Oct. 30, 1928. 1,690,072

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RECEPTACLE FOR VOLATILE LIQUIDS

Filed Nov. 13, 1924 2 Sheets-Sheet 1

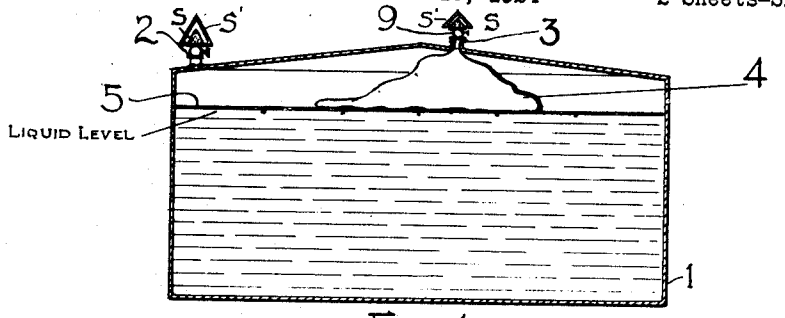


FIG. 1

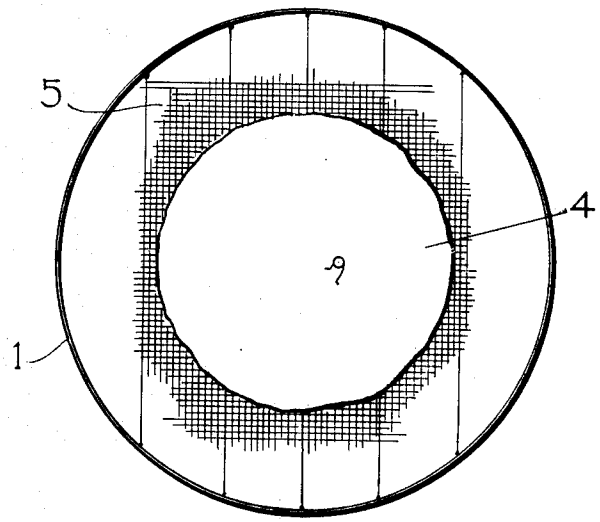


FIG. 3.

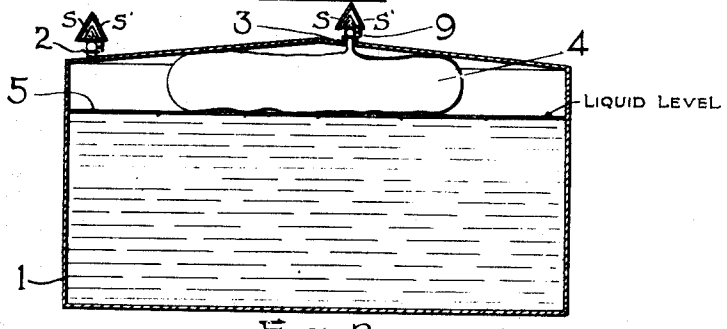


FIG. 2

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2 Sheets-Sheet 2

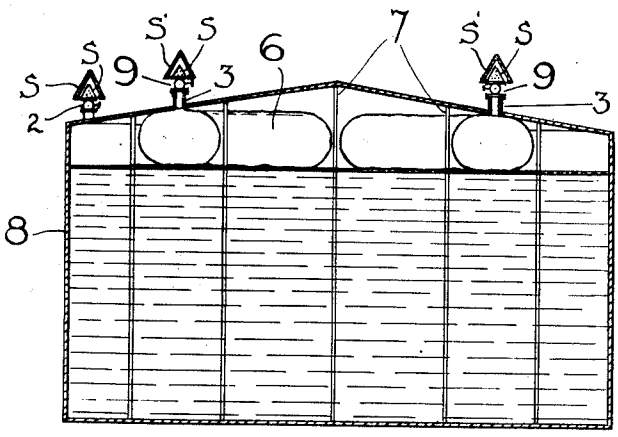


FIG. 4.

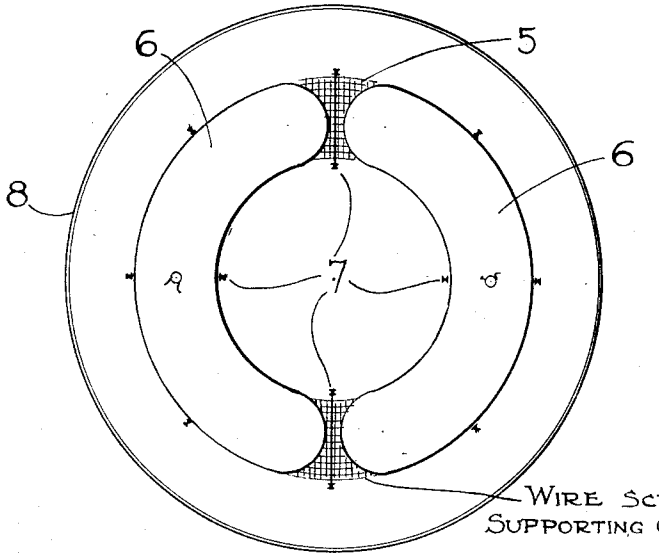


FIG. 5

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UNITED STATES PATENT OFFICE.

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RECEPTACLE FOR VOLATILE LIQUIDS.

Application filed November 13, 1924. Serial No. 749,721.

This invention relates to improvements in the storage of normally liquid substances having a relatively high vapor pressure at atmospheric temperature. Liquids of this kind cannot ordinarily be safely stored in hermetically sealed containers because of the development of dangerous pressures upon rise of temperature. If stored in vented containers there is considerable loss by volatilization. Also, upon decrease of temperature a partial vacuum may form in the container and air is drawn in. This is often highly undesirable on account of oxidation of the material, formation of explosive mixtures, or the like.

According to the present invention these difficulties are avoided and positive advantages are obtained by providing an inflatable chamber within the container. The chamber is adapted to receive air which may tend to be drawn into the container because of a subatmospheric pressure therein. It is deflated with the expulsion of the air when the temperature rises and there is a resultant increase of vapor pressure and expansion of vapors in the container to produce a superatmospheric pressure.

The invention will be more fully described in connection with the accompanying drawing, in which

Fig. 1 is a vertical section through a tank provided with an inflatable chamber;

Fig. 2 is a similar view, showing the chamber inflated;

Figs. 3 and 5 are a top plan view of the tank, the cover being removed; and

Fig. 4 is a vertical section through a modified form of tank and inflatable chamber.

Referring to Figs. 1 to 3, reference numeral 1 denotes a tank such as is commonly used for the storage of gasoline. This has been selected for illustration because the invention is particularly applicable in this connection. There is no limitation to this use, as the means described is advantageous in the storage and shipment of volatile liquids generally. The tank is provided with a pressure-vacuum safety valve 2 and vent pipe 3. The pressure-vacuum valve will be set to relieve abnormal pressures, such as are encountered particularly in filling or emptying the tank. A conical screen S, adapted to stop the passage of flame, may be installed over the valve. The screen is protected by a sheet metal cover S'.

The inflatable chamber 4 comprises a bag substantially impermeable by air and by the vapor of the liquid. The bag may be made from any suitable impermeable material having sufficient strength and flexibility, for example cloth impregnated with a mixture of glue and glycerine. If desirable, wires or other supports 5 may be provided to keep the bag from contact with the liquid in the tank. A screen S may be installed in the vent pipe 3, in case there should be leakage of inflammable vapor through the bag. We may use a chamber having metallic walls jointed for expansion, or similar devices, but in general balloonlike receivers are more suitable.

The inflatable device is placed within the tank and connected to the vent pipe. The device is preferably of such size that when fully inflated it occupies about 20–40% of the volume of the vapor space in the tank. It may of course be larger, if desired, but in general it should not be smaller when used in connection with liquids as volatile as gasoline. Where very high temperatures are likely to be encountered the inflatable chamber should be correspondingly capacious.

It is desirable to attach the inflatable chamber or bag in deflated condition when the temperature is high; or inflated, at a time of low temperature. If it is attached when the temperature is high, the bag will assume the position shown in Fig. 1. Upon fall of temperature, air will be drawn in and will distend the bag to the position shown in Fig. 2. When the temperature rises again the pressure of the vapors evolved in the tank will compress the bag and force the air from it. The tank is thus permitted to "breathe" without any interchange between its contents and the atmosphere.

In the form of the invention shown in Fig. 4, the principle is the same, but an expansible device 6 having a central opening is used. This is so arranged that it avoids the supporting columns 7 which sustain the roof of the tank 8. It is illustrated in inflated condition and as generally annular in contour.

The inflatable member may be immersed in the liquid at least in part, provided the hydrostatic pressure upon it is not sufficient to interfere with its proper operation and that the material of the inflatable member is not injured by contact with the liquid. Unless the inflatable member is strong enough

to sustain the maximum pressure that may be exerted upon it, the provision or a safety valve 9 on the vent pipe 3 is desirable. The valve may be adjusted to close at a predetermined pressure, thus shutting off further entry of air into the member. A manually operated valve may be used, if desired.

By means of the present invention valuable vapors are substantially completely retained at all times within the container and air is prevented from entering it. In addition to preventing the wastage of gasoline or the like, the present invention has a further important advantage in avoiding the fire risk incident to the outward breathing of inflammable vapors.

Various modifications of the illustrative constructions described may be made within the scope of the appended claims.

I claim:

1. A storage tank having a roof supported by a plurality of columns, a vent through said roof, an expansible chamber encircling a portion of said columns, and a connection between the chamber and the vent.

2. Storage apparatus for volatile liquids, comprising a closed container having a vent, an inflatable member within said container and an opening to the exterior thereof through the vent, said member being actuated by variation of pressure in the container, and a safety valve on the vent actuable to prevent excessive pressure on the inflatable member.

3. Storage apparatus for volatile liquids, comprising a closed container having a vent, an inflatable member within said container and opening to the exterior thereof through the vent, a screen below the member and adapted to support the same out of contact with the liquid, said member being actuated by variation of pressure in the container, and a fire-stopping screen arranged in the vent.

4. Storage apparatus for volatile liquids comprising a container having a vent, an inflatable member within the container and opening to the exterior thereof through the vent, and a screen adapted to support the member permanently out of contact with the liquid, said member being actuated by variations of pressure in the container and when fully expanded occupying 20 to 40% of the vapor space normally left above the liquid.

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