June 19, 1928. 1,673,983

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SEALING CONSTRUCTION FOR TANKS

Filed Dec. 11, 1926

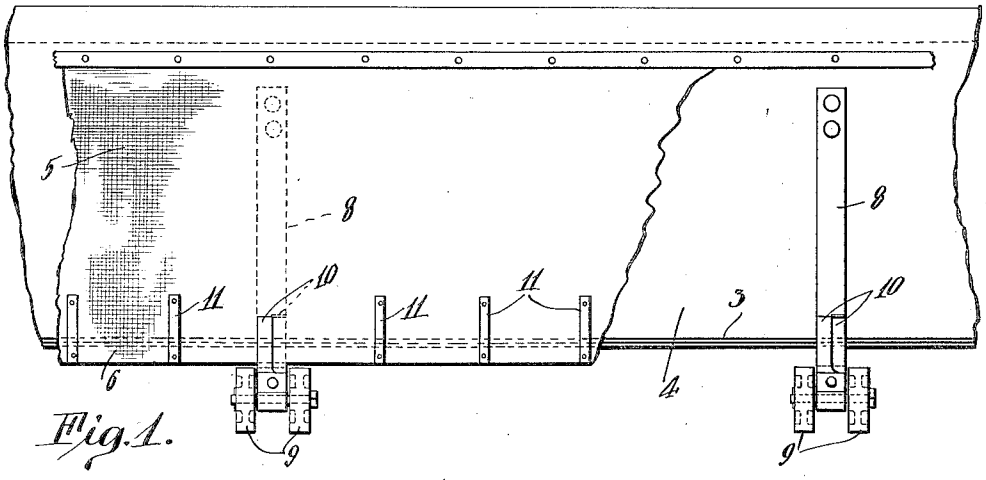


Fig. 1.

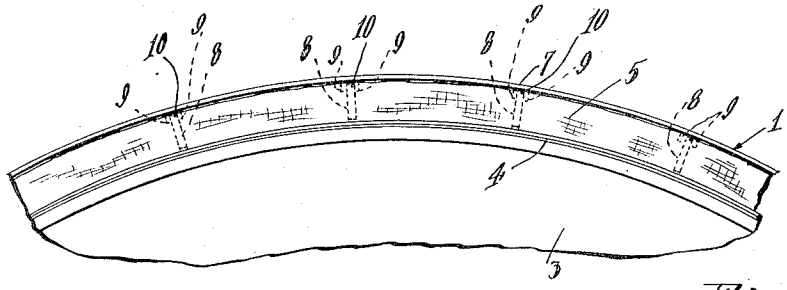


Fig. 3.

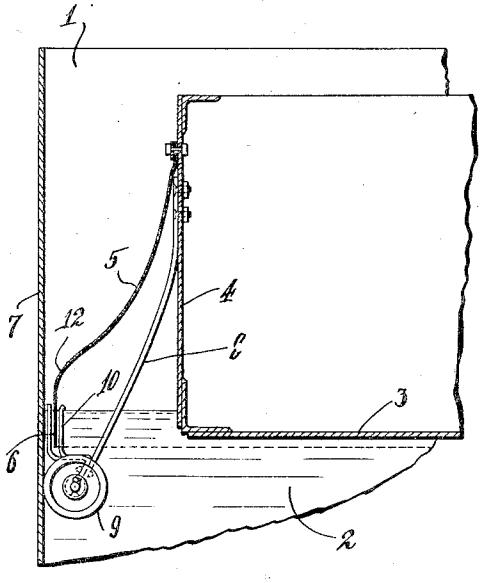


Fig. 2.

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Patented June 19, 1928. 1,673,983

UNITED STATES PATENT OFFICE.

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SEALING CONSTRUCTION FOR TANKS.

Application filed December 11, 1926. Serial No. 154,197.

This invention relates to a construction for effecting the sealing of liquid storage tanks of the type which have a floating roof supported on the surface of the liquid in the tank. Such storage tanks are used largely for storing gasolene and other volatile liquids. The general object of this invention is to provide simple means for sealing the annular space between the edge of the floating roof and the side wall of the tank. The invention contemplates the use of an apron connected with the roof and extending over to a point near the wall of the tank so as to cover the annular space and prevent the evaporation of the gasolene or other liquid. One of the objects of the invention is to provide simple means for centering and guiding the roof as it rises and falls with changes in level of the liquid and at the same time provide simple means for holding the outer edge of the apron substantially against the wall of the tank. According to the present invention, the sealing is effected by maintaining the roof properly centered in the tank and at the same time holding the outer edge of the apron very close to the wall of the tank without actually necessitating any contact between the apron and the tank. In this way the evaporation from the annular space between the roof and the tank wall is reduced to a minimum and substantially eliminated.

Further objects of the invention will appear hereinafter.

The invention consists of the novel parts and combination of parts to be described hereinafter, all of which contribute to produce an efficient sealing construction for tanks.

A preferred embodiment of the invention is described in the following specification, while the broad scope of the invention is pointed out in the appended claims.

In the drawings:

Figure 1 is a developed side elevation of a portion of the edge of the roof of a tank, such as referred to above, and embodying my invention, certain parts being broken away.

Figure 2 is a vertical section taken through the edge of the tank and the edge of the roof, broken away.

Figure 3 is a plan of a portion of the edge of the roof and showing a short portion of the periphery of the tank. This view is broken away and shown upon a reduced scale.

In the drawings 1 represents a tank of common construction used as a storage tank for a volatile liquid, such as gasolene indicated by the number 2. On this liquid a roof 3 floats. This roof usually includes a substantial cylindrical flange 4 which extends around and forms the edge for the roof.

In applying my invention to such a tank, I provide the gas-tight or gas-proof apron 5 which is preferably attached at its upper edge to the flange 4. This apron is a continous sheet of flexible fabric and extends outwardly from the roof with its outer edge 6 extending below the surface of the liquid 2 and also close to the inner face of the tank wall 7.

In addition to this, I provide simple means for centering and guiding the roof on the tank wall as the liquid level rises and falls. For this purpose, I provide a plurality of arms terminating in shoes which are constructed so as to exert pressure against the inner face of the wall 7. In other words, these arms press yieldingly against the inner face of the tank wall and they all exert a substantially equal pressure, the result of which is that they maintain the roof centered in the tank. The ends of these arms may be held out against the tank wall by any suitable means, but I prefer to accomplish this by embodying spring means in their construction. In the present embodiment of the invention, the arms 8 themselves are constructed of resilient material, the upper end of each arm being secured to the flange 4 and the lower portion of the arm extending downwardly and outwardly toward the wall 7 of the tank. If desired, the shoes at the ends of the arms 8 may press directly against the wall of the tank, but I prefer to provide each arm with a pair of oppositely disposed rollers 9 mounted to rotate in a vertical plane and roll up and down on the inner face of the tank wall.

Associated with each arm I provide means for holding the lower edge 6 of the apron substantially against the inner face of the tank wall. For this purpose, I form or attach a bracket or shoe 10 at the lower end of

each arm. This bracket is preferably bifurcated, (see Figure 2), so that the lower edge of the apron may be received between the forks. By this means the lower edge of the apron will be held quite close to the wall 7 of the tank, but not close enough to permit it to engage the rivets or the edges of the plates out of which the tank wall is constructed. The rollers 9 facilitate the up and down movement of the brackets 10 as the roof rises and falls with the change of level of the liquid. The apron 5 may be constructed of relatively stiff material such as thin sheet metal, or of fabric.

If the apron is constructed of sheet metal or other relatively stiff material, its edge will be readily maintained close to the wall of the tank. In this case it is immaterial whether the edge of the apron is submerged or not. If the apron is constructed of a flimsy fabric, of course, it is preferable to have its edge submerged; otherwise, it would be necessary to have a very large number of guide arms so as to insure that the edge of the apron would be maintained at all points close to the face of the wall.

If desired, stiffeners 11 may be employed for increasing the rigidity of the lower edge of the apron. These stiffeners may be in the form of elongated stiffener strips or slippers, (see Figure 1) attached to the outer side of the apron at its lower edge. The stiffening effect of these slippers is enhanced by having their upper ends extend well up on the curve of the apron, for example, to the point indicated at 12 in Figure 2.

It is understood that the embodiment of the invention described herein is only one of the many embodiments this invention may take, and I do not wish to be limited in the practice of the invention, nor in the claims, to the particular embodiment set forth.

What I claim is:

1. In a sealing construction for a liquid, the combination of a tank for the liquid, a floating roof supported on the liquid in the tank, an apron of gas-tight material attached at its upper edge to the roof and extending outwardly, a plurality of centering arms attached at the edge of the roof, constructed so as to exert pressure against the inner face of the tank wall to hold the roof centered therein, and means supported on the said arms for holding the lower and outer edge of the apron substantially against the wall of the tank.

2. In a sealing construction for a liquid, the combination of a tank for the liquid, a floating roof supported on the liquid in the tank, a flaxible apron of gas-tight material attached at its upper edge to the roof and extending outwardly with its lower edge below the liquid level, a plurality of centering arms attached at the edge of the roof, embodying means enabling the same to exert pressure against the inner face of the tank wall to hold the roof centered therein, and means on said arms for holding the lower and outer edge of the apron substantially against the wall of the tank.

3. In a sealing construction for liquid, the combination of a tank for the liquid, a floating roof supported on the liquid in the tank, a flexible apron of gas-tight material attached at its upper edge to the roof and extending outwardly with its lower edge below the level of the liquid, a plurality of centering arms attached to the edge of the roof, embodying means enabling the same to exert pressure against the inner face of the tank wall to hold the roof centered therein, means on said arms for holding the lower edge of the flexible apron substantially against the wall of the tank, and rollers carried by the arms for guiding the same up and down the wall of the tank.

4. In a sealing construction for a volatile liquid, the combination of a tank for the liquid, a floating roof supported on the liquid in the tank, a flexible apron of gas-tight material attached at its upper edge to the roof and extending outwardly, a plurality of centering arms attached to the edge of the roof, embodying means enabling the same to exert pressure against the inner face of the tank wall to hold the roof centered therein, means on said arms for holding the lower and outer edge of the flexible apron substantially against the wall of the tank, and stiffeners attached to the lower edge of the apron between the arms adjacent the wall of the tank.

5. In a sealing construction for a volatile liquid, the combination of a tank for the liquid, a floating roof supported on the liquid in the tank and having an upwardly extending flange adjacent the wall of the tank, an apron of gas-tight material attached at its upper edge to the flange and extending outwardly, a plurality of centering arms of resilient material attached to the edge of the roof and exerting pressure against the inner face of the tank wall to hold the roof centered therein and guide the same as the roof rises and falls with the liquid level, and means supported on said arms for holding the lower edge of the apron substantially against the wall of the tank.

6. In a sealing construction for volatile liquid, the combination of a tank for the liquid, a floating roof supported on the liquid in the tank, means for yieldingly guiding and centering the roof with respect to the tank wall as the level of the liquid rises and falls, an apron in the form of a flexible sheet of fabric attached to the roof at its inner edge, extending outwardly with the outer edge of said sheet disposed below the level of the liquid and lying substantially against the inner face of the tank wall.

7. In a sealing construction for liquid, the combination of a tank for the liquid, a floating roof supported on the liquid in the tank, a plurality of centering arms attached to the roof for engaging the inner face of the tank wall to center and guide the roof as it rises and falls with the liquid level, and an apron in the form of a continuous sheet of flexible fabric attached to the roof extending toward the wall of the tank with means for holding the lower and outer edge of said sheet substantially against the wall of the tank.

8. In a sealing construction for a liquid, the combination of a tank for the liquid, a floating roof supported on the liquid in the tank, an apron of gas-tight material attached at its upper edge to the roof and extending outwardly, a plurality of shoes engaging said apron near its lower and outer edge, with means for holding said shoes substantially against the wall of the tank.

9. In a sealing construction for volatile liquid, the combination of a tank for the liquid, a floating roof supported on the liquid in the tank, means for yieldingly guiding and centering the roof with respect to the tank wall as the level of the liquid rises and falls, and an apron in the form of a flexible sheet of gas-tight fabric attached to the roof at its inner edge extending outwardly with the outer edge of said sheet disposed below the level of the liquid and lying substantially against the inner face of the tank wall with means for preventing frictional contact of the fabric with the tank wall.

Signed at San Francisco, California, this 19th day of November, 1926.

JOHN KUHL.