Oct. 8, 1940. W. C. BUTTNER 2,217,330

EXCESS FLOW AND SHUT-OFF VALVE

Filed July 19, 1937

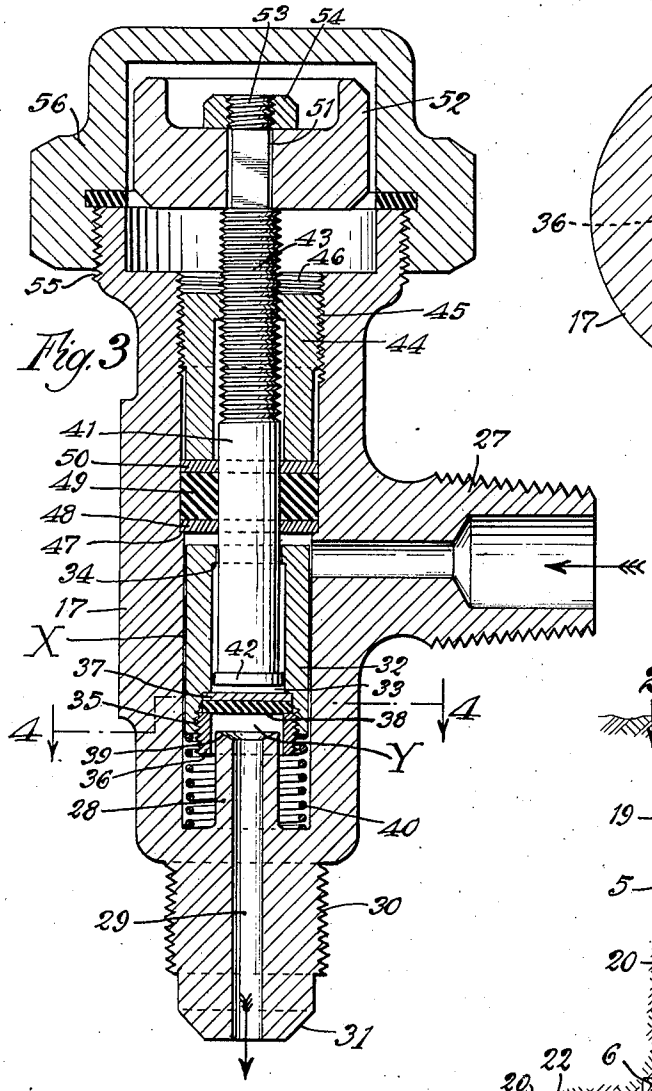


Fig. 3

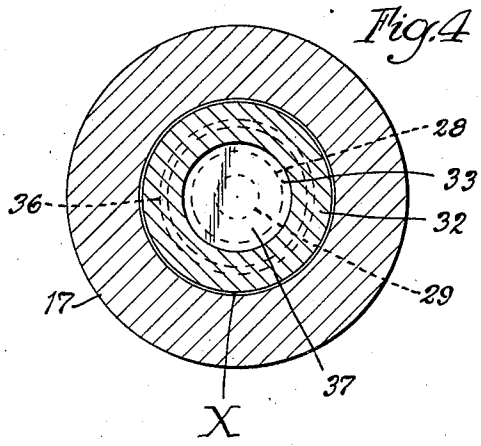


Fig. 4

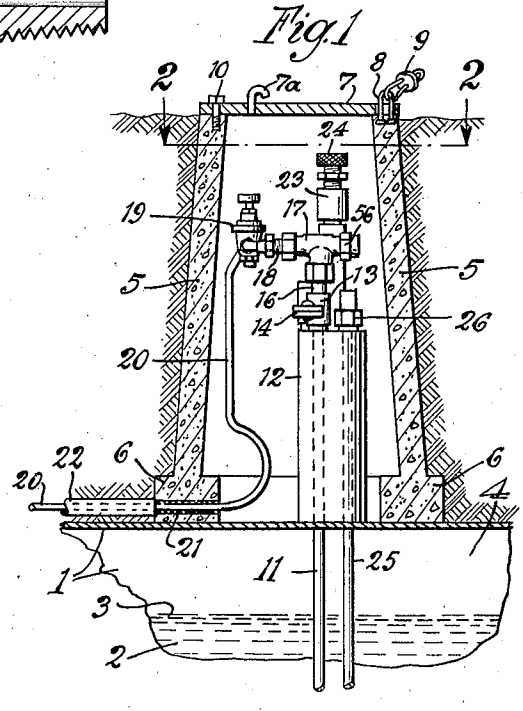


Fig. 1

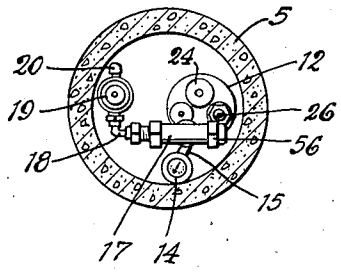


Fig. 2

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EXCESS FLOW AND SHUT-OFF VALVE

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2 Claims. (Cl. 137—153)

This invention relates to an excess flow check valve and to a system of storage and dispensation of gas.

It has for one object to provide in connection with such a system an adequate and positive excess flow check valve. It has for another object to provide a dispensing mechanism and control suitable for association with a tank intended generally for the storage and dispensing of liquefied hydrocarbon gas. In one typical installation the present invention is applicable to the use in connection with a liquefied petroleum gas equipment installation.

It has for another object, therefore, to provide such a system with a proper excess flow check valve. The valve itself is usable in other connections and the invention is not limited to the use of the valve itself in the particular installation shown.

Other objects will appear from time to time in the specification and claims.

The invention is illustrated more or less diagrammatically in the accompanying drawing, wherein:

Figure 1 is a vertical section through a dispensing assembly and showing in part a tank and a housing or covering for the dispensing and controlling assembly;

Figure 2 is a generally horizontal section taken at line 2—2 of Figure 1;

Figure 3 is a generally longitudinal section taken on an enlarged scale through the excess flow check valve; and

Figure 4 is a transverse section taken at line 4—4 of Figure 3.

Like parts are designated by like characters throughout the specification and drawing.

1 indicates generally a tank. As shown only the top or upper part of the tank is illustrated. It may be of any desired shape. The tank may contain gas or liquid or both. As shown a body of liquid 2 is contained within the tank. 3 indicates the upper level of the liquid and 4 indicates a space between the upper surface of the liquid and the top of the tank which may be filled with gas. 5 indicates a housing or enclosure for the dispensing assembly and associated parts. As shown it is made of concrete but may be of any other desired material. It has a foundation portion 6 which preferably contacts or adjoins the tank itself. A cover 7 which may be provided with a vent 7a, may be of any desired shape or form. As shown it is held in place by a U-bolt 8 which may have its ends sunk in the concrete 5 or otherwise secured to the equivalent housing member. A seal 9 engages the U-bolt and one or more screws 10 or equivalent members may be used to hold the cover in place.

A discharge or eduction pipe 11 extends into the interior of the tank and through a housing or enclosure 12. A member 13 may be connected to the pipe 11 and carries a pressure indicating gauge 14 which may be connected directly to the pipe 11 or to the member 13 or may be connected to the latter by a short pipe section 15. Secured either directly to the pipe 11 or to the member 13 or to a short pipe section 16, is an excess flow check valve 17 illustrated generally in Figures 1 and 2 and in detail in Figures 3 and 4. The excess flow check valve 17 is connected by any suitable connecting means which may be the member 18, to a regulator 19. The regulator may be of any desired construction and its details form no essential part of the present invention.

From the regulator a pipe 20 passes through the enclosure 15 as at 21 and thence to the point of use which may be the gas system of a house. An enclosing pipe or tube 22 may be used if desired.

Fluid is conveyed to the interior of the tank through a connection 23 which may, as shown in Figures 1 and 2, be provided with a filller valve assembly 24. The details of the filler valve are not shown as they form no essential part of the present invention. It is preferable to apply in this connection an automatically closing filler valve. As here shown a slip gauge tube 25 is applied. It lies within the housing 12 and extends into the tank. A control and manipulating member 26 is provided at the upper end of the slip gauge tube and by means of this it may be moved for use or secured in position.

The excess flow check valve 17, as shown in detail in Figures 3 and 4, comprise a hollow valve housing having a hollow exteriorly threaded inlet connection 27 and an interiorly projecting hollow reduced portion 28 through which a discharge or outlet passage 29 is formed. About the discharge passage 29 the valve body may be reduced and exteriorly threaded as at 30 and the extreme end may be reduced and inclined or rounded or given any desired shape 31.

A valve member 32 is slidably positioned within the housing of the valve 17. It is preferably hollow as at 33 and at its upper end, as shown in Figure 3, it is provided with an inwardly facing shoulder portion 34. The hollow 33 is enlarged and interiorly threaded as at 35 to receive an exteriorly threaded hollow valve disc retainer 36. This retainer holds in place

a valve disc plate 37 which may be of metal and relatively rigid, and a second valve disc 38 which may be of rubber or other generally analogous and relatively compressible material, arranged to seat upon and to seal with respect to the inner and preferably inclined or sharpened end or edge 39 of the member 28. A spring 40 is positioned within the housing of the valve 17, about the member 28, bears at one end against the housing and at the other against some suitable part of the valve. As shown it bears directly on the valve body 32. It might bear on some other part of the valve.

The valve is shown with a clearance X between its exterior and the interior of the housing 17. A clearance Y is also shown between the bottom of the valve disc 38 and the top or edge 39 of the member 28. In practice the clearance X is frequently extremely small, being measured in a few thousandths of an inch. The clearance has been exaggerated in the drawing for the purpose of simplicity in showing and it is to be understood that this is the case and that the invention is not limited to a valve having relative clearances as large as those shown.

As a means for opening the valve after it has become closed, the following parts are provided: A stem 41 is positioned partially within the valve housing, extends within the hollow 33 of the valve 32 and is shouldered or enlarged as at 42. At its upper end it may be threaded as at 43 to engage the interiorly threaded portion of a hollow packing nut 44 which is also exteriorly threaded as at 45 to engage threading 46 on the interior of the valve housing. A shoulder 47 is provided on the interior of the valve housing and against this shoulder a packing gland 48 may be seated. Packing 49 is interposed between the gland 48 and a second packing gland 50. The packing nut 44 holds the two packing glands and the packing in place and may be adjusted to apply the desired compression to these parts to insure a sufficiently tight fit about the stem 41. Near its upper end the stem 41 is preferably given an angular shape 51 and has seated upon it an adjusting nut 52 by means of which the stem may be turned to cause it to move in and out with respect to the valve housing. Obviously the adjusting nut may be secured to the valve stem in any other way. The stem is threaded as at 53 and receives a nut 54 which holds the adjusting nut securely upon the stem.

The valve housing is exteriorly threaded adjacent one end as at 55 and receives a hollow, interiorly threaded cap 56. The parts are generally assembled in the position shown in Figures 3 and 4 and when in normal use the spring 40 holds the valve unseated and fluid, normally gas, enters in the direction of the arrow, through the member 27, passes downwardly along the clearance between the valve member 32 and the interior of the housing 17, upwardly about the upper end of the member 28, and passing between the end or edge 39 of the latter, and the lower surface of the valve disc 38, passes outwardly in the direction of the arrow, through the discharge opening 29, thence through the regulator 19 to the pipe 20 and the point of use.

In normal operation the strength of the spring 40 is sufficient to hold the valve open to permit the passage of gas or fluid indicated. Should the quantity or speed of flow of the gas or fluid exceed a predetermined maximum limit, the valve 32 will close and the disc 38 will be seated upon the point, end or edge 39 and close the outlet 29 to prevent further discharge. When this occurs the valve will ordinarily not re-open of itself, even though the conditions which caused the excess flow are changed so that normal operation could be recommenced. When that occurs the cap 56 will be removed, the adjusting nut 52 will be rotated to cause the valve stem 41 to move upwardly from the position shown in Figure 3, until the shoulder 42 on the valve stem contacts the shoulder 34 in the valve 32 and the valve is then moved upwardly and unseated. It is ready then to recommence normal operation, the spring being sufficient to hold it unseated. When that condition has been re-established, the adjusting nut is rotated in the reverse direction and the valve returned toward or to the position shown in Figure 3. The cap 56 is replaced and the valve functions normally as intended until a further condition of excess flow redevelops, when it will close again and may again be opened as described, if desired.

It will be realized that whereas I have herewith shown and described a practical operative device, nevertheless many changes might be made in the size, shape, number and disposition of the parts without departing from the spirit of my invention and I wish, therefore, that my showing be taken as in a sense diagrammatic.

While I have spoken of hydrocarbon gas, the apparatus shown is usable with any of the gases which might be so generally classified. It may in addition be used with petroleum gas, liquefied petroleum gas, which latter expression in the trade generally covers gases of the character known as the paraffin series, including methane, ethane, propane, butane, pentane and others.

The use and operation of the invention are as follows:

While this device may be used in many connections, as shown it forms an excess flow check or shut-off valve for a gas system. The construction and arrangement of parts is such that the valve will normally stay open when the gas or fluid flow conditions are proper, that is to say, within a range determined in advance, and when the rate or conditions of flow do not rise above a predetermined maximum. When that occurs the valve 32 is seated against the resistance of the spring 40. It is to be understood that the forces and conditions causing the valve to seat may be many, friction, pressure and other factors being involved.

When the valve is seated in response to an excess flow, it will ordinarily stay seated even when flow has been completely cut off, although under some conditions it may, when the defect which caused the unsatisfactory flow conditions to occur, has been remedied, reopen itself. Since, however, it will not as a rule reopen itself, positive means are provided for doing this and preferably these means are sufficiently difficult of operation to require the presence of a service man so that the valve is not reopened until conditions throughout the system are such as to make reopening safe and desirable.

The positive means include the valve lifting mechanism shown. To operate it the cap 56 is removed. The nut or handle 52 is rotated and rotates the shaft or stem 41 which is threaded in the fixed member 44. Rotation is continued to cause the valve stem to back out or move out of the housing to bring the member 42 in engagement with the member 34 and this is continued until the valve is positively lifted from its seat. When that has been done and proper or

normal flow conditions re-established, the stem is rotated in the reverse direction and moved again to or toward the position of Figure 3 in which the member 42 acts as a stop for the member 34 so that the valve is open, being held by spring 40, and is again free to move to control the flow through the housing and associated passages and is thus again free to close in response to excessive flow or flow conditions. When the stem 41 has been moved back to the proper inactive position, the cap 56 is again put in place and the system remains in operating condition until the valve again closes when it may be necessary to reopen it in the manner just above described, and while the valve in the form shown is of particular advantage when used with gas in the liquefied phase, it may be otherwise used and its use is not limited to liquid gas.

I claim:

1. In combination in an excess flow shut-off valve, a hollow valve housing having a generally cylindrical portion, parts defining an inlet and outlet passage thereto, a raised valve seat projecting into said housing, and positioned adjacent one end of said outlet passage, a hollow valve member normally surrounding said valve seat and being movably positioned within said housing, and having a clearance with respect to said housing so small that excess flow past said valve exerts a frictional drag to close the valve, yielding means tending normally to hold said valve member unseated, said yielding means adapted to yield to permit seating of the valve upon the occurrence of predetermined flow conditions, and being incapable of reopening said valve, and means normally inactive, adapted to be actuated to unseat said valve.

2. In combination in an excess flow shut-off valve, a hollow valve housing, parts defining an inlet and an outlet thereto, a valve seat within said housing, a valve member movably positioned within said housing, said valve member conforming in its exterior shape substantially to the interior shape of that portion of the housing in which it is positioned, the clearance between the opposed surfaces of the two being a few thousandths of an inch, said valve member having a depression formed in its seating end, and a relatively, easily compressible sealing member positioned within said depression, means tending normally to hold said valve member unseated, said means adapted to permit seating of the valve upon the occurrence of predetermined flow conditions, and means normally inactive adapted to be moved to engage said valve and to unseat it.

WILLIAM C. BUTTNER.