Dec. 4, 1945. J. H. WIGGINS 2,390,141

DRAINAGE MEANS FOR FLOATING TANK ROOFS

Filed June 19, 1943 2 Sheets-Sheet 1

FIG. 1.

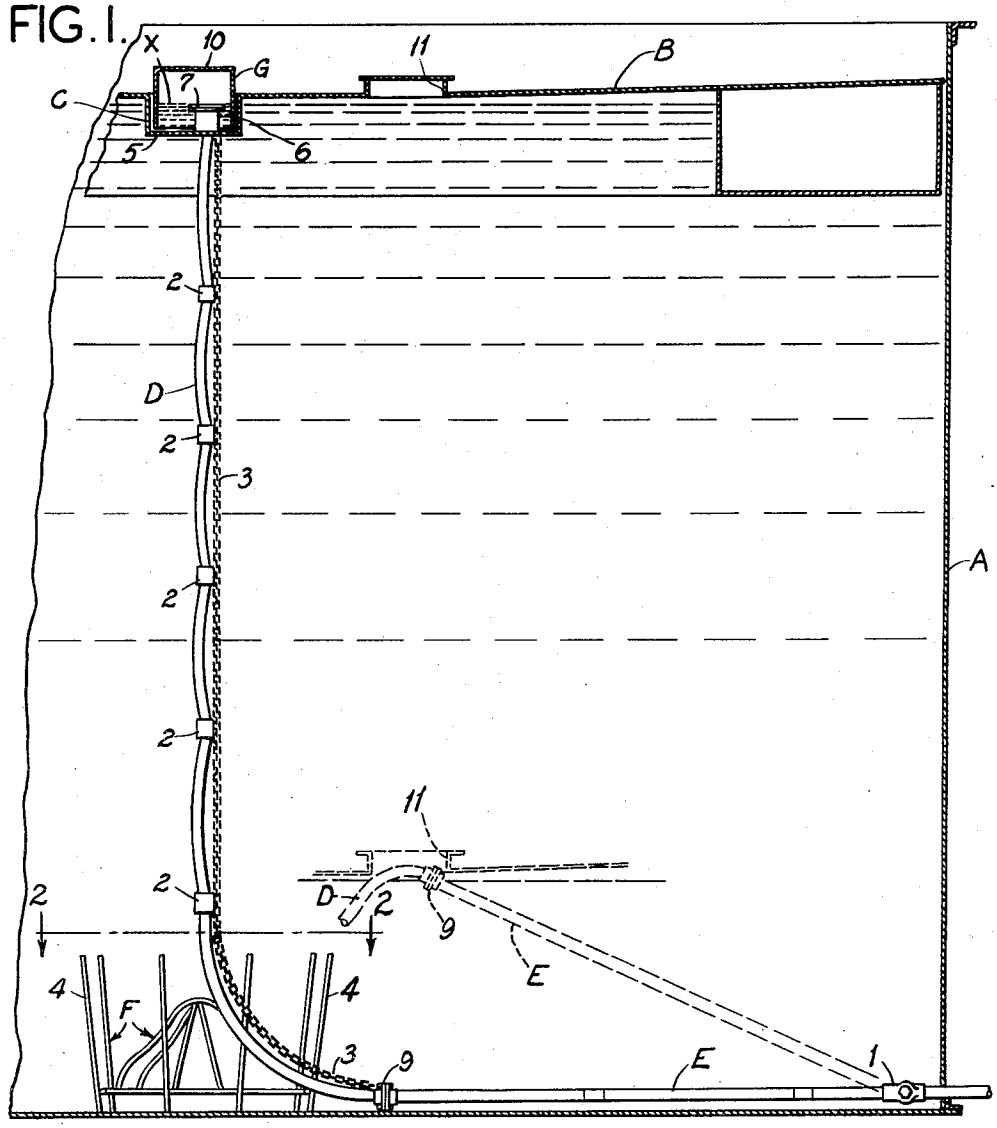
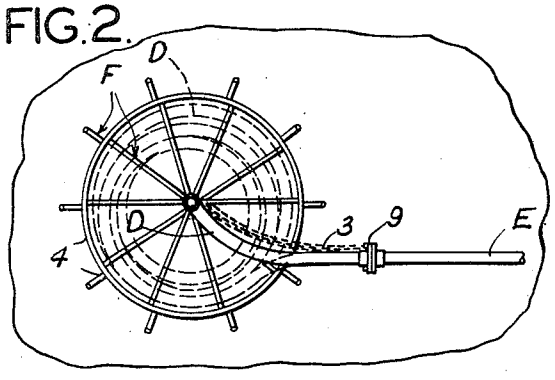



FIG. 2.

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Filed June 19, 1943 2 Sheets-Sheet 2

FIG. 3.

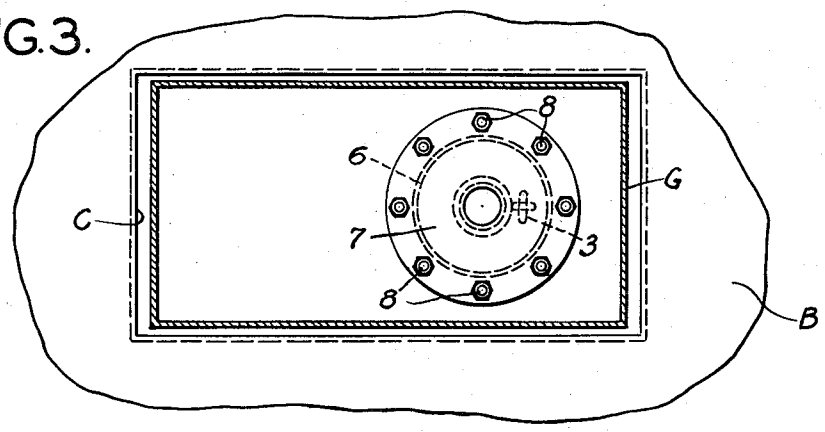



FIG. 4.

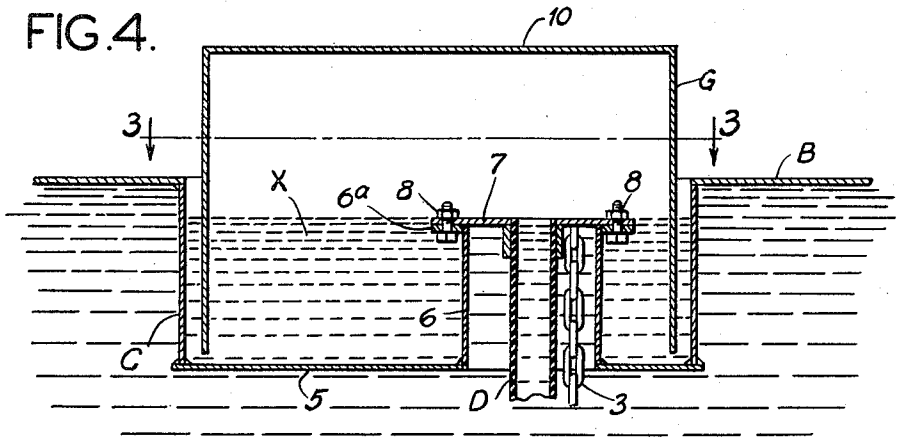
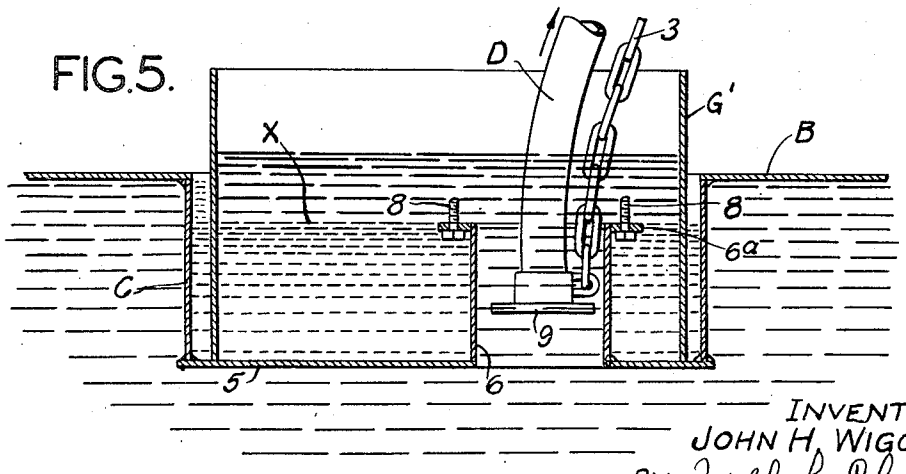



FIG. 5.

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# UNITED STATES PATENT OFFICE

2,390,141

## DRAINAGE MEANS FOR FLOATING TANK ROOFS

John H. Wiggins, Chicago, Ill.

Application June 19, 1943, Serial No. 491,743

4 Claims. (Cl. 220—26)

This invention relates to drainage means for floating tank roofs of the general type disclosed in my prior United States Patent No. 1,636,540, dated July 19, 1927.

The main object of my present invention is to improve the operation, simplify the construction, and reduce the cost of a floating tank roof drainage means of the general type or kind which comprises a flexible conduit that leads from a sump in the roof, and which is intended to coil and uncoil when the roof moves downwardly and upwardly, due to a change in the level of the liquid on which the roof floats.

To this end I attach weights to the flexible conduit leading from the sump, so as to insure that said conduit will sink in the liquid, and I arrange an annular trough of skeleton-like construction on the bottom of the tank, so as to cause said conduit to assume a certain approximate quadrant when the roof moves downwardly in the tank. Preferably, said weights are combined with the conduit by means of a chain or flexible element that is attached at one end to the roof, so as to sustain the load of the flexible conduit and the weights that are relied upon to prevent said conduit from floating. The above mentioned chain is shorter than the conduit, and it is clamped to the conduit at intervals along the length of the conduit, so that during the rise of the roof, the chain will pick up the conduit without subjecting said conduit to strains. When the roof is floating, the conduit hangs vertically from the roof, with no bend in said conduit at the point where it is attached to the sump in the roof, and instead of using a check valve or other type of valve for preventing liquid from escaping from the tank onto the top side of the roof, when the drain conduit is disconnected from the slump, I construct the sump so that after the drain conduit has been disconnected therefrom, the discharge outlet of the sump, to which the drain conduit was attached, is effectively closed by a liquid-sealed member that eliminates the possibility of the liquid in the tank overflowing onto the top surface of the roof.

Figure 1 of the drawings is a fragmentary, vertical sectional view, illustrating my improved drainage means.

Figure 2 is a top plan view of the cage or circular trough on the bottom of the tank in which the flexible conduit is adapted to coil, said view being taken on the line 2—2 of Figure 1.

Figure 3 is a horizontal sectional view, taken on the line 3—3 of Figure 4.

Figure 4 is an enlarged vertical sectional view of the sump in the roof, showing the closed top sealing member or baffle which normally is arranged over the discharge outlet in the bottom of the sump; and

Figure 5 is a vertical sectional view of the sump, showing the open-ended sealing member that is substituted for the closed top sealing member of the sump, preparatory to disconnecting or removing the flexible drain conduit that leads from the sump.

In the drawings, A designates a tank or container, that is adapted to hold liquid, B designates a floating roof sustained by the liquid in the tank, C designates a sump in said roof so constructed and arranged that water which falls onto the roof will find its way into said sump, D designates a flexible drain conduit, through which water escapes from the sump, and E designates an eduction pipe in the bottom portion of the tank A, attached to the lower end of the flexible drain conduit D and leading outwardly through the side wall of the tank. Preferably, the portion of the eduction pipe E, to which the lower end of the drain conduit D is attached, is connected with the remainder of said eduction pipe by a hinged joint 1, near the tank wall, so as to permit this terminal portion of the eduction pipe to be swung upwardly to facilitate disconnecting the flexible drain pipe D therefrom, as hereinafter explained.

Usually, the flexible conduit D will be formed from a piece of hose, and in order to impart sufficient weight to said hose, to prevent it from floating in the liquid in the tank, I combine weights 2 with same, and arrange said weights in spaced relationship throughout the length of the conduit D. The weights 2 are combined with the flexible conduit D and maintained in proper relationship with each other, by a chain or other flexible element 3, which is attached at its upper end to the floating roof, or to some part carried by the roof, and which is attached at its lower end to the lower end portion of the flexible conduit D. Preferably, the weights 2 consist of annular members surrounding the conduit D and attached in spaced relation to the flexible element 3. The chain 3 is shorter than the conduit D, and is connected with said conduit in such a way that when the chain is hanging suspended from the roof, as shown in Figure 1, there is no strain on the portions of the conduit located between the points where the conduit is attached to the chain by the annular attaching devices or weights 2, due to the fact that these intermediate portions of the conduit (the portions between the

holding or attaching devices 2) are longer than the portions of the chain between the attaching devices 2 on the chain. As previously stated, when the roof is floating on the liquid in the tank, the flexible conduit D hangs vertically from the roof, as shown in Figure 1, with no bend in said conduit at the point where it is attached to the sump C. When the roof moves downwardly, the flexible conduit D coils in a certain approximate position on the bottom of the tank, or in a cage or guiding structure located in the lower portion of the tank A. Preferably, an annular trough of skeleton-like construction is arranged on the bottom of the tank directly underneath the sump C. Said trough is herein illustrated as being composed of a circular row of nearly upright rods or members 4 that surround a center part formed by rods or bars F, which are bent so as to produce a substantially dome-shaped or cone-shaped element that co-acts with the upright side members 4 to form an annuar trough, inside of which the flexible conduit D coils or piles up during the downward movement of the roof, and uncoils during the upward movement of the roof.

The bottom 5 of the sump C is provided with a tubular discharge outlet 6 that projects upwardly from said bottom, and the upper end of the flexible conduit C is detachably connected with said discharge outlet 6 by a coupling flange 7 on the conduit D, that is secured by bolts or other suitable fastening devices 8 to a horizontally-disposed flange 6a on the discharge outlet 6 of the sump C. As shown in Figure 4, the upper end of the chain or flexible element 3 that carries the load of the flexible drain conduit D and the weights 2 thereon, is attached to the coupling flange 7. Similarly, the lower end portion of the flexible drain conduit D is provided with a coupling flange 9 that is detachably connected by bolts, or in any other suitable way, to the hinged eduction pipe E, the lower end of the chain 3 being fastened to the coupling flange 9, as shown in Figure 5. Normally, the discharge outlet 6 of the sump C and the intake end of the flexible drain conduit D, are sealed by a removable sealing member or baffle G in the sump, that is of substantially inverted cup shape, or provided with a closed upper end 10, as shown in Figure 4, the lower end of the side wall portion of said sealing member being submerged in a body of water $x$ confined in the sump C between the tubular discharge portion 6 of same and the side wall portion of said sump, and functioning as a liquid seal for the baffle G. Water that drains into the sump from the top side of the roof will overflow from the sump into the drain conduit D and be carried away to the eduction pipe E in the bottom of the tank, but oil or gas cannot escape from the interior of the tank onto the roof, through the open upper end of the drain conduit D, due to the closed top sealing member G, which is effectively sealed by the body of sealing water $x$ in the sump.

If it becomes necessary to disconnect the drain conduit D from the sump while the roof is floating on oil or other liquid confined in the tank, the closed top sealing member G is removed and replaced by an open-ended, tubular sealing member G' of the kind shown in Figure 5, which open-ended sealing member G' is of sufficient diameter to make it possible for a workman to disconnect the coupling flange 7 at the upper end of the drain conduit D from the discharge outlet 6 of the sump. After said parts 7 and 6 have been disconnected and separated, sufficient liquid backs up from the tank, through the discharge outlet 6 of the sump, to submerge the lower end portion of the open-ended, tubular sealing member G', but the liquid in the tank cannot flood the roof, because the oil can never flow under the bottom of member G, due to the fact that the sealing water and oil will not rise high enough to flow over the top of the member G'. After the upper end portion of the flexible drain conduit C has been disconnected from the sump, as previously explained, said conduit D is pulled upwardly, through the open-ended sealing member G', sufficiently to raise the coupling flange 9 at the lower end of said conduit, into the manhole neck 11 on the tank roof, thereby permitting a workman to reach down through said manhole 11 and disconnect the coupling flange 9 from the terminal end of the hinged portion E of the eduction pipe. The hinged portion of the eduction pipe is sustained in its upright position by a hook or other device inserted into the tank, through the manhole 11 in the roof, and after the discharge conduit D has been disconnected from the eduction pipe, said discharge conduit is completely removed from the tank by withdrawing it upwardly, through the discharge outlet 6 of the sump, as shown in Figure 5.

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

1. A floating tank roof provided with a flexible conduit leading downwardly from same and adapted to coil and uncoil in the lower portion of the tank as the roof falls and rises due to changes in the level of the liquid on which the roof floats, said conduit having an outlet from the tank, tubular weights distributed in spaced relation along the length of said conduit to prevent it from floating in the liquid, and a flexible supporting element of less length than said conduit, attached at its upper end to the roof and fastened to said weights so as to prevent the load of said weights from being exerted on the conduit when the conduit is hanging in a suspended condition from the roof.

2. A floating tank roof provided with a flexible conduit leading downwardly from same towards the bottom of the tank and adapted to coil and uncoil as the roof falls and rises due to changes in the level of the liquid on which the roof floats, said conduit having an outlet from the tank, weights combined with said conduit to prevent it from floating on the liquid, and means for preventing said weights from exerting a load on said conduit when said conduit is suspended from the roof.

3. A floating tank roof provided with a flexible conduit leading downwardly from the roof into the tank, said conduit having an outlet from the tank, and a flexible element of less length than said conduit, attached to the roof for sustaining said conduit when said conduit hangs in a suspended condition from the roof.

4. A floating tank roof provided with a flexible conduit that depends from the roof into the tank, said conduit having an outlet from the tank, a depending flexible element of less length than said conduit, attached to the roof adjacent said conduit, and spaced weights on said flexible element, attached to said conduit at intervals along the length of said conduit.

JOHN H. WIGGINS.