

Dec. 21, 1943.

J. H. WIGGINS

2,337,286

GAS AND LIQUID STORAGE APPARATUS

Filed Nov. 1, 1940

2 Sheets-Sheet 1

FIG. 1.

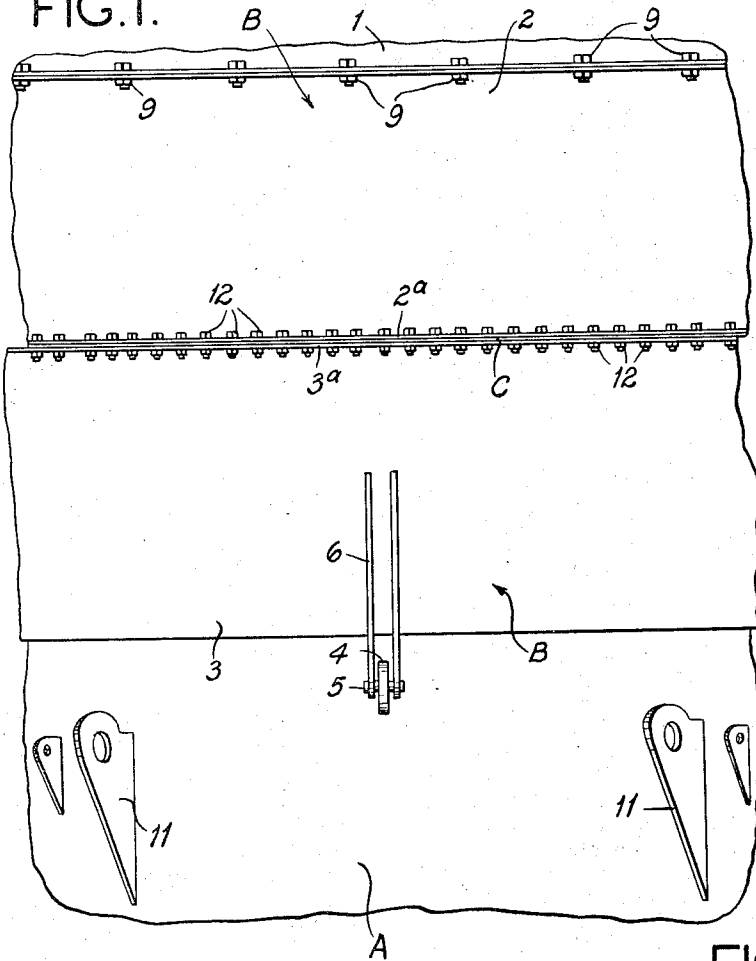


FIG. 2.

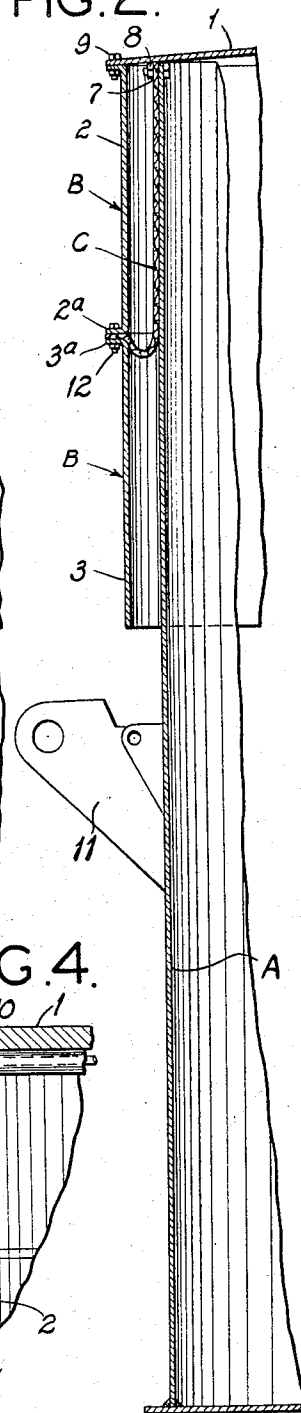


FIG. 3.

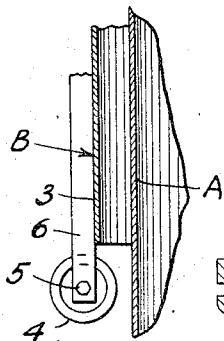


FIG. 4.

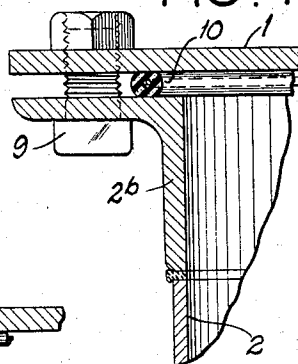
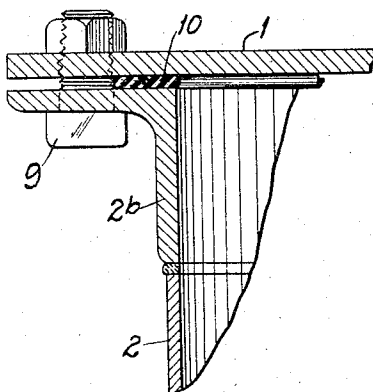


FIG. 5.



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FIG. 7.

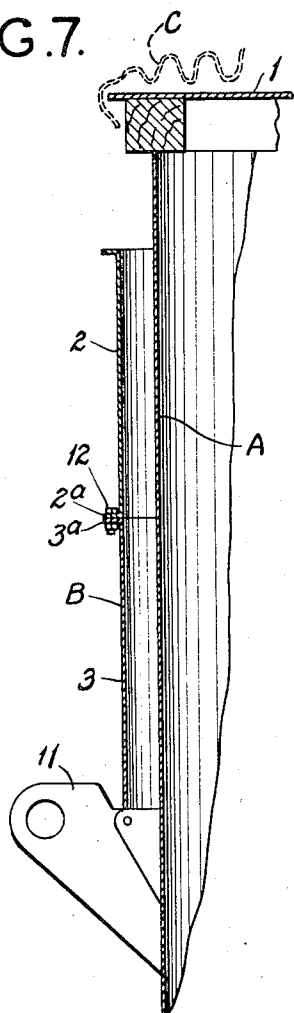


FIG. 8.

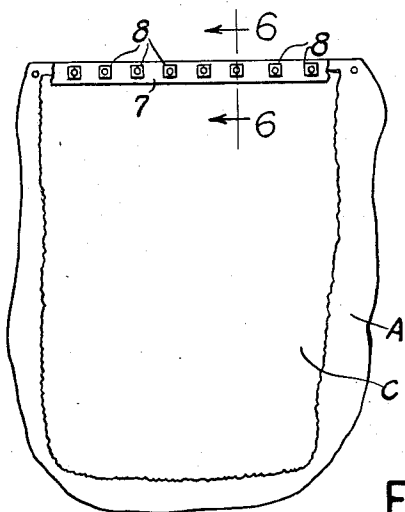


FIG. 6.

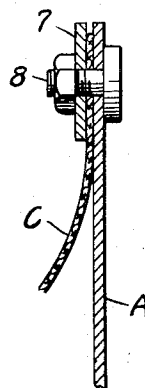


FIG. 11.

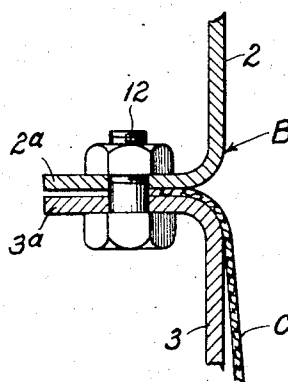


FIG. 9.

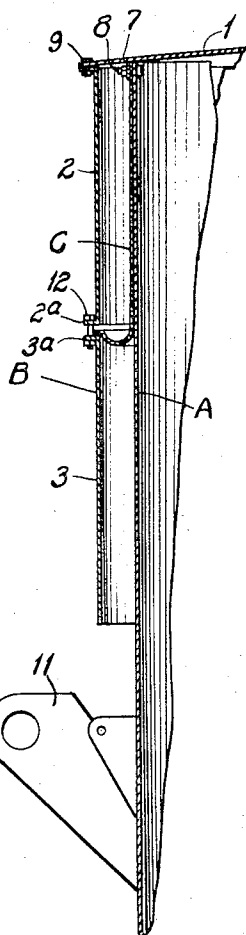
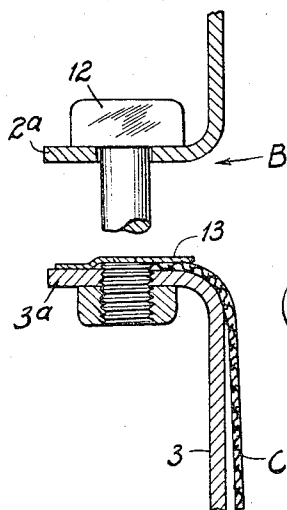


FIG. 10.



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2,337,286

GAS AND LIQUID STORAGE APPARATUS

John H. Wiggins, Chicago, Ill.

Application November 1, 1940, Serial No. 363,833

6 Claims. (Cl. 48—176)

This invention relates to apparatus of the kind that are used for storing gases and/or volatile liquids, and particularly, gases and/or liquid storage apparatus of the type in which the gas receiving space or chamber of the apparatus comprises a stationary portion, a vertically-movable portion, and a flexible, non-metallic sealing element that produces a gas-tight joint or connection between said parts and provides for the movement of said vertically-movable portion, as described in my prior U. S. Patents Nos. 2,050,405, 2,050,685 and 2,050,686, dated August 11, 1936, and No. 2,102,299, dated December 14, 1937. I have herein illustrated my invention embodied in an apparatus of the general type mentioned, whose vertically-movable portion constitutes the upper part of the gas receiving space or chamber of the apparatus and is arranged in telescopic relation with a stationary tank that constitutes the lower part of said space or chamber, but I wish it to be understood that certain features of my present invention are applicable to any type or kind of gas and/or liquid storage apparatus that employs a flexible sealing element which is adapted to double, fold, or assume a loop form in the normal functioning of the apparatus.

One object of my present invention is to provide an apparatus or structure of the general kind previously mentioned, whose co-acting parts are constructed or combined in a novel way that protects the flexible sealing element from injury and eliminates the possibility of said sealing element being chafed or cut when the apparatus is functioning.

Another object is to provide an apparatus of the general type mentioned, whose co-acting parts are constructed or combined in a novel manner that greatly simplifies the installation and/or replacement of the flexible sealing element of the apparatus.

Figure 1 of the drawings is a fragmentary side elevational view of the apparatus embodying my present invention.

Figure 2 is a fragmentary vertical sectional view of said apparatus.

Figure 3 is a detail view, in vertical section, of one of the guide rollers on the riser, employed to protect the sealing element against injury and to hold the riser in approximately concentric relation with the side wall of the tank.

Figures 4 and 5 are detail views, illustrating the operation of detachably connecting the roof of the riser to the side wall portion of the riser.

Figure 6 is a detail view, illustrating the means

used to detachably connect the sealing element to the side wall of the tank.

Figure 7 is a detail view, illustrating the operation of installing the sealing element, showing the side wall portion of the riser sustained by brackets on the tank side wall, and the roof of the riser separated from the side wall portion of the riser.

Figure 8 is a fragmentary side elevational view of the parts shown in Figure 6; and

Figures 9, 10 and 11 are detail views, illustrating the operation of attaching the sealing element to the side wall portion of the riser.

In the accompanying drawings A designates a stationary tank that constitutes the lower portion of the space or chamber which receives or confines the medium stored in the apparatus, B designates as an entirety the vertically-movable upper portion of said space or chamber, commonly referred to as a "riser," which is arranged in telescopic relation with said tank, and C designates a seal or sealing element constructed of gas-tight fabric or other suitable flexible or pliable material attached to the side wall of the tank A and to the side wall portion of the riser B, so as to maintain a gas-tight joint between said parts and still provide for the vertical movement of the riser. The riser comprises a roof 1, a cylindrical side wall member 2, arranged in concentric, or approximately concentric, relation with the tank side wall, and preferably detachably connected in a novel manner to the peripheral edge of the roof 1, and a skirt 3 of cylindrical form attached to and depending from the bottom edge of the cylindrical side wall member 2 of the riser. The seal C, which is of annular form, has its inner edge attached to the top edge of the side wall of the tank A, and has its outer edge attached to the riser B, preferably at the point where the top edge of the skirt 3 of the riser is fastened to the side wall member 2 of the riser. When the riser is in its lowermost position, the seal C hangs downwardly from the top edge of the tank side wall, as shown in Figure 2, and when the riser moves upwardly, said seal folds, doubles, or assumes a loop form so as to provide for the upward movement of the riser. At such times the skirt 3, which forms the lower half of the side wall portion of the riser, serves as a backing for the seal C and prevents said seal from being subjected to injurious strains, as described in my U. S. patents previously referred to.

In order to prevent the sealing element C from being cut or chafed during the upward and downward movement of the riser B, I have pro-

vided said riser with guide rollers 4, arranged at the lower end of the riser in such a position as to prevent the bottom edge of the skirt 3 of the riser from contacting with the sealing element C, said guide rollers 4 being arranged in spaced relation around the circumference of the riser, and each guide roller being preferably mounted on a horizontal axle 5 carried by a pair of vertically-disposed supporting bars 6 attached to the exterior of the skirt 3, as shown in Figure 1 and depending below the bottom edge of said skirt. In addition to preventing the bottom edge of the skirt from cutting the seal C, the guide rollers 4, by co-operating with the side wall of the tank A, effectively resist wind pressures that tend to move the riser out of concentric relationship with the tank side wall. The inner edge of the sealing element C is fastened to the upper end of the side wall of the tank A by a removable clamping bar 7 arranged on the exterior of said wall, as shown in Figures 6 and 8, and detachably connected to same by bolts 8, said bolts projecting laterally from the tank side wall far enough to prevent the side wall portion of the riser B from rubbing on or chafing the sealing element C.

One important feature of my present invention consists in combining the parts of the riser B and connecting the seal C with the riser and with the tank side wall in such a way that it is commercially feasible to construct the seal C in the form of a continuous ring or endless band, inasmuch as said co-operating parts are so designed and combined that the seal C can be replaced without emptying the tank A, when liquid is stored in said tank. Heretofore it has been the usual practice to rivet the roof of the riser to the side wall portion of the riser, but in my improved construction the roof 1 is detachably connected to the side wall member 2 of the riser by bolts 9 and a gasket 10, as shown in Figures 4 and 5. In the operation of installing the seal C, or when replacement of said seal becomes necessary, the workmen located on the exterior of the apparatus first block up the roof 1, as indicated in Figure 7, and then lower the side wall member 2 and skirt 3 of the riser onto laterally-projecting brackets 11 on the side wall of the tank A, thus producing an opening or space between the roof and side wall portion of the riser B through which the sealing element C can be inserted and arranged in operative position between the riser and the side wall of the tank, said sealing element C preferably having a diameter only slightly greater than the diameter of the roof, so that it can be telescoped over the roof and drawn downwardly around the edge of the roof. After the sealing element has been positioned between the tank side wall and the side wall portion of the riser B, as just explained, the inner edge or upper edge of said sealing element is detachably fastened to the tank side wall by the clamping bar 7 and bolts 8. Thereafter, the outer edge or bottom end of the sealing element C is connected to the riser by the procedure illustrated in Figures 9 and 10, which procedure involves: (1) removing the blocks under the roof so as to permit said roof to rest on the top edge of the side wall of the tank A; (2) then moving the side wall member 2 of the riser upwardly and attaching it to the roof 1 by bolts 9 after a suit-

able deformable gasket 10 has been interposed between the roof and the angle 2^b at the top edge of said side wall member 2; and (3) then raising the skirt 3 of the riser and suspending it from the side wall member 2 in spaced relationship with same, by a few vertically-disposed bolts 12 positioned in co-operating laterally-projecting flanges 2^a and 3^a on the side wall member 2 and skirt 3 of the riser. The bottom edge of the sealing element C can then be inserted between the flanges 2^a and 3^a and temporarily held by clips 13, as shown in Figure 10. The hanger bolts 12, used to suspend the skirt from the side wall member 2 of the riser, are then tightened so as to cause the sealing element C to be clamped at intervals by said bolts, and subsequently, the clips 13 are pulled out and the rest of the bolts 12 are inserted so as to cause the sealing element to be gripped tightly around its entire edge by the co-operating flanges 2^a and 3^a and the bolts 12 used to connect the skirt 3 to the side wall member 2 of the riser, thus causing the sealing element to be connected in a gas-tight manner to the side wall portion 3 of the riser, as shown in Figure 11.

Having thus described my invention, what I desire to secure by Letters Patent is:

1. A fluid storage apparatus, comprising a tank provided with a tubular side wall, a vertically-movable riser arranged in telescoped relation with said tank and provided with a side wall portion of less height than the side wall of the tank, said riser having a separable roof detachably connected to the upper end of the side wall portion of the riser, means for supporting the riser in a position with its top edge disposed below the top edge of the side wall of the tank when the roof of the riser is disconnected from same, and a flexible sealing element detachably fastened to the side wall portion of the riser at a point above the bottom point of same and also detachably fastened to the side wall of the tank.

2. An apparatus described in claim 1, in which the side wall portion of the riser is provided at its lower end with guide rollers disposed so as to maintain the riser in approximately concentric relation with the tank and also prevent the sealing element from being cut or damaged by the bottom edge of the side wall portion of the riser.

3. An apparatus described in claim 1, in which the sealing element is formed by a continuous ring or endless band of non-metallic, flexible material.

4. An apparatus of the kind described in claim 1, in which the means that supports the riser when the roof of the riser is separated from the side wall portion thereof, consists of laterally-projecting brackets on the side wall of the tank.

5. An apparatus described in claim 1, in which the means employed to detachably fasten the sealing element to the side wall of the tank comprises laterally-projecting devices on said side wall that serve as stops which prevent the side wall portion of the riser from rubbing or chafing the sealing element.

6. An apparatus described in claim 1, in which the side wall portion of the riser is formed by two separable, superimposed, annular members, between which one end or edge of the sealing element is clamped.

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