

March 19, 1935.

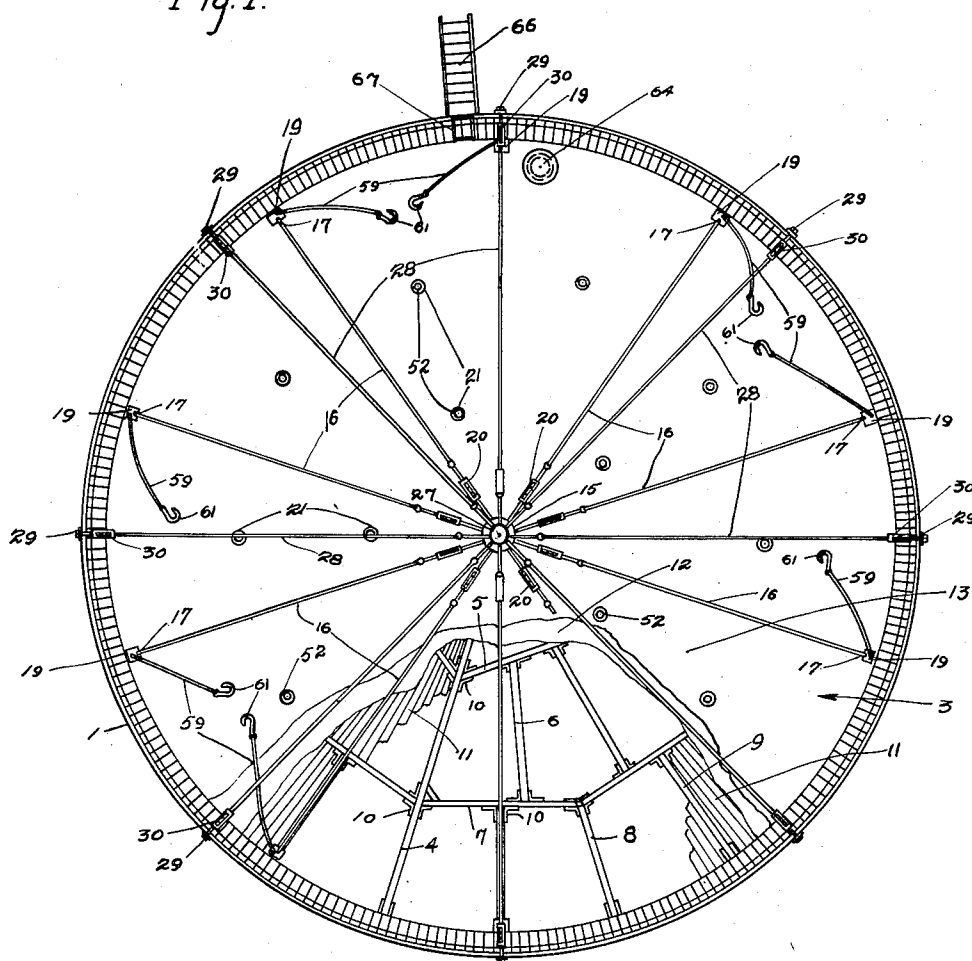
F. W. KUEFFER

1,994,478

SUPPORTING MEANS FOR FLOATING DECKS

Original Filed April 16, 1923 3 Sheets-Sheet 1

Fig. 1.



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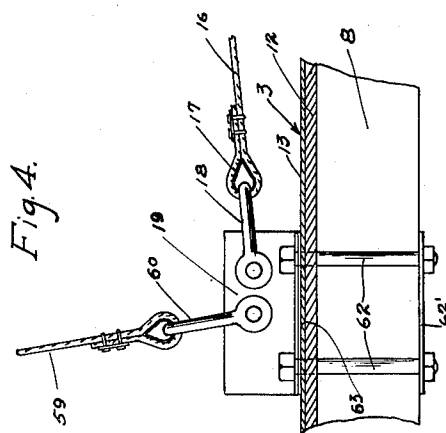
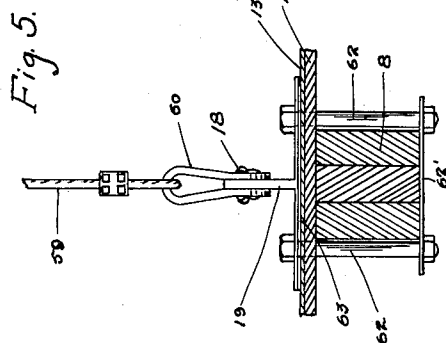
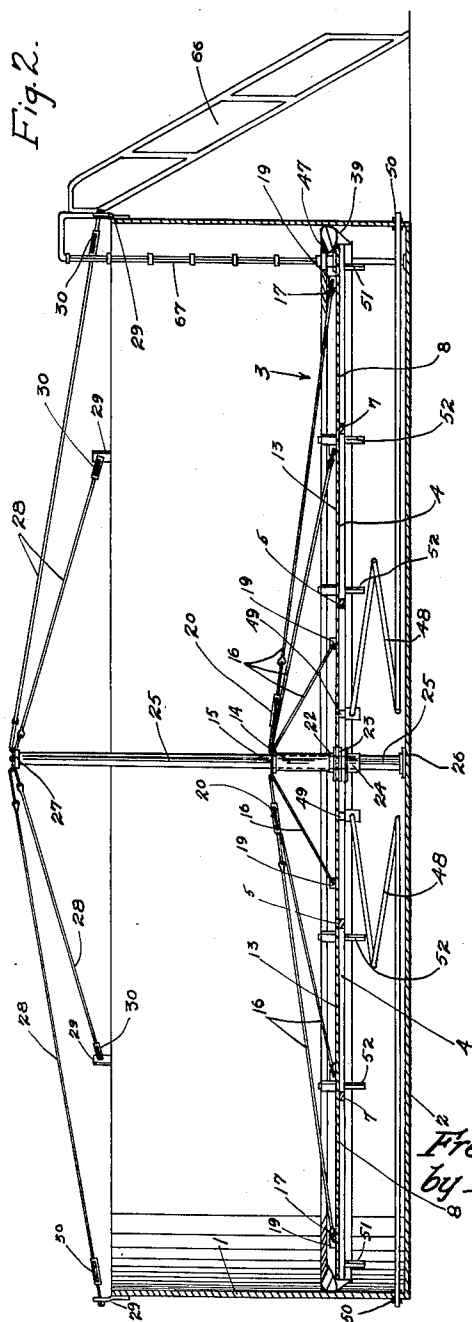
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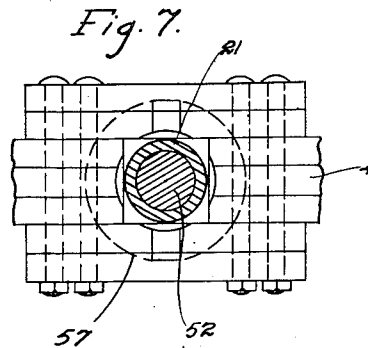
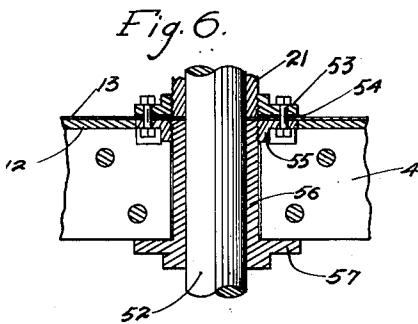
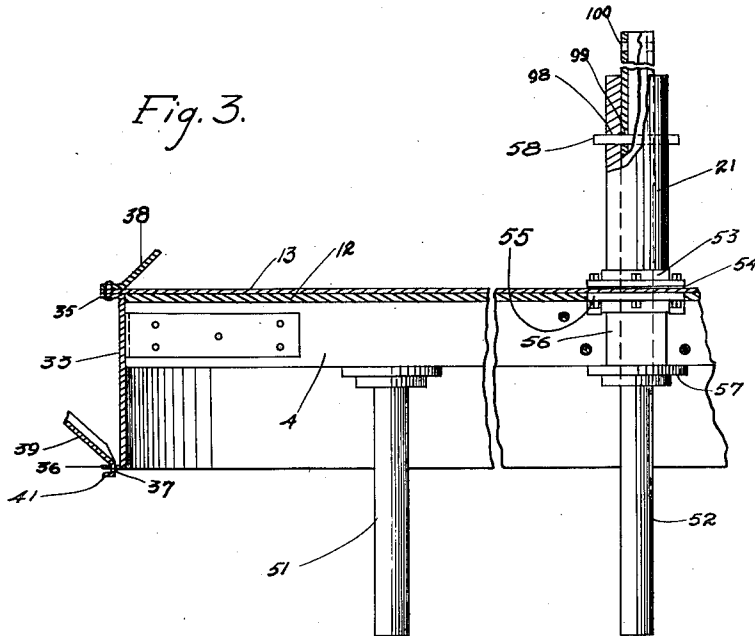
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SUPPORTING MEANS FOR FLOATING DECKS

Original Filed April 16, 1923 3 Sheets-Sheet 3



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UNITED STATES PATENT OFFICE

1,994,478

SUPPORTING MEANS FOR FLOATING DECKS

Frederich W. Kueffer, deceased, late of Independence, Mo., by Madge Kueffer, administratrix, Independence, Mo.; Madge Kueffer Scott, by order of court, assignor, by mesne assignments, to George D. Beardsley, Kansas City, Mo.

Original application April 16, 1923, Serial No. 632,487. Divided and this application May 17, 1929, Serial No. 363,930

4 Claims. (Cl. 220—26)

This invention relates to floating roofs or decks for tanks and more particularly to means for supporting the floating roof or deck in a position spaced from the bottom of the tank when the liquid is drained therefrom. This application is a division of the application of Frederich W. Kueffer Serial No. 632,487, filed April 16, 1923, Patent No. 1,765,593, patented June 24, 1930.

One of the objects of the present invention is to construct a flat roof of the floating type which shall be as light as may be consistent with structural stability. As the roof is to be normally supported at all points by the oil upon which it floats, no great factor of safety need be allowed to ensure horizontal rigidity. There may be, however, certain mechanical devices in the bottom of the tank which prevent the roof from descending quite to the bottom when all the oil is run off, thus depriving it of the support of the oil, and there are occasions when the oil must be drained from under the roof when the latter is at a comparatively high level, for the purpose of cleaning or repairing the tank.

In order to compensate at these times for the withdrawal of the support afforded by the oil, another object of the invention is the provision of permanent means for supporting the roof above the level of such mechanical devices as may be permanently positioned in the bottom of the tank, and the furnishing of detachable supporting means arranged to be selectively used as auxiliary to the permanent supporting means, or independently of the latter, to support the roof at a comparatively high elevation for cleaning out the tank.

With the above and other objects in view, the invention consists in the improved floating roof for oil tanks illustrated in the accompanying drawings, described in the following specification, and particularly claimed, and in such variations and modifications thereof as will be obvious to those skilled in the art to which the invention relates.

In the drawings accompanying and forming a part of this specification, and wherein the preferred embodiment of the invention is illustrated:

Figure 1 is a plan view of the floating roof, parts being broken away to show parts beneath.

Figure 2 is a side sectional view through a tank equipped with the improved floating roof.

Figure 3 is a detail view in elevation, partly in section showing one of the permanent legs, one of the detachable legs and a portion of a sealing member.

Figure 4 is a view in elevation of one of the anchor blocks.

Figure 5 is a view in cross section taken in a plane transversely to that of Figure 4.

Figure 6 is a sectional view showing in detail the construction of the thimble through which passes one of the detachable legs this being also the construction of the thimble surrounding the central guide posts, and

Figure 7 is a plan view showing a detail of the framing construction surrounding one of the detachable legs.

Referring now in detail to the several figures, the numeral 1 represents the peripheral wall of an oil tank which in the present example is cylindrical in shape having a bottom wall 2. The walls of said tank are of usual construction being made of a heavy grade of sheet metal, in the form of plates riveted together. As the tanks are usually of large size the side walls thereof are readily deformable from their true shape by the considerable unequally distributed stress. This has an important bearing upon the operation of the floating roof for while the latter is furnished, as will be seen, with means for adapting it to inequalities on the inner surface of the side wall of the tank, it is essential that means be provided for holding said side walls of the tank against excessive deformation from its normal shape. This roof consists of a flat member adapted to rest upon the surface of the oil within said tank and to rise or fall with the changes of level therein. The roof proper which is designated by the reference numeral 3 terminates preferably about six inches from the side wall of the tank on each side, and is constructed of a plurality of radially extending wooden rafters 4, the spaces between the adjacent rafters being bridged by framing arranged in any desired way, for instance as shown at 5, 6, 7, 8 and 9 in Figure 1. The joints between the members of said framing may be reinforced if desired by suitable metallic fittings 10. The spaces between said framing members are further bridged by lighter timbers 11 set on edge and preferably extending radially of the roof. Upon these timbers and the framing is arranged the sheathing panels 12, the latter being covered with the metallic plates 13, suitably riveted together or otherwise secured at the seams. At the central portion of the roof is erected a vertical sleeve 14 the top of which is flanged as at 15, said flange being peripherally apertured for the attachment of one end of the cables 16, the other ends 17 of said cables being secured by means of the clevises 18 to the anchor blocks 19 as clearly

shown in Figure 4. Said cables act as tensioning members supporting the edges of the roof and maintaining the latter in its flat shape. Turn buckles 20 are installed in these cables and perform the usual function of adjusting the tensioning of the latter. The lower end of the sleeve 14 is threaded in a manner precisely similar to the lower end of the sleeve 21 associated with the detachable legs and shown in Figure 6. Said threaded end of the sleeve 14 fits into a flanged member 22, the latter being bolted to the framing of the roof, a suitable packing gasket intervening. Below the sheathing is another flanged member 23 having a tubular extension 24 of the same size as and aligned with the sleeve 14. The bore of said sleeve and tubular extension affords a sliding bearing for the roof upon the vertical guide pole 25. Said guide pole is secured in any suitable manner as shown at 26 in Figure 2, to the bottom of the tank and extends some distance above the level of the upper edge thereof, having a flange 27 at its upper end apertured in a manner similar to that of the flange 15 and supporting cables 28 the outer ends of which are connected to off-set brackets 29 secured at intervals around the upper edge of the tank. Turn buckles 30 are intercalated in these cables and serve as a means not only for adjusting the verticality of the guide pole 25 but also for sustaining the side of the tank in its original shape or for correcting any material deformation which may have taken place in the shape of said side.

The roof is provided with a vertical rim 33 that is in the form of a shallow channel having upper and lower flanges 35 and 36 respectively, the latter being perforated as best shown at 37 in Figure 3 providing a hinged joint for the sealing members. The upper flange 35 is bolted to an overhanging edge of the plates 13 which form the metallic cover of the roof and to the flange of an inclined coping 38 which extends around the periphery of the roof proper at a slight elevation above said roof.

The sealing members 39 have a lug or lugs 41 fitting in the apertures 37 for hinging the same to the flange 36, and are provided with water shed members 47. Water that drains from the water shed members 47 upon the roof, as well as water that falls upon the latter is carried away by means of jointed conduits 48 which open at one end upon the upper surface of the roof as shown at 49 in Figure 2 and discharge through the side wall of the tank at 50.

In operation the floating roof rises and falls with change of level of oil in the tank being guided by the guide pole 25. The sealing members closely engage the side wall of the tank, and being individually movable only such members as encounter inequalities in the surface of said walls such as rivet heads or indented portions are rocked away therefrom the remaining members maintaining their sealing relationship. As the floating roof rises the jointed conduits 48 unfold, and they assume a folded position at the bottom of the tank when the oil is drained therefrom.

On account of the presence of said jointed conduits it is impossible for the floating roof to descend completely to the bottom of the tank. Thus a situation may arise in which all the oil is drained from the tank, the roof being maintained in an elevated position resting upon said jointed conduits. This might endanger the stability of the construction of the roof by robbing it of its means of support at peripheral and intermediate points. To meet this situation and

to ensure that the roof be adequately supported at such times, means have been provided consisting of legs 51 secured peripherally of the roof to the under side thereof, preferably beneath the radial framing members. These legs are of sufficient length to make contact with the bottom of the tank when the roof is resting on the jointed conduits. A series of detachable legs 52 are also arranged at intervals around the roof and extending through the latter. In the example shown in the drawings two series of such legs are provided but it is clearly within the scope of the invention to arrange said legs in any number of series and in any manner that may be called for by the structural requirements of the roof, to which they are applied. These legs are slidably arranged in bores formed in metallic fittings which may be similar in every respect except size to those which constitute the central bearing surrounding the guide pole 25.

As shown in Figure 6 each of these fittings comprises a sleeve 21 extending sufficiently high to be above the level of submergence of the roof, having the lower end thereof threadedly engaging a flanged member 53 the latter bearing against the upper face of the roof with a washer 54 intervening and being bolted to a similar flanged member 55 on the under side of the roof into which is threaded a thimble 56 having a bore continuous with the bore of the sleeve 21. Said thimble is arranged at a joint in the framing the latter being broken away for the accommodation thereof, as shown in Figures 6 and 7, and the lower end of said thimble being preferably flanged as at 57 to clampably engage the ends of said framing when the thimble is screwed into position. The detachable leg which passes through the sleeve 21 and thimble 56 may be in the form of a bar or hollow pipe and the sleeve 21 and said leg are formed with transverse apertures 98 and 99 respectively which may be brought into alignment, a pin 58 being passed therethrough to hold said leg in position. Said leg is of such length below said pin that it terminates in the same plane as the permanent legs 51.

For cleaning or repairing the tank it is sometimes necessary to support the roof at a sufficiently high elevation to permit the entrance of a man therebeneath after the oil has been drawn therefrom. To this end the detachable leg 52 is provided with another transverse pin hole 100 at a higher level than the aperture hereinafore mentioned so that when the pin 58 is passed through said upper aperture said leg will project below the surface of the roof sufficiently to give head room underneath for a man. When supported in this position the roof will of course be deprived of the peripheral support afforded by the permanent legs 51, to compensate for which cables 59 are provided which are attached at the lower ends to clevises 60 pivotally secured to the anchor block 19, being furnished at their upper ends with hooks 61 for engaging over the upper edge of the side wall of the tank. These cables are of such length as to become tensioned, at the point at which the legs 52, when adjusted to their greater length make contact with the bottom of the tank. The roof is provided with a manhole 64 near the edge thereof at one side to give entrance to the tank.

The anchor blocks 19 are secured to the rafters 8 by means of bolts 62 and plates 62' beneath said rafters and engageable with horizontal flanges 63 formed on said anchor blocks.

Access to the floating roof is had by means of a stairway 65 leading to the top edge of the tank and a collapsible ladder 67 adjoining said stairway 66 a portion of which rests upon the roof.

5 While the above describes what has been found to be a very practical embodiment of the invention, it is nevertheless to be understood that the floating roof may also be exemplified in numerous other alternative constructions and the right of
10 adopting all such legitimate changes as may be fairly embodied within the spirit and scope of the invention as claimed is reserved.

What is claimed as new and desired to secure by Letters Patent, is:—

15 1. The combination with a tank having a bottom, of a floating deck therefor, and flexible members carried by said deck and detachably engageable with the top edge of said tank for
20 holding said deck in predetermined spaced relation from the bottom of said tank.

2. The combination with a tank having a bottom, a side wall and a floating deck for said tank, of flexible members having means on one end
25 thereof pivotally connected with said deck, and hooks on the other end thereof detachably engaging the top of said side wall to hold said deck

in predetermined spaced relation to said bottom of said tank, at a substantial distance below the top of said side wall.

3. The combination with a tank having a bottom, a side wall and a floating deck for said tank, of flexible members having means on one end
5 thereof pivotally connected with said deck, and hooks on the other end thereof detachably engaging the top of said side wall to hold said deck in predetermined spaced relation to said bottom
10 of said tank at a substantial distance below the top of said side wall, said flexible members being adapted to repose on said deck when not in use.

4. The combination with a tank having a bottom, a side wall and a floating deck for said tank, of flexible members connecting said deck with
15 said side wall to limit downward movement of said deck toward said bottom to a predetermined distance from said bottom, said flexible members being connected with said side wall so as not to
20 interfere with the upward movement of said deck when buoyed by liquid rising in said tank.

MADGE KUEFFER.

Administratrix of the Estate of Frederick W. Kueffer, Deceased. 25