Jan. 8, 1929.

1,698,158

C. A. GLASS

FLOATING ROOF FOR OIL TANKS

Filed Oct. 22, 1924

Fig. 1.

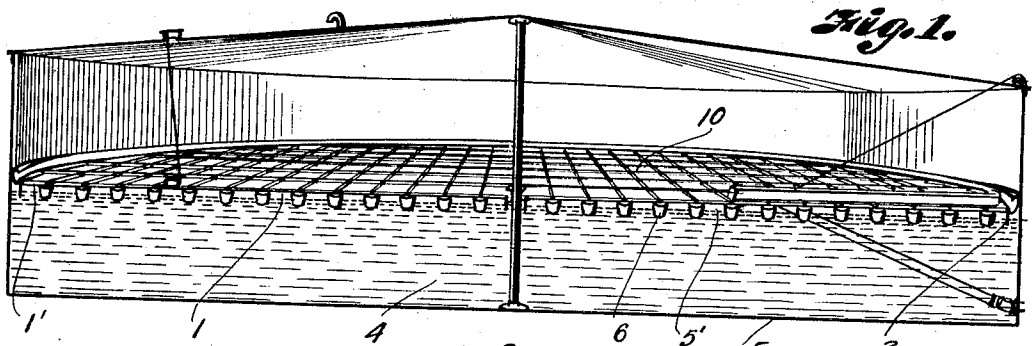


Fig. 2.

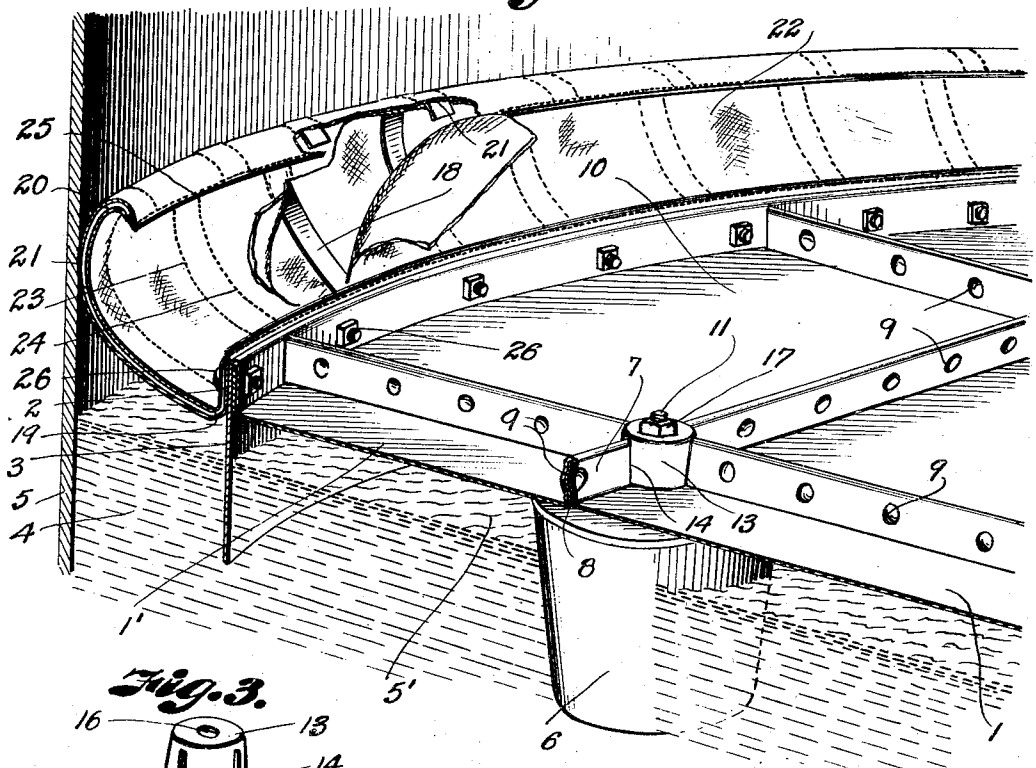


Fig. 3.

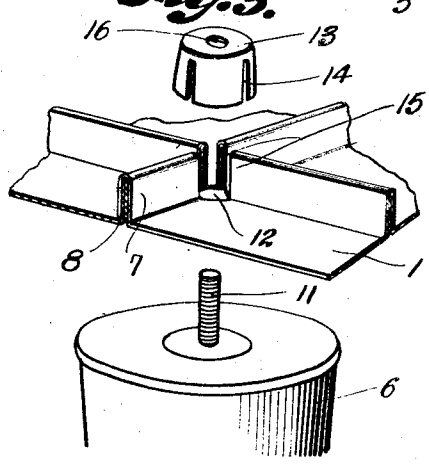
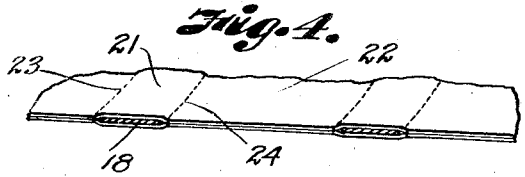


Fig. 4.



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Patented Jan. 8, 1929. 1,698,158

UNITED STATES PATENT OFFICE.

CLIFTON A. GLASS, OF KANSAS CITY, MISSOURI.

FLOATING ROOF FOR OIL TANKS.

Application filed October 22, 1924. Serial No. 745,127.

This invention relates to floating roofs or decks for oil tanks, the primary object being to provide a sectional floating roof or deck in the form of a raft which will be spaced slightly above the surface of the oil but which will close off communication between atmosphere and the oil and thereby prevent evaporation losses.

As explained in some of my former applications, the evaporation is due to the fact that the lighter volatile ends of the petroleum are taken up by the air admitted through the breather pipe in the roof or which leaks through the roof if the roof is not air tight. This air becomes impregnated with the highly volatile constituents of the petroleum and then passes out through the breather pipe to atmosphere. Such losses are considerable where no means is provided to prevent them, but with my invention, the evaporation losses are reduced to a minimum if not wholly eliminated.

The disadvantages above enumerated are well understood by those skilled in the art and the advantages of my invention will be clearly apparent by reference to the following description in connection with the accompanying drawings, in which

Fig. 1 is a vertical, longitudinal, sectional view through a tank constructed in accordance with my invention.

Fig. 2 is an enlarged perspective view of part of the deck.

Fig. 3 is a fragmentary perspective view, showing the means of joining the corners of the deck plates and the float for supporting them, and

Fig. 4 is a fragmentary view of part of the seal for sealing off communication between the chamber below the deck and the chamber above the deck through the space between the perimeter of the deck and the wall of the tank.

The deck is provided with a plurality of roof sheets 1 substantially rectangular, except the outer ones which have their outer edges curved to conform to the arc of a circle to complete a circular deck. The outer members are designated 1′ to differentiate them from the inner members. Generically all of the roof sheets are the same however, the outer roof sheets differing from the inner ones primarily by having their outer edges provided with upturned flanges 2 which support a separate depending skirt 3 which penetrates the oil 4 in the tank 5 a sufficient distance to seal off communication between the vapor space 5′ between the oil and the deck and the upper part of the tank.

The space 5′ is formed by reason of the fact that the deck is supported on floats 6 which will be more specifically described hereinafter. The edges of the deck sections or plates are connected together by overlapping joints or crimp joints which is best shown in Fig. 2.

The edges of each member are provided with inverted U-shaped flanges 7 to form grooves adapted to receive similar flanges 8 on the co-operating member so that the flange of one member is received in the groove of a complementary member. The flanges are then crimped or pressed together by a suitable device such as a roofing tool, commonly used by tinners and the joints are secured together by slightly crimping the metal transversely as by punching it to form the concave portions 9. The punching operation will not be sufficient to penetrate the metal but merely to crimp it. This will be clearly understood by reference to Fig. 2.

The plates are of such size that when they are secured together they form compartments 10, the number of compartments depending upon the sizes of the sheets and the cross sectional area of the tank. The four adjacent corners of any four sheets must be fastened together so that they will be adequately tied and the fastening means should be such as to render the deck air tight, so I have found that a convenient fastening device can be provided by arranging a threaded stud 11 on the top of the float 6 and extending it through the opening 12 formed at the juncture of the four corners of four co-operating plates. The stud may project through a tie cap 13 having slits 14 into which the ends 15 of the flanges or walls of the compartments extend and since the threaded stud 11 projects through the opening 16 and receives a nut 17 on its upper end, it will be obvious that the cap 13 can be forced down upon the plates by the nut 17 so that not only will the float 6 be securely fastened to the deck or raft but a sealed joint will be provided and since the plates are secured one to the other by an overlapping sealed joint, it will be apparent that no leak will occur between the vapor space 5 and the upper portion of the tank. If however one of the plates should become perforated or ruptured, due

to abnormal causes, the deck would not sink because the floats 6 would prevent sinking of the deck.

In actual practice, it is considered impossible to provide a deck having a main body portion of precisely the same cross sectional area as the tank, so that the outer edge of the deck will at all times snugly fit all parts of the inner wall of the tank with sufficient nicety to prevent leakage of vapor past the edge of the deck so in this class of floating decks, it has been deemed essential that a seal consisting of some flexible member or members be provided around the periphery of the deck to yieldingly bear against the inner wall of the tank and my invention contemplates a novel means for effecting such a seal. Its construction can best be understood by reference to Fig. 2.

The seal consists of a plurality of arcuate spring fingers or arms 18, the inner ends of the arms being bent at substantially right angles to the main body portions as indicated at 19 and the outer ends being curved in a slight reverse curve 20 so that when the spring arms are inserted in the pockets 21 formed in the fabric 22, they will hold the fabric in extended position as shown in Fig. 2. The fabric will be 2-ply and it will be stitched along the lines 23 and 24 to form the casings 21. The two plies of the fabric may be stitched together along its outer longitudinal edges so that the upper portions of the casings will be closed. The fabric employed will be one which is practically impervious to oil vapors and since the curved spring arms will force the fabric against the inner wall of the tank, it will be apparent that the upper curved portions can slide over the surface of the inner wall in intimate contact therewith to prevent evaporation losses, the sealing ring consisting of the fabric and the arms can be made separately and then secured to the flanges 2 of the outer deck sections by bolts 26.

A deck such as described can be conveniently and inexpensively manufactured because the sheets properly flanged can be provided at the mill, the flanging costing very little more than the plain sheets and the lock joints can be made by tools now available, that is no special tools will be required to effect the construction and assembly of the parts. The sheets can be shipped separately to the location and set up in the field, this being the important advantage in view of the conditions encountered around the oil fields.

What I claim and desire to secure by Letters-Patent is:—

1. A deck for oil tanks comprising a floatable body of less diameter than the tank in which it is to be located, a sealing ring for bridging the gap between the edge of the floatable body and the wall of the tank, the ring consisting of a flexible circular strip extending outwardly and upwardly from the upper edge of the rim of the body, and outwardly and upwardly curved spring arms supporting the strip, the inner ends of the arms being secured to the edge of the floatable body, and a skirt depending from said edge of the floatable body.

2. A deck for oil tanks comprising a floatable body of less diameter than the tank in which it is to be located, a sealing ring for bridging the gap between the edge of the floatable body and the wall of the tank and engaging at its outer rim only against said wall, the ring consisting of a flexible fabric and spring arms fastened to the edge of the float arranged in circular series and received in casings in the fabric.

3. A deck for oil tanks comprising a floatable body consisting of a plurality of plates having upstanding edge flanges, the edge flanges being interlocked, and means for fastening adjacent corners of the plates, said means comprising a cap engaging the flanges at their ends and a float member under the deck having means for engagement with the cap.

4. A deck for oil tanks comprising a floatable body consisting of a plurality of plates having upstanding edge flanges, the edge flanges being interlocked, and means for fastening adjacent corners of the plates, said means comprising a cap engaging the flanges at their ends and a float member under the deck, a screw member extending through the cap and the nut on the end of the screw member.

5. A deck for oil tanks comprising a floatable body consisting of a plurality of plates having upstanding flanges at their edges, one flange on one plate having a groove to receive the flange on a co-operating plate so that the plates can be fastened together, the flanges being provided with concavo convex upset portions so that the convex portion of one flange will be received in the concavo portion of the other flange to hold the flanges together and means for securing the plates at their corners.

6. A deck for oil tanks comprising a floatable body consisting of a plurality of plates having upstanding flanges at their edges, one flange on one plate having a groove to receive the flange on a co-operating plate so that the plates can be fastened together, the flanges being provided with concavo convex upset portions so that the convex portion of one flange will be received in the concavo portion of the other flange to hold the flanges together and means for securing the plates at their corners, said means comprising a float member abutting against the under faces of the plates, a flange fastening member and means for clamping the plates between the flanges fastening member and the float.

7. A deck for oil tanks a floatable body including a plurality of plates having upstanding interlocking edge flanges, means for interfastening corners of adjacent plates, including a cap engaging the ends of the plate, a float member under the deck, means in the float engaging the cap to anchor the float and cap to the deck and a skirt depending from the deck adjacent the edge of the deck.

8. A deck for oil tanks comprising a floatable body including a plurality of plates having upstanding interlocking edge flanges for fastening the plates together, a flange of one plate having a concave upset portion and a flange of another plate having a convex upset portion receivable in the concave portion of the first flange to hold the flanges together, means for securing the plates at their corners, float members for supporting the plates upon the surface of oil in the tank, and a depending skirt on the outer edge of the deck.

In testimony whereof I affix my signature.

CLIFTON A. GLASS.