Nov. 4, 1924. 1,514,116

J. H. WIGGINS

OIL STORAGE TANK

Filed May 19, 1922 4 Sheets-Sheet 1

Fig. 1.

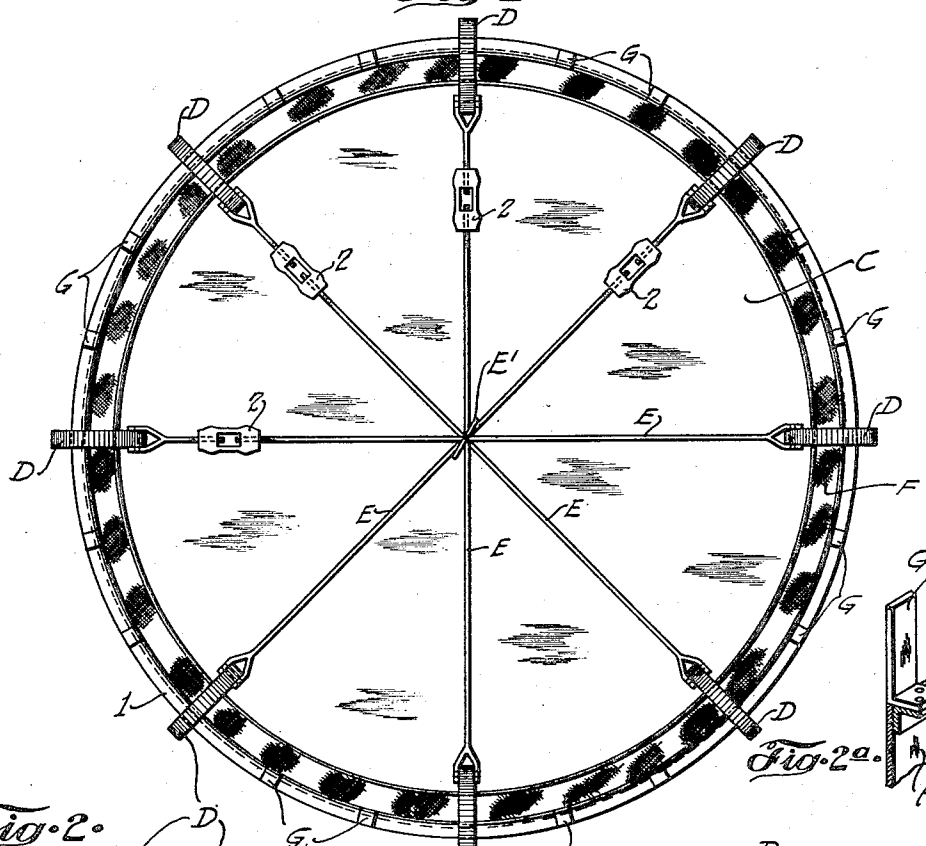
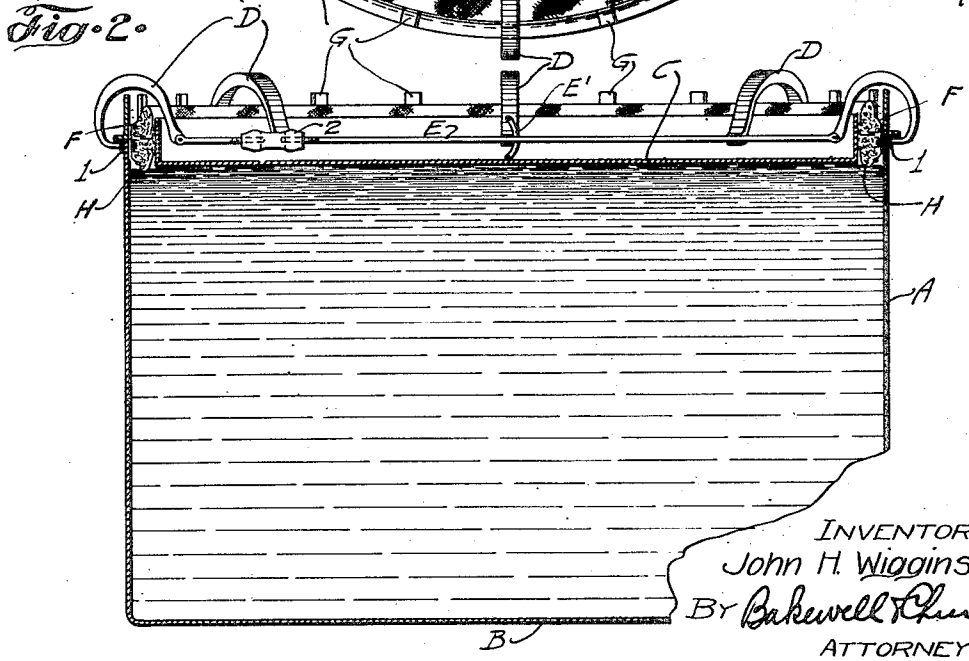


Fig. 2a.

Fig. 2.



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Fig. 3.

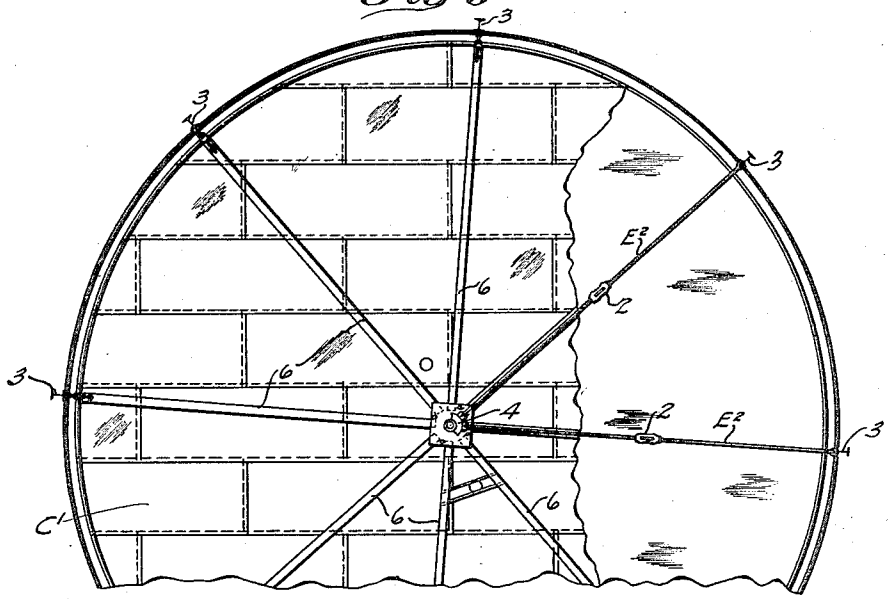


Fig. 4.

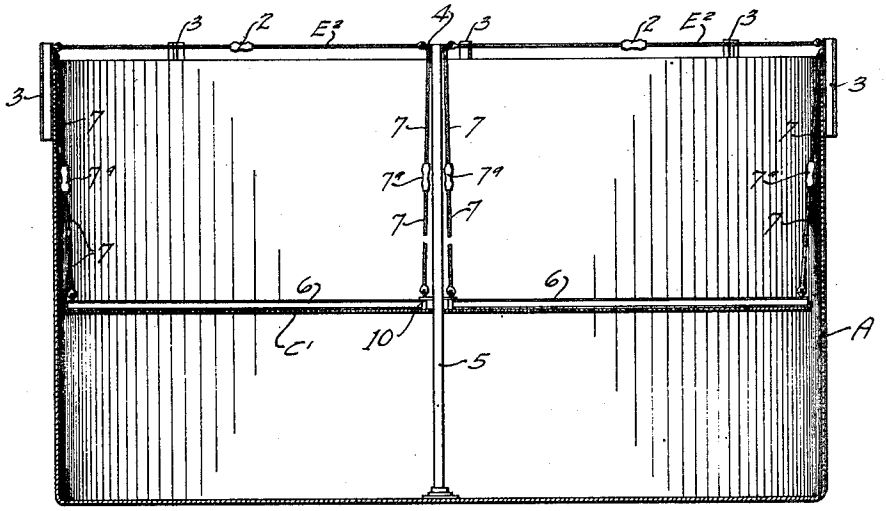


Fig. 4a.

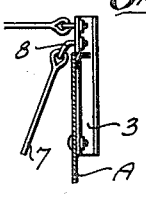
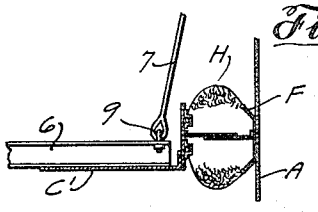


Fig. 4b.



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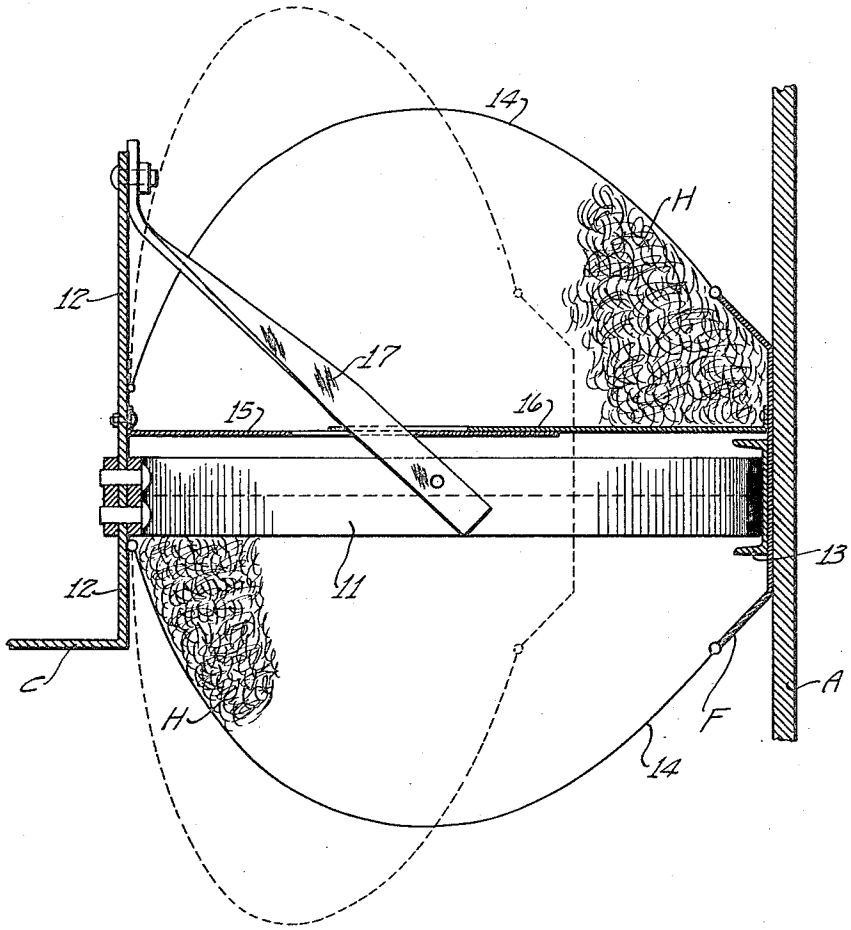
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Fig. 5.



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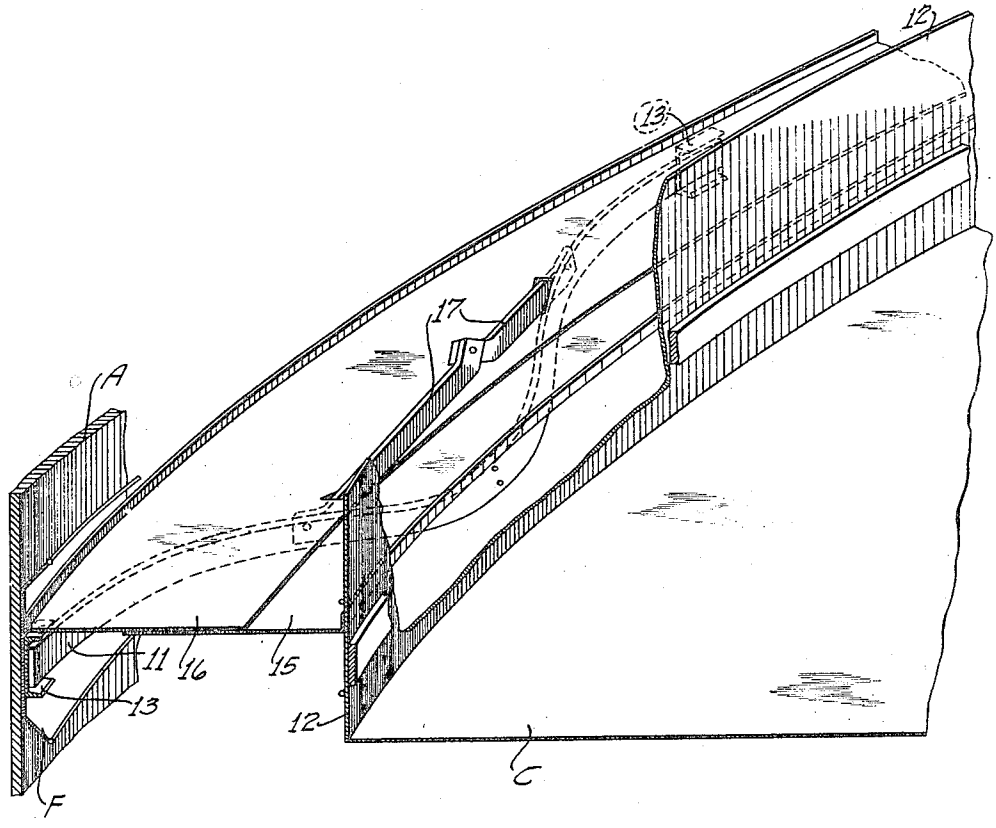
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Fig. 6.



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Patented Nov. 4, 1924. 1,514,116

UNITED STATES PATENT OFFICE.

JOHN H. WIGGINS, OF BARTLESVILLE, OKLAHOMA.

OIL-STORAGE TANK.

Application filed May 19, 1922. Serial No. 562,107.

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 Oil-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 oil storage tanks of the type in which the top or deck of the tank is not connected to the side wall of the tank, but normally floats upon and is supported by the oil in the tank.

One object of my present invention is to provide an oil storage tank of the general type referred to having a cylindrical side wall that is effectively braced against wind pressure and maintained in circular shape by tension members that extend transversely of the tank above the upper edge of same.

Another object is to provide an oil storage tank of the general type referred to which is of such construction that its full capacity can be utilized at all times.

Another object is to provide a novel closure for the annular space between the periphery of the floating deck and the side wall of the tank, that is fire-proof, practically air-tight and of such construction that it provides for variations in the relative position of the deck and side wall caused by expansion and contraction of the metal from which said elements are formed. Other objects and desirable features of my invention will be hereinafter pointed out.

Figure 1 of the drawings is a top plan view of an oil storage tank constructed in accordance with my invention.

Figure 2 is a vertical transverse sectional view of the tank shown in Figure 1.

Figure 2^a is a detail perspective view, illustrating one of the upwardly-projecting guides at the upper edge of the side wall of the tank that co-operate with the shoe.

Figure 3 is a top plan view, partly broken away, illustrating another form of my invention.

Figure 4 is a vertical transverse sectional view of the tank shown in Figure 3.

Figures 4^a and 4^b are detail sectional views of the tank shown in Figure 4.

Figure 5 is an enlarged detail view in vertical transverse section, illustrating the means that I prefer to use for closing the annular space between the periphery of the deck and the side wall of the tank; and

Figure 6 is an enlarged perspective view, illustrating one of the leaf springs that is used to support the shoe and hold it pressed against the side wall of the tank.

Referring to Figures 1 and 2 of the drawings which illustrate one form of my invention, A designates a cylindrical, vertically-disposed shell that forms the side wall of an oil storage tank, B designates the bottom of said tank and C designates the top or deck of the tank which normally floats upon and is supported by the oil in the tank. In order to brace the side wall A against wind pressure and maintain said side wall in circular shape, I have equipped the tank with a number of devices D connected to the upper edge of the side wall and joined together by tension rods E that extend transversely across the tank, the devices D being preferably connected to a horizontally-disposed flange formed by an angle 1 that extends around the upper edge of the side wall A, and said devices D being arranged in pairs disposed diametrically opposite each other, and each pair of devices being connected together by one of the tension rods E. If desired, the tension rods E can be provided with turn buckles or other suitable devices 2 for increasing or decreasing the length of said rods so as to vary the length of same, and a center ring E′ can be provided through which the tension rods pass and from which said tension rods project radially. The rods E maintain the side wall A of the tank in a truly circular shape, and they effectively brace the side wall against wind pressure by reason of the fact that said rods and the devices D with which they co-operate are combined with the side wall A of the tank in such a way that said side wall is divided into a number of relatively small arches. Means is provided for closing the annular space between the periphery of the deck C and the side wall of the tank, and while the particular construction of said means is immaterial, so far as the bracing of the side wall is concerned, said means usually comprise a substantially ring-shaped shoe F arranged in sliding engagement with the inner face of the side wall A and supported by the deck C in such a

way that it will rise and fall with said deck as the level of the oil in the tank varies. In order that the full capacity of the tank may be used at all times means is provided for enabling the shoe F to move upwardly above the top edge of said side wall when the tank is full or substantially so without interfering with the tension members that extend transversely across the tank. In the form of my invention illustrated in Figures 1 and 2, this is accomplished by using devices D of substantially C-shape in general form and providing the side wall A with vertically-disposed guides G that project upwardly above the top edge of said side wall, and thus act as guides against which the shoe F bears when the tank A is substantially full, or, in other words, when the oil in the tank is at such a level that the shoe F extends above the upper edge of the side wall A. The guides G are arranged in spaced relation around the upper edge of the side wall A, and the C-shaped devices D to which the tension rods E are connected are so proportioned that they will not interfere with the vertical movement of the shoe F or with the other elements of the means that is used to close the annular space between the periphery of the deck C and the side wall of the tank.

In Figures 3 and 4 of the drawings I have illustrated an oil storage tank in which the side wall A is braced against wind pressure and maintained in circular shape by tension members which may either consist of long rods that extend transversely of the tank, or short, radially-disposed tention rods E^2 connected at their outer ends to vertically-disposed projections 3 on the side wall A and connected at their inner ends to a collar 4 at the upper end of a vertically-disposed mast or upright 5 that projects upwardly from the bottom of the tank at the center of the tank, said tension rods being preferably provided with turn buckles 2 or other suitable adjusting devices. The tank shown in Figures 3 and 4 forms the subject-matter of my divisional application for patent Serial No. 693,397, filed February 16, 1924, and is provided with a floating deck C′ of rigid construction that is composed of horizontally-disposed sheet metal plates connected together and braced by radially-disposed members 6, preferably I-beams, or other commercially rolled flanged members that are securely riveted to said plates. Means is preferably provided for sustaining the deck C′ of the tank when said deck is not supported by the oil in the tank, and while said means can be constructed in various ways, I prefer to equip the tank with hanger rods 7 arranged at the side wall of the tank and at the center of the tank and constructed in such a way that they can be detachably connected to the deck C′ and to the mast 5 and the projections 3 at the upper edge of the side wall A. For example, the hanger rods 7 adjacent the side wall of the tank can be connected at their upper ends to U-bolts or other suitable devices 8 on the projections 3 at the upper edge of the side wall, as illustrated in Figure 4^a, and said hanger rods can be detachably connected at their lower ends to U-bolts or other suitable devices 9 arranged adjacent the periphery of the deck C′. The hanger rods 7 at the center of the tank can be detachably connected at their upper ends to the collar 4 on the mast 5 and detachably connected at their lower ends to devices on a center piece 10 on the deck C′ up through which the mast 5 projects. Turn buckles or other suitable devices 7^a can be provided for varying the length of the hanger rods 7. When the tank is empty the deck C′ can be sustained in a horizontal position parallel to the bottom of the tank by means of the hanger rods 7, and when it is desired to float the deck on the oil in the tank, the deck can be disconnected from said hanger rods.

The means previously referred to that is used for closing the annular space between the periphery of the deck and the side wall of the tank is preferably constructed in the manner illustrated in Figures 5 and 6. It comprises a substantially ring-shaped shoe F, previously referred to, composed of a number of segmental sections having their ends overlapped, a number of bowed leaf springs 11 connected to and projecting outwardly from a vertically-disposed, annular flange 12 at the periphery of the deck and having their end portions slidingly mounted in horizontally-disposed, channel-shaped guides or bearings 13 on the sections of the shoe F, a mass of asbestos or other suitable fire-proof material H of a sponge-like nature interposed between the shoe F and the upright flange 12 at the periphery of the deck, a flexible fire-proof housing for the asbestos H formed preferably from pieces of wire screening 14 or the like secured to the shoe F and to the flange 12 on the deck, as shown in Figure 5, and a means for preventing air and vapors from circulating, through said asbestos, such, for example, as co-operating, horizontally-disposed plates on said shoe F and flange 12 arranged in overlapping relation and so constructed that they will slide upon each other, and thus provide for variations in the relative position of the shoe and the deck. Preferably, the deck of the tank is provided with a horizontally-disposed plate or annular member 15 that projects outwardly from the upright flange at the periphery of the deck and the

segmental sections of the shoe F are provided with inwardly-projecting, horizontally-disposed plates 16 that lap over the plate 15 on the deck. The springs 11 hold the shoe F in approximately parallel relation with the deck and exert sufficient pressure on said shoe to hold it snugly against the inner face of the side wall A of the tank. In order to reinforce and strengthen the springs 11 and prevent the end portions of said springs from deflecting downwardly, each of said springs is combined with a pair of inclined braces 17 secured at their upper ends to the upright flange 12 at the periphery of the deck and projecting downwardly through co-operating holes in the overlapping plates 15 and 16 and secured at their lower ends to the spring 11, as shown in Figures 5 and 6. The asbestos H or other sponge-like material that is used for closing the space between the shoe F and the flange 12 on the deck can be arranged above the co-operating plates 15 and 16 or above and below said plates, as shown in Figure 5, and the pieces of screening or other flexible material 14 that form a housing for said asbestos can be connected to the shoe F and to the flange 12 in any suitable way, preferably, however, by hinge connections that have been shown diagrammatically in Figure 5. A means of the construction above described forms a very efficient closure for the annular space between the periphery of the deck and the side wall of the tank, as it prevents the circulation of air and vapor through said space, thus reducing the fire hazard to a minimum and also preventing the evaporation of the oil in the tank. Moreover, it is of such a character that it is not rendered inefficient by relative movement of the deck and side wall of the tank, due to expansion and contraction of the metal from which said parts are formed.

While I have herein described my improved tank as being used for storing oil, it will, of course, be understood that it can be used for storing any other kind of liquid.

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

1. A liquid storage tank provided with a side wall formed by a vertically-disposed, cylindrical member open at its upper end, a floating deck supported by the liquid in the tank, and tension members combined with said side wall in such a way that the sections of the side wall arranged between said tension members constitute a series of arches.

2. A liquid storage tank provided with a side wall formed by a vertically-disposed, cylindrical member open at its upper end, a floating deck supported by the liquid in the tank, and tension members projecting radially from the center of the tank and connected to said side wall in such a way that the sections of the side wall arranged between said tension members constitute a series of arches.

3. A liquid storage tank provided with a side wall formed by a vertically-disposed, cylindrical member whose upper end is open, a floating deck supported by the liquid in the tank and provided with a shoe arranged in sliding engagement with said side wall, the upper edge of said shoe terminating at a point higher than the plane in which the deck lies, tension members arranged transversely across the tank so as to brace the side wall of same, and means for maintaining said tension members at a sufficient height above the upper edge of the side wall to clear said shoe when the tank is full of liquid and the deck is arranged in close proximity to the extreme upper edge of the side wall of the tank.

4. A liquid storage tank provided with a side wall formed by a vertically-disposed, cylindrical member whose upper end is open, a floating deck supported by the liquid in the tank, devices connected to the upper edge of said side wall and arranged symmetrically around the tank, and tension members projecting radially from the center of the tank above the deck and connected to said devices.

5. A liquid storage tank provided with a side wall formed by a vertically-disposed, cylindrical member open at its upper end, a floating deck supported by the liquid in the tank, and tension members extending transversely of the tank and connected to the upper edge portion of said side wall in such a way that the sections of the side wall arranged between said tension members constitute a series of arches.

6. A liquid storage tank provided with a side wall formed by a vertically-disposed, cylindrical member whose upper end is open, a floating deck adapted to rest upon the liquid in the tank and having its peripheral edge spaced away from said side wall, means for closing the annular space between said deck and side wall comprising an upwardly-projecting shoe that bears against the inner face of said side wall, tension members arranged transversely across the tank so as to brace the side wall of same, and means for maintaining said tension members at a sufficient height above the upper edge of said side wall to clear said shoe when the tank is substantially full and the deck is arranged in close proximity to the upper edge of the side wall of the tank.

7. A liquid storage tank provided with a side wall formed by a vertically-disposed, cylindrical member whose upper end is open, a floating deck adapted to rest upon the liquid in the tank and provided with a shoe

arranged in sliding engagement with said side wall, and means projecting above the upper edge of said side wall against which said shoe bears when the liquid in the tank is at such a level that the shoe projects above the upper edge of said side wall.

8. A liquid storage tank provided with a side wall formed by a vertically-disposed, cylindrical member whose upper end is open, a floating deck adapted to rest upon the liquid in the tank and having its peripheral edge spaced away from said side wall, means for closing the annular space between said deck and side wall comprising a shoe that bears against the inner face of said side wall, and upwardly-projecting guides at the upper edge of said side wall against which said shoe bears when the tank is full or substantially full of liquid.

9. A liquid storage tank provided with a side wall formed by a vertically-disposed, cylindrical member whose upper end is open, a floating deck adapted to rest upon the liquid in the tank and provided with a shoe arranged in sliding engagement with the inner face of said side wall, guides for said shoe that project upwardly above the top edge of said side wall, tension members arranged above the deck for bracing the tank against wind pressure and maintaining it in a truly circular shape, and devices on the upper edge portion of said side wall connected to said tension members and constructed so as to not interfere with the upward movement of said shoe when it is in engagement with said guides.

10. A liquid storage tank provided with a cylindrical side wall, a floating deck adapted to rest upon the liquid in the tank, a closure for the space between said deck and side wall comprising a shoe that slides upon said side wall, guides for said shoe that project upwardly above the top edge of the tank, substantially C-shaped devices connected to the upper edge of said side wall and projecting inwardly from same, and tension members projecting radially from the center of the tank and connected to said C-shaped devices.

11. A liquid storage tank, comprising a side wall, a floating deck normally resting upon the liquid in the tank and having its peripheral edge spaced away from said side wall, a mass of sponge-like material arranged in the space between said deck and side wall, and means for preventing air or gases from circulating through said material.

12. A liquid storage tank, comprising a side wall, a floating deck normally resting upon the liquid in the tank and having its peripheral edge spaced away from said side wall, a closure for the space between said deck and side wall comprising a shoe arranged in sliding engagement with said side wall, and a mass of fire-proof material of a sponge-like nature arranged between said shoe and the periphery of the deck.

13. A liquid storage tank, comprising a side wall, a floating deck normally resting upon the liquid in the tank and having its peripheral edge spaced away from said side wall, a shoe carried by said deck and arranged in sliding engagement with said side wall, a mass of asbestos or the like interposed between said deck and shoe, means for preventing air or gases from circulating through said asbestos, and a flexible housing that encases said asbestos.

14. A liquid storage tank, comprising a side wall formed by a vertically-disposed, cylindrical member whose upper end is open, a floating deck normally resting upon the liquid in the tank, a shoe surrounding said deck and arranged in sliding engagement with said side wall, and springs at the periphery of said deck that carry said shoe and hold it pressed against said side wall.

15. A liquid storage tank, comprising a side wall formed by a vertically-disposed, cylindrical member whose upper end is open, a floating deck normally resting upon the liquid in the tank, a shoe surrounding said deck and arranged in sliding engagement with said side wall, springs at the periphery of said deck that carry said shoe and hold it pressed against said side wall, and means combined with said springs for maintaining said shoe in substantially parallel relationship with said deck.

16. A liquid storage tank, comprising a side wall, a floating deck that normally rests upon the liquid in the tank, horizontally-disposed leaf springs projecting outwardly from the peripheral edge of said deck, and a shoe surrounding said deck and combined with said springs in such a manner that said springs exert pressure on said shoe in a direction tending to hold it in engagement with said side wall.

17. A liquid storage tank, comprising a side wall, a floating deck normally resting upon the liquid in the tank, bowed leaf springs projecting outwardly from the periphery of the deck and connected intermediate their ends to the deck, a shoe surrounding said deck and arranged in sliding engagement with the side wall, and guides on the inner side of said shoe in which the end portions of said springs are slidingly mounted.

18. A liquid storage tank, comprising a side wall, a floating deck normally resting upon the liquid in the tank and provided at its peripheral edge with an upwardly-projecting flange, a shoe surrounding said deck and arranged in sliding engagement with said side wall, bowed leaf springs connected to the flange on the deck and to said shoe for pressing said shoe against said side

wall, and braces connected to said flange and to said springs for preventing the end portions of said springs from deflecting downwardly.

19. A liquid storage tank, comprising a side wall, a floating deck normally resting upon the liquid in the tank and provided at its periphery with an upwardly-projecting flange, a shoe surrounding said flange and arranged in sliding engagement with said side wall, bowed leaf springs projecting outwardly from said flange that sustain said shoe and hold it pressed against said side wall, and means for closing the space between said shoe and flange.

20. A liquid storage tank, comprising a side wall, a floating deck normally resting upon the liquid in the tank and provided at its periphery with an upwardly-projecting flange, a shoe surrounding said flange and arranged in sliding engagement with said side wall, bowed leaf springs projecting outwardly from said flange that sustain said shoe and hold it pressed against said side wall, a mass of fire-proof material of a sponge-like nature arranged between said flange and shoe, a flexible housing that encases said material, and means for preventing air or gases from circulating through said material.

21. A liquid storage tank, comprising a side wall, a floating deck normally resting upon the liquid in the tank and provided at its periphery with an upwardly-projecting flange, a shoe surrounding said flange and arranged in sliding engagement with said side wall, bowed leaf springs projecting outwardly from said flange that sustain said shoe and hold it pressed against said side wall, and co-operating plates on said shoe and flange arranged in overlapping relation for preventing air or gases from circulating through said sponge-like material.

22. A liquid storage tank, comprising a side wall, a floating deck normally resting upon the liquid in the tank and provided at its periphery with an upwardly-projecting flange, bowed leaf springs connected intermediate their ends to said flange and projecting outwardly therefrom, a shoe arranged in sliding engagement with said side wall and connected to said springs, horizontally-disposed, overlapping plates on said shoe and flange arranged in sliding engagement with each other, a mass of fire-proof material of a sponge-like nature arranged in the space between said shoe and flange, a flexible metallic housing that encases said sponge-like material, and means for preventing the end portions of said springs from sagging or deflecting downwardly.

23. A liquid storage tank provided with a cylindrical side wall, substantially C-shaped devices connected to the upper edge of said side wall in such a manner that the intermediate portions of same are spaced above the top edge of said side wall, and transversely-disposed tension members connected to said C-shaped devices.

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