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J. H. WIGGINS

FLOATING DECK FOR LIQUID STORAGE TANKS

Filed April 30, 1924

2 Sheets-Sheet 1

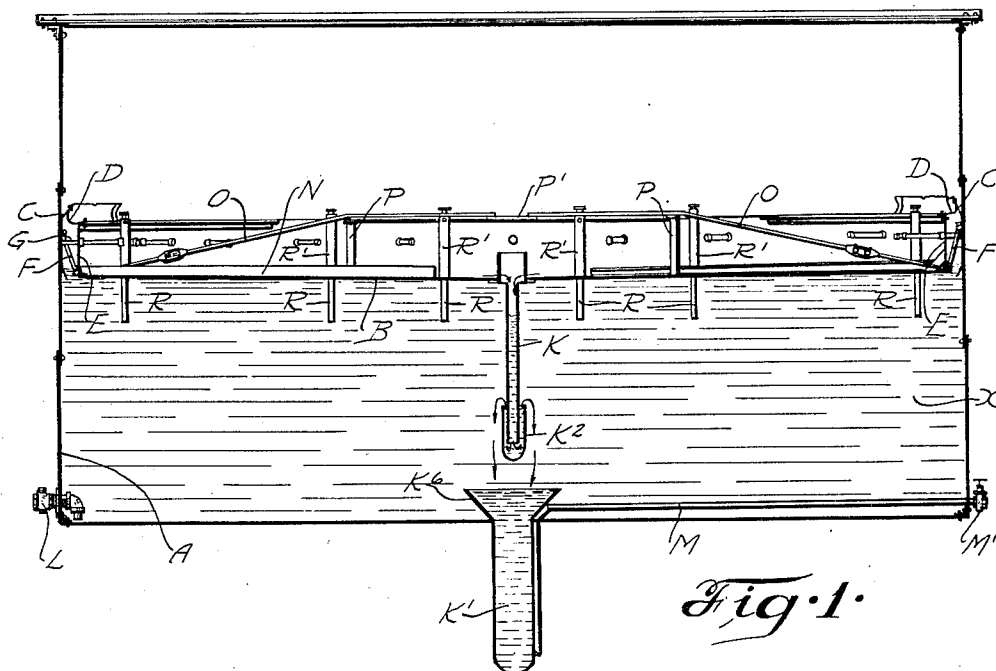
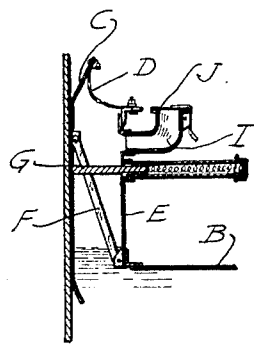
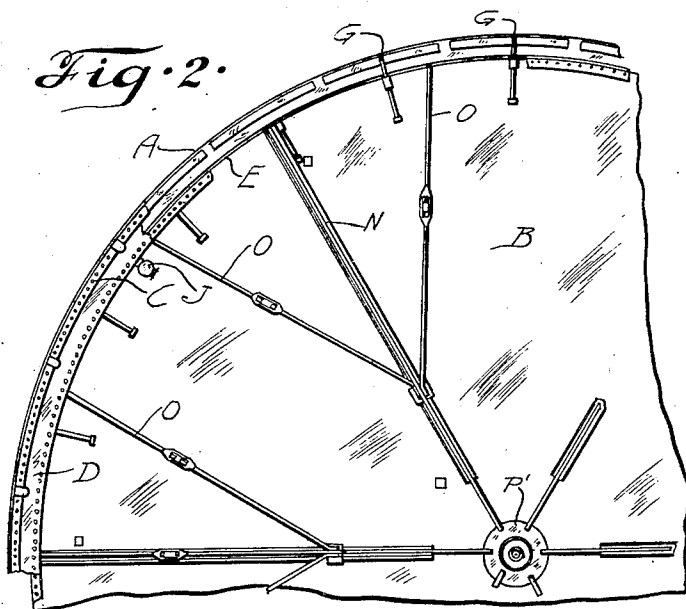


Fig. 2.



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2 Sheets-Sheet 2

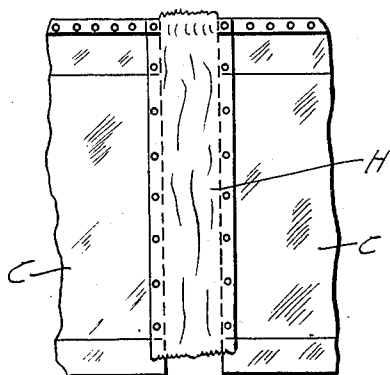


Fig. 4.

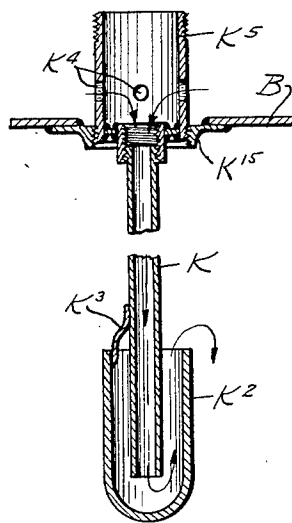


Fig. 6.

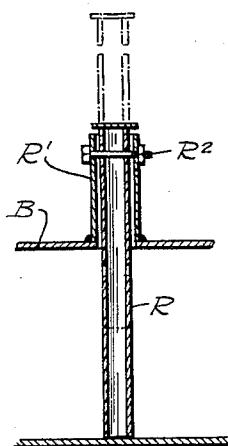


Fig. 5.

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UNITED STATES PATENT OFFICE.

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FLOATING DECK FOR LIQUID-STORAGE TANKS.

Application filed April 30, 1924. Serial No. 710,097.

To all whom it may concern:

Be it known that I, JOHN H. WIGGINS, a citizen of the United States, residing at Bartlesville, Oklahoma, have invented a certain new and useful Improvement in Floating Decks for Liquid-Storage Tanks, of which the following is a full, clear, and exact description, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to liquid storage tanks of the type that comprise a movable roof or deck which floats upon and is supported by the liquid in the tank and is an improvement on the floating deck described in my pending application for patent, Serial 540,847, filed March 3, 1922.

One object of my present invention is to provide a floating deck of the general type above referred to in which the segmental shoe members are sustained by hangers on the central body portion of the deck in such a way that gravity tends to hold said shoe members in parallel relation with and in snug engagement with the side wall of the tank.

Another object is to provide a floating deck of the general type above referred to in which the shoe members are joined together by pieces of gas-tight fabric and are also connected with the rim on the body portion of the deck by an annular-shaped piece of gas-tight fabric, thereby producing a space between the side wall of the tank and the rim on the body portion of the deck that is tight enough to hold either a slight pressure or a vacuum.

And still another object is to provide a floating deck or roof for liquid storage tanks that is equipped with a drain pipe of novel construction that embodies the desirable features and characteristics of the inverted syphon drain device described in my pending application for patent, Serial 599,904, filed November 9, 1922. Other objects and desirable features of my invention will be hereinafter pointed out.

Figure 1 of the drawings is a vertical cross-sectional view of a liquid storage tank provided with a floating deck constructed in accordance with my invention.

Figure 2 is a top plan view of a portion of the deck.

Figure 3 is an enlarged vertical sectional view illustrating the construction and ar-

rangement of the hangers that are used to carry the shoe members.

Figure 4 is a detail view showing portions of two of the shoe members in side elevation and the flexible joint between said shoe members.

Figure 5 is a detail sectional view illustrating the construction of the adjustable supports that are used to sustain the deck when the tank is empty or when the tank is being constructed; and

Figure 6 is a detail sectional view illustrating the construction of the drain pipe that is used for carrying off the water that falls on the central body portion of the deck.

Referring to the drawings which illustrate the preferred form of my invention, A designates the side wall of the tank, and B designates the central body portion of the floating deck that normally rests upon the oil or other liquid x in the tank, said body portion being so proportioned that it covers the major portion of the liquid in the tank. The deck is provided with a variable peripheral portion formed by a plurality of segmental shoe members C that bear against the inner face of the side wall of the tank and an annular-shaped piece of gas-tight fabric D that is connected to the upper ends of the shoe members C and to the upper edge of an annular rim E on the central body portion B of the deck. The shoe members C have their lower edge portion submerged in the liquid in the tank, and said shoe members are sustained by hangers mounted on the central body portion B of the deck in such a way that gravity tends to hold said shoe members in parallel relation with and in snug engagement with the inner face of the side wall of the tank. The hangers F preferably consist of arms pivotally connected at their lower ends to the central body portion B of the deck and pivotally connected at their upper ends to the shoe members C, said hangers being arranged between said shoe members and the rim E on the body portion of the deck, thereby permitting the shoe members to move radially with respect to said body portion without destroying the parallel relationship between said shoe members and the side wall of the deck. Two hangers F are preferably provided for each of the shoe members, and in order to maintain said shoe members in approximate concentric relationship with the

body portion B of the deck, the annular rim E on said body portion is provided with spring-pressed plungers G that bear against the shoe members C, as shown in Figure 3.

5 The joints between the shoe members C are protected by pieces of gas-tight fabric H that are connected to the ends of adjacent shoe members, as shown in Figure 4, and also connected to the piece of fabric D that

10 extends from the upper edges of the shoe members to the rim E on the body portion of the deck. This method of sealing the annular space between the shoe members and the rim E on the central body portion of the

15 deck is inexpensive to construct, it will effectively protect the liquid in this annular space from the atmosphere, and it is tight enough to hold either a slight pressure or a vacuum. In order to relieve the pressure in

20 the tank, in the event of an internal explosion, the annular space between the side wall of the tank and the rim E is provided with a number of outlets I, each of which is

25 equipped with a closure J arranged in such a way that it will open automatically whenever an abnormal pressure exists in the space between the rim E and the side wall of the tank.

The drainage means that is used for carrying away the water which falls on the deck is preferably formed by a vertically

30 disposed drain pipe K that projects downwardly from the centre of the body portion B of the deck and a depending extension or well K' on the bottom of the tank that is long

35 enough to provide for the rise and fall of the deck due to variations in the level of the liquid in the tank, the lower end of the drain pipe K terminating inside of a cup K² of

40 slightly greater diameter than said pipe and which is held in rigid relation with same by means of brackets or other suitable devices K³, as shown in Figure 6. Rain that falls

45 on the top surface of the deck will enter the drain pipe K through drain holes K⁴ in a sleeve K⁵, as shown in Figure 6, and will pass downwardly through said pipe K into the cup K² at the lower end of said pipe,

50 finally escaping from said cup as indicated by arrows in Figure 6 and collecting in the bottom of the tank at a point below the body of oil in the tank, as described in my application 599,904, filed November 9, 1922. In

55 order that the drain pipe K may be removed from the upper side of the deck, said pipe is connected in any preferred manner to the sleeve K⁵, which, in turn, is screwed down into a flanged collar K¹⁵ on the body portion

60 of the deck whose opening is large enough to permit the cup K² on the drain pipe K to pass upwardly through same. The well or extension K' on the bottom of the tank is provided at its upper end with a flange K⁶ that projects several inches above the bottom

65 of the tank so as to trap off the drain water

on the bottom of the tank from the drain water in said well, and in order to provide for the removal of the drain water that collects in the bottom of the tank, the tank is

70 equipped with a draw-off pipe that has a valve L. I also prefer to provide the tank with an emergency drain pipe M that leads from the bottom of the well K' and which

75 is provided with a valve M' that can be opened so as to permit water to escape freely from the well K' in the event a large quantity of water resulting from a cloudburst is suddenly projected onto the deck, when the

80 deck is in a low position in the tank.

The central body portion B of the deck is

80 preferably reinforced and strengthened by radially disposed reinforcing elements N on the top side of same, and truss members O are provided for imparting rigidity to the

85 deck. Preferably struts or uprights P are arranged on the top side of the deck, and radially disposed truss members O that extend over said struts are connected at their

90 outer ends to the central body portion B of the deck adjacent the edge of same and connected at their inner ends to a centre ring P', as shown in Figure 2. A trussed

95 deck of the kind above described is light, it is inexpensive to build, and it has sufficient rigidity to successfully perform the function for which it is designed.

In order that the deck may be sustained in a horizontal position above the bottom of the tank during the operation of erecting

100 the tank or when the tank is empty, the central body portion B of the deck is provided with a number of tubular supports R that are adapted to be moved downwardly into

105 engagement with the bottom of the tank and then rigidly secured to said body portion, so as to sustain the weight of same. As shown in Figure 5, the body portion B of the deck is provided with upwardly project-

110 ing sleeves R' through which the supports project upwardly, each of said sleeves having aligned holes therein through which a pin or locking device R² can be arranged

115 transversely of the support R so as to lock said support in its extended condition, as shown in full lines in Figure 5. After the tank has been filled with oil, the supports R are disconnected from the sleeves R' and

120 moved upwardly into an inoperative position, as shown in dotted lines in Figure 5.

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

1. A floating deck for liquid storage tanks, comprising a central body portion that normally floats upon the liquid in the tank,

125 shoe members arranged in sliding engagement with the side wall of the tank with their lower edge portions submerged in the liquid in the tank, and a supporting means

130 for said shoe members carried by the cen-

tral body portion of the deck and so constructed and arranged that gravity tends to hold said shoe members in parallel relationship with the side wall of the tank and in snug engagement with said side wall.

2. A floating deck for liquid storage tanks, comprising a central body portion adapted to normally float upon the liquid in the tank and provided at its outer edge with an upwardly projecting rim, segmental shoe members arranged parallel to and in sliding engagement with the side wall of the tank with their lower edge portions submerged in the liquid in the tank and spaced away from said rim, and swinging hangers for supporting said shoe members arranged between the side wall of the tank and the rim on the central body portion of the deck, said shoe members being pivotally connected to the upper ends of said hangers so that they can move relatively to same sufficiently to maintain the parallel relationship between said shoe members and the side wall of the tank.

3. A floating deck for liquid storage tanks, comprising a central body portion adapted to normally rest upon the liquid in the tank and provided adjacent its outer edge with an upwardly projecting rim, segmental shoe members arranged parallel to and in sliding engagement with the side wall of the tank with their lower edge portions submerged in the liquid in the tank and spaced away from said rim, and hangers for said shoe members pivotally connected at their upper ends to the shoe members and at their lower ends to the central body portion of the deck and arranged so that they normally exert pressure on said shoe members in a direction to hold them in engagement with the side wall of the tank.

4. A floating deck for liquid storage tanks, comprising a central body portion that normally floats upon the liquid in the tank, segmental shoe members arranged parallel to and in sliding engagement with the side wall of the tank with their lower edge portions submerged in the liquid in the tank, an upwardly projecting rim adjacent the outer edge of said central body portion, the submerged portions of said shoe members being spaced away from said rim so as to permit gases to bubble up into the annular space between said rim and shoe members, inclined hangers arranged between the side wall of the tank and said rim and having their upper ends pivotally connected to said shoe members and their lower ends pivotally connected to said body portion at a point below the top edge of said rim, and an independent means that tends to hold said shoe members in approximate concentric relationship with the central body portion of the deck.

5. A floating deck for liquid storage tanks, comprising a central body portion that nor-

mally floats upon the liquid in the tank and which is provided adjacent its outer edge with an upwardly projecting rim, segmental shoe members arranged in sliding engagement with the side wall of the tank with their lower edge portions submerged in the liquid in the tank, flexible gas-tight elements connected to said shoe members for closing the joints between the ends of same, and a flexible gas-tight element connected at its outer edge to said shoe members and at its inner edge to said rim for sealing the annular space between said parts.

6. A floating deck for liquid storage tanks, comprising a central body portion that normally floats upon the liquid in the tank and which is provided adjacent its outer edge with an upwardly projecting rim, segmental shoe members arranged in sliding engagement with the side wall of the tank with their lower edge portions submerged in the liquid in the tank, flexible gas-tight elements connected to said shoe members for closing the joints between the ends of same, a flexible gas-tight element connected to said shoe members and to said rim for sealing the annular space between said parts, and a supporting means for said shoe members carried by said central body portion and constructed so that the natural tendency of the shoe members is to remain in parallel relationship with the side wall of the tank and in snug engagement with the inner face of said side wall.

7. A floating deck for liquid storage tanks, comprising a central body portion that normally floats upon the liquid in the tank and provided adjacent its outer edge with an upwardly projecting rim, segmental shoe members arranged in sliding engagement with the side wall of the tank with their lower edge portions submerged in the liquid in the tank, pivotally mounted hangers on said central body portion arranged outside of the rim of same and combined with said shoe members in such a way that the shoe members are capable of moving relatively to same sufficiently to maintain the parallel relationship between said shoe members and the side wall of the tank, and flexible gas-tight elements for closing the joints between said shoe members and for closing the space between said shoe members and the rim on the central body portion of the deck.

8. A means for storing liquids, consisting of a tank, a floating deck that normally rests upon the liquid in the tank, a drain pipe projecting downwardly from said deck for carrying off water that collects on the top side of the deck, and a cup connected to the lower end of said pipe and so arranged that said pipe terminates inside of said cup at a point below the upper edge of the cup.

9. A means for storing liquids, consisting of a tank, a floating deck that normally rests

- upon the liquid in the tank, a drain pipe projecting downwardly from said deck for carrying off water that collects on the top side of the deck, a cup connected to the lower end of said pipe and so arranged that said pipe terminates inside of said cup at a point below the upper edge of the cup, and a well projecting downwardly from the bottom of the tank that is adapted to receive said cup and drain pipe under certain conditions.
- 10 10. A floating deck for liquid storage tanks, comprising a central body portion that normally floats upon the liquid in the tank, a variable peripheral portion for closing the space between said central body portion and the side wall of the tank, radially disposed reinforcing elements connected to the central body portion of the deck, struts or uprights projecting upwardly from said body portion, and radially disposed truss members combined with said struts and having their outer ends connected to the central body portion of the deck adjacent the outer edge of same.
11. A means for storing liquids, consisting of a tank, a floating deck that normally rests upon the liquid in the tank, and a siphon drain pipe projecting downwardly from said deck for carrying off water that collects on the top side of same and connected to said deck in such a way that it can be removed from the upper side of the deck.
12. A means for storing liquids, consisting of a tank, a floating deck that normally rests upon the liquid in the tank, a drain pipe projecting downwardly from said deck and provided at its lower end with a cup inside of which said drain pipe terminates at a point below the upper edge of the cup, and a part on the deck that sustains said pipe, constructed so that said pipe and the cup thereon can be withdrawn upwardly through the same.

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