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P. S. SHIELD

TANK VENT

Filed March 7, 1924

Fig. 1.

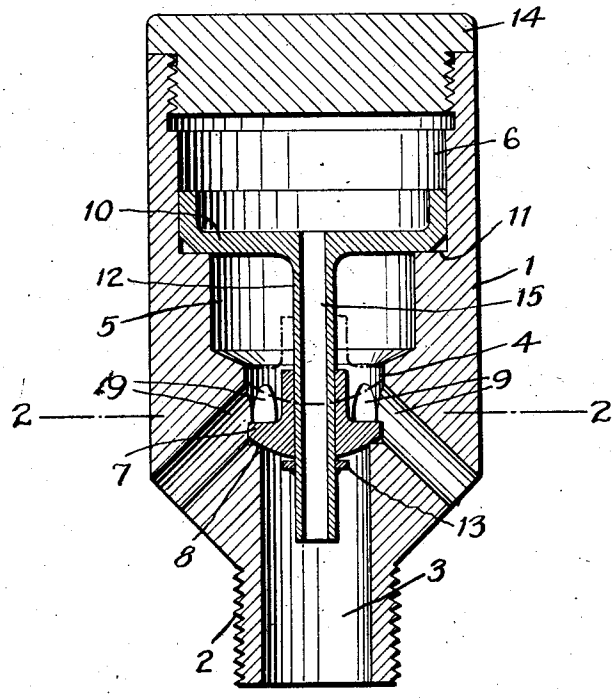
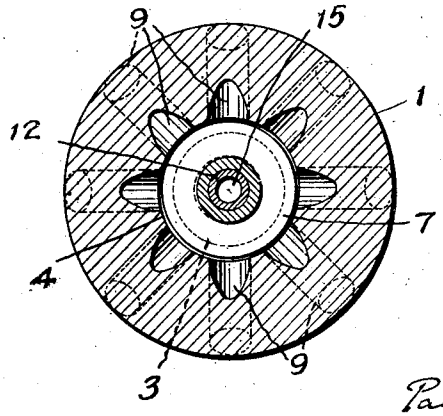


Fig. 2.



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TANK VENT.

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The invention relates to valved tank-vents for relief of positive and negative pressure in the tank. It is necessary in a vent for use on gasoline containers, for example, that the vent have at least two functions, one to relieve internal pressure whenever it is developed, as for instance from the heating of the contents due to exposure to the sun, the other to provide for the admission of air when the contents are being drawn off, and with regard to the latter function, in particular, the vent should have a sufficient capacity to prevent any retarding of the flow of the liquid through the discharge line, which it may be noted is an objection applying to most of the tank wagon vents now on the market. This latter requirement involves not only the provision of sufficient area in the air passages, but it also requires that the valves themselves be of such character as to reduce to a minimum the partial vacuum necessary to open the vacuum relief. The purpose of the present invention is to provide a vent, which among other advantages, satisfies these requirements and is of a simple construction.

In the accompanying drawings forming a part hereof:

Fig. 1 is a central vertical section through a vent embodying the invention, the valve being shown seated in full lines and raised, as if by internal pressure, in dotted lines; and

Fig. 2 is a horizontal cross-section on the line 2—2 of Fig. 1.

The vent comprises a body 1, which may be cylindrical in form, having a screw-threaded stem 2 at its lower end for connection with a tank. A central longitudinal passage 3 extends through the stem 2, and within the body part, and widens above into a number of counterbores or progressive enlargements 4, 5, and 6. The chamber 4 is a valve chamber containing a vertically movable valve member 7, which normally rests upon a valve seat 8. Air passages 9 extend from the valve chamber enlargement downwardly and outwardly through the wall of the body, placing the region 4, 5 in free communication with the atmosphere. The construction of the vent is such that there may be any desired number of these passages having an ample total effective area comparable with the area of the passage 3.

In the largest chamber 6 in the upper portion of the vent is a piston 10, which normally rests upon the shoulder 11. The piston is slidable within the cylindrical wall of its chamber, and has a downwardly extending central stem 12, which passes through the valve member 7, the valve member being slidable upward on the stem, the piston remaining stationary, as indicated by the dotted lines of Fig. 1. A collar 13 on the piston stem, below the valve, forms a one-way connection enabling the valve to be lifted by the piston when the latter rises. The top of the chamber 6 is shown tightly closed by a screw cap 14. The chamber 6 will be termed a closed chamber, since it is cut off from the pressure of the atmosphere outside the tank, but a passage is provided which maintains communication between this chamber and the air space in the top of the tank. In the drawing this passage is simply and advantageously contrived by making the stem 12 hollow throughout its length, the upper end of the passage 15 thus provided opening into the chamber 6 above the piston and the lower end opening into the passage 3.

The operation is as follows:

If positive pressure occurs within the tank, such pressure lifts the valve 7 upward along the stem 12, and the excess pressure escapes to the atmosphere through the lateral passages 9. When the pressure has been relieved the valve is automatically seated again by gravity or otherwise. It may be noted that there is no tendency for the piston 10 and its stem 12 to rise under positive pressure in the tank, because the pressure is communicated through the passage 15 to the chamber 6 and acts downwardly upon the large top area of the piston. In case of partial vacuum, that is to say reduced pressure within the tank, the valve is moved in the same direction as under positive pressure. This is effected through the chamber 6, then acting as a negative pressure chamber, and the piston 10, overcoming the pressure of the atmosphere, which then tends to hold the valve to its seat, the area of the piston 10 being so much larger than the area of the valve member, however, that it requires only slight reduction in pressure in the tank to open the vent for vacuum relief. The valve member 7, once lifted by the piston 10, remains lifted

as long as the negative pressure condition exists, owing to the fact that the inrush of air to the tank past the lower end of the passage 15 maintains or augments the vacuum effect in the chamber 6. It may be noted that the base of the piston chamber 6 forms a close-fitting seat for the bottom of the piston, so that even after some slight wear on the sides of the piston has taken place the initial vacuum necessary to start the piston upward is developed against a tight joint.

When the piston is raised in response to negative pressure, thereby opening the valve, the chamber 6 remains closed or substantially closed to direct communication with the atmosphere. This results from the fit of the piston in the cylindrical wall of the chamber 6, any slight leakage around the piston being inconsequential, and from the fact that the connection between the passage 15 and the chamber 6 above the piston remains unbroken. The suction of the air rushing into the takn past the open lower end of the passage 15, which is extended downward a substantial distance below the valve, serves to maintain or prolong the vacuum effect in the chamber 6 to insure wide and sustained opening of the valve permitting free entrance of air in order that drawing off of liquid from the tank shall not be retarded, insuring also that the valve will not close prematurely before normal pressure in the tank has been sufficiently restored, and in general insuring that the valve will act promptly and efficiently at all times and under all conditions calling for negative pressure relief.

This concludes a description of the best form of the invention now known to me. I wish it to be understood, however, that numerous changes in form, proportions, arrangements, details, and by way of additions or omissions or substitution of equivalents, may be made without departing from essentials.

What I claim as new is:

1. A tank-vent containing a valve member adapted to yield to positive tank pressure to permit the escape of excess pressure from the tank, a chamber, and means responsive to reduced pressure in said chamber to move said valve member in the same direction as in the case of excess pressure, in order to admit external pressure to the tank.

2. A tank-vent containing a valve member adapted to yield to positive tank pressure to permit the escape of excess pressure from the tank, a chamber, a member movable in response to reduced pressure in said chamber, and a shouldered stem forming an operative connection between said member and said valve member to move said valve member in the same direction as in the case of excess pressure, in order to admit external pressure to the tank, said stem and one of said members being free for relative movement when the valve member yields to excess pressure.

3. A tank-vent containing a valve member adapted to yield to positive tank pressure to permit the escape of excess pressure from the tank, a chamber, a member movable in response to reduced pressure in said chamber, and a shouldered stem forming an operative connection between said member and said valve member to move said valve member in the same direction as in the case of excess pressure, in order to admit external pressure to the tank, said stem being hollow and affording communication between said chamber and the tank.

4. A tank-vent comprising a body having a tank connection passage, lateral vent passages, a valve seat between the tank connection passage and the lateral passages, a valve member normally resting against said seat and adapted to be moved therefrom by excess pressure in the tank, a chamber beyond the valve member in communication with the tank, a member adapted to respond to reduced pressure in said chamber, and a shouldered rod between said member and said valve member to move said valve away from said seat when a reduced pressure condition occurs in said chamber, the valve member being movable relatively to said other member under excess pressure in the tank.

5. A vent having a valve seat, a valve member normally closed against said seat and tending to be held closed by the external pressure thereon when the pressure in the space to be vented is lowered, a chamber having means of communication with the said space, and means associated with such chamber and operating to move said valve member away from said seat when the pressure in said chamber is lowered.

6. A vent having a valve seat, a valve member normally closed against said seat and tending to be held closed by the external pressure thereon when the pressure in the space to be vented is lowered, a chamber having means of communication with the said space, and means associated with such chamber and operating to move said valve member away from said seat when the pressure in said chamber is lowered, the relation between the passage for the admission of air to said space and the communication way between said chamber and said space being such that the inrush of air operates to maintain a vacuum effect in said chamber temporarily.

7. A vent having a seat, a valve member normally closed against said seat and adapted to be moved away from said seat by excess pressure in the space to be vented to permit such pressure to escape, and means for employing reduction in pressure in such space also to unseat said valve member, the

movement of the valve in both cases being in the same direction.

8. A vent having a valve for relieving both positive and negative pressures in a space to be vented, said valve member opening away from and seating toward such space so as to yield directly to positive internal pressure in said space, and means responsive to reduction in pressure in such space and of superior power to the external pressure acting on said valve member, so as to unseat said valve member when a condition of reduced pressure occurs in said space.

9. A vent having a valve member for relieving both excess and minus pressure in the space to be vented, and means whereby said valve member is moved in the same direction to open the vent by virtue of either excess or reduced pressure in said space.

10. A tank vent containing a valve seat, a valve member which closes downward against said seat, a chamber above said valve member having means of communication with the interior of the tank, an operating member associated with said chamber and adapted to be raised when negative pressure is communicated from the tank to said chamber, there being a communication from the outside atmosphere to the space beneath said operating member so that the pressure of the atmosphere can raise said member, and an operating connection between said operating member and said valve member for lifting the latter.

11. A tank vent containing a valve seat, a valve member which closes downward against said seat, a chamber above said valve member, an operating member associated with said chamber and adapted to be raised when negative pressure is communicated from the tank to said chamber, there being a communication from the outside atmosphere to the space beneath said operating member so that the pressure of the atmosphere can raise said member, and a hollow stem extending downward from said operating member and adapted to lift said valve member, the vertical passage through said stem communicating at the upper end with the interior of said chamber, and the lower end of said passage communicating with the space between said valve member.

12. A tank vent containing a valve seat, a valve member which closes downward against said seat, a chamber above said valve member, an operating member associated with said chamber and adapted to be raised when negative pressure is communicated from the tank to said chamber, there being a communication from the outside atmosphere to the space beneath said operating member so that the pressure of the atmosphere can raise said member, and a hollow stem extending downward from said operating member and adapted to lift said valve member, the vertical passage through said stem communicating at the upper end with the interior of said chamber, said passage having a tubular extension at the lower end projecting a substantial distance downward below said valve member in order that inrush of air past said extension will operate to maintain a vacuum effect in said chamber temporarily.

13. A tank vent containing a valve seat, a valve member which closes downward against said seat, means forming a chamber above said valve member whereby negative pressure communicated from the interior of the tank to said chamber causes said valve member to be lifted by atmospheric pressure, and means forming a vertical passage through said valve member with a tubular extension projecting downward below said valve member, to maintain a vacuum effect in said chamber when said valve is lifted in response to negative pressure in the tank.

14. A tank vent containing a valve seat, a valve member which closes downward against said seat, means forming a chamber above said valve member whereby negative pressure communicated from the interior of the tank to said chamber causes said valve member to be lifted by atmospheric pressure, and means forming a communication passage between said chamber and the interior of the tank, said passage being extended downward below said valve member and opening into the space to be vented in such manner that inrush of air past the lower opening of said passage will operate to maintain a vacuum effect in said chamber temporarily, said chamber remaining substantially closed to direct communication with the atmosphere when said valve member is lifted.

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