

March 22, 1938.

G. W. CHENICEK

2,111,839

BREATHER BAG SYSTEM

Filed Sept. 23, 1936

3 Sheets-Sheet 1

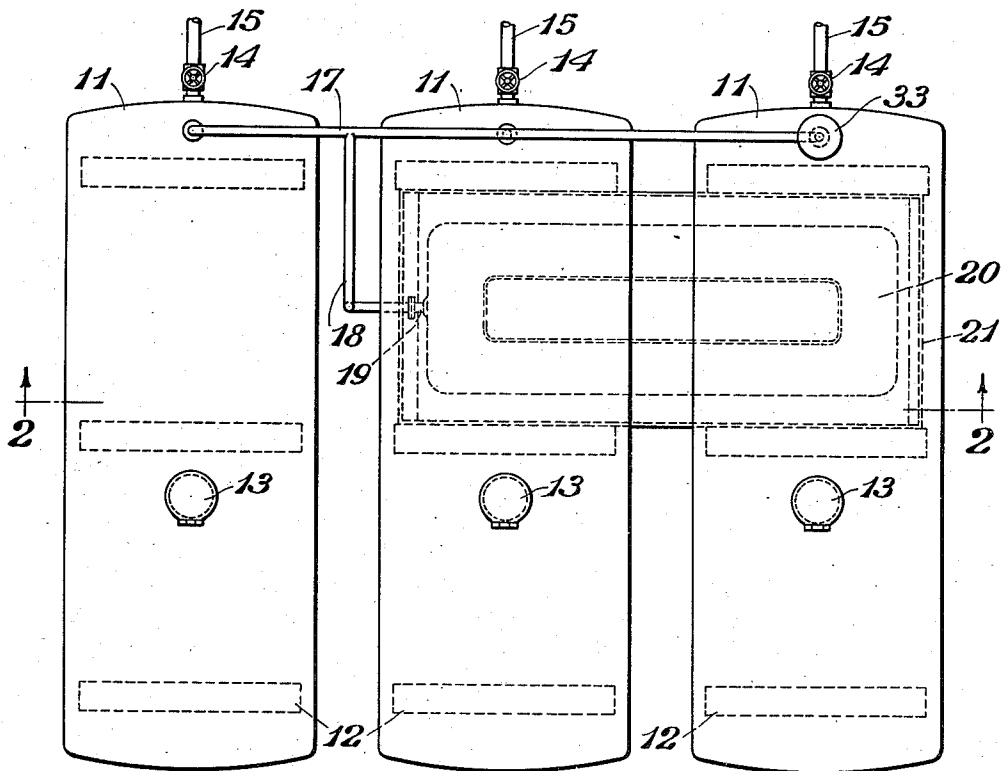


Fig. 1

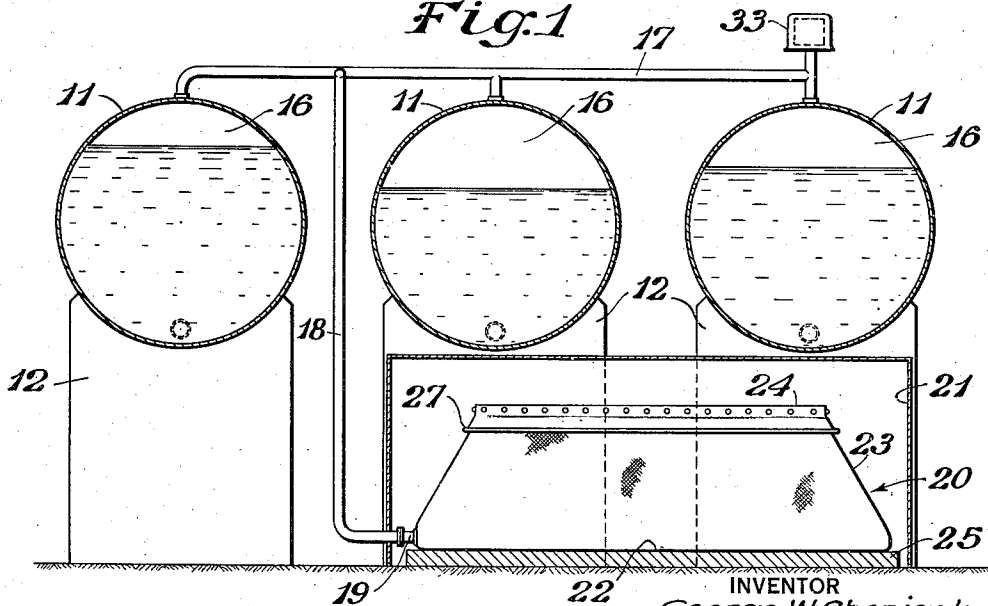


Fig. 2

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3 Sheets-Sheet 2

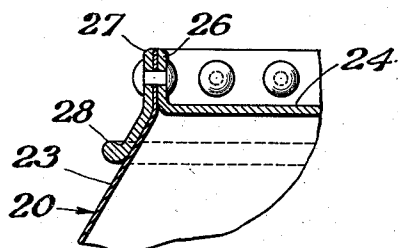


Fig. 4

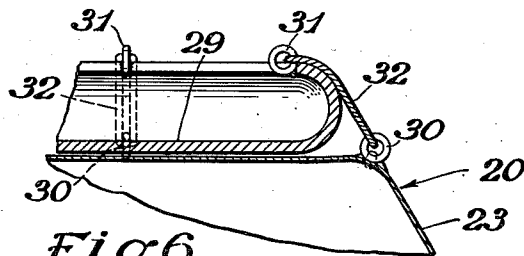


Fig. 6

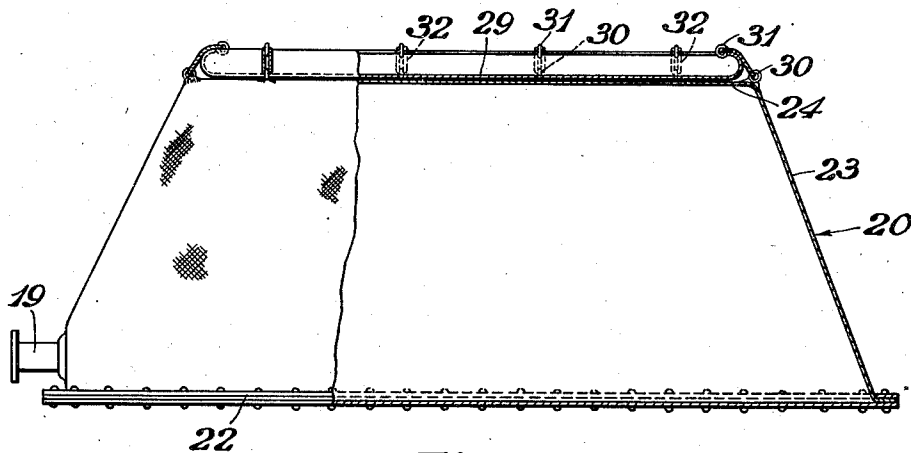


Fig. 5

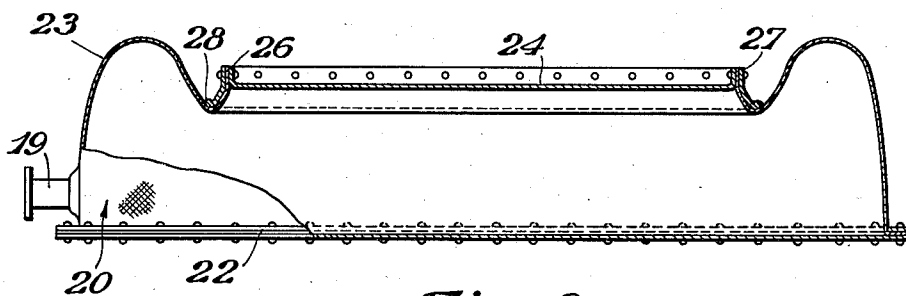


Fig. 3

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3 Sheets-Sheet 3

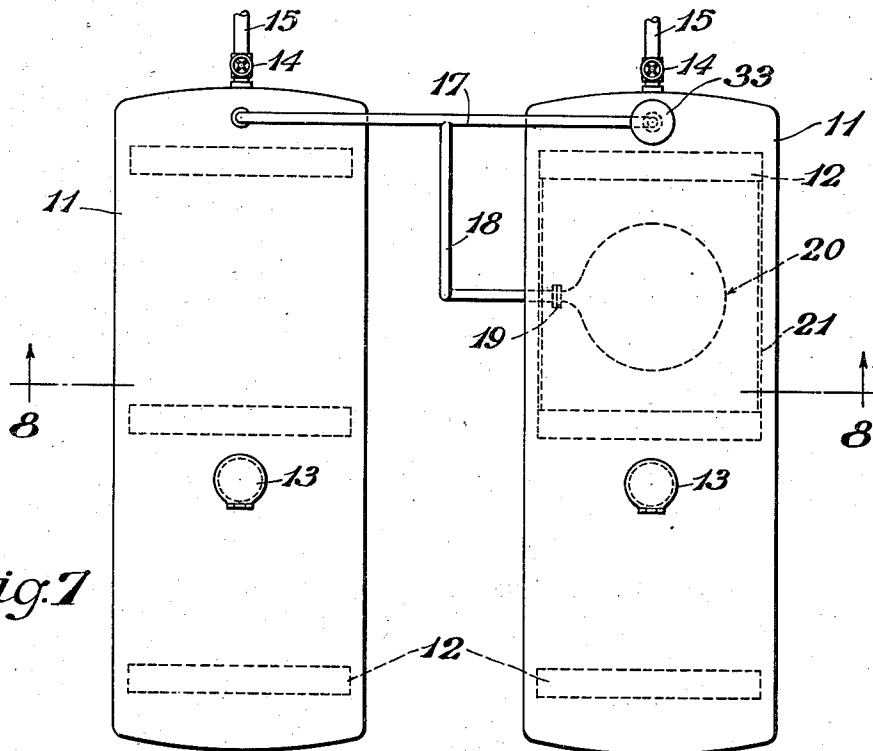


Fig. 7

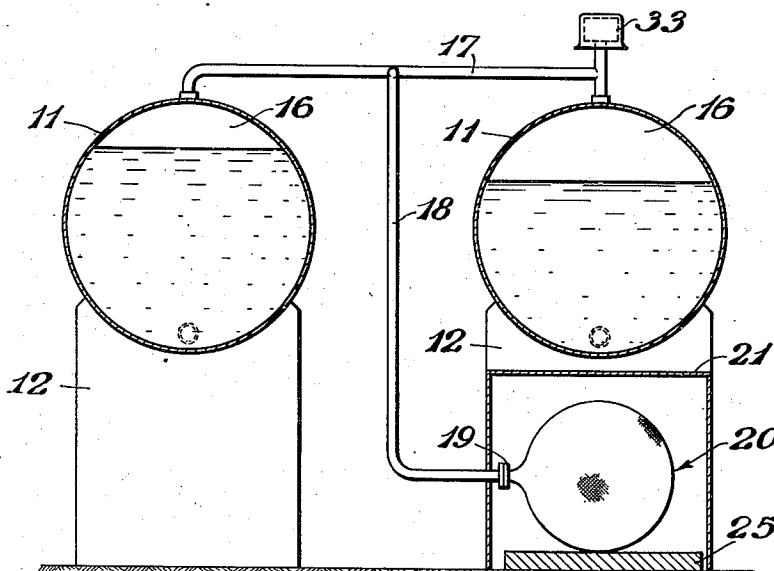


Fig. 8

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BREATHER BAG SYSTEM

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6 Claims. (Cl. 220—85)

This invention relates to systems for the prevention of evaporation losses in connection with the storage of volatile liquids such as gasoline. More particularly it relates to breather bag systems.

Large collapsible fabric bags known as breather bags were commercially developed many years ago to control evaporation losses in connection with the storage of gasoline and similar volatile liquids in large tanks typified by capacities of the order of magnitude of 80,000 barrels. However, such breather bags have not in the past been used or thought adapted to problems involved in connection with the storage of relatively small volumes of liquids such as are dealt with in typical bulk plants used in the marketing end of the petroleum industry. These bulk plant storage tanks are usually horizontal cylindrical tanks of about 10,000 to 21,000 gallons capacity.

It is an object of my invention to provide systems for preventing evaporation losses in connection with the storage of volatile liquids under conditions such as those met with in gasoline bulk plants. Another object is to provide systems which will permit "breathing" of volatile liquids stored in tanks without permitting the entrance of air or the loss of vapors. Still another object is to provide systems of the aforementioned type which will be efficient and economical in connection with the storage of relatively small volumes of volatile liquids. It is likewise an object of my invention to provide new and improved breather bags of small capacity type.

I have found it possible to construct breather bag systems of a highly economical and efficient sort for use in connection with the storage of gasoline at bulk plants. These breather bag systems are also adapted to the storage of other volatile liquids and various types of systems can be used within the scope of my invention.

My invention will be described more particularly with reference to the specific embodiments shown in the accompanying drawings which form a part of this specification and in which like numerals refer to like or corresponding parts.

In the drawings:

Figure 1 is a top plan view of a system showing the application of my invention to a typical bulk plant layout;

Figure 2 is a vertical section corresponding to Figure 1 and taken along the line 2—2 of Figure 1;

Figure 3 is an elevation, partly in section show-

ing, in partially deflated condition, a breather bag which is a slight modification of the breather bag shown in Figures 1 and 2;

Figure 4 is a detail of one upper corner of the breather bag of Figure 3;

Figure 5 is an elevation, partly in section, of another alternative form of breather bag;

Figure 6 is a detail of one upper corner of the breather bag of Figure 5;

Figure 7 is a top plan view of an alternative breather bag system; and

Figure 8 is a sectional elevation of the breather bag system of Figure 7 taken along the line 8—8 of Figure 7.

Referring more particularly to Figures 1 and 2 it will be seen that this bulk plant installation comprises three horizontal storage tanks 11 of the usual type which may each typically be from about 10,000 gallons to about 21,000 gallons or up to about 30,000 gallons in capacity. These storage tanks are supported on concrete piers 12 and are provided with the usual manholes 13, withdrawal and filling valves 14 and withdrawal and filling lines 15.

In accordance with my invention the vapor spaces 16 of all of the tanks in a given group are connected together by a vapor manifold 17 which communicates with the vapor spaces of the various tanks. This vapor manifold leads through a downcomer pipe 18 to an inlet 19 of a breather bag 20 disposed beneath at least some of the tanks and within the space defined by at least some of the piers which support the tanks. In the system of Figures 1 and 2 the breather bag is elongated in horizontal section and is disposed beneath two of the three tanks.

In order to prevent meddling with the breather bag and to protect it from the elements it is extremely important to enclose the space within which it is disposed. This is very readily accomplished by the use of sheets of corrugated iron 21 supported by the piers. Wooden members can be used for additional support of the sheet iron shed and other enclosing means can be used.

The breather bag used in connection with my invention should have a capacity sufficient to take care of all of the normal breathing incident to the temperature changes to be encountered. For a system of three tanks used in the storage of gasoline, each tank being of 17,000 gallons capacity, a breather bag of about 450 cubic feet capacity is suitable. As the temperature rises and vapors are driven off from the volatile liquid in the tanks, these vapors pass

to the breather bag and inflate it. As the temperature falls the breather bag deflates and vapors are driven back into the tanks. There is thus little or no vapor loss and a very great saving is effected which is far more than enough to pay for the very economical type of breather bag installation which I have devised.

My breather bag itself, as shown in Figures 1 and 2, has a fabric bottom portion 22, fabric sides 23 and a metallic top portion 24. The base is roughly horizontal and preferably rests upon a wooden or concrete platform 25 which keeps it off the ground and tends to prevent rotting of the fabric.

The fabric used in connection with these breather bags can be of any of the impervious types previously known to the art in connection with large refinery breather bags. The inside may suitably be coated with a glue type of coating resistant to the vapors being handled and the outside may suitably be rubberized. The sides of the bag are integral with the base or can be attached to it by seaming and sealing means known to the art. In Figures 1, 2, 3 and 4 the upper portions of the sides of the breather bag are attached to a metallic top portion 24 which is disposed above and is materially smaller than the bottom portion of the breather bag. At the juncture of the sides and top portion the fabric is folded and sealed into the space between an upstanding metallic rim 26 and a metallic ring 27 which has a turned-up portion 28 which serves to prevent tearing of the bag when the bag is deflated. The weighted top portion is highly desirable since these small breather bags disposed beneath the tanks do not deflate entirely satisfactorily unless they are weighted. The weight serves to force the vapors up into the tanks when the pressure in the tanks drops to zero. In the absence of the weight, the head of vapors in downcomer pipe 18 would keep the breather bag partially inflated even when the pressure in the tanks dropped to zero and this would result in waste breather bag capacity. When the bottom of the tank is about nine feet above the ground the weight may suitably be such as to put a pressure of 0.3 to 0.35 ounce per square inch on the vapors within the bag. Under other circumstances weighting may be such as to give breather bag pressures from about 0.1 to about 1.0 ounce per square inch.

The slightly modified form of bag shown in Figure 3 has a metallic bottom portion 22 rather than a fabric bottom portion as in Figures 1 and 2. The metal is bolted and sealed between two sections of the bottom portion as shown in Figure 3. This structure renders unnecessary the use of a platform below the bag. The bag of Figure 3 is shown partially deflated to illustrate the breathing action of the bag.

A modified bag is shown in Figures 5 and 6. This bag has a fabric top portion 24 instead of a metallic top portion. This has some advantage in that there are no fabric-metallic seams at the top of the bag. In fact by using a fabric bottom, as shown in Figure 2, and a fabric top as shown in Figures 5 and 6, fabric-metallic seams can be entirely avoided. In the bag of Figures 5 and 6 the weighting is accomplished by the use of a separate metallic weighting member 29 which is fastened to the top of the bag by means of rings 30 sewn into the bag and corresponding rings 31 carried by the metallic top portion. These rings are connected by rope ties 32.

The modification of Figures 7 and 8 illustrate a system in which a breather bag 20 is disposed entirely beneath a single tank. A breather bag disposed beneath a single tank can be used to protect a single tank or to protect two or more tanks against evaporation losses, as shown. The breather bag illustrated in Figures 7 and 8 is a simple spherical bag which serves to accomplish the purposes of my invention although the weighted bags of Figures 1 to 6 are highly preferable since their deflation is more positive and since the weight makes it possible to use bags of lesser capacity.

It is desirable in connection with a system of this kind to use a safety valve 33 adapted to prevent any substantial pressure or vacuum in the tanks. Such safety valves are well known to the art and are commercially available. Such a valve may suitably operate on 16 ounces per square inch pressure within the system or on 2 ounces per square inch vacuum below atmospheric pressure. However, if a breather bag of sufficiently large capacity is provided, these safety valves are not absolutely essential and do not function under any conditions normally met with since the breather bag takes care of all expansion and contraction without permitting the escape of vapors or the introduction of air.

While I have described my invention in connection with certain specific embodiments thereof, it is to be understood that these are by way of illustration rather than by way of limitation and the scope of my invention is to be determined only by the appended claims which should be construed as broadly as the prior art will permit.

I claim:

1. In combination, an elevated storage tank for volatile liquids, a plurality of piers supporting said storage tank in elevated position, a breather bag disposed beneath said storage tank within the space defined by at least some of said piers, means for connecting said breather bag with the vapor space of said storage tank to form a closed vapor system, means for at least partially surrounding said breather bag for protecting the same, said last-named means comprising at least some of said piers.

2. In combination, an elevated storage tank for volatile liquids, a plurality of piers supporting said storage tank in elevated position, a breather bag disposed beneath said storage tank within the space defined by at least some of said piers, means for connecting said breather bag with the vapor space of said storage tank to form a closed vapor system, means for at least partially surrounding and protecting said breather bag and means for supporting said surrounding and protecting means, said supporting means comprising at least some of said piers.

3. A breather bag system comprising a plurality of storage tanks, a plurality of piers supporting said storage tanks above the ground, a breather bag disposed beneath at least some of said storage tanks within a space defined by at least some of said piers, a manifold connecting said breather bag with the vapor spaces of said storage tanks, means for at least partially surrounding and protecting said breather bag and means for supporting said surrounding and protecting means, said supporting means comprising at least some of said piers.

4. A system according to claim 3 including a safety valve for preventing excessive pressure or vacuum within said system.

5. A breather bag system comprising a plurality of small storage tanks, a plurality of piers supporting said storage tanks in an elevated position, a breather bag disposed beneath at least some of said storage tanks within a space defined by at least some of said piers, said breather bag comprising a bottom portion, a weighted top portion substantially smaller than said bottom portion and disposed above said bottom portion, fabric sides connecting said bottom portion and said top portion to form a gas-tight structure and a gas inlet for said structure, means for at least par-

tially surrounding and protecting said breather bag, means for supporting said surrounding and protecting means, said supporting means comprising at least some of said piers, and a manifold connecting said breather bag with the vapor spaces of said storage tanks.

6. A system according to claim 5 in which said weight is such as to put a pressure of from about 0.1 to about 1.0 ounce per square inch on the vapors within the bag.

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