May 6, 1924. 1,493,174

J. H. WIGGINS

FLOATING DECK FOR LIQUID STORAGE TANKS

Filed Nov. 9, 1922 2 Sheets-Sheet 1

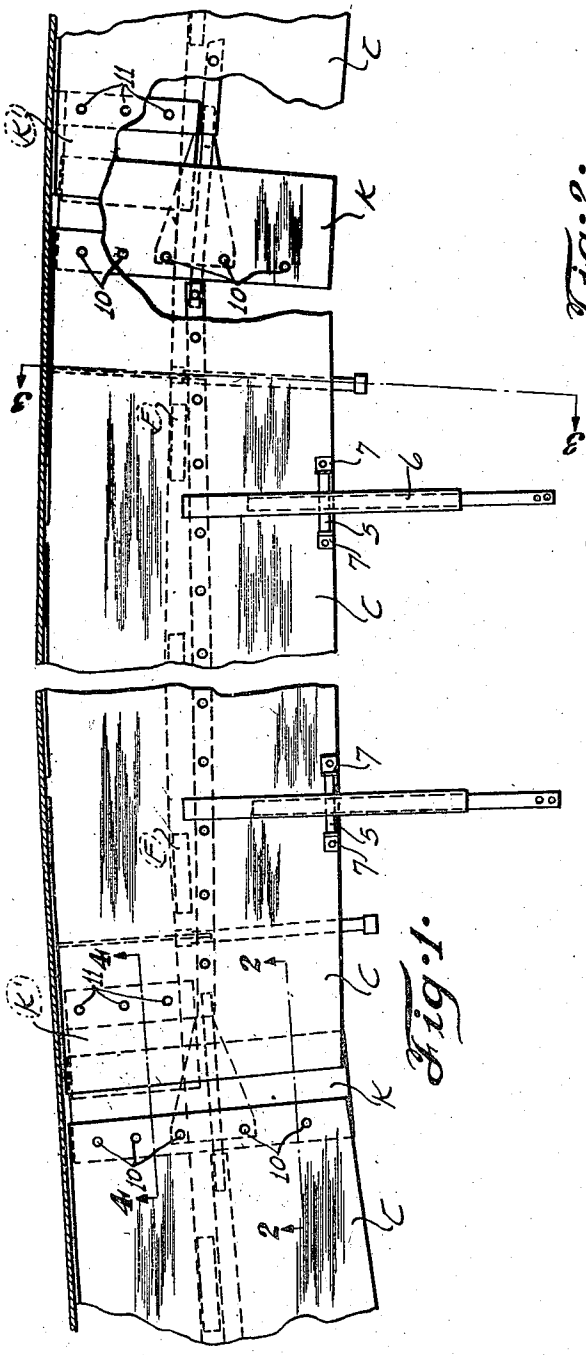


Fig. 1.

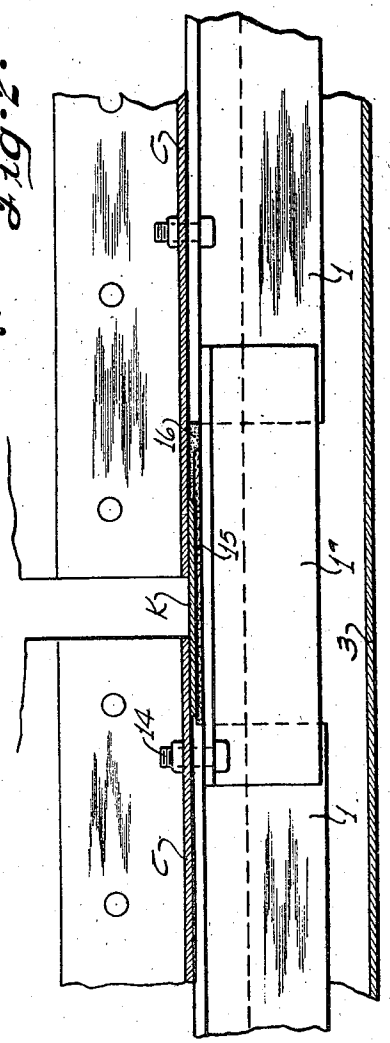


Fig. 2.

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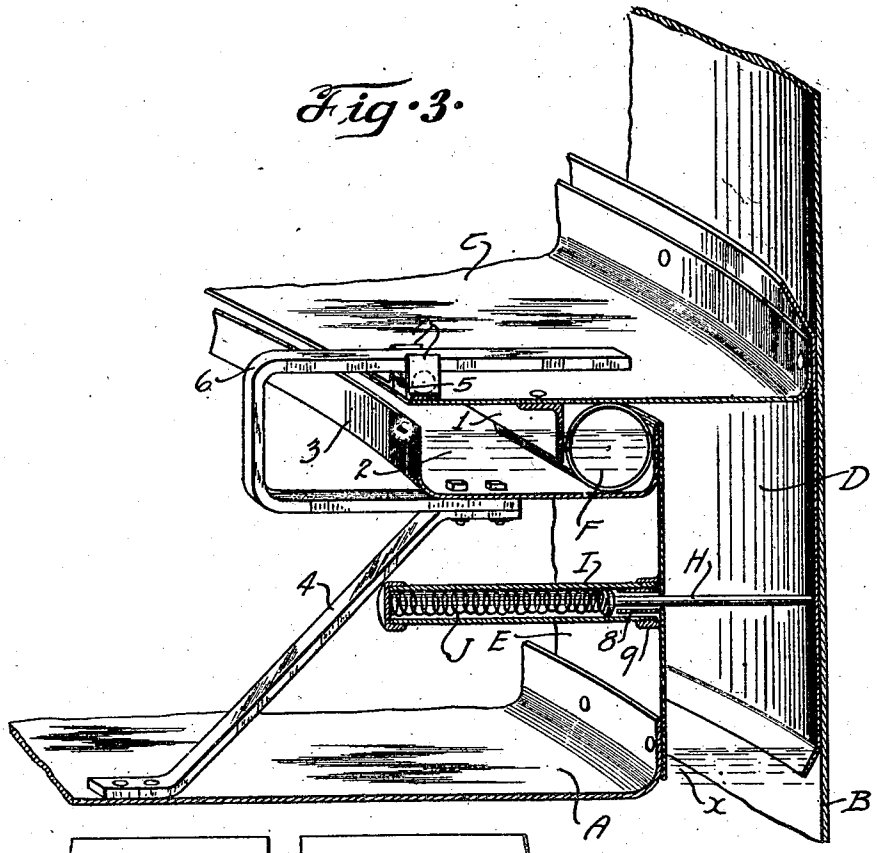
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Fig. 3.



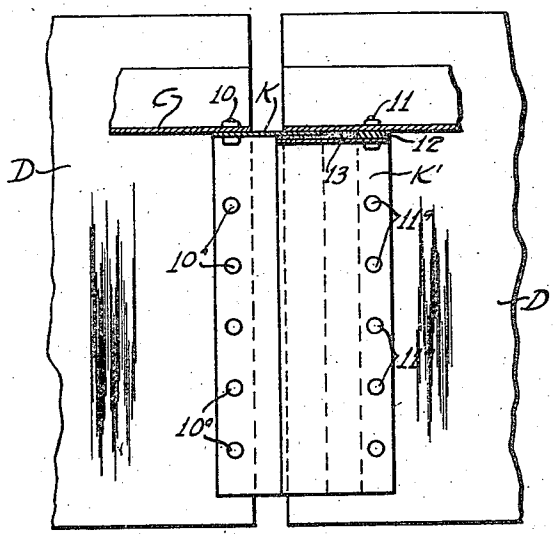


Fig. 4.

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UNITED STATES PATENT OFFICE.

JOHN H. WIGGINS, OF BARTLESVILLE, OKLAHOMA.

FLOATING DECK FOR LIQUID-STORAGE TANKS.

Application filed November 9, 1922. Serial No. 599,903.

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 top or deck which floats upon and is supported by the liquid in the tank, and is an improvement upon the floating tank deck described in my pending application for patent Serial No. 540,847, filed March 3, 1922.

One object of my present invention is to provide a floating deck for liquid storage tanks of the same general type as the deck described in my said application, which comprises a liquid seal for closing the joint or space between the central body portion of the deck and the variable peripheral portion of the deck, thereby effectively sealing the annular space between the upwardly-projecting rim on the central body portion of the deck and the shoe carried by the variable peripheral portion of the deck which slides against the inner surface of the side wall of the tank.

Another object is to provide a floating deck for liquid storage tanks that has a peripheral portion which is capable of expanding and contracting sufficiently to compensate for variations in the relative position and dimension of the deck and the side wall of the tank, and which is equipped with a liquid sealing means of such construction that it will automatically relieve the internal pressure in the tank in the event of an internal explosion in the tank.

And still another object of my invention is to provide a floating deck for liquid storage tanks that comprises a variable peripheral portion composed of relatively movable elements that are sustained and guided by rollers or other suitable rotatable devices that insure free and easy radial movement of said elements during the expansion and contraction of the peripheral portion of the deck. Other objects and desirable features of my invention will be hereinafter pointed out.

Figure 1 of the drawings is a top plan view, partly broken away, of part of the variable peripheral portion of a floating deck for liquid storage tanks constructed in accordance with my invention.

Figure 2 is a vertical sectional view, taken on the line 2—2 of Figure 1, looking in the direction indicated by the arrows.

Figure 3 is an enlarged perspective view, taken on the vertical section line 3—3 of Figure 1, looking in the direction indicated by the arrows; and

Figure 4 is a vertical sectional view, taken on the line 4—4 of Figure 1, looking towards the side wall of the tank.

The floating deck that forms the subject-matter of my present application is similar in general design and principle of operation to the floating deck for liquid storage tanks described in my pending application previously referred to, in that it comprises a central solid body portion A that floats upon the liquid in the tank, and a variable peripheral portion that serves as a closure for the annular space between said central body portion A and the side wall B of the tank and which is constructed in such a manner that it is capable of expanding and contracting sufficiently to compensate for variations in the relative position and dimension of the deck and side wall of the tank. In the particular form of my invention herein illustrated the variable peripheral portion of the deck is composed of a number of substantially segmental-shaped, horizontally-disposed plates C, each of which has secured to its outer edge one segment D of an annular shoe that bears against the inner face of the side wall B of the tank and whose lower edge portion is submerged in the liquid x in the tank, as shown in Figure 3, said plates C being so arranged that they serve as a closure for the annular space between the side wall B of the tank and a vertically-disposed, annular rim E at the periphery of the central body portion A of the deck.

The function of the annular shoe composed of the segments D is to trap off any gas or vapor rising from the surface of that portion of the liquid in the tank lying be-

tween the side wall B and the rim E on the main body portion A of the deck, and in order to prevent said gas or vapor from escaping to the atmosphere, I have provided the deck with a liquid seal that effectively closes the space or joint between the central body portion A of the deck and the plates C that constitute the variable peripheral portion of the deck. The liquid seal just referred to can be formed in various ways without departing from the spirit of my invention, but I prefer to provide the segmental plates C with depending sealing devices 1 that project downwardly into a body of liquid 2 carried by an annular trough 3 that is arranged under the plates C, as shown in Figure 3, it being preferable to use a liquid 2 that will not freeze and which evaporates slowly, such, for example, as fuel oil. The trough 3 preferably extends unbrokenly around the vertically-disposed rim E on the central body portion A of the deck and is supported by brackets 4 secured to said central body portion A and to the trough, as shown in Figure 3. Consequently, assuming that the joints between the plates C and between the segments B of the annular shoe are gas and air-tight, the seal formed by the liquid 2 in the trough 3 and the depending devices 1 on the underside of the plates C eliminates the possibility of air entering the tank by leaking through the joint between the top edge of the rim E and the plates C and also eliminates the possibility of gases or vapors escaping through said joint from the annular space between the rim E on the central body portion of the deck and the annular shoe which surrounds said rim.

In order to insure free and easy radial movement of the plates C, each of said plates is supported by a plurality of rotatable devices, such as horizontally-disposed, tubular rollers F arranged in the trough 3 between the outer side wall of said trough and the depending sealing devices 1 on the underside of the plates C, as shown in Figure 3, the plates C being maintained in a horizontal position by rollers 5 or the like on the upper side of said plates that bear against horizontally-disposed guide bars 6 that can be supported conveniently by the braces 4 on the central body portion of the deck to which the trough 3 are connected. The rollers 5 can be secured to the plates C in any suitable way, as for example, by means of brackets 7 on said plates, which carry said rollers. In the form of my invention herein illustrated the lower edge portion of each of the shoe segments D is held in snug engagement with the inner face of the side wall B of the tank by horizontally-disposed, spring-pressed plungers H that project radially from the annular rim E on the central body portion of the deck, as shown in Figure 3. It is immaterial how the plungers H are mounted, but I prefer to arrange each of said plungers in a horizontally-disposed cylinder I that projects inwardly from the inner side of the rim E on the central body portion of the deck and which is equipped with a spring J that exerts pressure on the plunger H in a direction to press the shoe segment D that co-operates with said plunger tightly against the side wall of the tank, the cylinder I being secured to the rim E by a collar 9 that is welded to said parts and being equipped with a tubular stop 8 that surrounds the shank of the plunger H and forms an abutment against which the head of the plunger H strikes when said plunger reaches the limit of its outward movement. By constructing the variable peripheral portion of the deck in the manner above described I not only obtain an air and gas-tight closure for the annular space between the side wall of the tank and the central body portion of the deck, but I produce a structure in which the liquid seal between the variable peripheral portion of the deck and the central body portion of the deck will automatically relieve the internal pressure in the tank in the event of an explosion in the tank, due to the fact that the sealing devices 1 are submerged in a body of liquid 2, which is shallow enough to permit an abnormal pressure to break through the seal.

The joints between the segmental plates C and the segmental shoe members D that are connected to said plates are closed by a means of novel construction that produces air and gas-tight joints between said parts without, however, interfering with the relative movement of said parts when the peripheral portion of the deck expands and contracts. In the form of my invention herein illustrated the means used for the purpose just referred to consists of co-operating tongues and pockets on said parts arranged in telescopic relation. and a non-solidifying, semi-liquid substance in said pockets, such, for example, as axle grease, that co-operates with the tongues and the walls of the pockets to form an air and gas-tight seal between the same. As shown in Figures 1 and 4, each of the plates C and the shoe segment D that is secured to same are provided at their right hand end with a laterally-projecting tongue K that slides in a pocket in the left hand end of the adjacent plate C and shoe segment D. Said tongue K is formed by a substantially angle-shaped plate that comprises a horizontally-disposed part which is connected to the underside of the plate C by fastening devices 10 and a vertically-disposed part that is connected to the inner side of the

shoe segment D on the plate C by means of fastening devices 10, as shown in Figure 4. The pocket that receives said tongue is also formed by an angle-shaped plate K' connected to the underside of the adjacent plate C and to the inner side of the shoe segment D on said adjacent plate by fastening devices 11 and 11a, respectively, which extends through a spacing strip 12, as shown in Figure 4, that holds the plate K' spaced far enough away from the parts to which it is connected to form a substantially angle-shaped pocket which receives the angle-shaped tongue K on the adjacent plate C and shoe segment D, to the left, looking at Figure 4. It will be noted in Figure 1 that the horizontally-disposed portion of the plate K' that constitutes the pocket just described does not extend clear across the entire width of the plate C to which it is connected, but terminates at a point in proximity to the depending sealing device 1 on the underside of the plate C which projects downwardly into the liquid in the trough 3. The horizontal portion of the plate that constitutes the tongue K, however, extends across the entire width of the plate C to which it is connected, so as to close the gap or joint between the ends of two adjacent plates C. In order to effectively seal the portion of the tongue K that slides in the pocket K' axle grease or some other suitable non-solidifying, semi-liquid substance 13 is arranged in said pocket, as shown in Figure 4, said substance 13 filling the joints or spaces between the tongue K and the walls of the pocket K' in which said tongue slides, and thereby eliminating the possibility of gas or air leaking into the tank or escaping from the tank through the sliding joints between the plates C and the sliding joints between the shoe segments D.

The joints between the ends of the depending sealing devices 1 on the underside of the plates C are closed by members 1a, each of which is pivotally connected by a vertical pivot or pintle 14 to the right hand end of one of the sealing devices 1 in such a way that it will lap over the left hand end of the adjacent sealing device 1 as shown in Figure 2. In order to produce tight joints between the top edge of the members 1a and the parts against which they bear, a gasket 15 and some axle grease or the like 16 are interposed between each of the members 1a and the parts that overlap same, as shown in Figure 2. Due to the fact that the members 1a are pivotally mounted in such a way that they can swing in a horizontal plane, said members 1a will not interfere with the relative radial movement of the plates C, and as the joints or spaces between the top edges of the members 1a and the parts against which they bear are sealed by gaskets 15 and a non-solidifying, semi-liquid substance 16, it will be impossible for gas or air to enter the tank or escape therefrom through the joints between the ends of the sealing devices 1 on the underside of the plates C.

When the tank is filled with liquid, the central body portion A of the deck floats upon the liquid and the horizontally-disposed plates C close the annular space between the side wall B of the tank and the central body portion A of the deck, and thus protect the contents of the tank from fire and from evaporation, the variable peripheral portion of the deck formed by the plates C being of such construction that the diameter of same can increase or decrease automatically, and thus compensate for relative movement between the side wall of the tank and the central body portion A of the deck. The annular shoe composed of the segments D is partially submerged in the liquid x in the tank, and as the plates C are provided with depending sealing devices 1 that are submerged in the liquid contained in the trough 3 carried by the vertically-disposed rim E that surrounds the central body portion A of the deck, the annular space between the rim E and the annular shoe that surrounds said rim is protected by two liquid seals, the joints between the ends of the plates C and the joints between the ends of the shoe segments D connected to same being effectively sealed by a non-solidifying, semi-liquid substance that coats the co-operating engaging faces of the telescoped or overlapped members on the plates C and shoe segments D. In addition to effectively cutting off communication between the atmosphere and the interior of the tank, the construction above described is desirable, in that an abnormal pressure in the tank, caused by an internal explosion, will be relieved automatically by the pressure breaking through the liquid seal formed by the depending devices 1 on the underside of the plates C and the shallow body of liquid 2 in which said devices are submerged. Free radial movement of the plates C and the shoe segments D is assured by the rollers F and 5 between which the plates C are arranged, thereby insuring that the annular shoe will remain in snug engagement with the side wall of the tank.

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 main body portion that normally floats upon the liquid in the tank, a variable peripheral portion for closing the space between said main body portion and the side wall of the tank, and a liquid seal

for closing the joint or space between said main body portion and said variable peripheral portion.

2. A floating deck for liquid storage tanks, comprising a main body portion that normally floats upon the liquid in the tank, a variable peripheral portion composed of relatively movable, horizontally-disposed elements for closing the space between said main body portion and the side wall of the tank, and a liquid seal for closing the joint or space between said main body portion and the elements constituting said variable peripheral portion.

3. A floating deck for liquid storage tanks, comprising a main body portion adapted to float upon the liquid in the tank, a peripheral portion for closing the space between said main body portion and the side wall of the tank comprising members that are capable of moving relatively to each other to provide for the expansion and contraction of said variable peripheral portion, means for producing air and gas-tight joints between said members, and a liquid seal for preventing the ingress or egress of gas or air through the space between said members and the main body portion of the deck.

4. A floating deck for liquid storage tanks, comprising a main body portion adapted to normally float upon the liquid in the tank, and a liquid sealed, expansible and contractible means for closing the space between said main body portion and the side wall of the tank.

5. A floating deck for liquid storage tanks, comprising a main body portion adapted to normally float upon the liquid in the tank, a variable peripheral portion for closing the space between said main body portion and the side wall of the tank comprising a shoe arranged in sliding engagement with the side wall of the tank with its lower edge portion submerged in the liquid in the tank, and a liquid seal for cutting off communication between the atmosphere and the space surrounded by said shoe.

6. A floating deck for liquid storage tanks, comprising a main body portion adapted to normally float upon the liquid in the tank, a variable peripheral portion composed of relatively movable members and comprising a shoe partially submerged in the liquid in the tank and composed of relatively movable members, means for producing air and gas-tight joints between all of said relatively movable members, and a liquid seal for producing a tight joint between the main body portion of the deck and the relatively movable members of the peripheral portion that project radially from said main body portion.

7. A floating deck for liquid storage tanks, comprising a main body portion that normally floats upon the liquid in the tank, a variable peripheral portion for closing the space between said main body portion and the side wall of the tank comprising relatively movable members, and rollers that sustain said members.

8. A floating deck for liquid storage tanks, comprising a main body portion that normally floats upon the liquid in the tank, a variable peripheral portion for closing the space between said main body portion and the side wall of the tank comprising relatively movable members, and rotatable devices that support and guide said relatively movable members.

9. A floating deck for liquid storage tanks, comprising a main body portion adapted to normally float upon the liquid in the tank, a variable peripheral portion comprising horizontally-disposed, relatively movable elements for closing the space between said main body portion and the side wall of the tank, rotatable devices that sustain said elements, and means for producing gas and air-tight joints between said elements.

10. A floating deck for liquid storage tanks, comprising a main body portion adapted to normally float upon the liquid in the tank, a variable peripheral portion comprising horizontally-disposed, relatively movable elements for closing the space between said main body portion and the side wall of the tank, rotatable devices that sustain said elements, means for producing gas and air-tight joints between said elements, and a liquid seal for closing the space or joint between the main body portion of the deck and said horizontally-disposed elements.

11. A floating deck for liquid storage tanks, comprising a main body portion adapted to float upon the liquid in the tank, a variable peripheral portion composed of relatively movable, horizontally-disposed elements for closing the space between said main body portion and the side wall of the tank, a body of liquid carried by said main body portion, and sealing devices on said horizontally-disposed elements that project into said body of liquid.

12. A floating deck for liquid storage tanks, comprising a main body portion provided at its periphery with an upwardly-projecting rim, relatively movable, horizontally-disposed elements arranged above said rim for closing the space between said rim and the side wall of the tank, and a liquid seal for closing the joint between the upper edge of said rim and said horizontally-disposed elements.

13. A floating deck for liquid storage tanks, comprising a main body portion pro-

vided at its periphery with an upwardly-projecting rim, relatively movable, horizontally-disposed elements arranged above said rim for closing the space between said rim and the side wall of the tank, an annular shoe combined with said horizontally-disposed elements and arranged in sliding engagement with the side wall of the tank with its lower edge submerged in the liquid in the tank, and a liquid seal for closing the joint between the upper edge of said rim and said horizontally-disposed elements.

14. A floating deck for liquid storage tanks, comprising a main body portion provided at its periphery with an upwardly-projecting rim, relatively movable, horizontally-disposed elements arranged above said rim for closing the space between said rim and the side wall of the tank, an annular shoe combined with said horizontally-disposed elements and arranged in sliding engagement with the side wall of the tank with its lower edge submerged in the liquid in the tank, a liquid seal for closing the joint between the upper edge of said rim and said horizontally-disposed elements, rotatable devices that sustain and guide said horizontally-disposed elements, and means for producing air and gas-tight joints between said horizontally-disposed elements.

15. A floating deck for liquid storage tanks, comprising a main body portion adapted to normally float upon the liquid in the tank and provided at its periphery with an upwardly-projecting rim, relatively movable, horizontally-disposed elements for closing the space between said rim and the side wall of the tank, an annular trough carried by said rim and adapted to contain a liquid, and depending sealing devices on the underside of said horizontally-disposed elements that project downwardly into the liquid in said trough.

16. A floating deck for liquid storage tanks, comprising a main body portion adapted to normally float upon the liquid in the tank and provided at its periphery with an upwardly-projecting rim, relatively movable, horizontally-disposed elements for closing the space between said rim and the side wall of the tank, an annular trough carried by said rim and adapted to contain a liquid, depending sealing devices on the underside of said horizontally-disposed elements that project downwardly into the liquid in said trough, and rollers in said trough on which said horizontally-disposed elements slide.

17. A floating deck for liquid storage tanks, comprising a main body portion adapted to normally float upon the liquid in the tank and provided at its periphery with an upwardly-projecting rim, relatively movable, horizontally-disposed elements for closing the space between said rim and the side wall of the tank, an annular trough carried by said rim and adapted to contain a liquid, depending sealing devices on the underside of said horizontally-disposed elements that project downwardly into the liquid in said trough, an annular shoe carried by said horizontally- disposed elements, and arranged in sliding engagement with the side wall of the tank with its lower edge submerged in the liquid in the tank, and rotatable devices for sustaining and guiding said horizontally-disposed elements.

18. A floating deck for liquid storage tanks, comprising a main body portion adapted to normally float upon the liquid in the tank and provided at its periphery with an upwardly-projecting rim, relatively movable, horizontally-disposed elements arranged above said rim for closing the space between the rim and the side wall of the tank, an annular shoe combined with said elements and arranged in sliding engagement with the side wall of the tank, rotatable devices for sustaining said horizontally-disposed elements, and means carried by the rim on the body portion of the deck for exerting pressure on said shoe in a direction to press it against the side wall of the tank.

19. A floating deck for liquid storage tanks, comprising a main body portion adapted to normally float upon the liquid in the tank, a variable peripheral portion comprising a shoe arranged in sliding engagement with the side wall of the tank and a plurality of horizontally-disposed, relatively movable members combined with said shoe and main body portion so as to form a closure for the space between the side wall of the tank and the main body portion of the deck, rotatable devices for sustaining said variable peripheral portion, and means carried by said variable peripheral portion for causing said shoe to bear against the inner face of the side wall of the tank.

20. A floating deck for liquid storage tanks, comprising a main body portion, a variable peripheral portion composed of relatively movable members for closing the space between said main body portion and the side wall of the tank, co-operating tongues and pockets on said members arranged in telescopic relation, and non-solidifying, semi-liquid material in said pockets to produce air and gas-tight joints between said pockets and tongues.

21. A floating deck for liquid storage tanks, comprising a main body portion adapted to normally float upon the liquid in the tank and provided at its periphery with an upwardly-projecting rim, relatively movable, horizontally-disposed plates arranged above said rim for closing the space

between the rim and the side wall of the tank, segmental shoe members connected to said plates and arranged in sliding engagement with the side wall of the tank, a horizontally-disposed, annular trough arranged inside of said rim that is adapted to contain a liquid, sealing devices on the undersides of said plates that project downwardly into the liquid in said trough, rollers in said trough on which said plates slide, guides on the main body portion of the deck that maintain said plates in a substantially horizontal position, and spring-pressed devices carried by said rim that hold said shoe segments against the side wall of the tank.

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