

March 22, 1949.

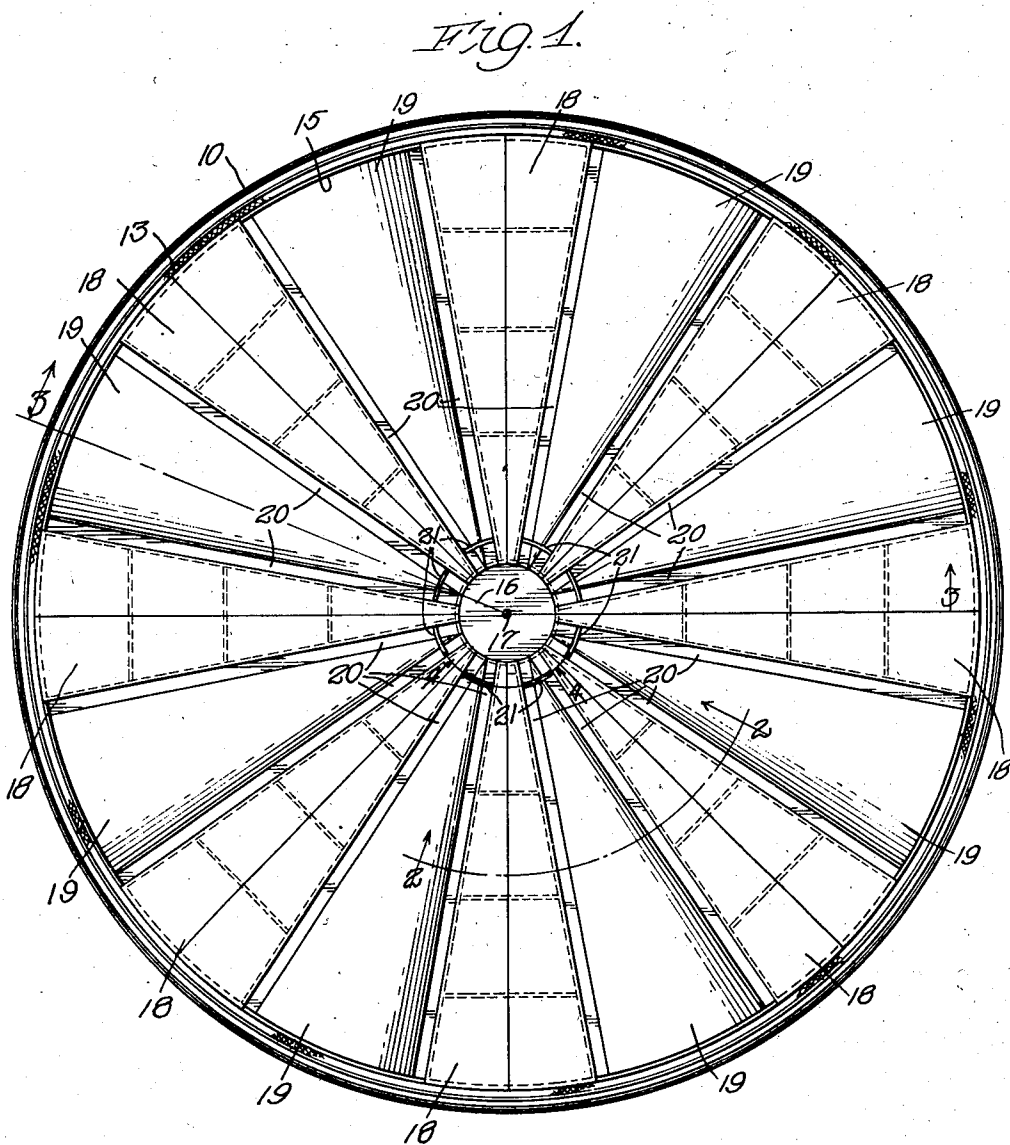
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2,464,786

FLOATING ROOF TANK

Filed Nov. 3, 1945

2 Sheets-Sheet 1



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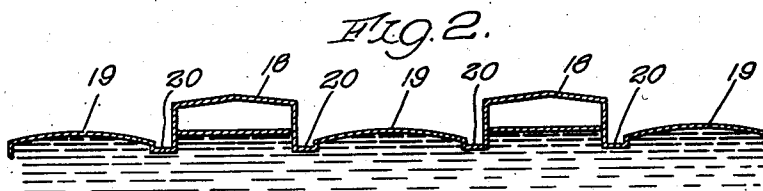
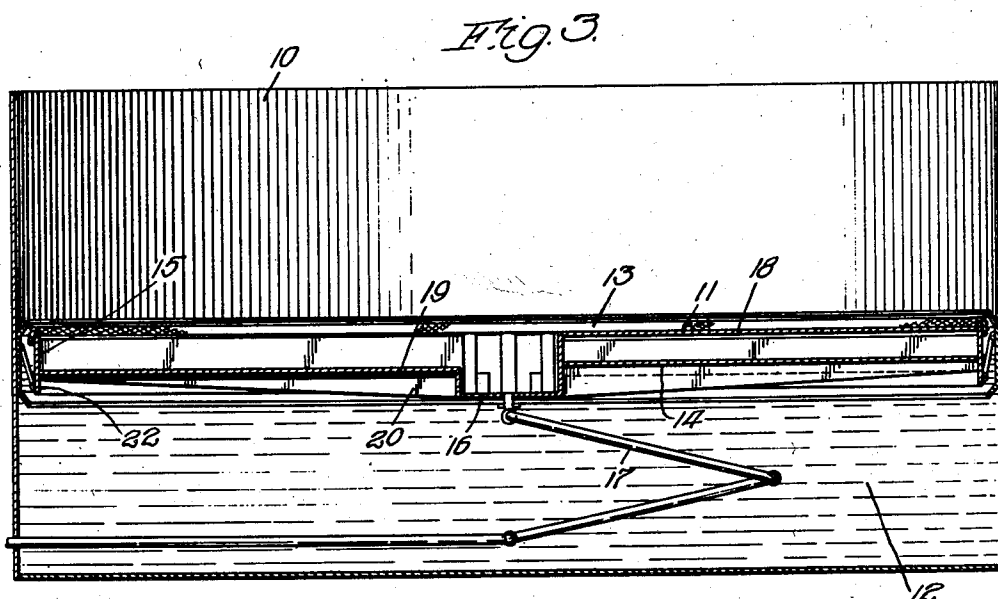
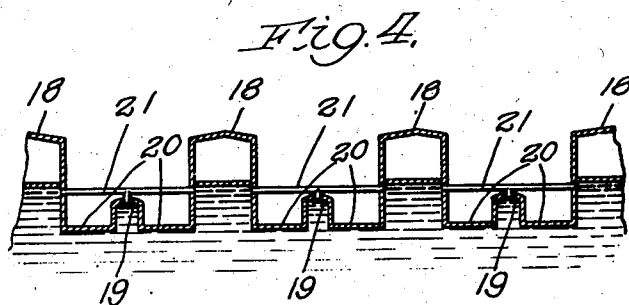
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FLOATING ROOF TANK

Filed Nov. 3, 1945

2 Sheets-Sheet 2



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UNITED STATES PATENT OFFICE

2,464,786

FLOATING ROOF TANK

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Application November 3, 1945, Serial No. 626,584

11 Claims. (Cl. 220-26)

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This invention relates to a floating roof tank and particularly to an improved roof structure for such tanks.

Floating roof tanks are used for the storage of volatile liquids, and are designed so that the roof floats on top of the stored liquid. Thus the roof rises and falls as the liquid contents of the tank are increased and decreased. I have invented and improved floating roof wherein all surfaces on the bottom of the roof are in contact with the stored liquid. This eliminates the vapor space and substantially lessens or prevents the usual corrosive effect.

The new floating roof comprises a plate-like structure normally floating on top of the liquid. There is provided an upstanding rim member around the plate-like structure adjacent the shell of the tank. The plate-like structure is formed with a low portion which serves as a drain basin. The rest of the structure slopes toward this drain portion so that any water falling on the tank will flow to the drain and can then be conducted to the outside of the tank. Air-tight pontoons are positioned around this lowest drain portion with the pontoons being located above the liquid contacting portion of the structure. Drain channels are provided in the areas between the pontoons, and these channels slope to the lowest drain portion in order to carry off rain water. If vapor should build up under the floating roof it is preferred that it be equally distributed, and this equal distribution of vapor is provided for by arranging interconnecting vapor lines connecting the highest portions of the plate-like structure.

When there is no liquid load of rain water on top of the roof the pontoons are in inoperative position above the liquid contacting portion of the roof. If the drain which is normally provided in roofs of this type is choked up and does not operate, then the pontoons help maintain the buoyancy of the roof. There are no separate vapor spaces per se provided in the roof, but if vapor should form between the stored liquid and the bottom of the roof the pressure of the vapor will be substantially uniform under the entire area, thus eliminating any flexing. If vapor does form it would tend to collect under the highest portions of the roof bottom, and it is preferred that a vapor line be provided interconnecting these highest portions. Because the bottoms of the pontoons are level with the liquid surface the pontoons cannot fill with stored liquid due to a leak in one or more pontoons, except under an emergency load of rain water or the like on the deck. This emergency load will be of short dura-

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tion so that very little of the stored liquid will flow into a leaky pontoon.

The invention will be described as related to the embodiment shown in the accompanying drawings. Of the drawings Fig. 1 is a plan view of the roof embodying the invention; Fig. 2 is an enlarged vertical section taken along the curved line 2-2 of Fig. 1; Fig. 3 is a vertical section taken through the entire tank including the roof, with the roof section being along line 3-3 of Fig. 1; and Fig. 4 is an enlarged vertical section taken along curved line 4-4 of Fig. 1.

In the embodiment shown in the accompanying drawings the storage tank comprises a substantially cylindrical shell 10, a roof 11 therein floating on top of the liquid contents 12 of the tank. Any desired seal 13 may be provided between the edge of the roof 11 and the shell 10.

The floating roof 11 is substantially circular in shape and comprises a plate-like bottom 14 in contact with the liquid 12 and an upstanding rim portion 15 around the edge. At the center of the bottom 14 of the roof structure there is provided a lowermost portion 16 serving as a drain. A hinged drain pipe 17 connects the bottom of the drain 16 to the outside of the tank. Any suitable draining means may be provided.

Located on top of the liquid-contacting portion of the roof are radial pontoons 18 extending from the central drain 16 to the rim 15 of the roof. The tops of the pontoons are substantially even with the top edge of the rim 15, and the bottoms of the pontoons are substantially horizontal with the inner ends of the pontoons being an appreciable distance above the bottom of the central drain 16.

The areas 19 between pontoons slope from the centers to the edge drain troughs 20 and the troughs slope to the central drain portion 16 in order that rain water and the like will flow readily into the drain. Drain channels 20 are provided in the open areas 19 with these channels being formed in the roof bottom 14, and with each channel located at the side of a pontoon 18. The drain channels 20 slope from the rim 15 to the central drain 16. The areas 19 between the pontoons 18, and also between the drain channels 20, are normally bowed upward as shown in Figs. 2 and 4.

In order to provide for equalization of vapor over the bottom of the roof whenever there is any vapor formation, it is preferred that vapor lines 21 be provided, interconnecting the highest portions of the roof bottom 14, as is shown in Fig. 4. These vapor lines ordinarily connect the

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spaces beneath the tops of the areas 18 and the spaces beneath the pontoons 18.

Because the roof rests on top of the liquid, with its entire bottom surface in contact with the liquid, there will normally be very little or no vapor formed except on the very hottest days. When there is vapor formed it will be equally distributed under the entire roof and escape of the vapor from around the roof will be prevented by a depending portion 22 of the rim 15 extending below the bottom surface of the roof.

One of the chief advantages of the new roof is that it may be constructed much more easily and much more cheaply than the ordinary roofs. In the ordinary construction of the tank the pontoons can be built in the shop and tested there. The plate-like structure which forms the bottom of the roof can be built on the tank bottom, and the pontoons then installed. This makes the erection of the tank in the field very much cheaper and simpler.

Having described my invention as related to a typical embodiment of the same, it is my intention that the invention be not limited by the details of description unless otherwise specified, but rather be construed broadly within its spirit and scope as set out in the accompanying claims.

I claim:

1. A storage tank for liquids comprising a substantially cylindrical outer shell and a floating roof therein; said floating roof comprising a substantially circular plate-like structure normally resting on top of the liquid, an upstanding rim around said plate-like structure adjacent the shell, a lowest drain portion located at substantially the center of said plate-like structure and forming a part thereof, a plurality of spaced air-tight pontoons radiating from said lowest drain portion toward the rim and located above the liquid-contacting portion of said structure, and drain channels in the areas between the pontoons sloping to said lowest drain portion.

2. The storage tank of claim 1 wherein the pontoons are normally substantially horizontal and the areas between the pontoons are substantially horizontal and normally bowed laterally upward.

3. The storage tank of claim 1 wherein the tops of the pontoons do not extend substantially above the top edge of the rim.

4. The storage tank of claim 1 wherein the top of each pontoon slopes toward the sides.

5. The storage tank of claim 1 wherein the drain channels are located substantially at the sides of the pontoons.

6. A storage tank for liquids comprising a substantially cylindrical outer shell and a floating roof therein, said floating roof comprising a substantially circular plate-like structure normally resting on top of the liquid, an upstanding rim around said plate-like structure adjacent the shell, a lowest drain portion located at substantially the center of said plate-like structure and forming a part thereof, a plurality of spaced air-tight pontoons radiating from said lowest drain portion to the rim having their tops substantially level with the top edge of the rim with the tops

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sloping toward the sides, said pontoons being substantially horizontal with their bottoms formed of said plate-like structure and the areas of said plate-like structure between adjacent pontoons being substantially horizontal and normally bowed laterally upward, and drain channels in the plate-like structure with each drain channel located at a side of one of said pontoons and all drain channels sloping to the lowest drain portions of said structure.

7. A storage tank for liquids comprising an outer shell and a floating roof therein; said floating roof comprising a plate-like structure normally resting on top of the liquid, a lowest drain portion located in said plate-like structure, a plurality of spaced air-tight pontoons positioned around said lowest drain portion and located above the liquid-contacting portion of said structure with the areas between the pontoons being substantially horizontal and normally bowed laterally upward, drain channels in the areas between the pontoons sloping toward the lowest drain portion and being formed in the plate-like structure, and interconnected vapor lines connecting the highest portions of said plate-like structure.

8. The storage tank of claim 6 wherein the areas of said plate-like structure between adjacent pontoons are normally curved upward between the drain channels.

9. The storage tank of claim 6 wherein the areas of said plate-like structure between adjacent pontoons are normally curved upward between the drain channels and interconnecting vapor lines are provided connecting the highest portions of said plate-like structure.

10. The storage tank of claim 6 wherein the areas of said plate-like structure between adjacent pontoons are normally curved upward between the drain channels with the tops of said curved portions being substantially level with the bottoms of the pontoons, and interconnecting vapor lines are provided connecting the highest portions of said plate-like structures.

11. The storage tank of claim 6 wherein the areas of said plate-like structure between adjacent pontoons are normally curved upward between the drain channels with the tops of said curved portions being substantially level with the bottoms of the pontoons, and interconnecting vapor lines are provided connecting the highest portions of said plate-like structures, said vapor lines connecting the spaces under said curved portions and the spaces under said pontoons.

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