the various features of the respective embodiments of the invention may be interchanged as desired. Either one or two bellows may be used in either construction or a peripherally packed displacement member may be used in either. In either embodiment the regulating structure may be modified in accordance with the previous disclosure, and in either construction the lower chamber may either be completely drained or may be controlled as to drainage by the high outlet and siphon arrangement shown in Figure 4. Various other modifications of the invention may be made within the scope of the appended claims.

It is important to the invention that the valve operate speedily to and from its closed position when its movement in either direction has been initiated. It is also important to the invention that during the portion of the cycle when the valve is supposed to be closed it shall remain completely closed. In the preferred construction of the device the valve is always either open or closed.

Regardless of whether the foregoing advantages are achieved or not, it is important to be able to regulate individually the two parts of the cycle in which the valve is in its relatively open position and in its relative closed position. In all embodiments shown in the drawings it is possible to regulate one portion of the cycle with respect to the other, and in the preferred embodiment of the regulating valve structure shown in Figures 1 and 4, it is possible to regulate each portion of the cycle entirely independently of the other so that adjustment of the length of time for which the valve is relatively open will not in any way affect the length of time for which the valve is relatively closed, and vice versa.

Valves made in accordance with this invention have a variety of uses in industry, including, by way of example, utility as a periodically operating flush valve.

I claim:

1. In a cycle valve structure, the combination with a valve casing providing a valve seat and having an inlet and outlet ports at opposite sides of the seat, the outlet port being of restricted capacity relative to the inlet, and a valve movable to and from the seat, of a displacement member having one side exposed continuously to pressure at the inlet side of the valve and an opposite side removed from such pressure, said member having sealing means between it and the casing, fluid-sealing its said sides from each other, means connecting said displacement member with the valve, a spring biasing said valve toward said seat, duct means leading from the opposite side of the displacement member and exposed to pressure at the outlet side of the valve, and a flow regulating device in said duct means comprising at least one check valve and a seat therefor, a stop limiting the opening of the check valve, means for adjusting the stop to regulate the extent of valve opening, and check-valve controlled shunt duct means leading about the check valve first mentioned for accommodating uni-directional flow past said first mentioned

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check valve in the direction in which said first check valve seats.

2. A self-contained automatic means for obtaining an adjustable intermittent discharge and stoppage of liquid from a pressure source, said means comprising a housing having an inlet and a relatively restricted outlet and a ported partition provided with a valve seat and dividing the housing into an inlet chamber into which the inlet opens and a discharge chamber from which the outlet opens, a valve having means guiding it for movement to and from the seat and provided with means biasing it toward its seat, a pressure responsive device having a motion transmitting connection with the valve and provided with opposing faces and with means fluid-sealing said faces from each other, one of which faces is exposed in the inlet chamber for utilizing pressures built up in the inlet chamber when the valve is on its seat to effect the opening of the valve, said housing including casing structure enclosing the other face of said device, and means to control the movement of the valve and including a duct system leading to the discharge chamber from the casing structure enclosing said other face of said pressure responsive device, and check valve means in the duct system for regulating fluid flow therethrough, said system including means for varying flow in one direction through said system independently of flow in the other direction therethrough.

3. The device of claim 2 in further combination with means including the motion transmitting connection aforesaid for effecting both the opening and the closing movements of the first mentioned valve with snap action, whereby each of said movements, once initiated, is completed abruptly.

4. The device of claim 2 in further combination with a yieldable sealing means enclosing at least one end of said duct whereby to accommodate communication of pressures through the duct without permitting foreign matter to pass therethrough.

5. The device of claim 2 in further combination with means normally biasing said first mentioned valve to said seat, the inlet chamber having an admission orifice opening in a valve lifting direction toward the position which the valve occupies as it starts to open, said valve having a beveled surface exposed to flow through said orifice as the valve opens, whereby to be accelerated in its opening movement by the impact of flow against such surface.

6. The device of claim 2 in which the connection between the pressure responsive device and the first mentioned valve comprises a cylinder connected with the pressure responsive device, a plunger reciprocable in the cylinder and having a direct physical connection with the said valve, and a spring interposed between the plunger and the cylinder to offer increasing bias as the pressure responsive device is displaced respecting the valve.

7. The device of claim 2 in which the connection between the pressure responsive device and the first mentioned valve comprises a cylinder connected with the pressure responsive device, a plunger reciprocable in the cylinder and having a direct physical connection with the said valve, and a spring interposed between the plunger and the cylinder to offer increasing bias as the pressure responsive device is displaced respecting the valve, the cylinder and plunger being respectively pivoted to the pressure responsive device

and valve to accommodate relative oscillation, the valve being provided with a lever mounting upon which said valve is pivoted for swinging movement to and from its seat.

8. The device of claim 2 in which the connection between the pressure responsive device and the first mentioned valve comprises a cylinder connected with the pressure responsive device, a plunger reciprocable in the cylinder and having a direct physical connection with the said valve, and a spring interposed between the plunger and the cylinder to offer increasing bias as the pressure responsive device is displaced respecting the valve, said plunger having a piston fit within said cylinder to provide dash pot action in the lost motion connection afforded through said cylinder spring and plunger between the pressure responsive device and said valve.

9. The device of claim 2 in which the terminus of said duct system is provided in the discharge chamber with an enclosure including a yieldably movable wall and packing sealing said wall about the end of the duct, whereby the duct is capable of transmitting pressures without access of foreign matter.

10. The device of claim 2 in which the capacity of the discharge chamber is sufficient to accommodate all liquid displaced through said duct upon movement of said pressure responsive device, the outlet chamber having outlet ports located materially above the bottom of the chamber, and a siphon duct leading therefrom and arranged to function only upon the opening of the valve for the subsequent draining of the chamber to provide the aforesaid capacity.

11. The device of claim 2 in which the duct comprises branches in shunt, said branches having oppositely arranged valve seats, check valves upon said seats arranged for opening in response to opposite directions of flow through the duct, and means for individually regulating the operation of the respective valves, said means being exposed for external adjustment.

12. A self-contained automatically opening and closing valve structure comprising in combination a valve casing having an inlet port and a relatively restricted discharge port and an intermediate partition provided with a valve seat, said casing having a supply pressure chamber at the inlet side of the partition and a control chamber at the discharge side thereof, a valve movable to and from the seat, a first displacement member having a valve guiding dashpot, said valve having a stem extending into said dashpot and provided with a piston therein, a spring acting on the piston in a valve opening direction, a spring acting on said displacement member in a valve closing direction, a bellows providing a seal for said displacement member and connected between said displacement member and said casing, the outer face of said bellows and said displacement member being exposed to the pressure of the fluid entering the casing through the inlet port, a second displacement member in said control chamber and having a sealing bellows connecting it with said casing and conduit means providing fluid communication between the first and second mentioned bellows and an operating fluid in said conduit means and filling said bellows and sealed by said bellows from communication with

fluid traversing said casing between the inlet and discharge ports thereof, said conduit comprising means for regulating fluid flow in at least one direction, whereby to pre-determine the rate of valve movement in one direction.

13. An automatically opening and closing valve structure comprising the combination with a casing having a transverse partition provided with a valve seat, said casing having lateral inlet port means immediately adjacent the partition, a valve movable to and from said seat and having a conically bevelled seating face exposed to fluid admitted through said port means, a stem connected with the valve, a sleeve reciprocable in the direction of valve opening and closing movement and closed at its end remote from the valve to provide a dashpot in which said stem is reciprocable to provide lost motion between said sleeve and valve, a spring encircling the stem and disposed within the sleeve and seated between the stem and sleeve to exert pressure upon said valve in a valve opening direction, a second spring acting upon said sleeve in a valve closing direction, a displacement member connected with the sleeve and provided with a seal, said displacement member having one of its faces exposed to the pressure of fluid supplied through said port means and having another face isolated from such pressure by said seal, said casing having a control chamber beyond said partition in the direction of fluid flow past said valve seat and said casing having a relatively restricted outlet from said control chamber, together with duct means for communicating pressure from said control chamber to the last mentioned face of said displacement member, fluid pressure on the first mentioned face of the displacement member being adapted to open the valve and the action of fluid flow on the conically bevelled face of the valve being adapted to effect a relatively abrupt completion of valve opening movement, pressures in the control chamber due to the relatively restricted outlet aforesaid being communicated through said duct means to supplement said second spring to effect a closing of said valve until pressures in said control chamber are again relieved through said restricted outlet, said duct means comprising means for regulating fluid flow in at least one direction, whereby to pre-determine the rate of valve movement in one direction.

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REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
849,105	Brooks -----	Apr. 2, 1907
873,766	Matson -----	Dec. 17, 1907
928,459	Kieselhorst -----	July 20, 1909
1,218,567	Kellan -----	Mar. 6, 1917
1,556,332	Gorman -----	Oct. 6, 1925
1,651,778	Rice -----	Dec. 6, 1927
1,796,941	Pottenger -----	Mar. 17, 1931
2,271,497	Newell -----	Jan. 27, 1942
2,361,773	Knapp -----	Oct. 31, 1944
2,366,144	Griswold -----	Dec. 26, 1944