Jan. 16, 1945. W. E. GRUENING 2,367,497

GASHOLDER

Filed Feb. 26, 1940 2 Sheets-Sheet 1

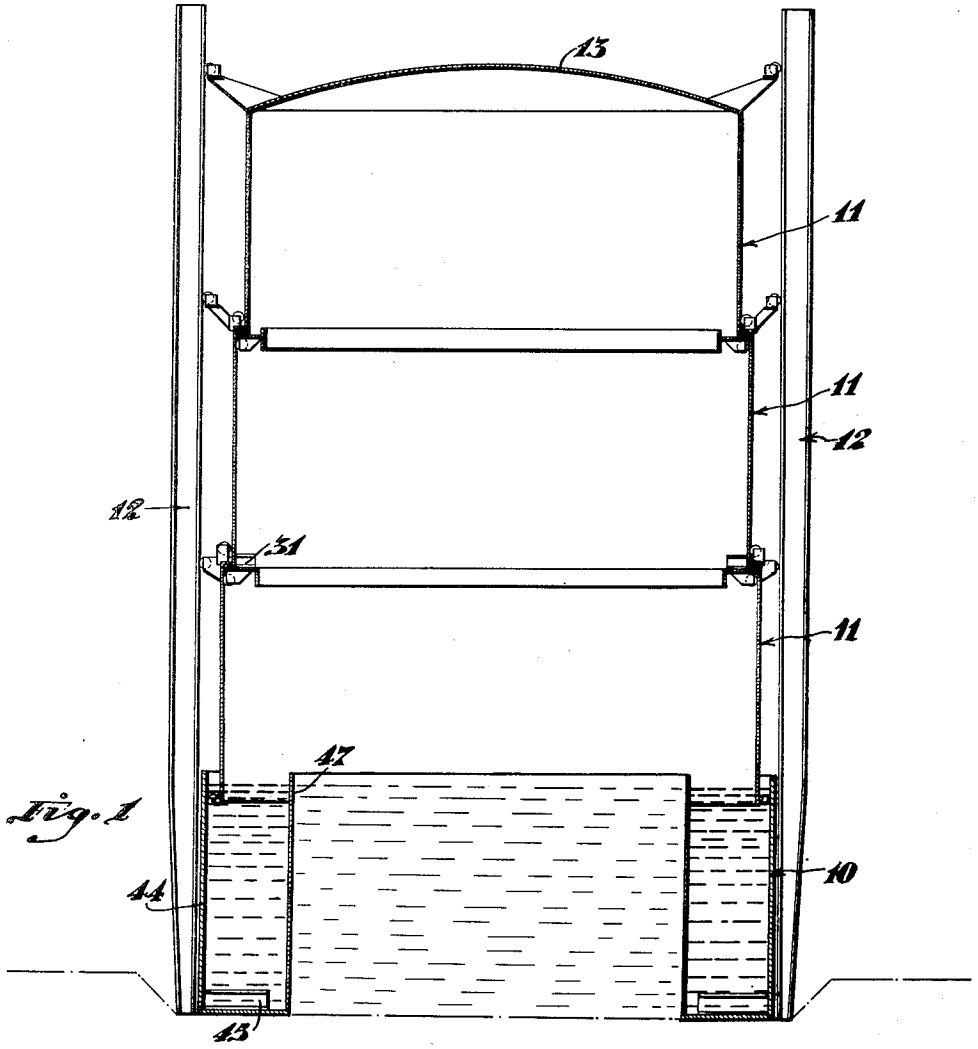


Fig. 1

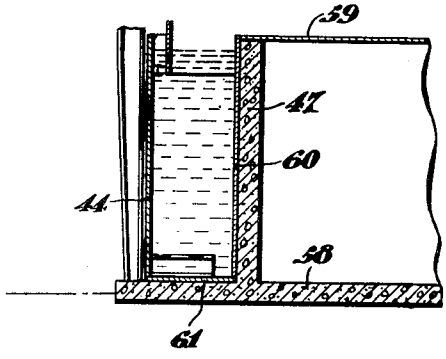


Fig. 7

INVENTOR.

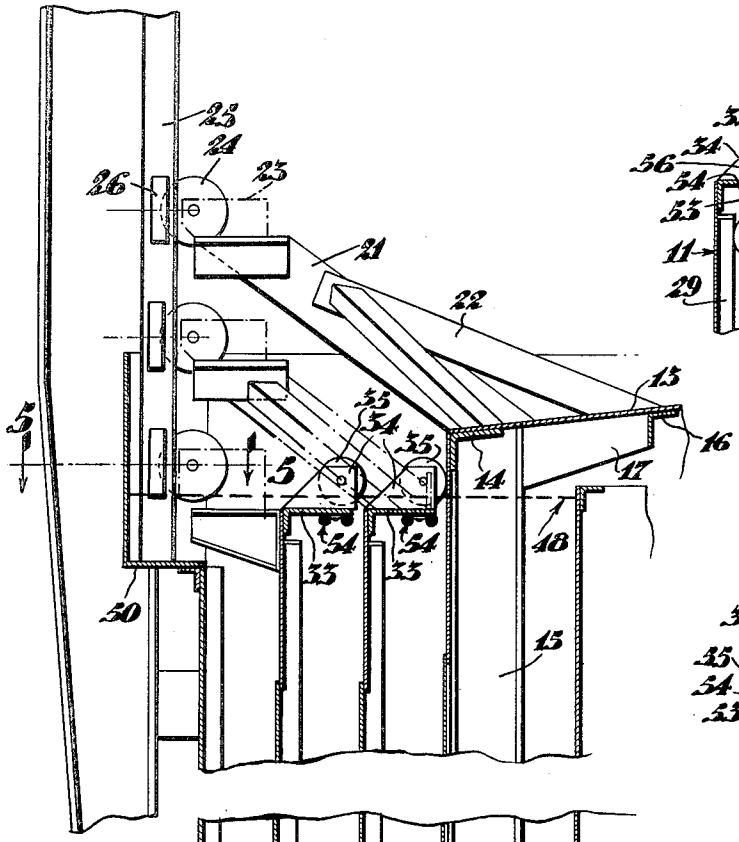
BY William E. Gruening

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Jan. 16, 1945. W. E. GRUENING 2,367,497

GASHOLDER

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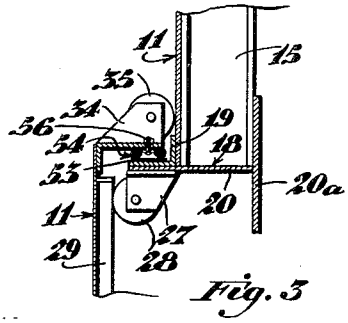


Fig. 3

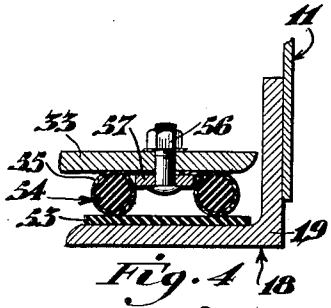


Fig. 4

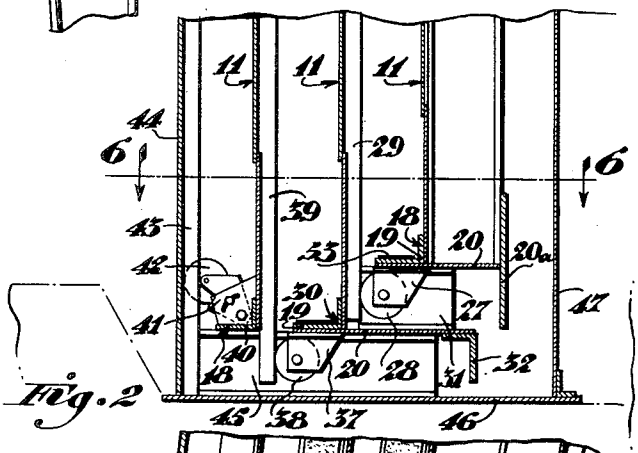


Fig. 2

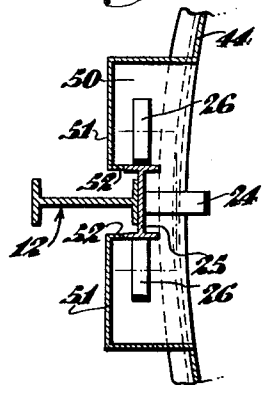


Fig. 5

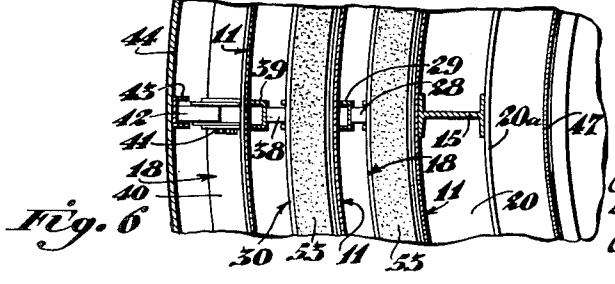


Fig. 6

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2,367,497

UNITED STATES PATENT OFFICE

2,367,497

GASHOLDER

William E. Gruening, Cincinnati, Ohio, assignor to The Stacey Brothers Gas Construction Company, Cincinnati, Ohio, a corporation of Ohio

Application February 26, 1940, Serial No. 320,763

5 Claims. (Cl. 48—177)

This invention relates to storage tanks and is particularly directed to gas holders. More particularly, this invention is in the nature of an improvement upon that type of tank known in the industry as a telescopic wet or lift type holder. This type of holder consists of a series of telescoping sections or lifts. As the gas is delivered into the tank, the upper section or bell rises. When its lower edge, which includes a cup, reaches the top of the next section, it engages the inverted cup of the next section and this section is then lifted. The sections may be described as nested when there is no gas in the tank and their movement may be described as telescopic. These various sections or lifts are guided in a surrounding frame work.

In the well known wet type holder, the sealing arrangement consists of a trough or cup around the lower edge of each lift and an inverted trough or grip section around the top edge of each of the outer lifts. These bottom troughs or cups are filled with water. As each section rises, the depending flange at the top grip of the next lift is submerged in the water in the cup. The cup of each section thus engages the grip section of the next lift in which it is in contact position for elevation and the various sections are thus elevated or inflated.

When the holder has been inflated, it will be apparent that the water sealed connections are exposed directly to the elements. It is an extremely difficult matter to prevent the water in these cups from freezing in cold weather. The past practice has been to supply steam or hot water by means of flexible hose so that whether the holder is fully inflated or only partially inflated, the steam or hot water is supplied to the cups to prevent freezing. Moreover, there is a rapid deterioration of the materials in the vicinity of the water line of these cups and it is impossible to properly maintain or prevent deterioration at these fluctuating water lines.

It has been an object of the present inventor to eliminate the water seal and to provide a type of seal which will work as well in winter as in summer and which will efficiently seal the joints between the sections solely by virtue of the pressure resulting from the weight of the section or sections being lifted. Thus in the development of the invention, it has been the objective to eliminate as much as possible the use of exposed water to eliminate heating costs and to reduce maintenance costs.

One embodiment of this concept consists of packing attached to the top curbs of the second and all lower sections and component packing at the bottom curb of each lift except the bottom one. Accordingly, taking one joint as an example, the lower curb of the uppermost section rises under the top curb of the lifted section and the component packing elements are then in contact. The amount of pressure exerted at the packing is equal to the weight of the suspended section.

It has been a problem to lubricate the various internal guide rollers, that is the rollers which guide these sections at the lower end of the sections and also to prevent corrosion of the plates of the sections and the various other parts.

Therefore, it has been a further object of this inventor to provide an annular trough of oil at the base of the water or storage tank structure in which trough all of the sections or lifts are submerged when in nested or lowermost position.

Now it will be appreciated that the cup or trough of oil will of necessity be as deep as the height of a lift or section. Since the tanks are of large diameter, this would entail the use of too much oil. As a high annular ring like trough of oil is provided, it will be apparent that a heavy inner wall as well as outside wall must ordinarily be used. Furthermore, it would be difficult to exhaust the gas from the space within the annular oil trough.

Accordingly, it has been a further object of the present inventor to provide a trough containing another fluid such as water in the inside space. A number of advantages result from this. A lighter inside wall may be used due to the hydrostatic pressure balance. Since the space is filled with water, gas is excluded. Although water is used, there is little chance of it freezing, in the first place, because of its volume, in the second place, because of the presence of oil around it and in the third place, because of the presence of gas over it. Thus there are virtually little or no heating requirements.

Assuming that oil were not used, that is, that a large tank were provided completely filled with water into which the sections nested, it would only be necessary to keep this water slightly above freezing because of its volume. The flexible hose required to direct heat to the water cups of the past has always been a source of trouble.

With the oil in the exterior annular space it is unnecessary to keep the lift plates painted, for each time the holder deflates, the plates will be coated with oil and this will prevent corrosion. The holder may be made more attractive by using colored pigments in the oil which colors blend

with or match the paint used on the rest of the structure in order not to detract from its general appearance.

Figure 1 is a general more or less diagrammatic view taken diametrically through the holder showing it fully inflated.

Figure 2 is a fragmentary view taken the same as Figure 1 but showing the sections fully lowered and submerged in the oil, in nested position.

Figure 3 is a fragmentary sectional view taken on a diametrical line, at one of the joints, showing the relationship of two sections when inflated.

Figure 4 is a detail sectional view of the packing of Figure 3.

Figure 5 is a sectional view taken on line 5—5, Figure 2 showing the guide arrangement for any one of the sections relative to the main guide frame work of the holder.

Figure 6 is a sectional view taken on line 6—6, Figure 2.

Figure 7 is a fragmentary sectional view taken diametrically through the base of the holder showing a modified structure.

This invention described in general consists of a tank structure made up of lifts or sections adapted to nest in an annular or ring like tank. Oil is disposed in the annular tank. A skeleton frame work surrounds the tank structure and rises from about the ringlike oil trough. The various sections or lifts are provided with guide means cooperating with the guides of the framework and thus the sections or lifts are guided as they rise and fall during inflation. The sections provide flanges or curbs at those edges to be sealed, having a superposed arrangement adjacent curbs including component packing elements therebetween.

Referring to the drawings, the annular oil tank is generally indicated at 10 and the lifts or sections which nest within it at 11. A series of uprights 12 formed of I-beams, make up the posts of the framework which guides the lifts as they move up and down in the operation of the tank. These uprights may be connected by any suitable circumferential arrangement of girders and bracing members.

The lifts are formed in each instance of steel plates. The uppermost lift 11 is in the form of a bell including the roof 13 for the structure. The roof is connected to the side wall of the bell by a circumferentially arranged angle iron member 14. The side wall is additionally braced by means of I-beams 15 disposed vertically around its inside wall. An angle iron girder 16 is disposed circumferentially around the roof on the inside thereof and fins 17 extend between the rail and each girder 15.

A curb rail 18 is formed around the outer lower edge margin of the bell and is constituted by an angle iron rail 19 strengthened by a sheet metal plate ring 20 secured against the lower ends of the rails and the bottom flange of the angle iron 19. A vertically band of sheet metal 20a is attached around the inner side of the lower end of the lift against the lower inner faces of the girders.

The upper end of this roof section or bell, includes a plurality of radially upwardly extended bearing extensions 21. The extensions are appropriately braced by members 22. Upon these extensions are secured bearing brackets 23 each of which has one roller 24 engaging the web of an I-beam guide 25 and rollers 26 engaging the opposite sides of the I-beam (Figure 5). Each upright 12 carries one of these guide rails 25. The curb rail 18 at the base of this section has roller brackets 27 depending therefrom and carrying rollers 28 engaging the webs of guide rails 29 vertically disposed on the inner wall of the intermediate lift 11 (Figure 6).

The inwardly projected lower curb rail 30 of the intermediate lift carries a series of support pads 31 upon which the roof section rests through its curb rail, when in lower position. This curb rail of the intermediate lift also includes a reinforcing plate 20, and an angle iron rail 19. A rail 32 stiffens the inner edge of the plate 20. The upper ends of the intermediate and lower lifts provide an inwardly projected curb rail formed of angle iron strips 33 having long horizontal flanges. These rails, besides carrying the packing, carry bearing brackets 34 on their upper surfaces journaling rollers 35 engaging against the outer walls of the respective adjacent sections. A guide arrangement extends radially upwardly from these intermediate and lower sections to the main guide rails 25 of the framework. This guide arrangement is similar to that described for the roof section.

Bearing brackets 37 are secured to the underside of the lower curb rail 30 and carry rollers 38 rolling vertically along the webs of guide rails 39 secured vertically to the inner face of the outer lift section. This outer lift section also includes a lower curb rail 18 formed of an angle iron strip 40. Adjustable bearing brackets 41 carry rollers 42 which roll up and down the vertical guide rails 43 fixed to the inner surface of the outer oil tank wall 44. The curb rails of the intermediate and lower lift sections are adapted to rest upon supporting pads 45 fixed to the base 46 of the annular tank.

The inner tank wall 47 is formed of light sheet metal. The inside of the annular trough, that is the portion confined by its inner wall, is filled with water to the same level as the oil in the annular tank. Thus there is very little hydrostatic pressure on the inner tank wall. The oil level in the annular tank is generally indicated at 48.

In order to bring the guide rails 25 down to a point well below the lowest position of guide roller travel, the outer tank wall includes an offset portion adjacent each girder (Figure 5). The tank wall is notched out and a bottom wall section 50 is provided for the offset. The side and end wall sections 51 rise from this base wall and have inturned flange portions 52 welded to the flanges of the guide rails 25 at both sides of the uprights. The base wall to the annular tank may extend as a solid base across the water tank portion, if desired. This entire structure is set in concrete and slightly countersunk as shown.

The upper curb rails of the outer and intermediate lifts and the lower curb rails of the intermediate and upper lifts carry sealing elements. These elements are detailed in Figure 4. The element 53 on the lower curb rail may consist of a flat sheet of synthetic rubber. The upper packing element 54 consists of horizontally spaced round sections of synthetic rubber circumferentially arranged and joined by a sheet of fabric 55 wrapped around the round sections and overlapped to form a central connecting portion. The upper packing unit is connected to the upper curb rail 33 by means of bolts 56 passing through a flat steel ring 57 engaged against the fabric between the synthetic rubber sections.

This synthetic rubber facing strip presents a soft sealing surface as opposed to the irregular and pitted surfaces of the average steel angle. It

will be apparent that these sealing elements are completely submerged in the oil when the tank is deflated and are thus periodically oil treated to maintain their pliability.

As shown in Figure 7 the wall 47 and the base 58 may be made of concrete. This will provide a heavier, thicker wall 47 and it will not be necessary to use water for creating a hydrostatic pressure at the inside of the wall. A steel roof 59 is provided on the top of the wall 47 for blocking out the space inside the wall. The trough is formed of steel plates in the same manner as the main form. The inside wall 60 and the base wall 61 are included as liners for the concrete side wall 47 and the base 58. These walls 60 and 61 may be made of very light sheet metal.

Having described my invention, I claim:

1. In a gas holder, upper and lower lifts, liquid means for sealing the lifts at the base of the holder, the upper lift having an outwardly extending horizontal flange adjacent to its bottom, the lower lift having an inwardly extending horizontal flange adjacent to its top, the latter being above the former to provide an interlocking relationship, and pliable packing rings disposed between the flanges to provide a gastight seal between them, said pliable packing adapted to constitute a dry seal between the lifts when the upper lift is fully inflated and to become ineffective when the upper lift is less than fully inflated, the liquid seal at all times constituting the bottom seal of the holder.

2. In a gas holder tank, an annular oil trough, sections of circular form nested within the oil tank, means for guiding the sections relative to each other and relative to the tank, outwardly projected horizontal curb rails at the base of each section, inwardly projected horizontal curb rails at the top of each section except the uppermost section, said lower curb rails adapted to engage the upper curb rails as the tank is inflated and deflated and, pliable component sealing elements on the flanges adapted to be engaged as each section is elevated and lowered for sealing the joints between the sections, said joints ceasing to be effective as sealing means when each lower section to the joint is fully telescoped in the annular trough.

3. In a gas holder tank, an annular tank containing oil or the like in its annular space and water within the space encircled by the tank, said tank including an inner wall of relatively light material, a series of sections nested in said annular tank, those edges of the sections which are adjacent when the sections are raised including superposed flanges, a flat packing ring on one flange and, horizontally spaced rubber packing rings of round cross section fixed on the other flange and adapted to engage the flat packing ring when the tank is inflated and deflated, said annular tank being of sufficient depth to receive and submerge all of the packing rings when the holder is deflated and there is no longer sealing engagement between said packing rings of round cross section and flat packing ring.

4. In a gas holder, an annular tank adapted to contain oil or the like, a series of lifts telescopically mounted in and adapted to nest completely within the chamber, means for guiding said lifts in their telescopic movement, the base of each lift including a horizontal flange, the top of each lift, with the exception of the uppermost lift, including a horizontal flange, the flanges of adjacent lifts adapted to engage as the holder is inflated and deflated, and a packing ring between the flanges for sealing the contact between the flanges, said sealing contact ceasing when each lifts is fully telescoped in the annular tank.

5. In a gas holder tank, an annular trough adapted to contain liquid, tank sections of circular form adapted to nest within said trough, outwardly horizontally projected curb rails at the top of the lower section and at the bottom of the upper section respectively, said upper section having a closed top, means for guiding the sections relative to each other and relative to the trough as they are telescopically moved when inflated with gas, sealing means disposed between said upper and lower curb rails and adapted to engage and seal the joint between the sections when the curb rails come together and the upper section picks up the lower section during inflation of the tank and lowers the latter section during deflation, whereby the joint between the sections is sealed by virtue of the weight of the suspended lower section, said joint ceasing to be a sealing means when the lower section is fully telescoped in the annular trough.

WILLIAM E. GRUENING.