

Sept. 20, 1949.

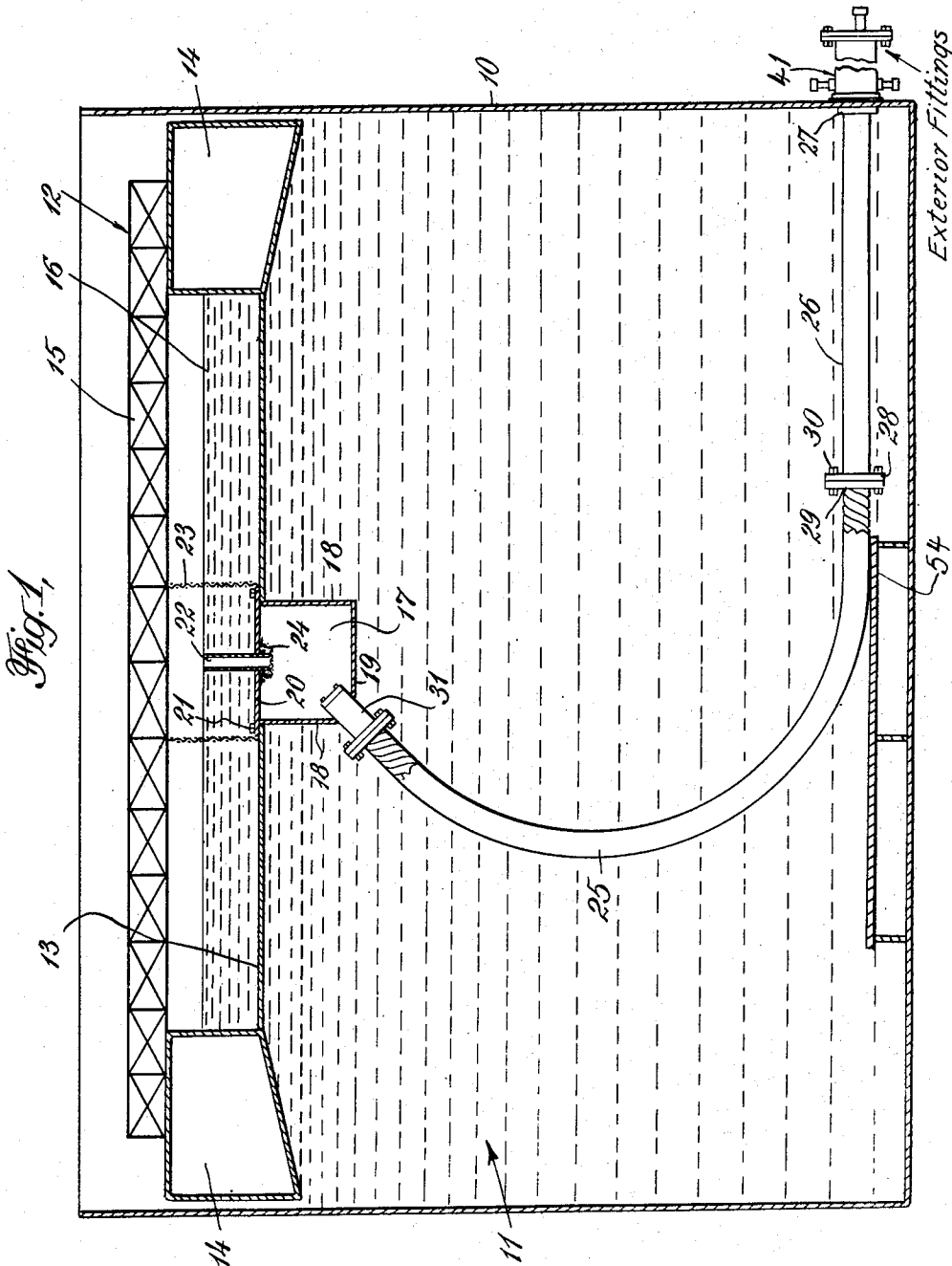
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DRAINAGE SYSTEM FOR TANKS

Filed June 8, 1948

2 Sheets-Sheet 1



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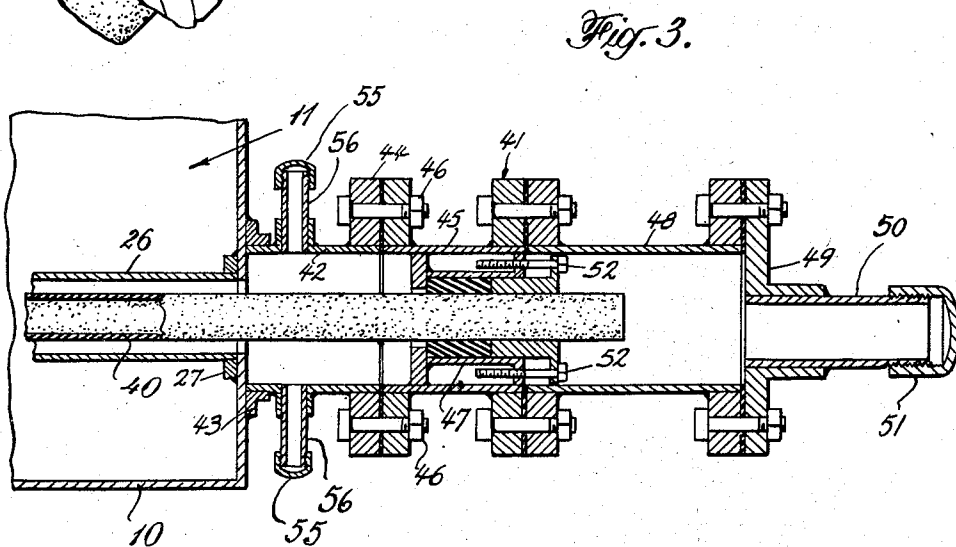
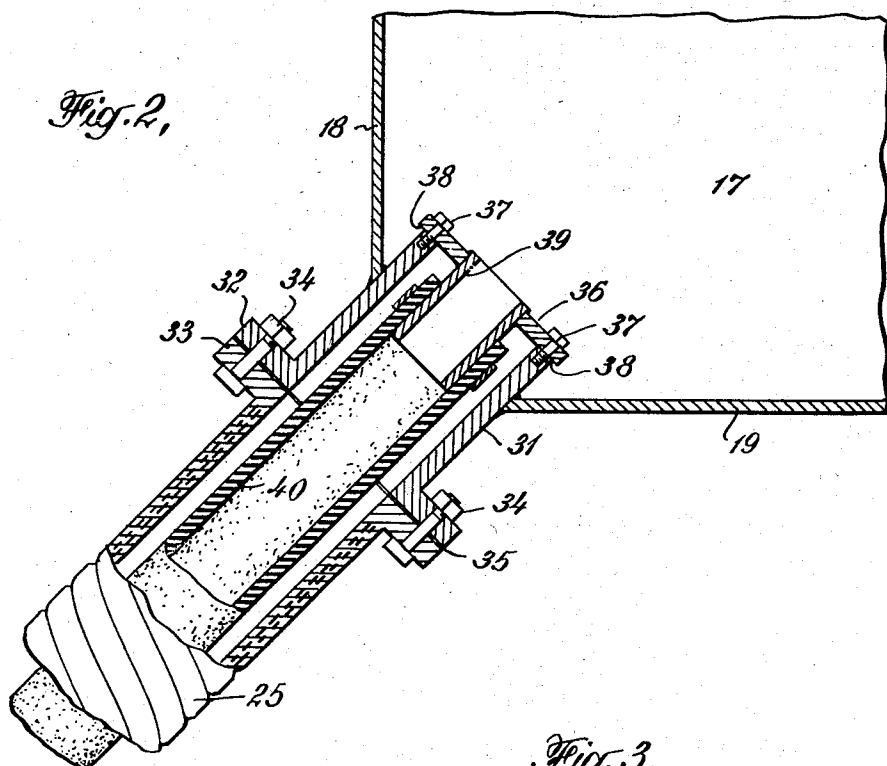
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2,482,468

DRAINAGE SYSTEM FOR TANKS

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Application June 8, 1948, Serial No. 31,771

3 Claims. (Cl. 220-26)

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This invention relates to drainage means for tank roofs and more particularly to drainage means for tank roofs of the floating type such as are used on oil tanks.

Currently the accepted practice followed in draining tank floating roofs is by means of a rubber hose which is connected at one end to a sump which is usually located at substantially the center of the roof and after passing the free end of the hose down through the body of liquid in the tank it is connected to a discharge port formed in the side of the tank at a point near the bottom thereof. An arrangement of this type is shown in the U. S. patent to Wiggins, No. 2,390,141. With such an arrangement the outside of the hose is always in contact with the oil in the tank and subject to attack by the different chemicals which are found in light and crude petroleums. As a result deterioration of the hose is rapid and after a given period of time it must be replaced. The practice in the prior art is to drain the tank before undertaking to replace the hose. The present invention makes it no longer necessary to drain the tank to replace the hose.

The present invention contemplates a flexible metal conduit permanently connected between the sump and discharge port in such a manner that its interior is substantially sealed from the oil in the tank. The top and bottom ends of the conduit are secured to fittings which carry accessible fittings adapted to receive the ends of a rubber hose after it has been inserted in the conduit. With such an arrangement the rubber hose can be replaced at will without draining the tank.

An additional feature of the present invention is that the conduit, due to the air space between it and the enclosed hose has bouyancy and forms a support for the rubber hose which relieves both the hose and its fittings of strain.

Therefore the principal object of this invention is to provide a tank-roof drain which can be replaced at will without emptying the tank.

Another object of this invention resides in the provision of novel supporting means for roof drain hoses which will relieve both the hose and its connections of strain.

Other objects of the present invention will become apparent from the following detailed description when considered with the drawings, in which,

Figure 1 is a schematic illustration of a vertical section of an oil tank showing the present invention applied thereto;

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Figure 2 is an enlarged vertical section of the upper conduit and hose fittings shown in vertical section; and

Figure 3 is an enlarged vertical section of the bottom hose and conduit fittings shown in vertical section.

Referring to the drawings in detail, particularly Figure 1, there is shown a tank 10 having fluid 11 therein. Tank 10 is provided with a roof 12 which is of the floating type. Roof 12 comprises a sheet metal plate 13 that is secured to and carried by a substantially toroidal pontoon 14. In floating roofs of this type it is customary to provide a horizontal truss member 15 that rests on and connects opposite sides of the pontoon 14. The sheet metal plate 13, forming the greater part of the floating roof, is secured to the bottom portion of the inner periphery of the toroidal pontoon. In this manner the plate 13 forms a bottom 16 and the inner periphery of the pontoon forms the side wall for a reservoir 16 into which water will flow in the event of rain. This reservoir 16 may also be used to keep a definite amount of water on the roof at all times. This last is accomplished by providing a drain sump 17 carried by the sheet metal plate 13 at a point located at substantially its center. The drain sump 17 is defined by side wall 18, bottom 19 and top 20. The top of side wall 18 is secured to the sheet metal plate by bolts, rivets or by welding, as desired. The top 20 is removably held in position on a gasket by bolts 21. At a point on the top 20 lying approximately over the center of the sump 17 there is provided a vertically disposed pipe 22 which is secured in an opening provided in the top 20 and forms a communicating trap between reservoir 16 and the sump 17. Pipe 22 extends vertically above the top 20 a distance equal to the depth of water that it is desired to maintain in the reservoir 16. In order to prevent trash from being carried over into the sump 17 a screen 23 may be provided around the trap pipe 22. As additional precaution a second screen 24 may be placed over the lower end of pipe 22 as shown.

In the prior art water draining into the sump 17 was discharged through a flexible pipe which connected the bottom of the sump to a discharge port in the side wall of the tank 10 at a point located near the bottom thereof. The pipe customarily was a rubber hose. This hose in better installations was usually provided with some means for supporting it to remove the strain on the fittings to which the pipe was secured.

According to the present invention a flexible

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metal conduit 25 is connected at one end to the sump 17 and at the other end to a pipe 26 which communicates with an opening in the side wall of the tank 10 at a point near its bottom and is secured to an appropriate flange 27 to make a fluid tight connection therewith. Pipe 26 may be of any desired length up to approximately 25 feet. Its inner end is provided with a flange 28 to which a similar fitting 29 on the bottom end of a flexible conduit 25 may be connected in a conventional manner by bolts 30. The metal conduit 25 is connected at its upper end as shown in detail in Figure 2. A fitting 31 is passed through the bottom and side wall of the sump at their line of intersection and secured thereto as by welding. The end of the fitting extending inside the tank is provided with a flange 32 that is adapted to receive a like flange 33 carried by the upper end of the metal conduit 25. The two flanges 32 and 33 are connected together by bolts 34 with a gasket 35 interposed therebetween. The end of fitting 31 extending into the sump 17 is machined to receive a flange 36. Flange 36 is secured to the sump end of the fitting by means of bolts 37 with a gasket 38 between the flange and the fitting. Flange 36 is provided with a threaded central opening that is adapted to receive the threaded end of a short section of pipe 39. The other end of the short section of pipe is adapted to have secured thereto by conventional fittings a rubber hose 40.

Hose 40 has an outside diameter so selected that it is smaller than the inside diameter of the metal conduit 25. Hose 40 extends downwardly through the conduit 25 and the pipe 26 and its lower end projects through the opening 41 in the side wall of the tank 10. The bottom end of the hose 40 is secured in position by means of exterior fittings 41.

The exterior fittings 41 are shown in detail in Figure 3. One end of a short section of pipe or tubing 42 engages a flange element 43 which is secured, as by welding, to the tank 10 about the opening through the wall thereof. The section of pipe or tubing 42 may threadedly engage flange 43, or be welded thereto. The opposite end of the section of pipe or tubing 42 is provided with a flange 44 which may be secured thereto by threads or by welding. There is secured to flange 44 a spool 45 by means of bolts 46. Spool 45 has fixed to its inner surface a stuffing box 47 that is adapted to form a seal about the end of the hose 40. A second spool 48 engages spool 45 and is in alignment therewith. This spool 48 with end plate 49 form a chamber about the end of hose 40. End plate 49 is provided with an opening that is adapted to receive a short section of pipe 50. Pipe 50 may threadedly engage the end plate or be welded thereto. The outer end of the pipe 50 is externally threaded to receive a seal cap 51.

In operation when it is desired to drain the roof of the tank it is only necessary to remove the cap 51. If it is desired to tighten the stuffing box, access to bolts 52 may be had by removing spool 48.

In operation when it becomes necessary to replace the hose carried inside of the conduit 25 and pipe 26 it is only necessary to remove the bolts 37, then lift the flange 36 and disengage the hose 40 from the short section of pipe 39. After this has been done the spool 48 is then removed, the stuffing box loosened by backing out bolts 52, and then the spool 45 is removed along with the stuffing box 47 from the bottom end of

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the hose. Then the full length of the hose may be withdrawn from the conduit 25 and the pipe 26. After the fitting for the top of the new hose has been secured to the upper end of the hose the bottom end can be fed into the conduit from the sump 17 and forced downwardly through the conduit 25 and pipe 26 until the top fitting is in place. After replacing the bolts 37 the bottom end can be secured with the stuffing box and fittings.

Since the conduit 25 and pipe 26 are substantially fluid tight the operation of replacing the hose can be carried out without loss of fluid 11 from the tank 10 and without the necessity of draining the contents from the tank.

Due to the fact that the inside diameter of conduit 25 is greater than the outside diameter of the hose carried therein, an air space is sealed off between the two. This provides the unit with buoyancy. This buoyant force acting upon the unit removes the strain on the hose and its connections.

On the bottom of tank 10 there is provided a platform 54 that is adapted to support the flexible metal conduit 25 when the roof moves downwardly. This prevents the conduit from being buried in the water which is almost always present in the bottom of a storage tank. Supporting the conduit above the water will prevent the freezing of the conduit in the winter time and thus keep it free to move as the roof of the tank moves up and down with change of fluid level in the tank.

Should it become necessary to drain fluid from the space between hose 40 and the conduit 25 one or more of the caps 55 can be removed from the outlets formed by the short sections of pipe 56 which are carried by the element 42 of the fittings.

I claim:

1. A drain for tank roofs of the floating type that comprises in combination means defining a discharge port in the roof, a flexible metal conduit, means for securing one end of the conduit to the bottom of the roof in communication with said port, means for securing the other end to the wall of the tank in communication with a discharge orifice, a hose disposed inside of said conduit, means carried by the upper conduit securing means that are accessible from the roof top for securing the upper end of the hose, and means carried by the lower conduit securing means accessible from outside the tank for securing the lower end of said hose, whereby the hose can be removed and replaced without draining the contents from the tank.

2. A drainage system for tank roofs of the floating type that comprises in combination means defining a reservoir on the roof, means secured to the bottom of the reservoir defining a sump, means defining a communicating passageway between the reservoir and the sump, said means also providing a trap for limiting the amount of liquid discharged into the sump from the reservoir, means defining a discharge port located substantially at the bottom of the sump, a flexible metal conduit, means for securing one end of the conduit to the sump defining means in communication with said port, means for securing the other end to the wall of the tank in communication with a discharge port, a hose disposed inside of said conduit, means carried by the upper conduit securing means that are accessible from the inside of the sump for securing the upper end of the hose to the sump defin-

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ing means, and means carried by the lower conduit securing means accessible from outside the tank for securing the lower end of said hose, whereby the hose can be removed and replaced without draining the contents from the tank.

3. A drain for tank roofs of the floating type that comprises in combination means defining a discharge port in the roof, a flexible metal conduit, means for securing one end of the conduit to the bottom of the roof in communication with said port, means for securing the other end to the wall of the tank in communication with a discharge orifice, a hose disposed inside of said conduit, said hose having an outside diameter substantially smaller than the inside diameter of

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the conduit, means carried by the upper conduit securing means that are accessible from the roof top for securing the upper end of the hose and making a fluid-tight seal between the adjacent upper ends of the hose and conduit, and means carried by the lower conduit securing means accessible from outside the tank for securing the lower end of said hose and making a fluid-tight seal between the adjacent bottom ends of the hose and conduit, whereby the trapped air between the hose and conduit will offer a bouyant force to the conduit.

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No references cited.