Nov. 27, 1956 M. D. CANNELL 2,771,917

LIQUID TRANSFER APPARATUS AND AUTOMATIC SHUT-OFF THEREFOR

Filed May 20, 1954

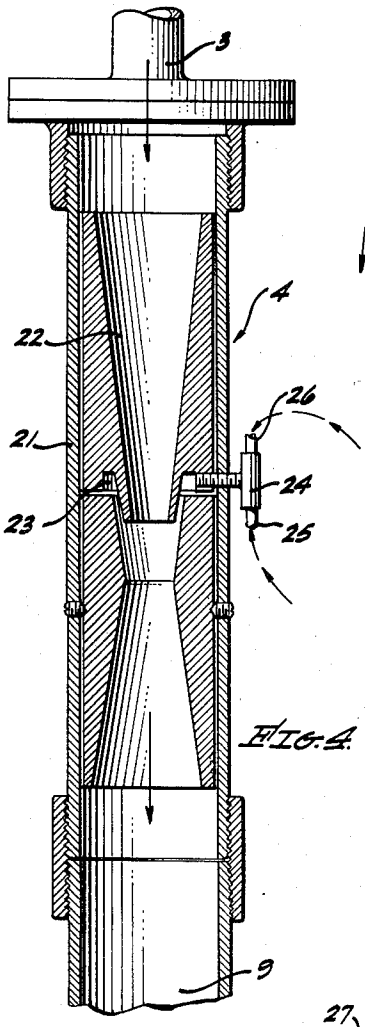


FIG. 4.

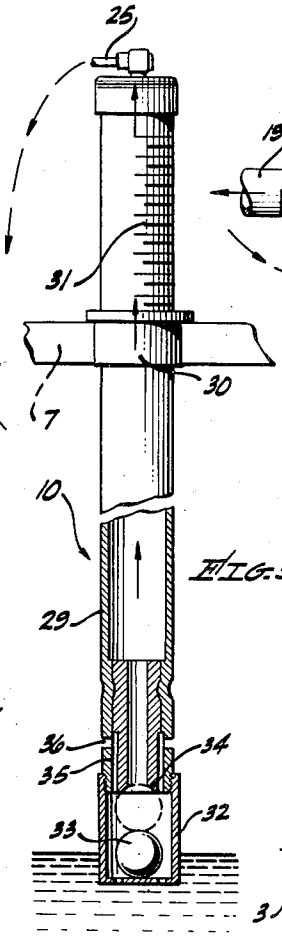


FIG. 3.

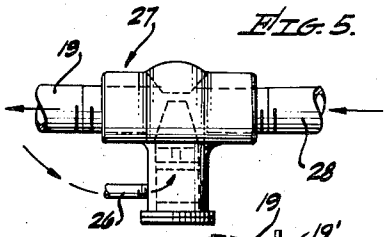


FIG. 5.

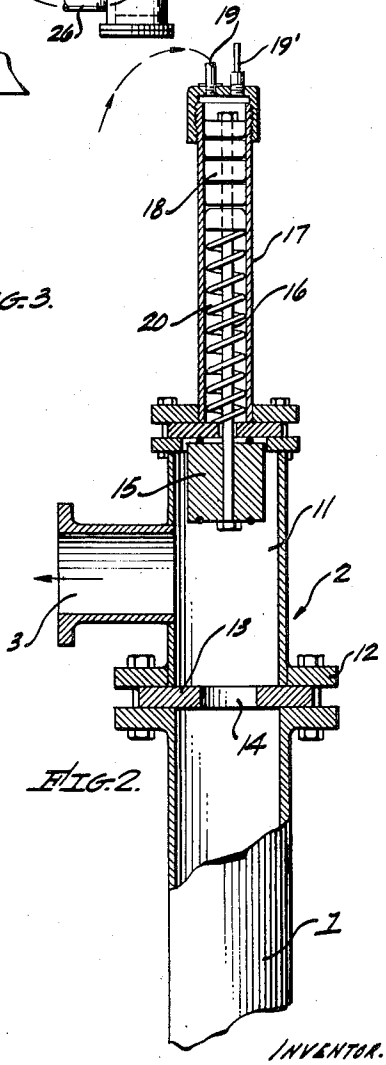


FIG. 2.

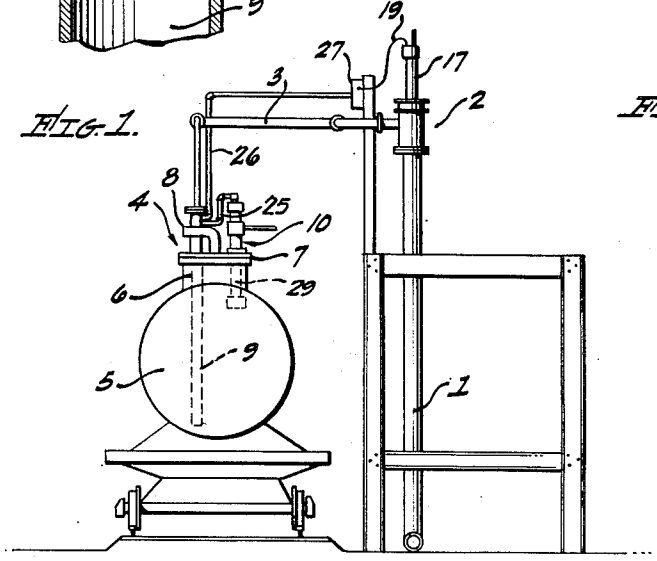


FIG. 1.

INVENTOR.
MURRAY D. CANNELL,
BY
ATTORNEY.

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LIQUID TRANSFER APPARATUS AND AUTOMATIC SHUT-OFF THEREFOR

Murray D. Cannell, Wilmington, Calif.

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4 Claims. (Cl. 141—217)

This invention relates to a liquid transfer apparatus and automatic shut-off therefor, particularly applicable in the loading of tank cars or trucks with gasoline, oil or other liquids.

An object of my invention is to provide a novel liquid transfer apparatus of the character stated, which can be used to control the flow of volatile fluids, such as gasoline, and which will effectively shut off the flow when the height of the liquid in the tank reaches a predetermined point.

Another object of my invention is to provide a novel liquid transfer apparatus of the character stated in which the flow is shut off through the medium of a vacuum actuated valve mechanism, the vacuum being created by the flow of liquid into the tank.

Still another object of my invention is to provide a novel liquid transfer apparatus of the character stated in which vacuum is built up in a venturi. Due to the flow of liquid into the tank this vacuum is permitted to build up by a float which is within the tank, and which closes a port to permit vacuum to accumulate.

Another object of my invention is to provide a novel liquid transfer apparatus in which the liquid flow is shut off by means of a valve, this valve being pressure actuated, the fluid pressure being controlled by a valve which is opened when vacuum accumulates to the required amount.

Other objects, advantages and features of invention may appear from the accompanying drawing, the subjoined detailed description and the appended claims.

In the drawing:

Figure 1 is a diagrammatic end view of my liquid transfer apparatus and automatic shut-off therefor.

Figure 2 is a longitudinal sectional view of the shut-off head.

Figure 3 is a side elevation of the float control with parts broken away to show interior construction.

Figure 4 is a longitudinal sectional view of the venturi device.

Figure 5 is a side view of the vacuum controlled valve.

Referring more particularly to the drawing, the numeral 1 indicates an intake pipe through which the liquid is forced under pressure while it is being loaded into a tank car or truck. The intake pipe 1 extends into a shut-off head 2 and liquid flows out of this head through the pipe 3. The pipe 3 then extends into the venturi 4, which extends into the tank car or truck 5. The turret 6 of the tank 5 is closed by a removable cover 7 so that the fumes from the gasoline or other liquid can be accumulated. These fumes are withdrawn through the pipe 8 and returned to the reservoir containing the liquid, all of which is usual and well known in the art.

The pipe 9 which extends downwardly from the venturi assembly 4 extends through the cover 7 and thence into the tank 5, all of which is usual and well known. In tank cars it is necessary that they be filled to a definite level and, furthermore, that the fumes or vapors from the liquid shall be recovered and not permitted to escape into the air. For this reason the turret 6 of the tank is covered.

In order that the liquid may be controlled at a definite level within the tank 5, I provide a float control 10 which extends through the cover 7 and into the tank 5. The various units of my apparatus will be subsequently described in detail.

The control head 2, which is mounted on the pipe 1, consists essentially of a T-fitting 11 which is flanged at the bottom, as shown at 12, so that it may be bolted to the top of the pipe 1. A plate 13 extends across the pipe 1 and is provided with a port 14 through which liquid flows from the pipe 1. The liquid normally flows out through the pipe 3 and thence into the tank 5, as previously described. When the level of the liquid in the tank 5 reaches a predetermined point, the shut-off head 2 is closed in the following manner:

A valve 15 is mounted on a rod 16 and the rod extends into a cylinder 17. The cylinder 17 is mounted on top of the fitting 11 in a suitable manner, such as by bolting, or the like. Cups 18 are mounted on the rod 16 and act as pistons in the cylinder 17 when air pressure is exerted through the pipe 19, as will be subsequently described. When pressure (air or fluid) is exerted through the pipe 19, the cups 18 will be forced downwardly, thus seating the valve 15 over the port 14 and closing this port. This shuts off the flow of fluid to the tank 5. A spring 20 within the cylinder 17 acts against the cups 18, normally holding the valve 15 in a raised position, as shown in Figure 2. The pipe 19' which extends into the top of the cylinder 17 is connected to a whistle or a suitable visual signal means if additional warning is needed.

The pipe 3 extends into the top of the venturi assembly 4, which includes a pipe section 21 within which the venturi 22 is mounted. The pipe 9 extends downwardly from the pipe 21 and into the tank 5, substantially as shown. The liquid flowing into the top of the pipe 21 and thence through the venturi 22 will create a partial vacuum in the annular space 23. A T-fitting 24 screws into the pipe 21 and thence into the annular space 23. A pipe 25 extends from the upper end of the float control 10 into the fitting 24, and this pipe normally permits air to flow into the fitting 24 to break the vacuum in the space 23. When flow of air through the pipe 25 is stopped, as will be subsequently described, vacuum builds up in the space 23 and this vacuum is then transmitted to the pipe 26 to a vacuum controlled valve 27. When vacuum accumulates sufficiently in the pipe 26 it will open the valve 27, permitting air under pressure to flow from the pipe 28 and thence through the pipe 19 to the shut-off head 2, and particularly into the top of the cylinder 17.

The float control 10 consists of a pipe 29 which extends vertically through the cover 7 and into the tank 5. The pipe 29 is slidable in a ring 30 in the cover 7, and thus the lower end of the pipe 29 can be adjusted within the tank 5. Calibrations 31 on the pipe 29 above the ring 30 may indicate the position of the lower end of the pipe. A cage 32 is mounted on the lower end of the pipe 29 and a ball float 33 (preferably cork) is positioned within the cage 32. A seat 34 in the lower end of the pipe 29 is spaced from the wall of the pipe, as shown at 35. Holes 36 in the wall of the pipe extend into the space 35, thus permitting air to flow upwardly into the pipe 29 and thence through the pipe 25 into the fitting 24, to thus constantly break the vacuum which is being formed in the annular space 23. When the float 33, however, rests on the seat 34 no air can flow through the pipe 25 and, consequently, a vacuum is built up in the space 23, which vacuum is then exerted through the pipe 26 to actuate the valve 27.

In operation the cover 7 is mounted on the turret 6 and the float control is adjusted vertically so that the cage 32 is at the proper shut-off level within the tank 5. Liquid is now pumped through the pipe 1 and passes into the fit-

ting 11 since the valve 15 is now raised due to the spring 20. The liquid then flows through the pipe 3 and thence into the venturi assembly 4, passing through the venturi 22 and thence into the tank 5. The movement of liquid through the venturi 22 will create a partial vacuum in the space 23. The vacuum in the space 23, however, is constantly broken due to the flow of air through the holes 36 and the space 35, and thence into the pipe 29, then through the pipe 25 and the fitting 24, which extends into the vacuum space 23. As soon as the liquid level in the tank 5 raises sufficiently to cause the float 33 to rest on the seat 34, the air flow through the pipe 25 is stopped, which results in a vacuum building up in the space 23. This vacuum is then transmitted through the pipe 26 to the valve 27, causing that valve to open and permitting air or other pressure to flow from the pipe 28 to the pipe 19 which pushes the cups 18 downwardly and seats the valve 15 over the port 14, thus shutting off the flow of liquid to the tank 5.

Having described my invention, I claim:

1. An automatic shut-off for a liquid transfer apparatus for tanks comprising a liquid intake pipe, a shut-off head mounted in the intake pipe, a valve in the shut-off head, a seat in said intake pipe against which the valve rests to close the intake pipe, pressure actuated means engaging said valve to move the valve to a closed position, an outlet pipe extending from the shut-off head and thence into said tank, a venturi in the outlet pipe, said venturi having a vacuum space therein, a vacuum controlled valve, a pipe extending from the vacuum space to the vacuum controlled valve, a pressure intake line extending into the vacuum controlled valve, and a pressure outlet line extending from the vacuum controlled valve into said pressure actuated means, another pipe extending into the tank, a line extending from the last named pipe to said vacuum space, and float means in the last named pipe closing said line in one position of the float.

2. An automatic shut-off for a liquid transfer apparatus for tanks comprising a liquid intake pipe, a shut-off head mounted in the intake pipe, a valve in the shut-off head, a seat in said intake pipe against which the valve rests to close the intake pipe, pressure actuated means engaging said valve to move the valve to a closed position, an outlet pipe extending from the shut-off head and thence into said tank, a venturi in the outlet pipe, said venturi having a vacuum space therein, a tank into which said outlet pipe extends, a float control including a pipe extending into the tank, a seat in the last named pipe, a float engageable with the seat resting thereon when liquid level rises in the tank, said pipe having an air intake therein below the seat, and a line extending from the last named

pipe into said vacuum space, a vacuum controlled valve, a pipe extending from the vacuum space to the vacuum controlled valve, a pressure intake line extending into the vacuum controlled valve, and a pressure outlet line extending from the vacuum controlled valve into said pressure actuated means.

3. An automatic shut-off for a liquid transfer apparatus for tanks comprising a liquid intake pipe, a shut-off head mounted in the intake pipe, a valve in the shut-off head, a seat in said intake pipe against which the valve rests to close the intake pipe, a cylinder mounted on the shut-off head, a piston in the cylinder, means connecting the piston and the valve whereby pressure against the piston closes the valve, an outlet pipe extending from the shut-off head, a venturi in the outlet pipe, said venturi having a vacuum space therein, a vacuum controlled valve, a pipe extending from the vacuum space to the vacuum controlled valve, a pressure intake line extending into the vacuum controlled valve and a pressure outlet line extending from the vacuum controlled valve into said pressure actuated means, another pipe extending into the tank, a line extending from the last named pipe to said vacuum space, and float means in the last named pipe closing said line in one position of the float.

4. An automatic shut-off for a liquid transfer apparatus for tanks comprising a liquid intake pipe, a shut-off head mounted in the intake pipe, a valve in the shut-off head, a seat in said intake pipe against which the valve rests to close the intake pipe, a cylinder mounted on the shut-off head, a piston in the cylinder, means connecting the piston and the valve whereby pressure against he piston closes the valve, an outlet pipe extending from the shut-off head, a venturi in the outlet pipe, said venturi having a vacuum space therein, a tank into which liquid from the outlet pipe flows, a float control extending into the tank, said float control including a pipe, said pipe having a seat therein, a float, said float resting against the seat when liquid in the tank rises, said pipe having an air intake below the seat, and a line extending from said float control and into said vacuum space, a vacuum controlled valve, a pipe extending from the vacuum space to the vacuum controlled valve, a pressure intake line extending into the vacuum controlled valve, and a pressure outlet line extending from the vacuum controlled valve into said pressure actuated means.

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