April 21, 1942. F. O. GRAHAM 2,280,309

VALVE DEVICE

Filed Nov. 2, 1940 2 Sheets-Sheet 1

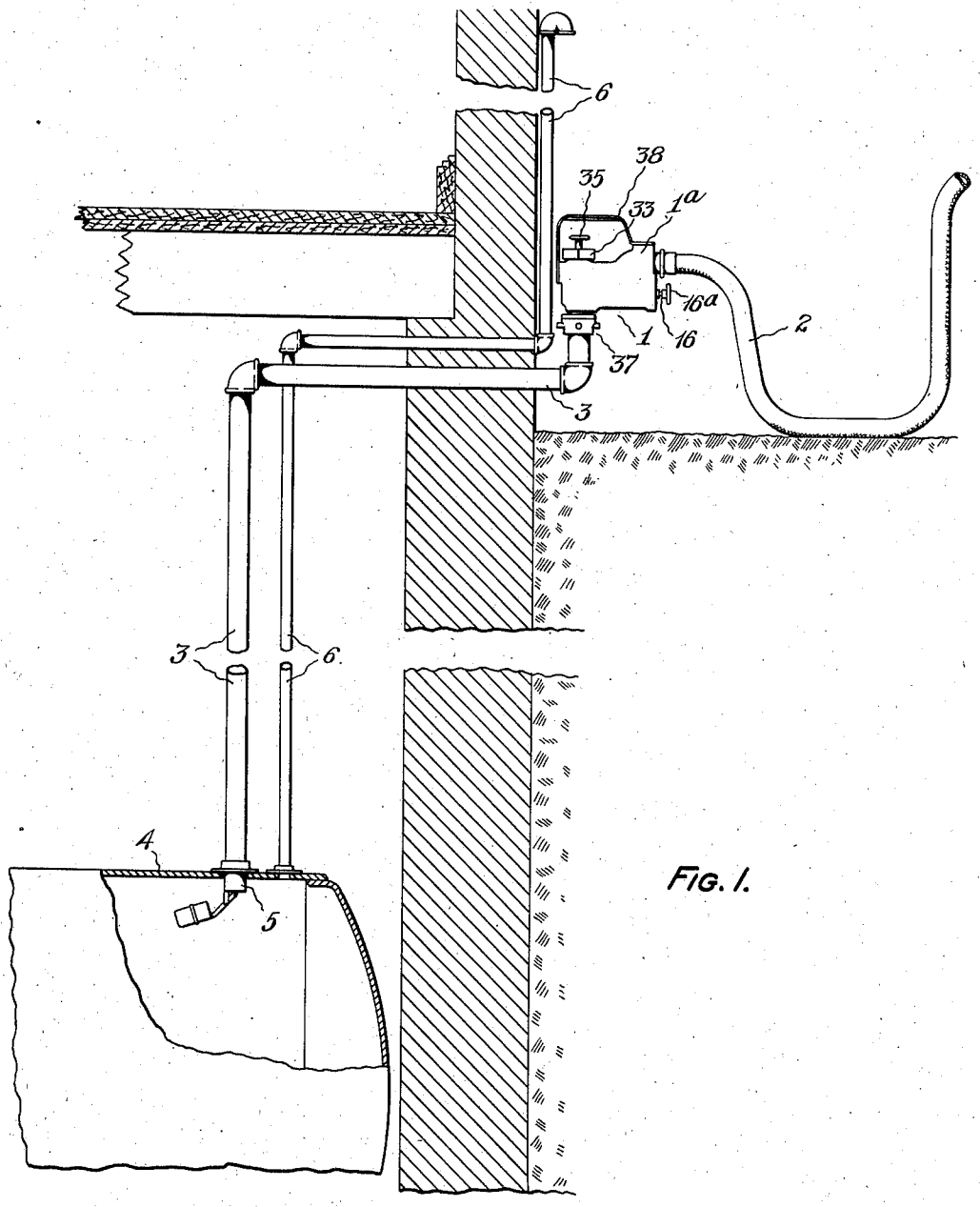


FIG. 1.

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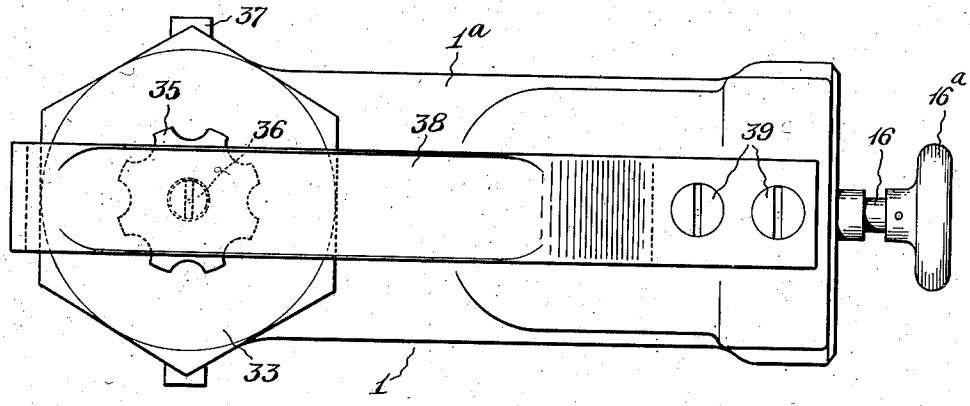


FIG. 3.

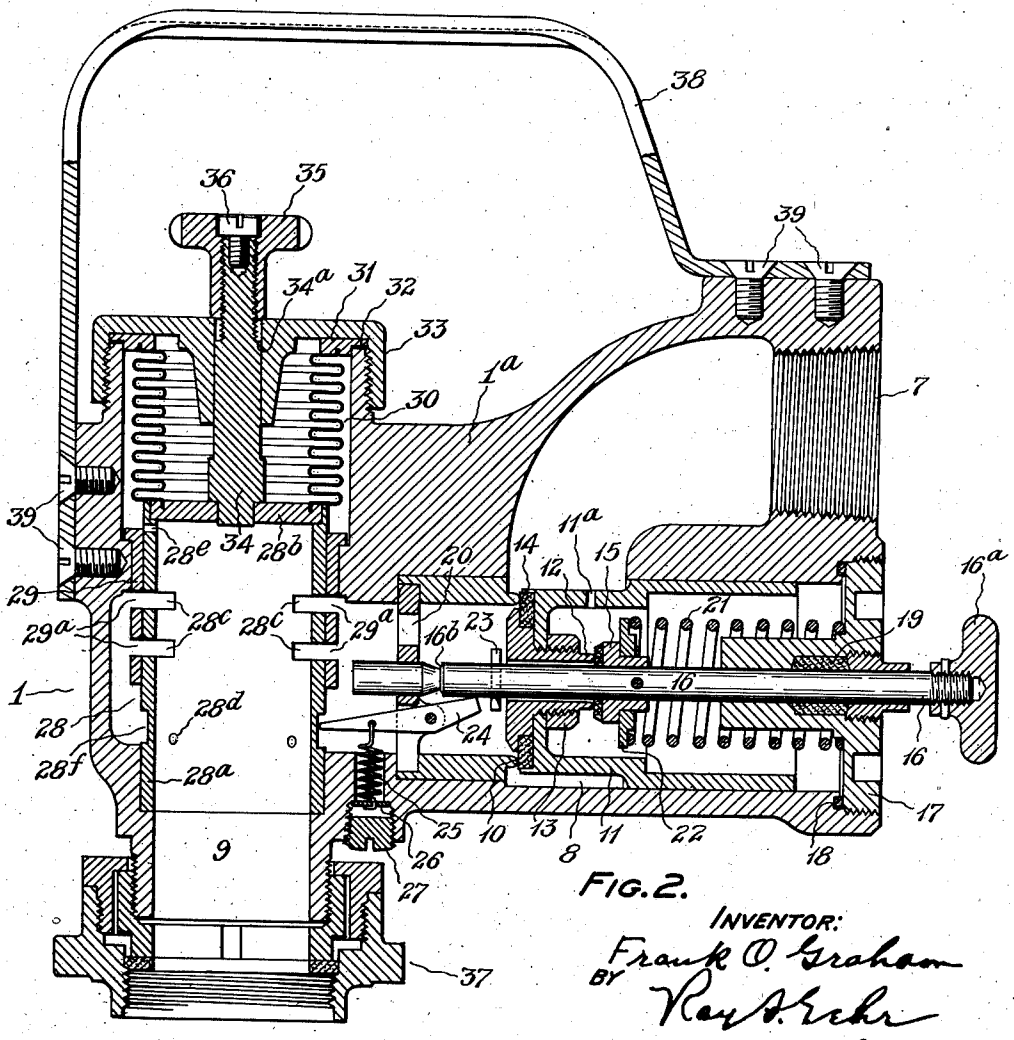


FIG. 2.

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UNITED STATES PATENT OFFICE

2,280,309

VALVE DEVICE

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Application November 2, 1940, Serial No. 364,064

10 Claims. (Cl. 277—42)

This invention relates to valve devices for controlling the flow of fluids and particularly to such valve devices which are adapted to be opened manually and to close automatically under the influence of the fluid pressure in the discharge passage of the device.

The invention has for one of its objects the provision of a valve device in which the control of the fluid flow is effected by a main valve and an auxiliary valve which variably throttles the fluid flow when the main valve is open so as automatically to limit the maximum discharge pressure of the device.

Another object of the invention is to provide means whereby movement of the throttling valve serves automatically to initiate the closing movement of the main valve.

A further object of the invention is to provide a valve device of the character in question in which the maximum fluid flow capacity of the device is subject to variation by manual adjusting means.

Another object of the invention is to provide a valve device of the character in question in which the automatic closing of the main valve is subject to the intervention of manual means by which the main valve can be made to close at any time to stop the fluid flow.

Another object of the invention is to provide a valve of the character in question in which the design, both of the individual parts and of the entire assembly, is such as to facilitate manufacture and insure reliable operation of the device.

Still other objects of the invention more or less incidental or ancillary to those above noted will be apparent from the further explanation of the invention which follows.

The invention, with the various objects in view, consists in certain features of construction and combinations of parts hereinafter set forth in connection with the accompanying drawings of a preferred embodiment of the invention, it being understood that the invention can be embodied in a variety of specific forms of construction.

In the drawings,

Fig. 1 is a side elevation showing apparatus including my improved valve as used for the delivery of fuel oil to a storage tank, the valve device being permanently attached to a flexible hose line adapted to be associated with a delivery truck and being detachably connected to the inlet conduit of the storage tank.

Fig. 2 is a central vertical sectional view of the valve device.

Fig. 3 is a plan view of the device.

Referring in detail to the construction illustrated, 1 designates the improved valve device in its entirety, 2 indicates a section of the flexible hose line which is connected at one end to the inlet of the valve device 1 and which is adapted to be connected with the outlet of a tank of a delivery truck such as is used in delivering fuel oil to the premises of the consumer. 3 is an inlet pipe of a storage tank 4 which may be in the basement of a building or buried in the ground. The pipe 3 is fitted at its discharge end with a float-controlled valve 5 which operates to stop the flow through pipe 3 when the liquid level in the tank rises to a predetermined maximum. The tank 4 is fitted with a vent pipe 6 through which air and vapor in the tank can escape during the filling of the tank.

Considering the valve device 1 as shown in Figs. 2 and 3, the casing 1a of the device has an inlet opening 7 to which the hose pipe 2 is shown connected in Fig. 1. This inlet 7 communicates with a straight section 8 of the fluid passage through the casing and said section 8 in turn intersects and communicates with a straight section 9 of said passage.

An annular valve seat member 10 is pressed into passage section 8 and a cup shaped valve member 11 is slidably mounted in the bore of passage section 8 to cooperate with the seat 10. The valve member 11 has its face apertured to receive a tubular valve seat member 12 which is secured to valve 11 by means of nut 13 and serves also to secure to the face of the valve a suitable packing 14. A pilot valve 15 is arranged to cooperate with the seat 12, said pilot valve being fast on a rod or spindle 16 which extends through the valve seat 12 and is slidably supported at its outer end in a closure 17 which is threaded into the end of passage section 8 and, in connection with a gasket 18, tightly closes the outer end of said passage section 8. The closure 17 is fitted with a packing gland 19 which surrounds the spindle 16 and prevents leakage of liquid along said spindle. The inner end of the spindle 16 is guided in a spider 20 which is clamped between a shoulder of the casing 1a and the valve seat member 10. Pilot valve 15 is yieldingly pressed against its seat 12 by a coil spring 21 which at one end abuts against the closure 17 and at its other end engages a ring 22 on the valve 15. Adjacent the face of the valve 11 the spindle 16 is fitted with a transverse pin

23 which is adapted to engage the face of valve 11 and move it in an opening direction when the spindle 16 is pulled out, said spindle being fitted with a knob 16a for that purpose. The side wall of valve 11 has an aperture 11a for a purpose which will later appear.

When the valve 11 is opened manually by pulling out the spindle 16 it is held in open position by the automatically-operating latch 24 which is in the form of a lever pivotally supported on the guide spider 20 in position to engage a circumferential shoulder 16b of the spindle 16. One end of the latch lever 24 is yieldingly pressed against the spindle 16 by means of the tension spring 25 which has one of its ends attached to latch lever 24 and its other end secured to an anchor disk 26 disposed in a passage formed through the wall of casing 1a, this passage being sealed by a threaded plug 27. With this arrangement the latch 24 is automatically snapped into engagement with the said shoulder 16b when the spindle 16 is moved outward.

In the section 9 of the valve passageway is arranged a sleeve valve which is designated as an entirety by the numeral 28 and which comprises a tubular member 28a and a disk 28b which closes the upper end of member 28a. The upper part of valve 28 slidably engages a sleeve 29 which is pressed into the bore of section 9 of the passageway while the lower part of valve 28 slidably engages the wall of the casing 1a directly. Slot-like apertures 28c are formed in the side wall of valve 28 to cooperate with similar apertures 29a in the sleeve 29. In its normal position as shown in Fig. 2 the slots 28a and 29a are in full registration with each other to afford a comparatively free passage for fluid from the section 8 of the passageway to section 9 thereof. The valve 28 also has one or more restricted drain openings 28d which are open at all times.

A tubular metallic bellows member 30 is hermetically joined at its lower end to the upper end of valve 28 and is similarly connected at its upper end to a ring 31 which engages a top aperture of the casing 1a with an intervening gasket 32 against which it is clamped by a screw cap 33. The valve 28 is fitted with an upwardly-extending spindle 34 which slidably engages a central aperture in the cap 33 and has its upper end threaded to receive a knob 35 which can be adjusted upward or downward on the spindle 34 and which is operatively secured to the spindle by means of a cap screw 36. The lower end of the knob member 35 engages the top of the cap 33 so that when the knob is turned in a clockwise direction valve 28 is drawn upward in casing 1a against the spring tension of the bellows 30. When the knob 35 is turned in a counter-clockwise direction, the resilient bellows 30 forces valve 28 downward as far as the engagement of the lower end of the knob 35 with the cap 33 will permit. In the lowermost position of valve 28, with its slot-like apertures 28c fully open as shown in Fig. 2, the top of cap screw 36 is flush with the top of knob 35 and when, by clockwise adjustment of knob 35, the valve 28 is adjusted upward the amount of the latter adjustment is indicated by the distance the cap screw 36 extends above the top of knob 35. Such upward adjustment of valve 28 is limited by the engagement of a shoulder 34a on spindle 34 with the lower end of knob 35. To avoid hydraulic resistance to the movement of valve 28, the side wall thereof is formed with an aperture 28e to afford communication between the interior of the valve and the space surrounding the bellows 30.

It will be seen that the valve 28 can be adjusted manually upward and downward by means of knob 35 to vary the effective capacity of the passageway through the valve device. In addition, valve 28 is subjected to the unbalanced upward pressure of fluid in the section 9 of the passage through the casing and if this pressure becomes strong enough to overcome the spring tension of the bellows 30 valve 28 is thereby moved or adjusted upward by the fluid pressure.

To effect the automatic closure of the main valve 11 the throttle valve 28 has its side wall formed with a circumferential groove 28f disposed so that the lower side of the groove will engage the adjacent end of latch 24 when valve 28 moves upward and thus disengage the latch 24 from shoulder 16b of the spindle 16. When this occurs the pressure of spring 21 moves pilot valve 15 against its seat carried by valve 11 and thus forces the latter valve toward its seat, a steady movement of the valve 11 in the closing direction being permitted by the flow of liquid from inlet passage 7 through restricted aperture 11a of the valve into the chamber formed between the valve and the casing closure 17.

The discharge end of passage section 9 is screw threaded to receive a pipe coupling assembly which is designated as an entirety by 37 and need not be described as it is of conventional construction.

The valve device is fitted with a handle 38 in the form of a metallic strap which is secured at its two ends to the casing 1a by means of screws 39, 39.

In the use of my improved valve device in connection with the discharge of fuel oil from a delivery truck into a storage tank, the procedure is as follows. The valve device being attached to the flexible hose pipe 2 of the truck, when the latter moves into position adjacent the delivery tank the valve device is readily attached to the inlet pipe 3 by means of the threaded coupling 37. This connection having been made, the operator opens the valve 11 by pulling outward the spindle 16. The first part of this movement opens the relief valve 15 so that liquid on the interior of valve 11 can flow freely past the relief valve seat 12 and the continued outward movement of spindle 16 causes the pin 23 to engage the face of the valve 11 and move the valve to its fully open position against the tension of spring 21. When the valve 11 reaches its fully open position, latch 24 automatically engages the shoulder 16b on the spindle 16 and holds the valve open.

The liquid is then free to flow from the tank on the delivery truck through the hose pipe 2, valve 1 and inlet pipe 3 into the storage tank 4, the float valve 5 of the tank being open. As the level of the liquid rises in tank 4 air and any vapor present in the tank escape through the vent pipe 6. If this vent pipe is of ample capacity and unobstructed, practically no pressure will be built up in the storage tank 4 and the throttle valve 28 of the valve device 1 will be held in its open position by the spring tension of bellows 30. In the event of accidental obstruction of vent pipe 6 more or less pressure will build up in the storage tank 4 as oil enters it and there will be a resultant back pressure in the discharge passage 9 of the valve device. If this back pressure exceeds the moderate spring

tension of the bellows 30 the valve 28 will move upward against that spring tension and thus throttle the flow of liquid to a point where the discharge of liquid into the tank 4 corresponds to the rate of flow of air through the relief pipe 6. Consequently it is impossible for any dangerous pressures to be built up in the storage tank 4 as a result of obstruction of the vent pipe.

When the liquid in the tank 4 rises to the level of the float of valve 5 the float is lifted to gradually close valve 5 and correspondingly throttle the liquid flow. This results in the formation of back pressure in pipe 3 and the discharge section 9 of valve 1. This in turn causes an upward, closing movement of valve 28 and when the valve has moved a little past the position in which its slots 28c are closed it actuates the latch 24 to disengage the latter from the shoulder 16b and permit the closure of the main valve 11. Upon disengagement of the latch, spring 21 first forces the relief valve 15 against its seat 12 and then forces the main valve 11 toward its seat 10. The closing movement of the valve 11 is effected without shock because the inflow of liquid to the interior of the valve is restricted by the small size of the aperture 11a.

As soon as the main valve 11 has closed, coupling 37 may be loosened to permit ingress of air and the draining of liquid in the outlet passage 9 of valve 1 and inlet pipe 3 past the incompletely closed valve 5 and into storage tank 4. With the reduction of pressure in the discharge passage 9 of valve 1, when main valve 11 closes, the valve 28 is moved to its open position and liquid on the discharge side of valve 11 is adequately drained through slots 28c and apertures 28d and 28e of valve 28.

If at any time during the discharge of liquid through the valve device it is desired to stop the flow of liquid, this can be accomplished by the attendant by simply pulling upward on the knob 35 to disengage the latch 24 of main valve 11.

Also, to meet various operating conditions, the attendant can readily vary the maximum flow capacity of the valve device by rotation of the knob 35 in one direction or the other to increase or decrease the rate of flow through the valve passages 28c and 29a.

By arranging the inlet section 8 and the outlet section 9 of the valve passage at an angle to each other, a casing structure is formed which both facilitates the assembly of the main and throttle valves and makes possible the use of structural parts of a relatively simple and rugged character adapted to operate reliably in the use of the device.

While the construction of the valve device which I have shown and described is such as I now prefer, it is to be understood that the apparatus can be modified in various ways without departing from the invention as defined in the appended claims.

What I claim is:

1. In a valve device, the combination of a casing having a passage therethrough for the flow of fluid, a valve seat in the said passage, a valve associated with the seat and movable toward and from said seat to control the flow of fluid through the passage, a spring for pressing the valve against the seat, manual means for opening the valve against the pressure of said spring, a latch device operating automatically to hold the valve in open position, means actuated by fluid pressure in the discharge part of the casing passage for disengaging the latch, and means for manually moving the fluid-pressure-actuated means to effect disengagement of the latch device.

2. In a valve device, the combination of a casing having a passage therethrough for the flow of fluid, a valve seat in the said passage, a main valve associated with the seat and movable toward and from said seat to control the flow of fluid through the passage, a spring for pressing the valve against the seat, manual means for opening the valve against the pressure of said spring, a latch device operating automatically to hold the valve in open position, a spring-biased valve operatively arranged in the casing on the outlet side of the main valve to throttle flow of fluid through the casing passage, said spring-biased valve being normally open and operable by the fluid discharge pressure of the device to move toward closed position against the pressure of its spring as said discharge pressure rises, and an operative connection between the latch and the spring-biased valve whereby movement of said valve in the closing direction disengages the latch device.

3. A valve device as claimed in claim 2 in which the operative connection between the latch and the said spring-biased valve acts to disengage the latch after the spring-biased valve has moved past its closed position.

4. In a valve device, the combination of a casing having a passage therethrough for the flow of fluid, a valve seat in the said passage, a main valve associated with the seat and movable toward and from said seat to control the flow of fluid through the passage, a spring for pressing the valve against the seat, manual means for opening the valve against the pressure of said spring, a latch device operating automatically to hold the valve in open position, a spring-biased valve operatively arranged in the casing on the outlet side of the main valve to throttle flow of fluid through the casing passage, said spring-biased valve being normally open and operable by the fluid discharge pressure of the device to move toward closed position against the pressure of its spring as said discharge pressure rises, an operative connection between the latch and the said spring-biased valve whereby movement of said valve in the closing direction disengages the latch device, and means operable manually to move the spring-biased valve in its closing direction to effect disengagement of the latch device.

5. In a valve device, the combination of a casing having a passage therethrough for the flow of fluid, a valve seat for said passage between the inlet and outlet thereof, a valve associated with the said seat to control flow of fluid therethrough, manual means for opening said valve, means for holding the valve in an open position, means in the passage on the outlet side of the said valve operable by the fluid pressure in the discharge part of the said passage to throttle the flow through the passage as the said pressure rises, and means for releasing the valve-holding means when the said pressure has increased to a predetermined value.

6. In a valve device, the combination of a casing having a passage therethrough for the flow of fluid, a valve seat for said passage between the inlet and outlet thereof, a valve associated with the said seat and adapted to control flow therethrough, manual means for opening said valve, means for holding the valve in an open position, means in the passage on the outlet side

of the said valve operable by the fluid pressure in the discharge part of the said passage to throttle the flow through the passage as the said pressure rises, and means for releasing the valve-holding means when the throttling means has reduced the effective capacity of the passage to a predetermined point.

7. A valve device as claimed in claim 6 in which the means for throttling the flow of fluid is adjustable to vary the maximum cross sectional capacity of the fluid passageway of the device.

8. In a valve device, the combination of a casing having a passage therethrough for the flow of fluid, a valve seat for said passage between the inlet and outlet ends thereof, a main valve associated with the seat and arranged to close with the flow of fluid through the passage, said valve being constructed and arranged to form in conjunction with the casing a pressure chamber on the inlet side of the valve having a restricted communication with the inlet portion of the said passage and the said valve having a passage therethrough, a pilot valve controlling the passage through the main valve, manually operable means for opening the said pilot valve to effect communication between the pressure chamber and the outlet portion of the main passage of the device and thereafter moving the main valve to open position, a latch operating automatically to hold the main valve in open position, and means actuated by fluid pressure on the outlet side of the main valve for disengaging the latch.

9. In a valve device, the combination of a casing having a passage therethrough for the flow of fluid, a valve seat for said passage between the inlet outlet ends thereof, a main valve associated with the seat and arranged to close with the flow of fluid through the passage, said valve being constructed and arranged to form in conjunction with the casing a pressure chamber on the inlet side of the valve having a restricted communication with the inlet portion of the said passage and the said valve having a passage therethrough, a pilot valve controlling the passage through the main valve, spring means for pressing the pilot and main valves against their seats, manual means for successively moving the pilot and main valves off their seats, latch means operating automatically to hold the main valve in open position, and means operable by fluid discharge pressure of the valve device for disengaging the said latch means.

10. In a valve device, the combination of a casing having a passage therethrough for the flow of fluid and comprising two mutually intersecting sections, a valve seat in one of said passage sections, a main valve in said section cooperating with said seat and biased for movement against the seat to stop flow of fluid therethrough, manual means for opening the valve, a latch device operating automatically to hold the valve in open position, a spring-biased throttling valve disposed in the other said section of the casing passage, the latter valve being normally open and movable by the fluid pressure in the discharge part of the casing passage to move it in a closing direction, and an operative connection between the last named valve and the said latch whereby the latch is disengaged by the closing movement of the valve.

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