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SEALING STRUCTURE FOR FLOATING TANK ROOFS

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FIG. 1.

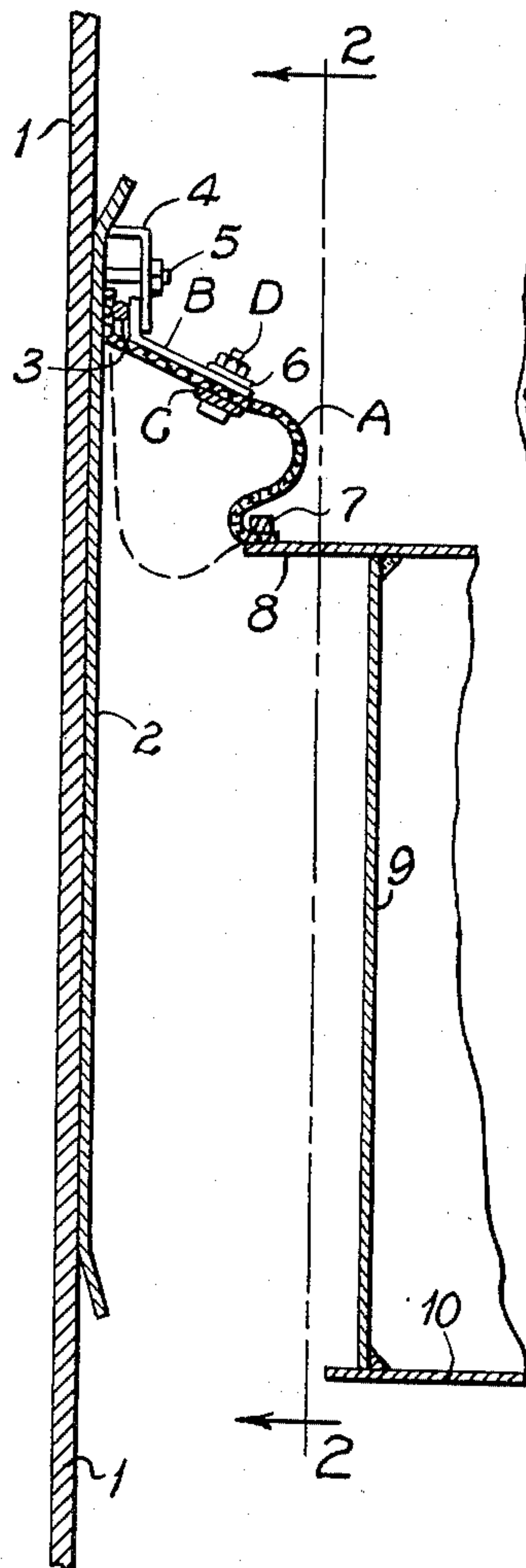
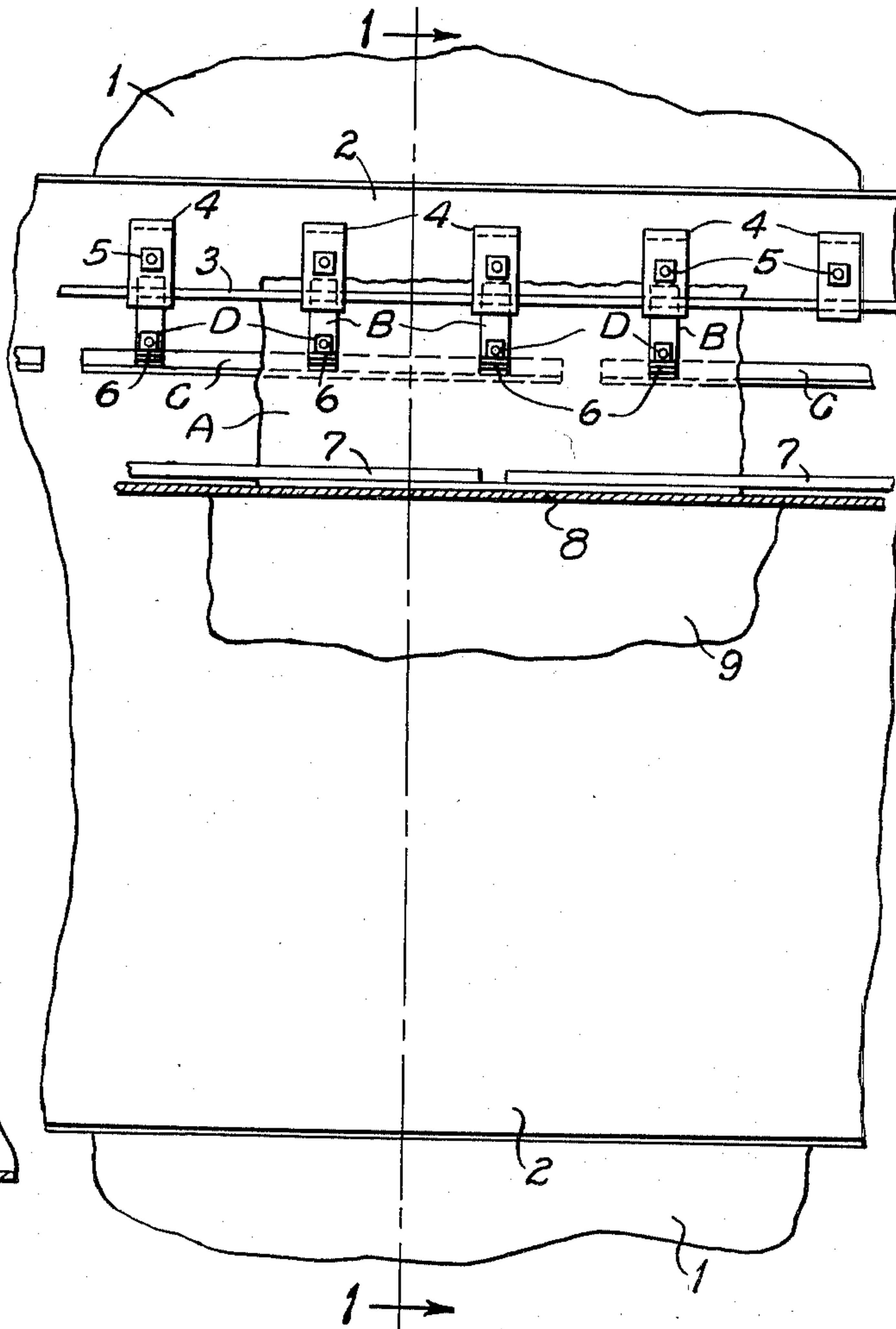


FIG. 2.



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## SEALING STRUCTURE FOR FLOATING TANK ROOFS

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3 Claims. (Cl. 220—26)

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This invention relates to floating tank roof sealing structures of the kind that usually are designated or referred to as "dry seals," inasmuch as they do not employ or rely upon a liquid substance to seal the space between the floating roof and the side wall of the tank. It is an improvement on floating tank roof dryseals of the particular type or kind that comprise an annular member arranged in sliding engagement with the side wall of the tank and commonly referred to as a "side wall shoe," and a flexible, curtain-like, gas-tight element, commonly referred to as a "primary seal" attached to said side wall shoe and to the peripheral edge of the floating roof, so as to form a dry seal for the space between the floating roof and the side wall shoe, said shoe being carried by the roof and mounted thereon in such a manner that it is capable of moving relatively to the roof, sufficiently to accommodate or compensate for variations in the width of the annular space between the roof and the tank side wall and also variations in the shape of the tank side wall.

The main object of my present invention is to provide a floating tank roof sealing structure of the general type above mentioned, which is of such design or construction that the flexible, curtain-like primary seal is effectively maintained in such a position or condition that it will not collect and hold objectionable quantities of rain water, snow, ice, rust and dirt, thereby keeping said primary seal in a dry condition and prolonging the life of same.

Another object of my invention is to provide a novel means for preventing a primary seal of the kind referred to from assuming such a position or condition that a portion of same is liable to become caught between the side wall shoe and the edge of the roof, and thus be cut or damaged in the instance where said shoe and the peripheral edge of the roof engage each other.

And still another object of my invention is to provide a mechanism for attaining the above described results, that is inexpensive, easy to install and easy to adjust. Other objects and desirable features of my invention will be hereinafter pointed out.

Figure 1 of the drawings is a vertical sectional view of a floating tank roof sealing structure embodying my invention, said view being taken on the line 1—1 of Figure 2; and

Figure 2 is a view at right angles to Figure 1, taken on the line 2—2 of Figure 1.

In the drawings, the reference character 1 designates the vertical side wall of a tank that is

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used for holding liquid, 8 designates the deck portion of a conventional floating roof that floats on the liquid in said tank, and 9 designates a rim at the peripheral edge of said roof that forms one wall of an annular pontoon whose bottom is designated by the reference character 10. The space between the roof and the tank side wall is sealed by a dry seal which comprises an annular shoe 2 arranged in sliding engagement with the tank side wall 1, and a flexible curtain-like primary seal A attached at its outer edge to the side wall shoe 2 and attached at its inner edge to the peripheral edge of the deck portion 8 of the floating roof, said primary seal being formed from a material, usually a treated fabric, that is flexible and also gas-tight. In the structure herein shown the primary seal A is clamped to the inner face of the side wall shoe by a horizontally-disposed rod 3 extending circumferentially around the shoe and acted upon by clamps 4 carried by adjustable clamping bolts 5 which project inwardly from the inner face of the side wall shoe 2, as shown in Figure 1. Said primary seal is attached to the peripheral portion of the roof by a clamping means 7 mounted on the top side of the deck portion 8 of the roof and extending circumferentially around the same. The parts previously described are of conventional construction and may be of any preferred design, as they form no part of my present invention.

In conventional floating tank roof dry seals sealing structure equipped with a flexible, gas-tight primary seal, no means is provided for supporting the intermediate portion of the primary seal located between the points of attachment of said primary seal to the side wall shoe and to the roof. Hence, it is possible for the primary seal to assume a looped form, as shown in broken lines in Figure 1, thus producing a pocket in the primary seal which is capable of holding objectionable quantities of rain water, snow, ice and dirt that cause rapid deterioration of the fabric of which the primary seal is constructed. My invention, broadly stated, consists in equipping a floating tank roof sealing structure of the general type mentioned, with an easily accessible and adjustable supporting means for the primary seal that will eliminate a pocket of the kind referred to, and which will prevent the primary seal from assuming such a shape or form that substances can collect and remain on the top surface of same in sufficient quantities to impair the operation of the primary seal or produce rapid deterioration of the material from which it is made. Preferably, the supporting



means above referred to is easily accessible from the top side of the floating roof and it is of such construction and arrangement that it supports the intermediate portion of the primary seal and holds the major area of said primary seal in an inclined position sloping downwardly and inwardly from the side wall shoe toward the top side of the floating roof, thereby insuring efficient draining of the top surface of the primary seal and preventing substantial quantities of substances such as snow, ice, dirt and rust from collecting and remaining thereon. In order to prevent water from being trapped on the lower end portion of the primary seal A by the previously mentioned clamping means that attaches the primary seal to the roof, said clamping means is preferably formed by segmental-shaped bars 7 arranged in spaced relation so as to produce gaps or drain openings between the ends of said bars, as shown in Figure 2.

One means that can be used to maintain the primary seal in the condition or position above described, comprises a plurality of arms D combined in any suitable way with the side wall shoe 2 and projecting inwardly from the inner side of same so as to serve as supports for the intermediate portion of the primary seal A. In the form of my invention herein illustrated, the arms or supports D are arranged in pairs and said pairs of arms carry segmental-shaped bars C that extend circumferentially around the intermediate portion of the primary seal A, the ends of the bars C being separated from each other by gaps or joints, as shown in Figure 2, so as to enable each supporting unit, consisting of one bar C and two arms D, to be adjusted vertically and circumferentially, relatively to the adjacent supporting units between which it is positioned. The supporting units above described are arranged on the top side of the primary seal A, outside of the gas space between the roof and the side wall shoe, and are attached to the primary seal, as shown in Figures 1 and 2.

In the form of my invention herein shown each of the arms B is formed from a strip of metal that is bent so as to form an angularly-disposed upper end portion that is positioned between the clamping ring 3 at the upper end of the primary seal and one of the clamps 4 that holds said clamping ring in position, thus producing a mechanism in which the means that is used to attach the upper end portion of the primary seal to the side wall shoe, also serves to attach the supporting arms B to the side wall shoe. The arms B and circumferentially-disposed bars C, are thus disposed on the top side of the primary seal A, and seal is attached to the bars C by bolts D, whose adjusting nuts are located outside of the gas space in superimposed relation with washers 6 that bear on the top side of the primary seal.

In assembling the structure, the upper end portion of the primary seal A is first attached to the side wall shoe 2 by the clamping ring 3 and clamps 4. Then some of the clamps 4 are released or loosened sufficiently to permit the arms B to be set in operative position, after which said released clamps are tightened so as to clamp the upper end portions of the arms B between the clamps 4 and ring 3. The primary seal is then pulled tight, longitudinally of the downwardly and inwardly-inclined portions of the arms B and is secured to the bars C by the bolts D. The segmental bars C are preferably made about two feet in length, and as the ends of said

bars are separated from each other by gaps or joints, the primary seal is capable of a limited radial and circumferential movement relatively to the roof. After all of the supporting units, consisting of the pairs of arms B and the segmental bars C carried by same, have been installed, workmen go around the peripheral portion of the roof and adjust said units vertically by bending the arms B up or down, so as to set the primary seal in such a position that water or dirt collecting pockets cannot form in same, and the major portion of the area of said primary seal will be maintained in a position sloping downwardly and inwardly from the side wall shoe 2 toward the top side of the room. In addition to maintaining the primary seal in an efficient draining position, free from objectionable loops or pockets in which water or the like can collect, a supporting structure of the kind above described eliminates the possibility of any portion of the primary seal being caught between the side wall shoe and the edge of the roof, and thus be cut or damaged in case the side wall shoe and the edge of the roof engage each other, due to the fact that when the side wall shoe is in concentric relationship with the roof, all portions of the primary seal are disposed in a higher plane than the deck of the roof, and movement of the side wall shoe inwardly towards the roof causes the lower end portion of the primary seal to be disposed in overhanging relationship or greater overhanging relationship with the edge portion of the roof, depending upon the original setting or adjustment of the primary seal. In addition to effectively holding the primary seal in a position or condition that eliminates rapid deterioration of the material from which said seal is constructed, the supporting structure above described is inexpensive, and it is easy to install and adjust from the top side of the roof.

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

1. A sealing structure for floating tank roofs, comprising an annular side wall shoe, a flexible, gas-tight curtain-like sealing element bridging the space between said shoe and the floating roof and having its circumferential edges attached to said shoe and roof, and inwardly-projecting supporting arms on said shoe disposed on the top side of said sealing element and attached to the intermediate portion of said element at points which cause said arms to effectively prevent the intermediate portion of the sealing element from assuming the shape or form of a pocket having an opening on the top side of said sealing element in which substantial quantities of water, dirt, etc., can collect.

2. A sealing structure of the kind described in claim 1, in which said arms are constructed of readily pliable material that is adapted to be manually bent upwardly or downwardly during the installation of the structure, so as to vary the position or location of the sealing element in the finished structure.

3. A sealing structure for floating tank roofs, comprising a side wall shoe of annular form, an annular, flexible, gas-tight, curtain-like sealing element bridging the space between said shoe and the floating roof and having its inner edge attached to the roof, an attaching mechanism for connecting the outer edge of said sealing element to the shoe, and bendable supporting arms for the intermediate portion of said sealing element projecting inwardly from the shoe



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in overhanging relation with said element and attached to the intermediate portion of said element, for the purpose described, said supporting arms being fastened to the shoe by the previously mentioned attaching mechanism which connects the outer edge of the sealing element to the shoe.

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