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R. E. WILSON

ART OF PREVENTING LOSS BY EVAPORATION FROM STORAGE TANKS

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Fig. 2.

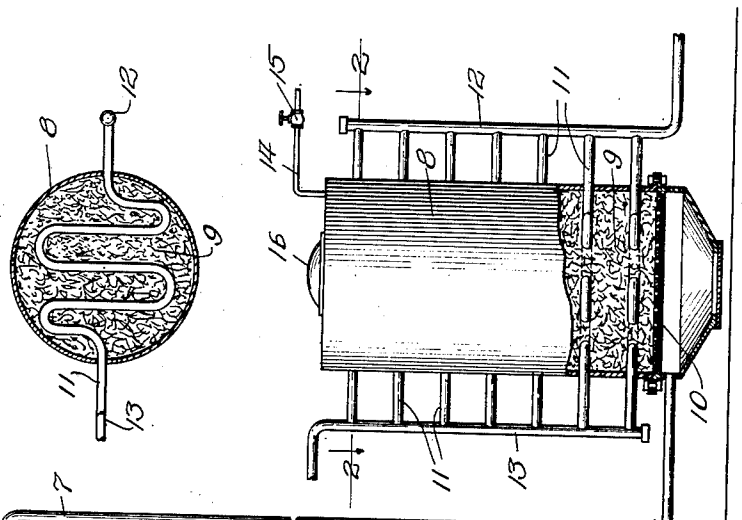
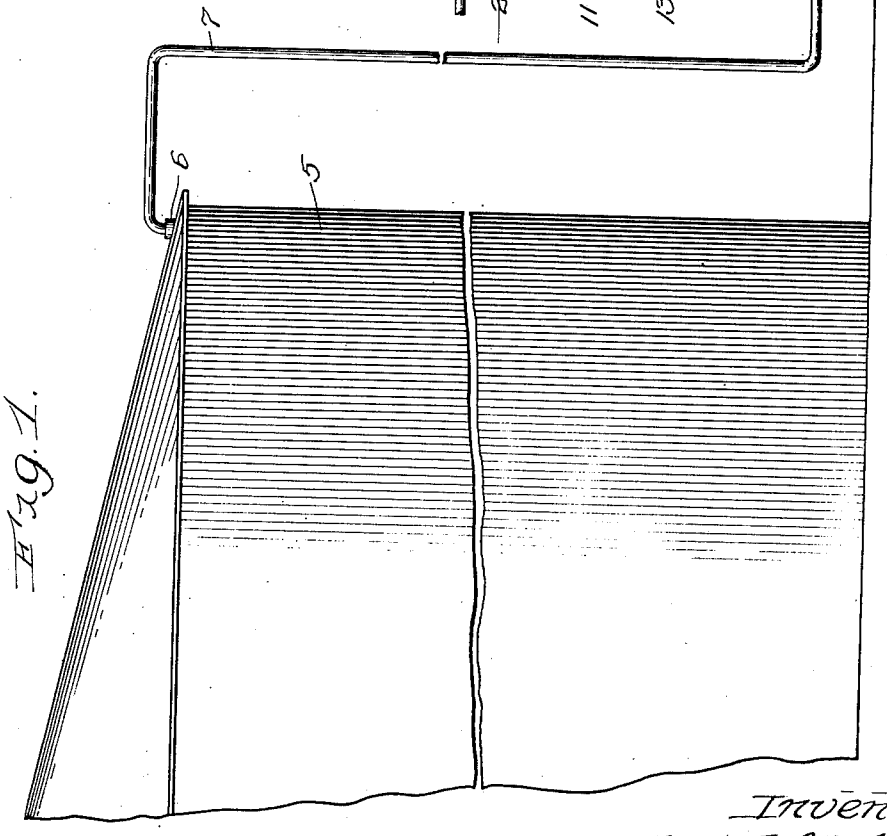


Fig. 1.



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UNITED STATES PATENT OFFICE.

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ART OF PREVENTING LOSS BY EVAPORATION FROM STORAGE TANKS.

Original application filed June 22, 1923, Serial No. 647,114. Now Patent No. 1,489,725, dated April 8, 1924. Divided and this application filed January 30, 1924. Serial No. 689,472.

To all whom it may concern:

Be it known that I, ROBERT E. WILSON, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a new and useful Improvement in the Art of Preventing Loss by Evaporation from Storage Tanks, of which the following is a specification.

This invention relates to the prevention of loss by evaporation from storage tanks containing volatile liquids, and more particularly from vented storage tanks containing volatile materials such as gasoline, crude petroleum and the like. It will be fully understood from the following description, illustrated by the accompanying drawings, in which

Figure 1 is a diagrammatic view partly in section, of apparatus suitable for carrying the invention into effect; and

Fig. 2 is a transverse sectional view on the line 2—2 of Fig. 1.

In accordance with this invention a storage tank 5 containing, for example, gasoline or other material having volatile constituents, is connected by its sole vent 6 and a suitable conduit 7 with the inlet, preferably near the base of a container 8 in which a body of a suitable solid absorbent material is provided. This absorbent material 9 may suitably rest upon a perforated plate 10, and in it are embedded a plurality of coils 11, which serve for attemperating the body of solid absorbent. The coils 11 are connected on the one hand to an inlet manifold 12 and on the other hand to an outlet manifold 13. An outlet from the interior of the absorbent container 8 is provided at 14, this outlet suitably communicating with the atmosphere and being provided with a valve 15. A man-head 16 is provided at the top of the container 8 for access to its interior.

In storage, there is normally a more or less regular expiration of vapor charged air from the tank and of fresh air back into the tank 5, resulting from the more or less regular external atmospheric temperature changes and the effects of sunlight. This "breathing" of the tank is more particularly noticeable in seasons and in climates when there are marked differences between day and night temperatures. In accordance with the present invention, vapor charged air passing from the tank 5 enters and is forced through the body of absorbent material 9 in the container 8. During suction of air back into the tank, the air is sucked back through the same absorbent material in a countercurrent direction, picking up adsorbed vapors. In accordance with the present invention, the absorbent material is so attemperated by a suitable heating or cooling medium passing through the coils 11 as to maintain a temperature during the period of inspiration or suction higher than that prevailing during the period of expiration. This temperature differential may ordinarily be maintained by supplying through the coils 11 a cooling medium during the warmer part of the day, during which expiration takes place. However, in some cases, instead of cooling the body of absorbent during the period in which expiration takes place, it may be heated during the cooler hours of the night, while retraction or inspiration takes place. It is also readily apparent that both heating and cooling mediums may be applied, the cooling medium during the day and the heating medium during the night, in order to maintain this temperature differential between period of expiration and suction. The temperature control may be manual, by an operator, or may be automatic, either by a set schedule; by any suitable temperature sensitive device, which may be located in the vapor space of the tank or is exposed to external atmospheric changes and sunlight; or by suitable pressure sensitive device in conduit 7 operable to cause cooling of the adsorbent during passage of vapor to it or heating during suction into the tank or bath.

Any suitable adsorbent material, such as silica gel, ferric hydroxide gel, fuller's earth, activated charcoal, or the like may be employed. Such adsorbents are fuller's earth, silica gel and ferric hydroxide gel are to be preferred as under the relatively slight temperature changes prevailing under the conditions of the present invention, these absorbents give back the absorbed vapors more readily than adsorbents of the type of activated charcoal. The amount of the adsorbent required varies with the size of the tank and the conditions to which the latter is subjected. Thus for a 120 foot tank in the mid-continent field, from 30 to 70 barrels of fuller's earth has been found satisfactory.

The temperature differential to be maintained is determined largely by external atmospheric conditions. During periods of inspiration or retraction into the tank, the body of absorbent material should be maintained at a temperature at least as high as the highest temperature obtained by it during the preceding period of expiration and preferably at a temperature from 10 to 25° F., higher. For example, if the highest temperature attained by the solid absorbent material during the day, while the expiration takes place, is 90° F., the absorbent material should be maintained during the following night while suction back into the tank takes place, at a temperature of at least 90° F. and preferably at 100 to 115° F. As already stated it is readily apparent that the temperature differential may be maintained by cooling the absorbent during periods of expiration, by heating it during periods of retraction of vapor and air, or by both.

In carrying out the present invention substantially all vapors of volatile constituents of the tank are absorbed by the absorbent 9 and are to a considerable extent yielded up and returned to the tank on suction of vapor and air back into the latter. It is therefore readily apparent that under these conditions loss by evaporation is very greatly reduced.

This application is a division of my application Serial No. 647,114, filed June 22, 1923.

I claim:

1. The method of preventing loss by evaporation from a vented storage tank which comprises providing a sole outlet from the vapor space of such a tank to and through a body of silica gel, and attemperating the silica gel to a temperature at least as high during suction into the tank as that prevailing during expiration from the tank.

2. The method of preventing loss by evaporation from vented storage tanks containing volatile materials such as gasoline which comprises providing a sole outlet from the vapor spaces from such tanks to and through a body of silica gel, and attemperating the silica gel so as to maintain the temperature during passage of vapor from the body of silicia gel to the tank from 10 to 25° F. higher than that prevailing on passage of vapor and air from the tank to the body of silica gel.

ROBERT E. WILSON.