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RELIEF VALVE STRUCTURE FOR STORAGE TANKS FOR VOLATILE LIQUIDS

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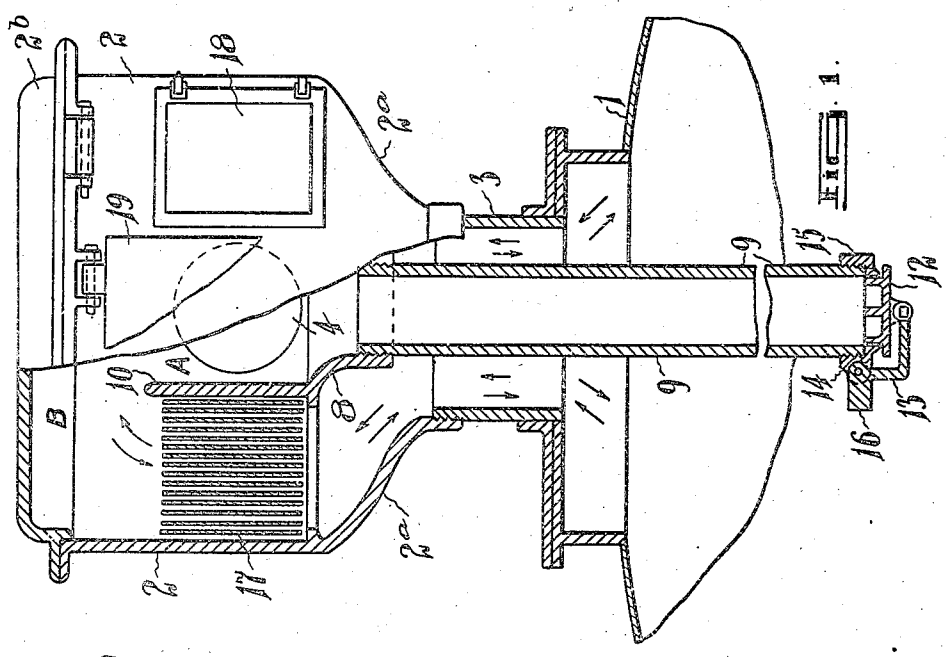


Fig. 1.

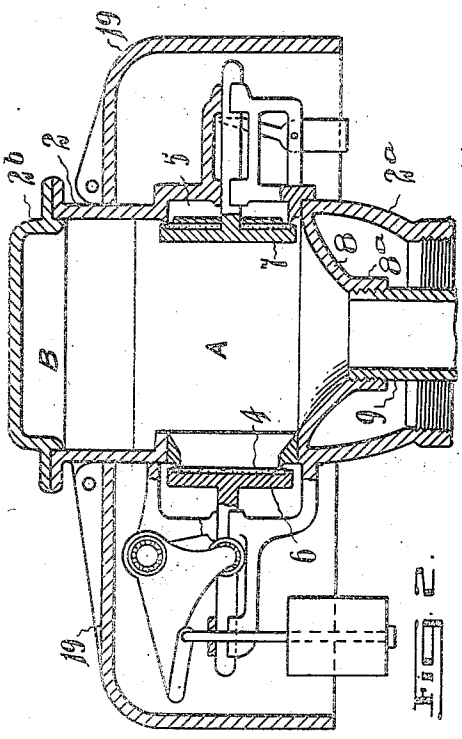


Fig. 2.

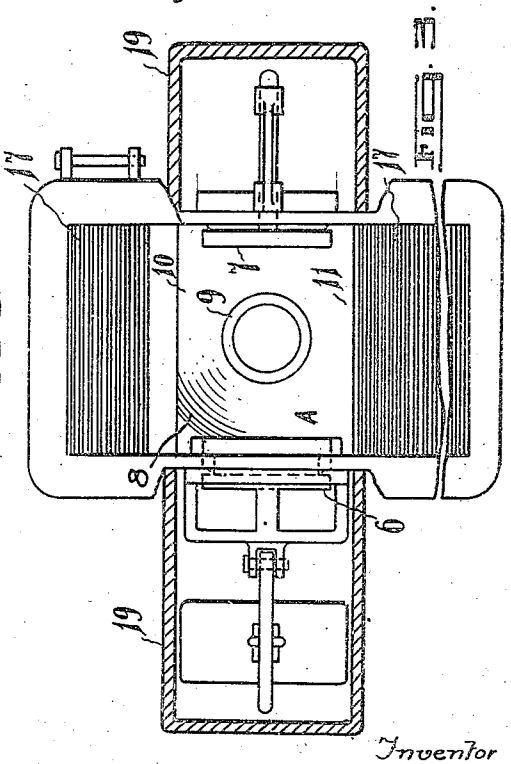


Fig. 3.

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RELIEF VALVE STRUCTURE FOR STORAGE TANKS FOR VOLATILE LIQUIDS

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5 Claims. (Cl. 220—85)

This invention relates to relief valve structure for storage tanks for volatile liquids, such as gasoline. To prevent loss of gasoline through evaporation and also to avoid explosion which may be caused by ignition of gasoline fumes mixed with air, it is necessary to fully enclose storage tanks for gasoline. However, a relief valve must be provided to relieve the pressure in the tank during filling and emptying thereof and to allow for expansion and contraction of the liquid. It has been found that such relief valves become stuck or clogged by frost and rust which accumulate around the valve openings, and the object of the present invention is to construct a valve which will eliminate or reduce clogging or sticking of the valve by reason of accumulation of frost, rust, or other foreign matter.

This object is achieved by providing a settling chamber having an opening in the bottom thereof for carrying accumulations of foreign matter to the bottom of the tank or a point adjacent thereof.

The invention is hereinafter more particularly described and is illustrated by way of example, in the accompanying drawing in which

Fig. 1 is a side elevation partly broken away to show the device in vertical section;

Fig. 2 is a vertical section taken at right angles to the view in Figure 1; and

Fig. 3 is a plan view with the closure removed and top of the canopies cut away.

In the drawing corresponding parts in the different figures are indicated by the same numerals.

The valve structure is adapted to be mounted on a tank 1 the top of which is shown in a fragmentary manner in Figure 1. The valve structure comprises what may conveniently be called a head 2 having a constricted lower portion 2^a having an internally threaded opening in the bottom thereof into which is threaded a pipe 3 which is secured to the top of the tank 1 and opens thereinto.

On opposite sides of the head 2 are valve openings 4 and 5 communicating with the atmosphere. The valve opening 4 is closed by a valve member 6 of the pressure type, which is suitably weighted to maintain it in a closed position until the pressure in the tank reaches a predetermined amount, which may be from ½ oz. to 30 lbs., whereupon the valve will open and relieve the pressure. Inasmuch as the construction of this valve is common in the art and does not form part of this invention, it is shown more or less diagrammatically and is not described herein.

For opening and closing the valve opening 5 there is provided a valve member 7 of the suction type, which opens when the pressure in the tank falls below a predetermined amount, which may be at any desired point below atmospheric pressure. Construction of this valve mechanism is also well known in the art and details of construction do not form part of the present invention and they are therefore not described but are shown more or less diagrammatically in Figures 2 and 3.

Accumulations of rust, frost and other foreign matter around the valve openings 4 and 5 may cause the valve members 6 and 7 to become stuck either closed or open causing danger of explosion or loss of fuel. To overcome this difficulty according to the present invention what may be called a settling chamber A is formed in the head 2 between the openings 4 and 5. The settling chamber is formed by a substantially horizontal partition 8 extending from one side of the head adjacent and just below one of the valve openings to the other side of the head adjacent and just below the other valve opening, said partition sloping downwardly and having an opening at the bottom thereof provided with an internally threaded flange 8^a into which is screwed a pipe 9 which is adapted to extend downwardly within and spaced from the portion 2^a of the head 2 and substantially concentric thereof, into and downwardly in the tank 1 to a point adjacent to but spaced from the bottom of the tank.

As will appear from Figure 1 the partition 8 is spaced from the opposite walls of the head 2 and two vertical partitions 10 and 11 extend upwardly from the substantially horizontal partition to a point adjacent the top of the head 2 but spaced therefrom. For convenience the space above the partitions 10 and 11 and below the top of the head 2 may be called the dome B.

As will be seen particularly in Figure 1, a passageway is formed within the top of the tank 1 up through the pipe 3, between the restricted portion 2^a of the head 2 and the partition 8, between the partitions 10 and 11 and the outer sides or walls of the head 2 to the dome B which in turn communicates with the upper portion of the settling chamber A. Fumes pass up and down through this passageway as the pressure in the tank increases and decreases and the valves 4 and 5 open and close. The walls 10 and 11 act as baffles for directing the fumes up to the dome or top of the head 2 and downwardly through the settling chamber A to the valve openings 4 and 5. As the fumes pass up and down through the settling chamber A, foreign matter mixed with them drops into the bottom of the settling chamber A. Likewise as the valves open and close any foreign matter which has accumulated around them and is loosened drops away and down the sloping bottom 8 of the settling chamber A into the pipe 9.

The fumes will be reabsorbed in the liquid in the pipe 9 and the heavier matter will fall to the bottom and be deposited on the bottom of the tank where it will remain until the tank is cleaned out. To compensate for pressure which is in the tank and to prevent forcing of the liquid up the tube, a

weighted valve 12 pivoted to an arm 15, pivoted to a lug 14 on a seat 15 screwed to the end of the pipe 9, and having a weight 16, is provided. Preferably the valve is weighted to resist substantially the same pressure as the relief valves 6 and 7. When this valve is closed rust etc. which falls down the pipe 9 will be caught on the valve, but when the valve opens this will be deposited in the tank and will drop to the bottom thereof.

To prevent flash-back, flame arresters 17, 17 are provided in the passageway between the substantially vertical partitions 10 and 11 and the sides of the head 2. These flame arresters which are well known in the art comprise a plurality of vertically spaced metal plates which permit the fumes to pass between them. As shown in Figure 1 on the outside of the head 2 may be provided clean-out doors 18. The head 2 may be provided with a hinged top or closure 2^b, and over the outside of the valves 6 and 7 covering the operating mechanism may be provided hinged canopies 19, 19 as shown in Figures 1 and 2.

Although the invention has been described in some detail applicant does not desire to be limited to said details since modifications and variations are possible within the scope and spirit of the invention.

What I claim as my invention is:

1. A relief valve structure for storage tanks for volatile liquids comprising a head having an opening in the bottom thereof communicating with the top of the tank; a settling chamber in said head having openings in the sides thereof communicating with the atmosphere and an opening in the bottom thereof; pressure sensitive valves in said openings in the sides permitting equalization of pressure between the atmosphere and the interior of the tank, the bottom of said chamber sloping downwardly below the said openings in the sides to the said opening in the bottom, whereby accumulations of foreign matter around the valves will drop to said bottom opening; a pipe extending downwardly from the opening in the bottom of the settling chamber to a point adjacent the bottom of the tank; and a passageway in said head communicating between the opening in the bottom of the head and the top of the tank and extending to and communicating with the settling chamber adjacent the top thereof, whereby fumes will flow upward through said passageway and down through the settling chamber to one of the valves, and air will flow in a reverse direction from the other valve, depending on the relative pressure in the tank and in the atmosphere.

2. A relief valve structure for storage tanks for volatile liquids comprising a head having an opening in the bottom thereof communicating with the tank and openings in the sides thereof for pressure sensitive valves permitting equalization of pressure between the atmosphere and the interior of the tank; and a settling chamber in the head formed by at least one substantially vertical partition and a partition extending across the head above the opening in the bottom of the head, at least one edge of said last mentioned partition being spaced from the adjacent side of the head, and the vertical partition extending upwardly from the spaced edge of the horizontal partition to a point below but adjacent the top of the head, whereby a passage for air and fumes is formed between the side of the head and the partition from the opening in the bottom of the head to the top of the settling chamber, the settling chamber having an opening in the bottom thereof adapted to be connected to a pipe extending to a point adjacent the bottom of the tank.

3. A relief valve structure for storage tanks for volatile liquids, comprising a head having openings in the sides thereof communicating with the atmosphere; a pressure valve in one of said openings in the sides and a suction valve in the other of said openings; and a settling chamber in said head formed by two substantially vertical spaced apart partitions extending from one side of the head to the other and spaced from the bottom and top of the head and a third partition extending from opposite sides of the bottom of the head and between the lower edges of the vertical partitions, forming passageways between the vertical partitions and the side walls of the head, said passageways extending from the bottom of the head to the settling chamber at the top thereof, said third partition having an opening therein; and a pipe extending downwardly from the opening in the third partition to a point adjacent the bottom of the tank.

4. A relief valve structure for storage tanks for volatile liquids comprising a head having an opening in the bottom thereof communicating with the top of the tank; a settling chamber in said head having openings in the sides thereof communicating with the atmosphere and an opening in the bottom thereof; pressure sensitive valves in said openings in the sides permitting equalization of pressure between the atmosphere and the interior of the tank, the bottom of said chamber sloping downwardly below the said openings in the sides to the said opening in the bottom, whereby accumulations of foreign matter around the valves will drop to said bottom opening; a pipe extending downwardly from the opening in the bottom of the settling chamber to a point adjacent the bottom of the tank; a passageway in said head communicating between the opening in the bottom of the head and the top of the tank and extending to and communicating with the top of the settling chamber; and a weighted valve in the end of the pipe adjacent the bottom of the tank.

5. A relief valve structure for storage tanks for volatile liquids comprising a head having an opening in the bottom thereof communicating with the top of the tank; a settling chamber in said head having openings in the sides thereof communicating with the atmosphere and an opening in the bottom thereof; pressure sensitive valves in said openings in the sides permitting equalization of pressure between the atmosphere and the interior of the tank, the bottom of said chamber sloping downwardly below the said openings in the sides to the said opening in the bottom, whereby accumulations of foreign matter around the valves will drop to said bottom opening; a pipe extending downwardly from the opening in the bottom of the settling chamber to a point adjacent the bottom of the tank; and a passageway in said head exteriorly of the settling chamber communicating between the opening in the bottom of the head and the top of the tank and extending to and communicating with the settling chamber adjacent the top thereof, whereby fumes will flow upward through said passageway and down through the settling chamber to one of the valves, and air will flow in a reverse direction from the other valve, depending on the relative pressure in the tank and in the atmosphere.

PETER MATHER ELLIOTT.