

May 30, 1939.

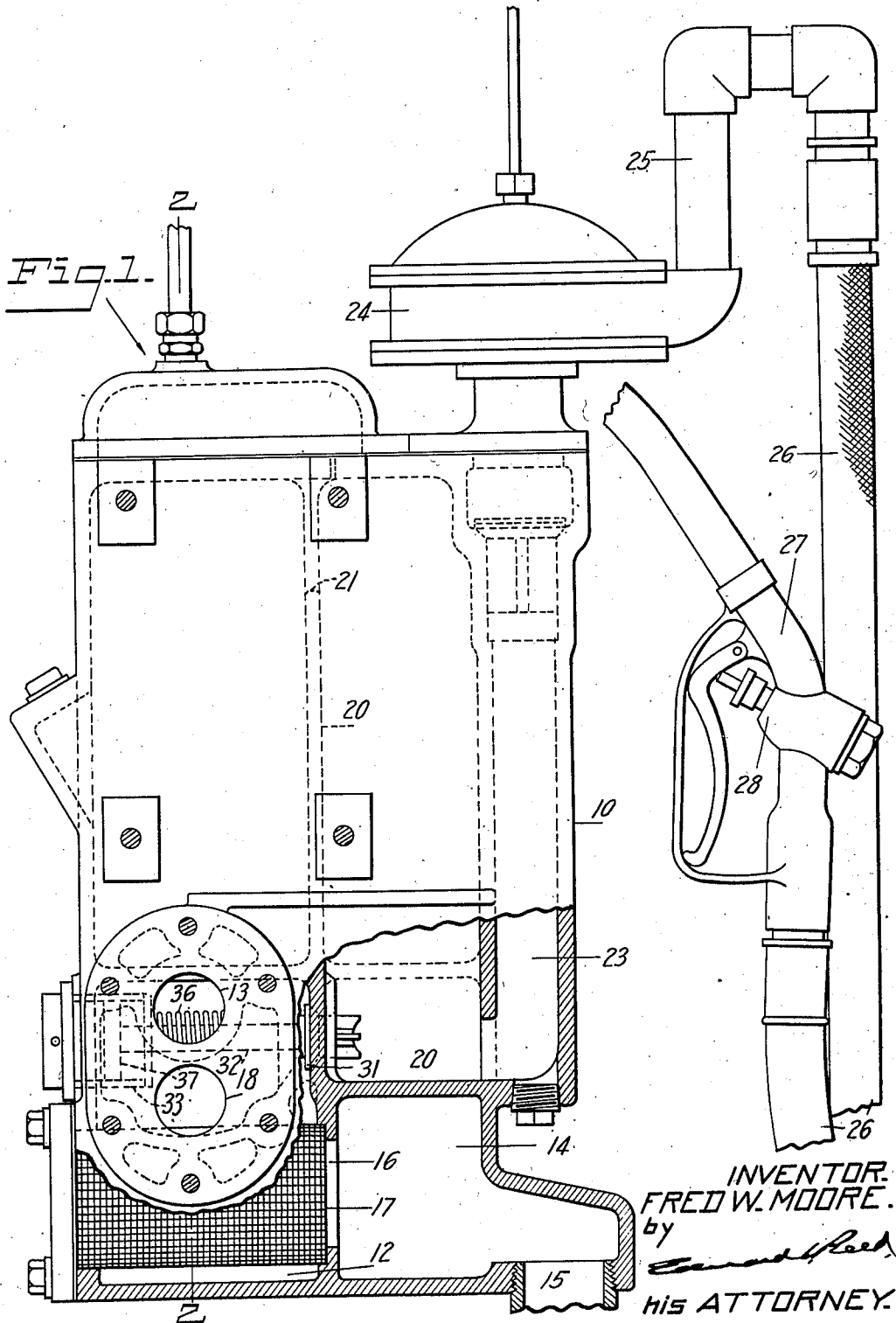
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2,160,028

BYPASS VALVE

Filed Nov. 8, 1937

2 Sheets-Sheet 1



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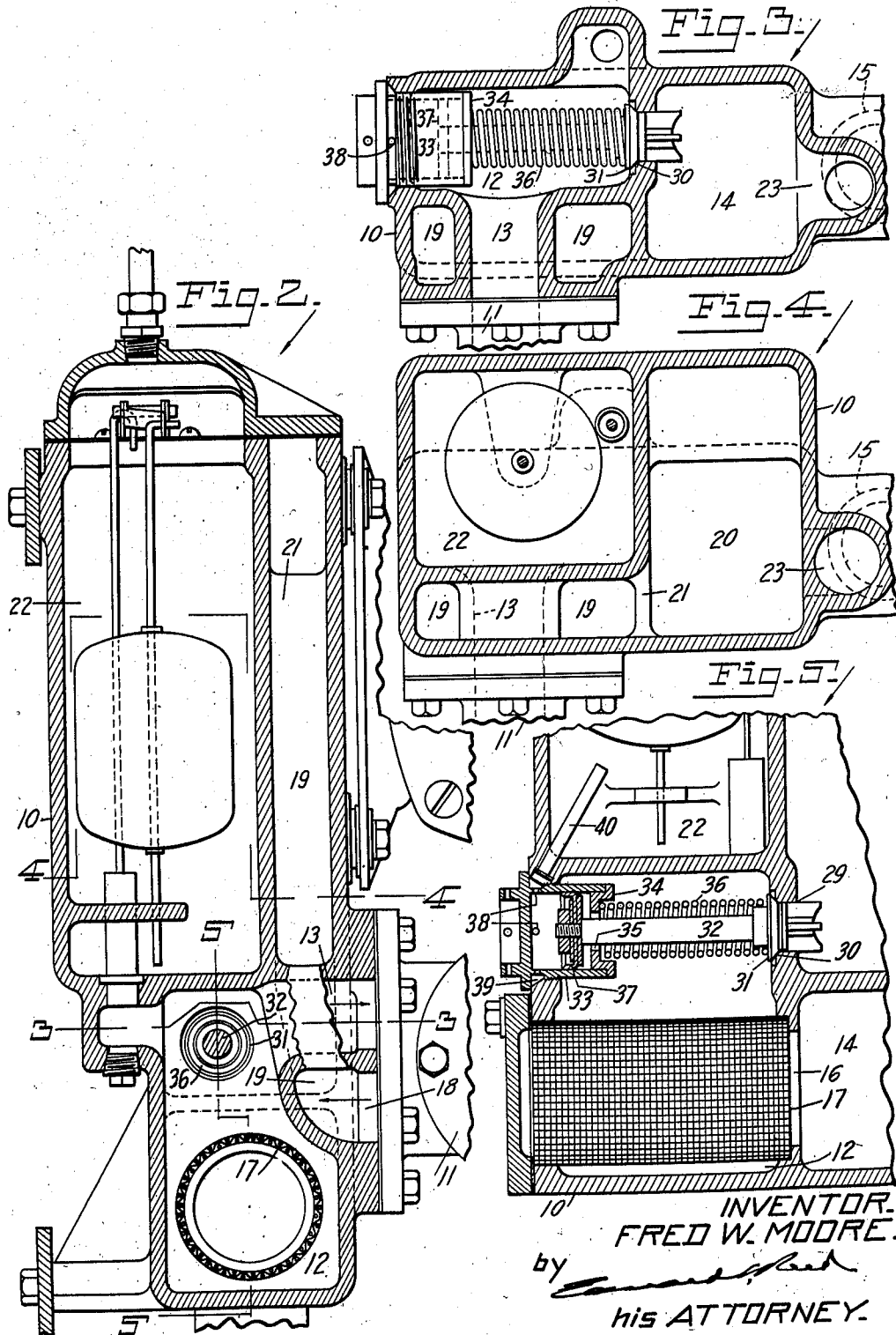
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UNITED STATES PATENT OFFICE

2,160,028

BYPASS VALVE

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4 Claims. (Cl. 103—42)

This invention relates to pressure operated valves and more particularly to a by-pass valve designed for use in a liquid dispensing apparatus, such as a gasoline dispenser.

5 In a gasoline dispensing apparatus of the wet hose type the flow of liquid through the discharge line is controlled by a valve in the delivery nozzle and the pump will usually be in operation before the delivery begins and will continue to operate after the delivery has been completed. To prevent the stalling and probable burning out of the motor when the pump is operated while the flow of liquid through the discharge line is cut off it is customary to provide the pump with a by-pass valve which will open under excessive pressure in the discharge line and permit the liquid to flow back to the supply or suction line which leads to the intake of the pump, thus causing the liquid to circulate from the pump outlet to the pump inlet. Such a by-pass valve is ordinarily controlled by a spring which should be of such strength that it will hold the valve closed during the flow of liquid through the discharge line but will permit the valve to open when that flow is interrupted while the pump is in operation. A spring of sufficient strength to hold the valve firmly seated against normal flow pressure offers such resistance to the opening of the valve as to impose a heavy overload on the motor when the flow is interrupted or when the pump is started with the nozzle valve closed. If the spring tension is adjusted to avoid this overload it will not always hold the valve firmly to its seat and there will be more or less leakage about the valve during the flow of liquid through the discharge line, which will reduce the output of the apparatus. Further, the suction in the supply line tends to unseat the valve and the spring must overcome this suction as well as the normal pressure in the discharge line. The amount of suction in the supply line depends in part at least upon the lift of the pump and as the lift is not the same in all installations it is not possible to so adjust the spring at the factory that the valve will operate satisfactorily under any and all conditions of installation, and the adjustment must be made after installation. The operator has no means of determining with accuracy whether the spring tension is too great or too little and it is seldom that he can affect an accurate adjustment of the spring, so that there is usually either a leakage about the by-pass valve or an excessive resistance to the opening of that valve.

One object of the invention is to provide means for so controlling the movement of a pressure op-

erated valve that the resistance offered to the opening movement thereof during the normal flow of liquid will be different from the resistance offered to that movement when the flow of liquid has been interrupted.

A further object of the invention is to provide means for utilizing the suction on the intake side of a pump to modify the resistance offered to the opening movement of a pressure operated valve by the spring which opposes said opening movement.

A further object of the invention is to provide means for automatically reducing the resistance offered to the opening movement of a by-pass valve when the flow of liquid is interrupted.

A further object of the invention is to provide a by-pass valve with a relatively light spring for closing the same and with suction controlled means for supplementing the action of that spring during the normal flow of the liquid.

A further object of the invention is to provide a simple efficient device for utilizing the suction on the intake side of a pump to resist the opening movement of a by-pass valve.

Other objects of the invention may appear as the apparatus is described in detail.

In the accompanying drawings Fig. 1 is a side elevation, partly in section, of a liquid discharge unit of a liquid dispensing apparatus, showing my invention applied thereto; Fig. 2 is a section taken on the line 2—2 of Fig. 1; Fig. 3 is a transverse section taken on the line 3—3 of Fig. 2; Fig. 4 is a transverse section taken on the line 4—4 of Fig. 2; and Fig. 5 is a vertical section taken on the line 5—5 of Fig. 2, showing the by-pass valve in detail.

The invention may be applied to pressure operated valves in liquid dispensing apparatus of various kinds and is here shown as applied to the by-pass valve of a gasoline dispensing apparatus. This particular apparatus is provided with an air eliminator and has a somewhat tortuous discharge line leading from the pump to the delivery hose. It will be understood, of course, that this particular embodiment is shown for the purpose of illustration only and that the invention may be applied to an apparatus in which the discharge line leads directly from the pump to the hose.

The apparatus here illustrated comprises a combined pump and air eliminator unit adapted to be mounted within the cabinet of a gasoline dispensing apparatus. This unit includes an upright structure 10 in the upper portion of which the air eliminator is provided and on one side of which the pump is mounted. The pump may

be of any suitable character but it is preferably of the rotary type and inasmuch as the pump per se forms no part of the invention a portion only of the same is shown at 11. The structure 10 is provided in its lower portion with a chamber 12 which forms a part of the supply or suction conduit for the pump and has a port 13 communicating with the pump intake. The suction chamber 12 has a lateral extension 14 which is connected by a pipe 15 with a source of liquid supply, such as the usual underground tank, not here shown. The extension 14 communicates through an opening 16 with the interior of a cylindrical screen 17 in the main suction chamber 12 from which the liquid flows upwardly through the port 13 to the pump.

The pump outlet is connected with a port 18 which leads to a passageway 19 extending upwardly therefrom about the port 13 which is in the form of a tubular extension from the suction chamber 12. This passageway 19 communicates at its upper end with a downwardly extending passageway 20 which is separated from the passageway 19 by a partition 21 over the upper end of which the liquid flows from one passageway to the other. As the liquid flows over the upper edge of partition and downwardly through the passageway 20 the air and vapors are separated therefrom and enter the air eliminator chamber 22 and inasmuch as this air eliminator forms no part of the present invention it need not be described. The passageway 20 is connected at its lower end with an upwardly extending passageway 23 which leads beyond the upper end of the structure 10 to a meter 24 which is connected by a pipe 25 with a flexible hose 26 having at its end a delivery nozzle 27 which is provided with a valve 28 to control the flow of liquid through the nozzle. Thus it will be noted that the discharge conduit for the pump includes the port 18 passageways 19, 20 and 23, meter 24, hose 26 and the valved nozzle 27 and when the valve in the nozzle is closed the flow of liquid through this discharge conduit is interrupted.

A by-pass valve for permitting the return of liquid from the discharge conduit to the suction conduit is interposed between the suction conduit and the lower part of the passageway 20. As here shown the passageway 20 is connected with the suction chamber 12 by a port 29 having at that end thereof adjacent the suction chamber a valve seat 30. Slidably mounted in this port is a valve 31 the head of which is adapted to engage the seat 30 to prevent the flow of liquid through the port. This valve may be held to its seat by any suitable means which will yield under excessive pressure in the discharge conduit and permit the valve to open. In the present instance the valve is provided with a stem 32 which extends across the suction chamber into a cylinder 33 in which it is slidably supported. This cylinder is provided at its inner end with an annular member 34 having an opening 35 through which the stem extends and which constitutes an abutment between which and the head of the valve 31 is confined a coiled spring 36 which moves the valve to its closed position and resists its opening movement. Mounted in the cylinder 33 is a piston 37 to which the valve stem 32 is secured. The opening in the abutment 34 is somewhat larger than the valve stem 32 so that the inner face of the piston is subjected to the suction in the suction chamber. Inasmuch as the valve 31 is also subjected to that suction the piston is provided with an exposed area somewhat larger than the

exposed area of the valve so that the piston will overcome the action of the suction on the valve and press the valve toward its seat thus supplementing the action of the spring 36 in resisting the pressure of the liquid in the discharge conduit and enabling a relatively light spring to be utilized for seating the valve. The cylinder 33 may be mounted in any suitable location in the suction chamber but, as here shown, is mounted in the outer wall of that chamber in direct alignment with the valve so that the latter may be connected with the piston by a straight stem without the interposition of other mechanism. The cylinder may be vented on the outer side of the piston in any suitable manner to avoid resistance to the movement of the piston. In the present instance a series of ports 38 connect the cylinder with a circumferential conduit 39 which in turn communicates with a breather tube 40 extending into the lower portion of the air eliminator chamber 22.

When the pump is idle and there is no suction in the suction conduit the valve is held to its seat by the action of the spring 36 the tension of which is sufficient to prevent the opening of the valve under the weight of the liquid in the discharge conduit, it being understood that in an apparatus of this kind the discharge conduit is full of liquid during the intervals between delivery operations. When the motor is started the initial operation of the pump will immediately create an excess of pressure in the discharge conduit which will act on the valve 31, and inasmuch as there is at this time no suction in the suction chamber this pressure has to overcome only the action of the relatively weak spring and the valve will therefore open quickly without subjecting the motor to any substantial overload. When the nozzle valve is opened and the liquid flows through the discharge conduit suction will be created in the suction conduit and will act on the piston 37 to supplement the action of the spring and move the valve to its closed position and hold the same tightly closed against the pressure in the discharge line caused by the normal flow of liquid through the latter, thereby providing ample pressure on the valve during the delivery operation to prevent leakage of liquid about the valve. When the nozzle valve is closed and the flow of liquid through the discharge conduit is interrupted the suction in the suction conduit will be immediately interrupted so that the opening of the valve, under the excess pressure which immediately builds up in the discharge conduit, will be resisted only by the action of the spring.

By thus utilizing the suction in the suction line to supplement the action of the spring on the valve and thereby providing greater resistance to the opening movement of the valve during delivery operations than is provided during the intervals between delivery operations, I am able not only to prevent leakage about the valve and at the same time to permit the valve to open under a relatively small excess of pressure in the discharge conduit, but I am also able to install and adjust the valve at the factory so that it will operate satisfactorily under any conditions in which it may be installed. This is due to the fact that a light spring may be used which will be of sufficient strength to seat the valve and hold the same closed when the pump is idle, or is creating little or no suction in the suction chamber, the strength required for this purpose being the same in all installations regardless of the lift of the pump. The area of the piston exceeds

the exposed area of the valve sufficiently to cause the combined action of the piston and the spring to hold the valve seated under the influence of as small a suction as is likely to exist in any installation during delivery operations, and any increase in suction, due to variations in pump lift or otherwise, will merely increase the pressure of the piston on the valve. Thus the valve will be held firmly on its seat during delivery operations regardless of the amount of suction in the suction chamber and the pressure in the discharge line required to open the valve is only that which is necessary to overcome the action of the light spring.

While I have shown and described one embodiment of my invention I wish it to be understood that I do not desire to be limited to the details thereof as various modifications may occur to a person skilled in the art.

Having now fully described my invention, what I claim as new and desire to secure by Letters Patent, is:

1. In a by-pass valve for controlling the flow of liquid through a port connecting the discharge conduit of a pump with the suction conduit therefor, a valve member supported in said suction conduit for movement to a position to close said port and having surfaces exposed respectively to the pressure in said discharge conduit and to the suction in said suction conduit, a spring tending to move said valve member to its closed position, a cylinder, a piston in said cylinder connected with said valve member independently of said spring and having a surface spaced from said valve and exposed to the suction in said suction conduit, said surface of said piston being opposed to and of an area at least equal to the area of that surface of said valve member which is exposed to said suction, said cylinder having a vent on that side of said piston opposite said valve member, a liquid receptacle communicating with said discharge conduit and normally containing liquid, and a vent tube leading from said vent into the liquid in said receptacle.

2. In a by-pass valve for controlling the flow of liquid through a port connecting the discharge conduit of a pump with the suction conduit therefor, a valve member supported in said suction conduit for movement to a position to close said port and having surfaces exposed respectively to the pressure in said discharge conduit and to

the suction in said suction conduit, a spring tending to move said valve member to its closed position, a suction actuated device comprising a closed chamber having a vent near one end thereof and a part movable toward and from said vent and exposed to suction in said suction conduit, means for connecting said part with said valve member, a receptacle for liquid, and a normally open conduit leading from said vent into the liquid in said receptacle.

3. In a by-pass valve for controlling the flow of liquid through a port connecting the discharge conduit of a pump with the suction conduit therefor, a valve member supported in said suction conduit for movement to a position to close said port and having surfaces exposed respectively to the pressure in said discharge conduit and to the suction in said suction conduit, a spring tending to move said valve member to its closed position, a cylindrical structure extending into said suction conduit and having adjacent its inner end a closure movable toward and from the outer end thereof and exposed to suction in said suction conduit, means for connecting said closure with said valve member for movement therewith, a vent in the outer portion of said cylindrical structure, a receptacle for liquid, and means for connecting said vent with said receptacle below the normal level of the liquid therein.

4. In a by-pass valve for controlling the flow of liquid through a port connecting the discharge conduit of a pump with the suction conduit therefor, a valve member supported in said suction conduit for movement to a position to close said port and having surfaces exposed respectively to the pressure in said discharge conduit and to the suction in said suction conduit, a spring tending to move said valve member to its closed position, a cylinder, a piston in said cylinder connected with said valve member independently of said spring and having a surface exposed to the suction in said suction conduit, said surface of said piston being opposed to and of an area at least equal to the area of that surface of said valve member which is exposed to said suction, said cylinder having a vent on that side of said piston opposite said valve member, a receptacle for liquid, and a conduit connecting said vent with said receptacle below the normal level of the liquid therein.

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