May 4, 1943. J. H. WIGGINS 2,318,134

SEAL FOR FLOATING TANK ROOFS

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FIG. 1.

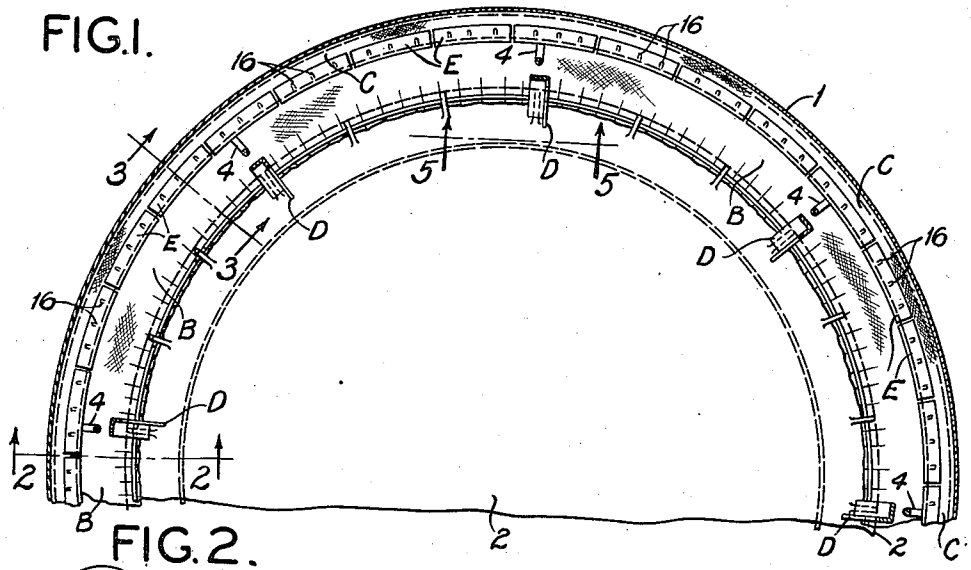


FIG. 2.

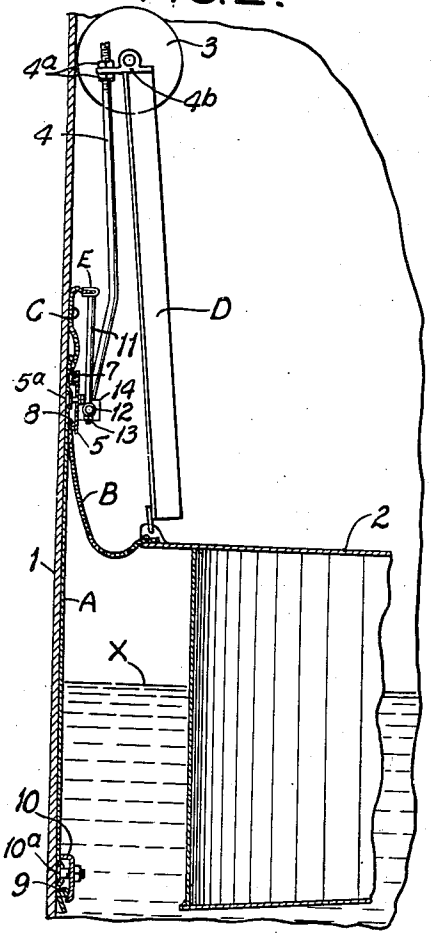


FIG. 4.

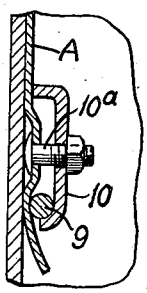
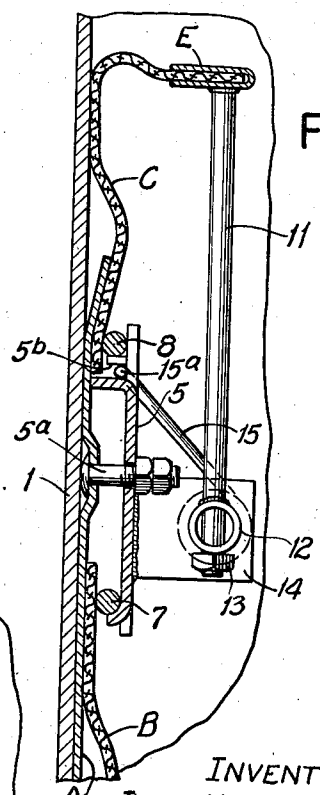


FIG. 3.



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SEAL FOR FLOATING TANK ROOFS

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FIG. 5.

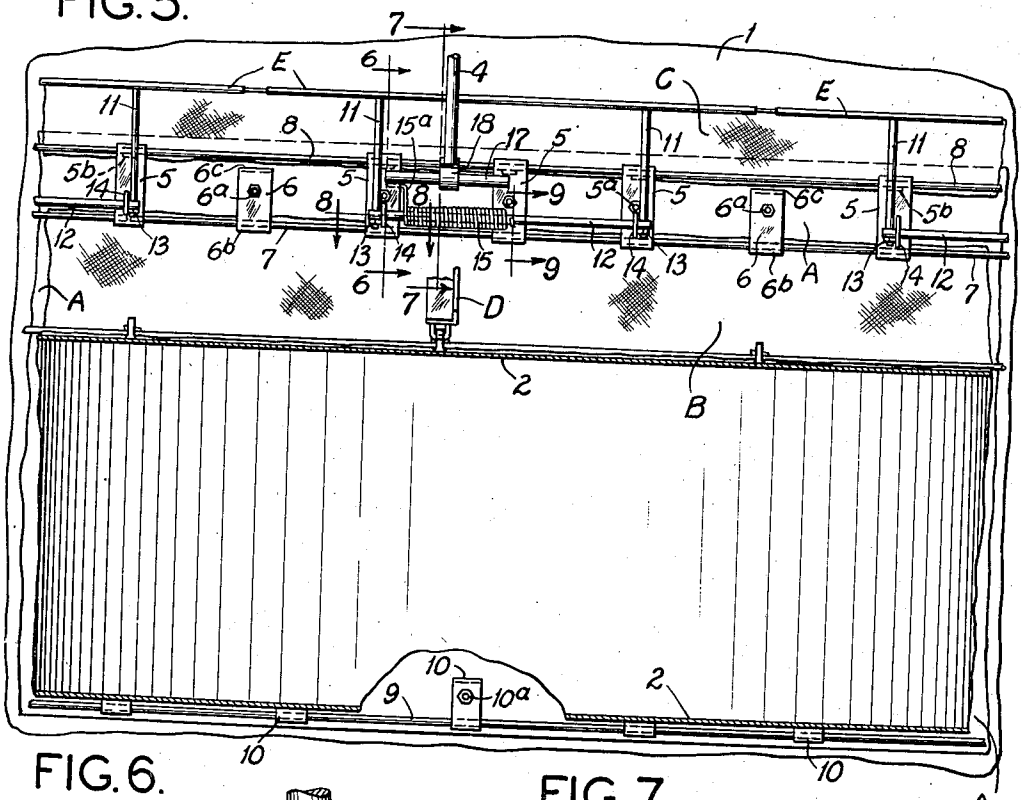


FIG. 6.

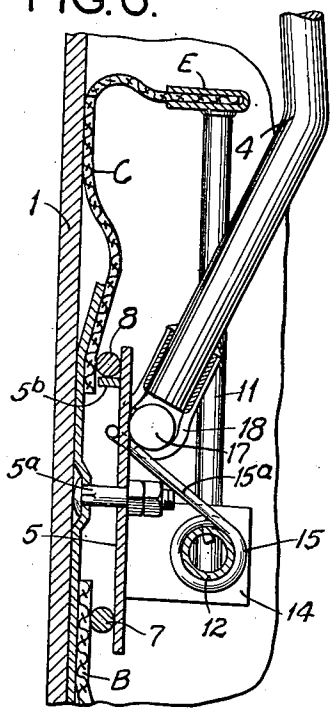
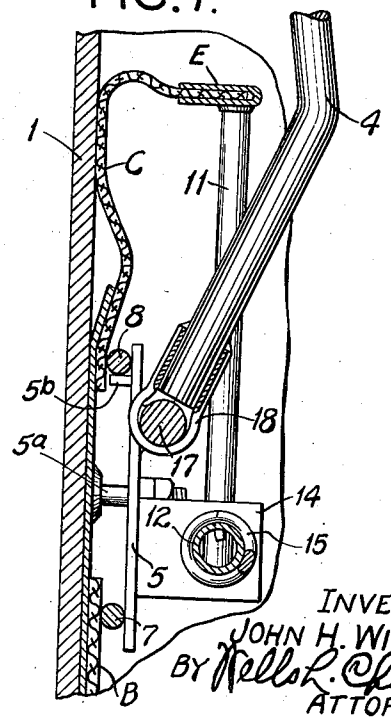


FIG. 7.



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SEAL FOR FLOATING TANK ROOFS

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FIG. 8.

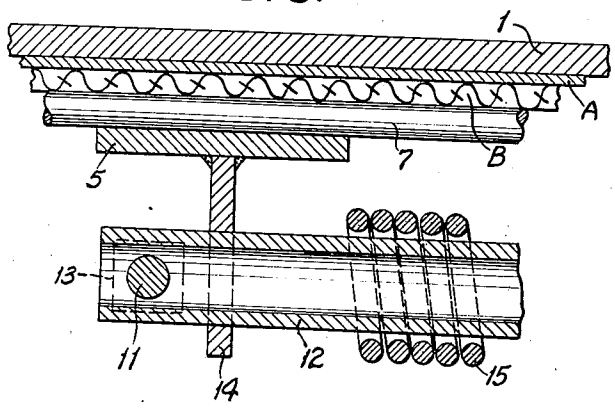


FIG. 9.

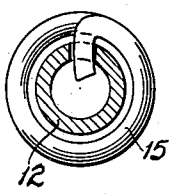


FIG. 10.

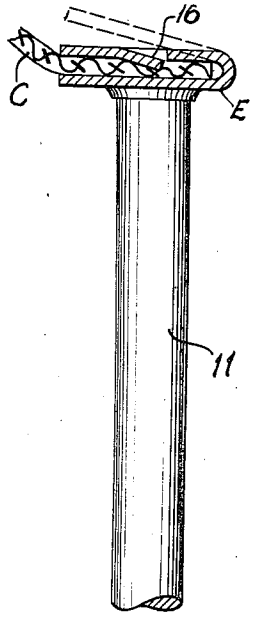


FIG. 11.

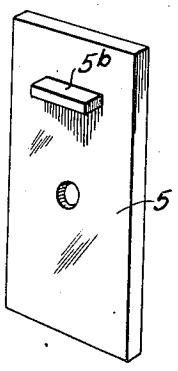
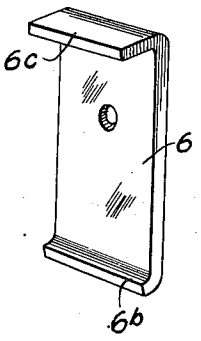


FIG. 12.



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SEAL FOR FLOATING TANK ROOFS

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FIG. 13.

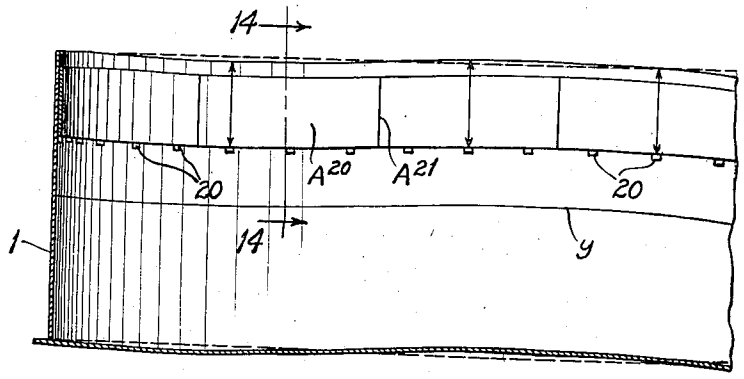
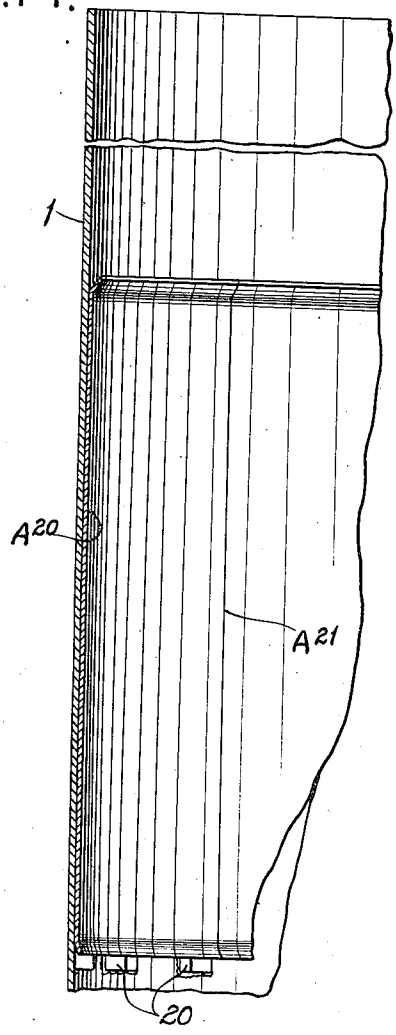


FIG. 14.



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Patented May 4, 1943

2,318,134

UNITED STATES PATENT OFFICE

2,318,134

SEAL FOR FLOATING TANK ROOFS

John H. Wiggins, Chicago, Ill.

Application May 24, 1940, Serial No. 337,020
In Great Britain December 7, 1939

8 Claims. (Cl. 220—26)

This invention relates to floating tank roof seals of the type that comprise an annular metal shoe arranged in sliding engagement with the side wall of the tank, swinging hangers on the floating roof that support said shoe, and a primary seal or closure for the annular space between the shoe and the floating roof, formed usually from gas-tight fabric attached to the shoe and to an annular rim on the outer edge or peripheral portion of the floating roof.

In my pending application for patent Serial No. 247,031, filed December 21, 1938, I have described a floating tank roof seal of the general type above referred to, in which the side wall shoe is suspended in a novel manner from the hangers on the floating roof, and is provided at its upper edge with an auxiliary seal or secondary seal that is held pressed tightly against the inner face of the tank side wall, so as to seal the space or joint between said wall and the shoe suspended from the hangers on the roof. My present invention has for its main object to improve the operation, reduce the cost, and facilitate the construction or erection of a floating tank roof seal that has one or more of the distinguishing features or characteristics of the seal described in my said pending application, and which comprises elements that are similar in general construction and principle of operation to some of the elements or parts of the seal described in said application. In order to attain or accomplish the above mentioned objects, I have devised (1) a novel means or novel devices for joining or connecting the fabric parts of the seal to the metallic parts: (2) a novel means or novel devices for pivotally attaching the suspending links on the hangers to the side wall shoe; and (3) a novel type of mounting or supporting means for the secondary seal at the top edge of the side wall shoe.

The novel means and devices that constitute my present invention, are capable of being used independently of each other in floating tank roof seals of the general type first referred to. Accordingly, I do not wish it to be understood that my improved fabric attaching or securing means is limited to use in a seal in which the side wall shoe is sustained, supported or suspended in the particular manner herein disclosed, and I do not wish it to be understood that the particular secondary seal or auxiliary seal herein disclosed is limited to use in a floating tank roof equipped with a side wall shoe and a primary seal of the particular construction herein illustrated and described.

Figure 1 of the drawings is a fragmentary top plan view of a floating tank roof seal constructed in accordance with my present invention.

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

Figure 3 is a vertical sectional view, taken on the line 3—3 of Figure 1, looking in the direction indicated by the arrows.

Figure 4 is a sectional view of one of the clamping devices used to hold or secure the reenforcing ring to the lower edge portion of the shoe.

Figure 5 is a vertical fragmentary sectional view, taken on the line 5—5 of Figure 1, looking in the direction indicated by the arrows and showing some of the parts of the seal in elevation.

Figures 6 and 7 are vertical sectional views, taken on the lines 6—6 and 7—7 of Figure 5, looking in the direction indicated by the arrows.

Figure 8 is a horizontal sectional view, taken on the line 8—8 of Figure 5.

Figure 9 is a vertical sectional view, taken on the line 9—9 of Figure 5.

Figure 10 is an enlarged detail view, illustrating how the fabric constituting the secondary seal is attached at its top edge to one of the spring-pressed rockable carriers employed to support the secondary seal and hold it pressed tightly against the tank side wall.

Figure 11 is a perspective view of one of the dual clamping plates or double-acting plates used to attach the primary seal and secondary seal to the side wall shoe.

Figure 12 is a perspective view of one of the single-acting clamping plates used to attach the primary seal to the shoe.

Figure 13 is a fragmentary elevational view, looking outwardly towards the side wall of the tank, illustrating the method of assembling and combining the metal plates that constitute the side wall shoe; and

Figure 14 is an enlarged cross-sectional view of the tank side wall, taken on the line 14—14 of Figure 13.

In the accompanying drawings, 1 designates a tank side wall of circular form, 2 designates a floating roof of the pontoon type, pan type, or any other type arranged inside of the tank so as to float on the liquid x in the tank, A designates an annular side wall shoe arranged vertically in sliding engagement with the side wall 1, B designates a primary seal, usually formed from fabric, attached to the shoe A and to the peripheral portion of the floating roof 2 so as to form a

closure for the annular space between the roof and the side wall of the tank, C designates a secondary seal or auxiliary seal, usually formed of fabric, arranged adjacent the top edge of the shoe A and adapted to press against the side wall 1 so as to seal the joint or space between said wall and the shoe A, D designates swinging hangers on the roof 2 arranged so that rollers or friction-reducing devices 3 at the upper ends of same bear against the inner face of the tank side wall, and 4 designates vertically-adjustable rods or links suspended from the upper ends of the hangers D and attached to the inner side of the shoe A so as to suspend said shoe from the hangers in such a way as to insure the proper co-operation of the shoe with the side wall of the tank. The parts just described are of the same general construction and arrangement as the corresponding parts of the structure disclosed in my pending application for patent previously referred to, but in my improved seal herein illustrated certain new features or additional features have been incorporated into the structure for the purpose of improving the operation of the seal, reducing the cost of manufacture of same, and simplifying the operation of installing the seal.

One novel feature of my present invention consists of the means used to attach the primary seal B and the secondary seal C to the shoe A. Briefly described, said means comprises a plurality of double-acting or dual clamping plates 5 and a plurality of single-acting clamping plates 6 bolted to the inner side of the shoe A and arranged so as to clamp or hold clamping rings or rods 7 and 8, as illustrated in Figure 5, each of the dual clamping plates 5 being connected to the shoe by a bolt 5^a, and each of the single-acting clamping plates being connected to the shoe by a bolt 6^a. The single-acting clamping plates 6, which are shorter than the dual clamping plates 5, co-act only with the ring 7 and are used to attach the outer edge of the primary seal B to the shoe A, said ring 7 being arranged so as to lap over, engage, or bear upon the primary seal B at a point slightly below the top edge of same, as illustrated clearly in Figures 2 and 3. The long clamping plates or dual clamping plates 5 co-operate with the clamping means 7 for the primary seal, and also engage the clamping ring 8 which engages or presses upon the secondary seal C at a point slightly above the bottom edge of said seal. This method of attaching the fabric elements B and C to the side wall shoe overcomes the necessity of forming holes in said elements, because the adjacent edges of said elements are spaced apart, as shown in Figure 6. Another advantage of such a construction is, that the retaining clamps 5 and 6 can be loosely bolted to the shoe A, and thereafter, the fabric elements B and C can be slipped into operative position between the inner side of the shoe A and the retaining rings, rods or devices 7 and 8 on which the clamps 5 and 6 exert pressure in a direction to tightly clamp the primary and secondary seals B and C to the shoe A. In order to facilitate the operation of installing the seal, each of the short or single-acting clamps 6 is provided at its lower end with an inwardly-projecting portion 6^b, and is provided at its upper end with an inwardly-projecting portion 6^c, as shown in Figure 12. The portions 6^b at the lower ends of the clamps 6 perform the function of a temporary holding or sustaining means for the clamping ring 7 associated with the primary seal B, and the portions 6^c at the upper ends of the clamps 6 perform the function of a stop or limiting means that determines the distance which the secondary seal C moves downwardly when said seal is inserted between the shoe A and the clamping ring 8 in the operation of attaching the secondary seal to the side wall shoe. The dual clamping plates 5 are intended to be loosely bolted to the shoe A, after the primary seal B has been attached to said shoe, and in order that said plates 5 may be used to temporarily hold or position the clamping ring 8 that co-acts with the secondary seal C, prior to tightening the nuts on the bolts 5^a, which sustain the clamping plates 5, each of said plates is provided adjacent its upper end with an inwardly-projecting portion 5^b, as shown in Figure 11, disposed so that after the plates 5 have been mounted on the shoe, by means of the bolts 5^a, the clamping ring or rods 8 can be positioned upon the portions 5^b of the plates 5, with the result that the ring 8 is in proper position to clamp the secondary seal C to the shoe when the retaining bolts for the plates 5 are tightened, as shown in Figure 5. The clamping plates 5 and 6 are arranged in spaced relationship around the entire circumference or area of the annular side wall shoe A to which they are bolted.

The side wall shoe A may be of any preferred construction, so long as it is of substantial height and has sufficient circumferential flexibility to conform, or approximately conform, to the shape of the curved or circular-shaped side wall 1 of the tank. Said shoe may be composed of a plurality of segmental-shaped shoe members, whose ends are joined together by gas-tight flexible connecting devices, or it may consist of a single shoe that extends practically continuously around the side wall of the tank. Preferably, said shoe A is constructed in the form of a split ring, whose gap or joint is protected by a sealing device that provides for the expansion and contraction of the shoe. In order that the shoe will be relatively light in weight, strong enough to successfully perform its function, and still be capable of flexing circumferentially sufficiently to conform to the curvature of the side wall of the tank, I prefer to construct the shoe from relatively light weight sheet metal and provide the top and bottom edge portions of same with reenforcing or strengthening devices. Thus, if the shoe A is formed from relatively light weight sheet metal, such, for example, as No. 16 extra heavy galvanized steel, the clamping ring 8 that is used to press the secondary seal C tightly against the shoe A, also performs the function of a re-enforcing or strengthening device for the upper edge portion of the shoe. The lower edge portion of said shoe can be re-enforced or strengthened by a ring 9 that extends circumferentially around the shoe and which is clamped to the inner side of the lower edge portion of the shoe by clamps 10 secured to the shoe by bolts 10^a, as shown in Figure 4. Preferably, the top and bottom edge portions of the shoe A are bent laterally slightly, so as to insure that the shoe will slide over any slight protuberance or raised surface on the inner face of the tank side wall, the re-enforcing rings 8 and 9 being of material assistance in such a deforming operation, inasmuch as they are located in relatively close proximity to the top and bottom edges of the shoe and extend circumferentially around the shoe. The secondary seal or auxiliary seal C is supported in such a position that it projects upwardly from the top edge of the shoe A, and it is held pressed tightly against the tank

side wall 1, so as to form an effective seal between the tank side wall and the shoe A. The means used to support the upper end portion of the auxiliary seal C and press said seal against the tank side wall at a point above the top edge of the shoe A, consists of supporting devices or carriers that move radially with relation to said shoe. Said radially-movable supporting devices or carriers can be constructed and arranged in various ways, without departing from the spirit of my invention, and various means may be used to cause said devices to exert sufficient outward pressure on the upper end portion of the auxiliary seal C to hold said auxiliary seal in sliding engagement with the side wall of the tank. In the form of my invention herein illustrated, the bottom edge of the secondary seal is clamped tightly to the shoe A, as previously described, and the top edge of said secondary seal is attached to a plurality of spring-actuated, rockable or oscillating carriers that are pivotally mounted on the inner side of the shoe A, in such a way as to move radially in relation to said shoe. Said carriers consist of relatively short units arranged end to end so that they extend circumferentially around the entire circumference of the shoe, and they are of such construction that they can be mounted quickly and easily on the shoe and attached to the seal C. In the drawings I have used the reference character E to designate the body portion of each of the carriers just referred to. The particular construction of said carriers is not essential, and they can be mounted on the side wall shoe in vaious ways, so long as they are constructed or arranged so that they will hold the secondary seal C in proper position, without depending upon any inherent strength in the fabric of which said seal is constructed, and will be constantly under the influence of a means, preferably a spring means or resilient means, that exerts pressure on the seal C in a direction to hold said seal in snug engagement with the inner face of the tank side wall. One convenient and inexpensive way of constructing said carriers is to provide each carrier with a horizontally-disposed body portion E, to which the top edge of the fabric C is detachably connected, and equip said body portion E with depending arms 11 that are mounted on the inner side of the shoe A in such a way that said arms are capable of rocking on horizontal axes towards and away from the tank side wall. Each carrier may be provided with a pair of rock arms 11, whose lower ends are adapted to be inserted in holes in a horizontally-disposed shaft 12, and secured to same by nuts 13 mounted on threaded portions at the lower ends of the arms 11 during the operation of installing the seal. The rock shaft 12, to which the arms 11 are attached, is supported in bearings 14 on certain of the clamping plates. Herein said bearings are shown as being welded or otherwise rigidly connected to some of the clamping plates 5 and projecting laterally from same, as shown in Figure 5 and in Figure 8. The force or pressure used to operate the carriers E, is herein illustrated as consisting of torsion springs 15 mounted on the rock shafts 12 of said carriers in such a way as to exert constant pressure on said carriers in a direction tending to move the body portions E of same outwardly towards the side wall of the tank. In installing the carriers each of the springs 15 is mounted on the shaft 12 with which it co-operates in such a way that one end of the spring will be anchored to the shaft. After the arms 11 of the carrier have been attached to the shaft 12, the spring 15 is placed under tension, and a laterally-projecting arm 15a at the free end of the spring is snapped into engagement with one of the plates 5, as shown in Figure 6, thereby causing the spring 15 to exert pressure on the carrier in a direction tending to move it to the left, looking at Figures 6 and 7. The upper edge portion of the secondary seal is preferably attached to the carrier by constructing the body portion E of said carrier in such a way that this operation can be effected quickly and without the use of rivets or other separate fastening devices. Preferably, the body portion E of the carrier is made substantially channel-shaped, so that the legs of same can be spread slightly, as shown in broken lines in Figure 10, to receive the edge of the fabric C. Thereafter, the top leg or top member of the body portion of the carrier is bent downwardly to exert clamping pressure on the fabric, and if desired, slitted or deformed parts 16 of said top leg can be bent downwardly so as to form, in effect, spurs or retaining devices that securely attach the fabric C to the spring-pressed member E, which sustains the fabric C and holds it tightly pressed against the tank side wall.

The rods or links 4, previously mentioned, that are used to suspend the side wall shoe A from the upper ends of the hangers D, are adjustably connected to said hangers, preferably by adjusting nuts 4a on said rods that are arranged above and below perforated lugs 4b on the upper ends of the hangers D, as shown in Figure 2. The lower end of each of the suspending rods or links 4 is pivotally attached to the inner side of the side wall shoe A, preferably by a horizontally-disposed shaft or pin 17 (see Figure 5) carried by a pair of the dual clamping plates 5, previously described, that form part of the means employed to connect the fabric to the shoe A, the lower end of the suspending rod or link 4 being provided with a strap 18, as shown in Figures 6 and 7, through which the horizontally-disposed shaft or pin 17 extends. After the shaft 17 has been inserted in the strap or bearing 18 at the lower end of the link 4 with which said shaft co-operates, said shaft 17 is then welded to a pair of plates 5, so as to form a unit. In the operation of installing the seal said unit is mounted on the shoe A by means of the bolts 5a. Consequently, some of the dual clamping plates or double-acting clamping plates 5, in addition to functioning as clamping devices for the rings 7 and 8 employed to attach the primary and secondary fabric seals to the side wall shoe A, also serve as supports for pivot or pintle pins (the horizontally-disposed shafts or pins 17), that join the suspending links or rods 4 to the side wall shoe.

In order that the shoe A will accurately conform to the side wall 1 of the tank, I have devised a novel method of arranging and combining the metal plates from which the shoe is constructed during the operation of erecting the shoe. Briefly stated, said method consists in arranging the shoe plates in such a position relatively to each other before they are connected together, that the top and bottom edges of the shoe, after the shoe is completed, will conform to irregularities in the horizontal joints of the tank side wall. In other words, instead of building the shoe in such a manner that it has perfectly straight, or perfectly horizontal, top and bottom edges, I have devised a method by which the shoe can be easily erected in such a way that if the horizontal joints in the tank side wall are not truly horizontal, or

are wavy, the top and bottom edges of the shoe will be of corresponding shape, or, in other words, will conform to irregularities in the joints of the side wall. It is highly practical to use such a side wall shoe with a seal of the kind herein disclosed, inasmuch as the side wall shoe is suspended from the hangers D on the roof by vertically-adjustable rods or links 4, whose lengths can be varied easily (by manipulating the nuts 4a) so as to accommodate or provide for irregularities in the top and bottom edges of the shoe. In Figures 13 and 14 I have illustrated a method of building the shoe A inside of the tank, or after the side wall 1 of the tank has been erected. As shown in said figures, the reference character *y* designates horizontal joints in the side wall of a tank, which may have a relatively great diameter, say, for example, a diameter in excess of 100 feet or more. After the side wall has been erected, lugs 20 are temporarily welded to the tank side wall at various points and in such position with relation to a horizontal joint *y* of the side wall, that said lugs are spaced an equal distance, or the same distance, from said horizontal joint. Sections of the side wall shoe, as indicated by the reference character A^{20} are then mounted upon the lugs 20, and the adjacent vertical edges A^{21} of the shoe plates are connected together, usually by riveting. In this manner any irregularity vertically that exists in the horizontal side wall joint *y* which constitutes the datum to which the shoe is erected, is followed after all the shoe plates A^{20} have been joined together. After the shoe has been completed, and while the roof is floating on the liquid in the tank, the shoe is mounted in proper position on the roof hangers by means of the links 4 which are adjusted vertically, so as to arrange the shoe in correct position, the lugs 20 being removed from the tank side wall after the adjustment of the shoe suspending links has been completed. It has been demonstrated in actual practice that this method of constructing and mounting a side wall shoe greatly improves the operation of the seal, because the shoe accurately conforms to any vertical irregularities that may exist in the horizontal joints of the side wall, and is then hanging like a curtain in exactly the same shape as it was erected and with an easily available datum for checking the whole vertical travel of the roof, since every tank circumferential seam is parallel to all others. This is a radical departure from the prior procedure of building the shoe with straight top and bottom edges, and then using said shoe with a side wall having wavy horizontal joints, some portions of which were always disposed in angular relationship with the top and bottom edges of the shoe. My method or procedure makes it possible to produce a structure in which the floating roof is disposed in a level position, but the side wall shoe carried by said roof has a top that follows the outline or shape of the horizontal side wall joints, and which may or may not be level or truly horizontal without detracting from the efficiency of the shoe.

If this shoe is built in one shape and is later hung so that its top edge in one place is, say, 1" higher relatively than another portion (as it was built) internal stresses are set up which move the top edge away from the tank wall at one point and the bottom edge away from the tank wall at another point.

In other words, with a long limber cylinder-like shoe, it is essential that it be hung like it is built, if easily attained contact of the full surface of the shoe with the tank side wall be attained.

Having one horizontal tank seam to use as a datum for hanging the shoe when in service, is a tremendous help, because, then all the horizontal tank seams are a datum, since every point in all of them is equidistant from a similar point in the next seam vertically beneath it. In other words, if the original datum waves up and down, all other horizontal tank seams wave up and down in just the same manner.

It is believed that from the preceding description of my invention it will be clear how the co-acting members or parts of my improved seal are assembled and combined during the operation of erecting the seal, and while considerable latitude is permissible, in the exact procedure employed in erecting the seal, I have found it to be preferable to first attach the primary seal B to the side wall shoe A by first temporarily bolting the clamping plates 6 to the shoe, then positioning the clamping ring 7 on the holding portions 6b at the lower ends of the plates 6, then forcing the top edge of the fabric B upwardly between the shoe and the clamping ring 7, after which the nuts on the bolts 6a can be tightened. To install the secondary seal C, it is only necessary to loosely bolt the dual clamping plates 5 to the side wall shoe, then position the clamping ring 8 on the ring supporting portions 5b of said clamping plates 5, and then force the bottom edge of the fabric C downwardly between the shoe and the ring 8 until said bottom edge strikes against the inwardly bent portions 6c of the clamping plates 6. Subsequently, when the nuts on the bolts 5a are tightened, the lower edge portion of the fabric C will be sure to be in proper position to be engaged by the clamping ring 8, due to the fact that the portions 6c of the clamping plates 6 that served as stops for the bottom edge of the fabric C are arranged in a slightly lower position than the ring supporting portions 5b of the clamping plates 5. If desired, some of the plate 6 can be used to temporarily hold or position the clamping ring 8 during the operation of attaching the secondary seal to the side wall shoe, inasmuch as the bolts 6a pass through the plates 6 slightly off center, with the result that if any one of the plates 6 is turned upsidedown, or in the reverse of its normal position, it will be long enough to engage or co-operate with the clamping ring 8 to temporarily hold the same while the plates 5 are being loosely bolted to the shoe. Similarly, the installation of the parts which constitute the spring-pressed carriers for the secondary seal C can be effected quickly and easily, simply by mounting the springs 15 on the rock shafts 12, positioning the said shafts in their bearings 14, and attaching the two arms 11 of each carrier to the rock shaft 12 with which they co-operate. To fasten the top edge of the secondary seal to the carriers E, it is only necessary to insert the edge portion of said seal in the channel-shaped body portions E of the carriers and deform the top parts of said body portions so as to bind or grip the fabric constituting the secondary seal. By using some of the long or dual clamping plates 5 forming part of the fabric clamping means, to support the pivots or pintle pins 17 by which the depending rods 4 on the hangers are attached to the side wall shoe, I effect another economy in the cost of constructing and installing the seal. In the operation of tightening the nuts on the supporting bolts of the clamps 5 and 6, the heads of said bolts exert sufficient pres-

sure on the side wall shoe to deform the same and produce depressions in the outer side of said shoe in which the bolt heads are seated, flush with the outer surface of said shoe that contacts with the tank side wall. This is, of course, made possible by constructing the shoe A from relatively light gauge sheet metal plates instead of from stiff or relatively heavy plates, as was the general custom prior to the invention of the circumferentially flexible, light weight side wall shoe described in my prior application previously mentioned.

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

1. A floating tank roof seal provided with a side wall shoe, a secondary seal arranged at the top edge of said shoe and adapted to press against the tank side wall, the bottom edge of said secondary seal being attached to the shoe, and rockable carriers on the inner side of the shoe, projecting upwardly from same and attached to the top edge of the secondary seal, for supporting the upper end portion of said secondary seal.

2. In a floating tank roof seal, the combination of a side wall shoe, a plurality of spring-actuated, rockable carriers mounted on said shoe and projecting upwardly above the top edge of same, and a fabric sealing element attached at its lower end to the shoe and suspended from said carriers said sealing element being pressed against the tank side wall by said spring-pressed carriers.

3. A floating tank roof seal provided with a side wall shoe, rockable carriers mounted on said shoe adjacent the upper edge portion of said shoe and provided with portions that project higher than the top edge of the shoe, a sealing element attached to said carriers and to said shoe and maintained by said carriers in a substantially upright position in engagement with the tank side wall, and means for detachably mounting the carriers on said shoe.

4. A floating tank roof seal, comprising a side wall shoe, a sealing element having a portion disposed above the top edge of said shoe, securing clamps detachably connected to the shoe for fastening said sealing element to the shoe, and rockable carriers removably mounted on said clamps and attached to the upper end portion of said sealing element, said carriers being arranged so as to press the sealing element against the tank side wall.

5. A floating tank roof seal, comprising a side wall shoe, a sealing element arranged at the top edge of said shoe, securing clamps on the shoe for detachably connecting said sealing element to the shoe, and rockable carriers on the shoe attached to said sealing element and arranged so as to press said sealing element against the tank side wall, said carriers being removably mounted on said securing clamps, and torsion springs combined with said carriers so as to constantly exert pressure on said carriers in a direction to hold said sealing element in engagement with the tank side wall.

6. A floating tank roof seal provided with a side wall shoe, a fabric sealing element detachably connected to the top edge portion of said shoe and projecting upwardly from same, and rockable carriers on the shoe projecting above the top edge of same and provided with portions that embrace the sealing element so as to attach said sealing element to the carriers, said portions being adapted to be deformed so as to tightly grip said sealing element.

7. In a floating tank roof seal, the combination of a side wall shoe, a primary sealing element and a secondary sealing element arranged in spaced relationship adjacent the top edge of the shoe with the secondary sealing element projecting upwardly above the shoe, a clamping means for both of said sealing elements mounted on the shoe at a point between said two sealing elements so as to fasten said sealing elements to the shoe, and spring-pressed, rockable carriers removably mounted on the inner side of the shoe and having portions that are adapted to be deformed so as to grip and hold a portion of said secondary seal that is disposed above the top edge of the shoe.

8. A floating tank roof seal provided with a side wall shoe, a flexible sealing element attached to said shoe and projecting upwardly above the top edge of same, a radially-movable means on said shoe for supporting the upper end portion of said sealing element, and means for causing said radially-movable means to exert pressure on said sealing element in a direction to hold said element in snug engagement with the tank side wall at a point above the top edge of said shoe.

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