

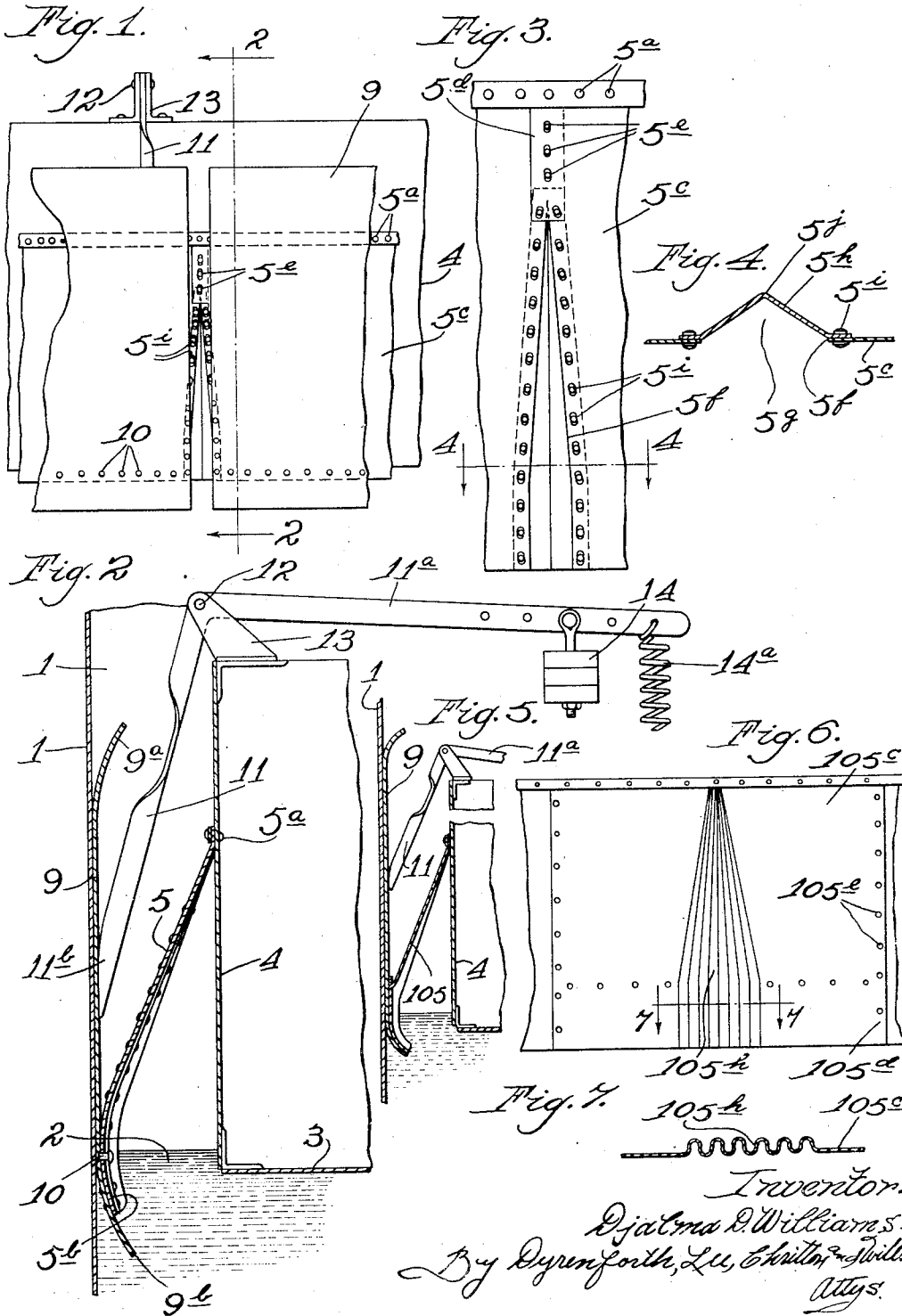
April 4, 1933.

D. D. WILLIAMS

1,903,306

SEALING CONSTRUCTION FOR TANKS

Filed June 7, 1930



Inventor.
Djalma D. Williams.
By Durenforth, Lu, & Winter, Attys.

UNITED STATES PATENT OFFICE

DJALMA D. WILLIAMS, OF DALLAS, TEXAS, ASSIGNOR TO CHICAGO BRIDGE & IRON COMPANY, OF CHICAGO, ILLINOIS, A CORPORATION OF ILLINOIS

SEALING CONSTRUCTION FOR TANKS

Application filed June 7, 1930. Serial No. 459,798.

This invention relates to liquid storage tanks of the type which have a roof which floats upon the surface of the liquid in the tank. It is customary to provide such tanks with means for preventing or lessening evaporation of the liquid from the annular space between the tank wall and the floating roof.

The general object of this invention is to provide means for sealing such annular space between the tank wall and the floating roof.

One of the features of my invention is the provision of an expansible and contractable all-metal curtain or apron that is substantially gas tight with its upper and inner edge attached to the roof and its lower and outer edge disposed below the level of the liquid and lying close to the inner face of the tank wall.

Another feature is the provision of wear plates disposed between the apron and the inner face of the tank wall to prevent frictional contact of said apron with the tank wall. Another feature is the provision of means for supporting these wear plates by the apron itself.

Means are provided for yieldingly urging the lower and outer edge of the apron outwardly toward the inner wall of the tank. Such means includes bell cranks or lever arms having their lower arms pressing outwardly against the wear plates, but not attached to said wear plates.

Another feature is the provision of improved means for making the continuous metallic apron expansible and contractable so that it may change its shape to conform to different positions of the float and to any irregularities in the size or shape of the tank wall.

Other features and advantages of my invention will appear more fully as I proceed with my specification.

In that form of device embodying the features of my invention shown in the accompanying drawing,—

Figure 1 is a developed side elevation showing a portion of the wear plates, apron and floating roof, looking from the shell of the tank inwardly toward the floating roof; Fig. 2 is a sectional view, taken as indicated by the

line 2—2 of Fig. 1; Fig. 3 is a view similar to Fig. 1 on an enlarged scale, showing the expansible connection between portions of the apron; Fig. 4 is a view taken as indicated by the line 4—4 of Fig. 3; Fig. 5 is a view similar to Fig. 2, showing a modified form; Fig. 6 is a view similar to Fig. 3 of said modification; and Fig. 7 is a view taken as indicated by the line 7—7 of Fig. 6.

As shown in the drawing, 1 represents the wall of a tank, for example, a cylindrical sheet metal tank such as is commonly used for the storage of volatile liquids. As here shown, the liquid stored in said tank is indicated by 2. Numeral 3 indicates a roof floating on the liquid and provided with the usual peripheral upstanding marginal edge or rim 4.

The diameter of the floating roof is somewhat smaller than the diameter of the tank 1, leaving an annular space surrounding the roof. I shall now describe the means for sealing this space. Such sealing means includes primarily a metallic apron 5 having its upper and inner edge attached to the rim 4 by the rivets 5^a. The apron 5 extends downwardly and outwardly with its lower and outer edge disposed below the surface of the liquid 2 and held close to the tank wall 1. The extreme lower edge of the apron 5, as indicated by 5^b, is preferably curved inwardly away from the tank wall to prevent undesirable contact of the same with any obstructions that there might be on the wall. The apron 5 includes a plurality of sheet metal sections or plates 5^c circumferentially arranged around the float, the adjacent edges of said sections overlapping slightly near the top, as indicated by 5^d, and fastened together by the rivets 5^e. Below such overlap, the plates are cut back or slanted away from each other toward the bottom, as indicated by 5^f, thus providing a tapered separation between the same, increasing in width toward the bottom, such separation or space being indicated by 5^g in Fig. 4. The space referred to is shown in Figs. 1 to 4, inclusive, as closed by a thin flexible piece of sheet metal 5^h having its edges joined to the edges of the plate 5^c by the

rivets 5¹. The insert or connecting piece 5^b is provided with a centrally arranged bend 5¹ to permit the same to expand or contract as the edges 5^c of the plates 5^c move toward or away from each other. It will be seen that by this construction, the apron, indicated in general by 5, is expansible or contractable, the inserts 5^b bending at 5¹ in order to permit such expansion or contraction.

A series of wear plates 9, 9 are placed between the lower edge of the apron 5 and the tank wall 1. These wear plates 9 are supported by the apron 5, attachment being effected by the rivets 10. Such attachment is preferably at or near the level of the liquid 2. The upper and lower edges of the wear plates 9 are preferably bent inwardly somewhat, as indicated by 9^a and 9^b, respectively, in order to assist the wear plates in riding over any unevennesses on the inner surface of the tank wall 1.

Means are provided for yieldingly holding the wear plates 9 outwardly against the inner surface of the tank wall 1. Such means, as here shown, include the bell cranks 11, pivoted at 12 on the arms 13 carried by the upper edge of the flange 4. The inner ends of the bell cranks, as indicated by 11^a, are provided with weights 14, or springs 14^a or both, that operate to urge the lower ends 11^b of the arms 11 outwardly against the wear plates 9. As here shown, the lower ends 11^b of the arms may merely press against the wear plates 9.

In Figs. 5, 6 and 7, I have shown a modified form of apron. It is to be understood that the wear plates and other parts are the same, and, consequently, I shall not describe in detail anything but the apron and its construction. As shown in Figs. 5, 6 and 7, the rim of the floating deck is again indicated by 4, the tank wall, by 1, the wear plates, by 9, etc. The apron, in general, however, is indicated by 105. This apron is made up of circumferentially arranged metallic sheets or plates 105^c having their edges somewhat overlapped, as indicated at 105^a and joined by the rivets 105^c. Each of the plates 105^c is provided with a centrally arranged corrugated portion 105^b being preferably somewhat narrower at the top than at the bottom. This corrugated portion permits the apron 105 (and especially the lower and outer edge thereof) to expand and contract.

While I have shown and described certain embodiments of my invention, it is to be understood that it is capable of many modifications. Changes, therefore, in the construction and arrangement may be made without departing from the spirit and scope of the invention as disclosed in the appended claims, in which it is my intention to claim all novelty inherent in my invention as broadly as permissible, in view of the prior art.

What I regard as new, and desire to secure by Letters Patent, is:

1. A liquid storage tank including: a shell; a roof adapted to float on liquid in the tank; and a substantially gas-tight continuous semi-flexible metal apron of unbroken continuity throughout its circumference and with portions having relatively flexible folds therein to make said apron expansible and contractible, said apron having its upper and inner edge attached by one continuous gas-tight connecting seal to the periphery of the roof and its lower and outer edge adapted to be immersed in liquid in the tank.

2. Apparatus as claimed in claim 1 with means for yieldingly urging the lower and outer edge of the apron outwardly toward the shell of the tank.

3. Apparatus as claimed in claim 1 with means for yieldingly urging the lower and outer edge of the apron outwardly toward the shell of the tank and wear plates arranged between the apron and the shell of the tank.

4. Apparatus as claimed in claim 1 with means for yieldingly urging the lower and outer edge of the apron outwardly toward the shell of the tank and wear plates arranged between the apron and the shell of the tank, said wear plates being supported by the apron.

5. Apparatus as claimed in claim 1 with wear plates arranged between the apron and the shell of the tank and means for yieldingly urging the lower and outer edge of the apron outwardly toward the shell of the tank, said means pressing outwardly against said wear plates.

6. Apparatus as claimed in claim 1 with wear plates arranged between the apron and the shell of the tank, said wear plates being supported by the apron, and means for yieldingly urging the lower and outer edge of the apron outwardly toward the shell of the tank, said means pressing outwardly against said wear plates.

In witness whereof, I have hereunto set my hand this 28 day of May, 1930.

DJALMA D. WILLIAMS.