Nov. 12, 1929. C. H. HAUPT 1,735,461

METHOD AND MEANS FOR SEALING FLOATING ROOFS

Filed Nov. 10, 1926 2 Sheets-Sheet 1

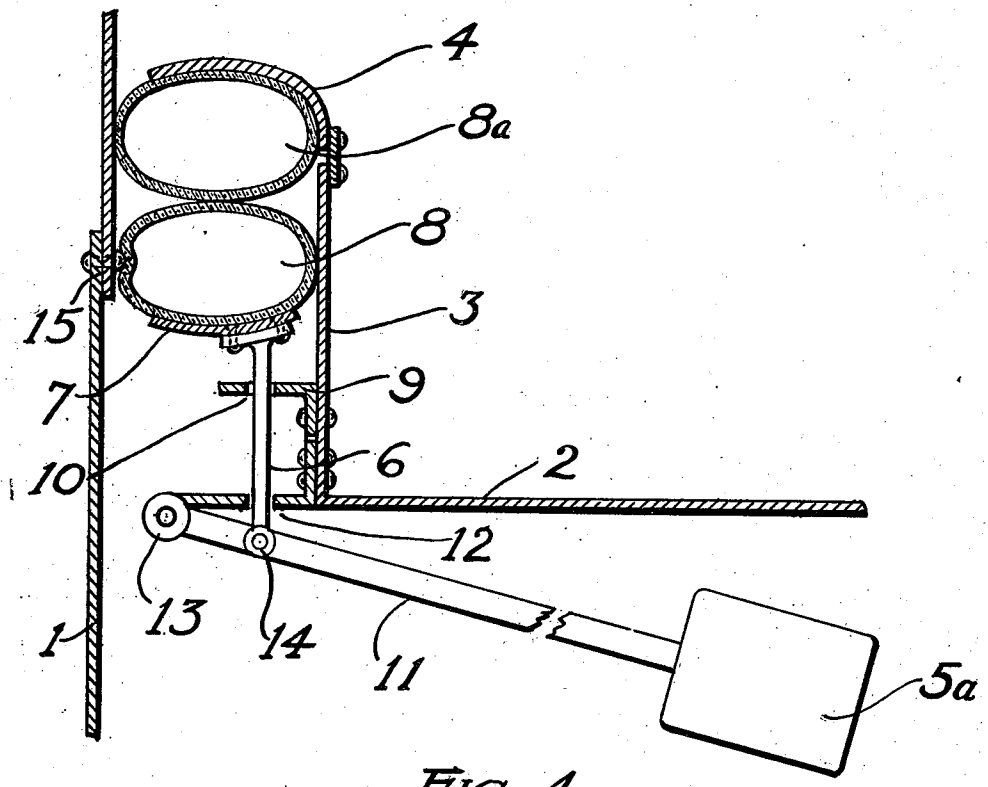

FIG.-4

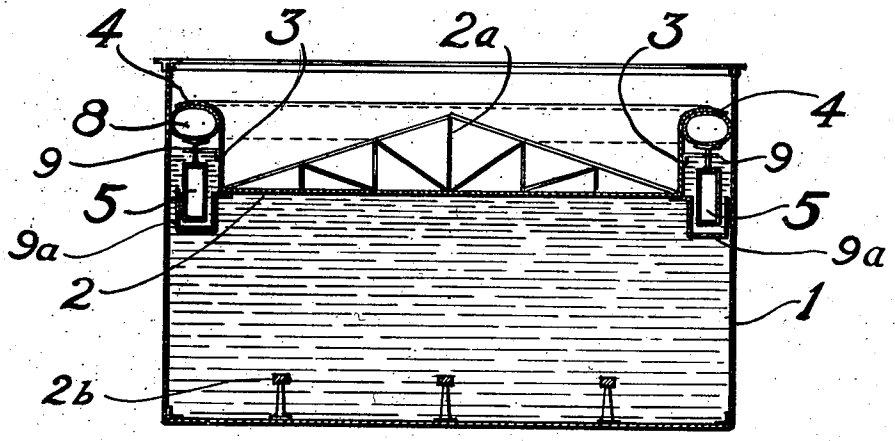

FIG.-1

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METHOD AND MEANS FOR SEALING FLOATING ROOFS

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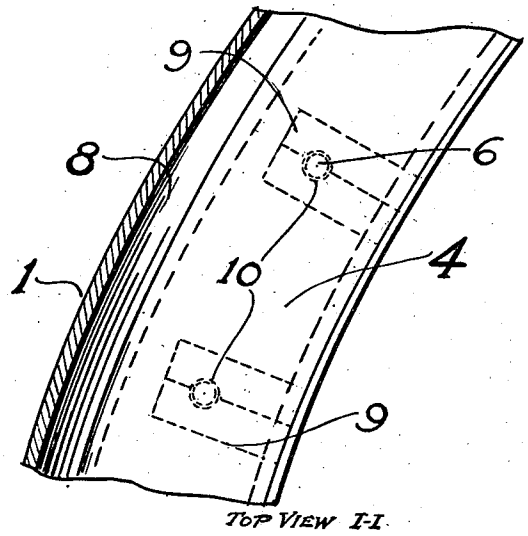

TOP VIEW I-I

FIG.-3

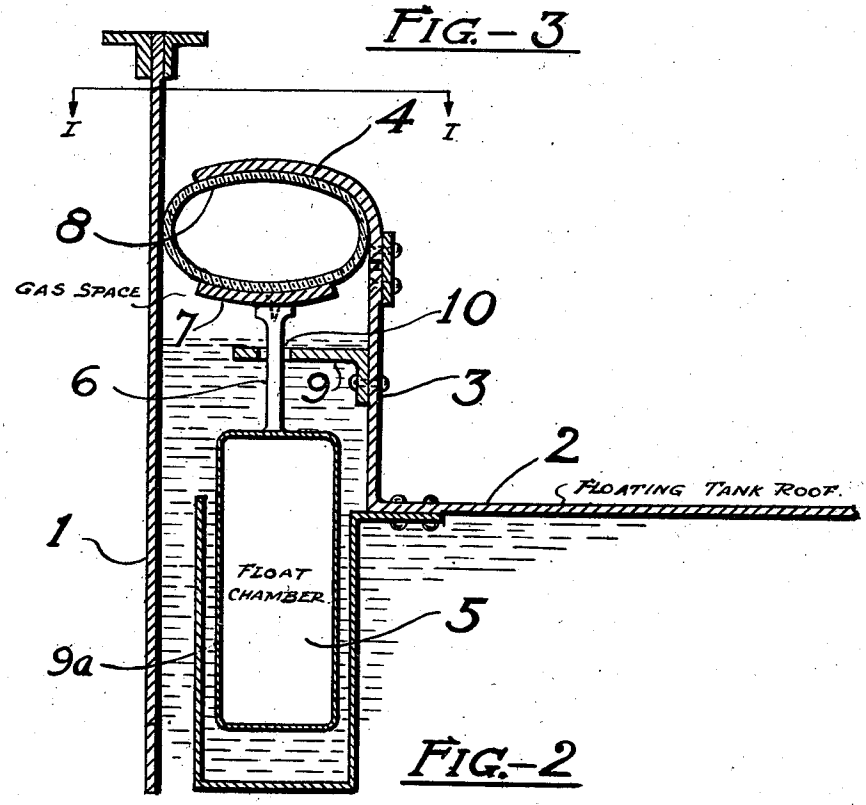

FIG.-2

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UNITED STATES PATENT OFFICE

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METHOD AND MEANS FOR SEALING FLOATING ROOFS

Application filed November 10, 1926. Serial No. 147,527.

The present invention relates to an improvement in storage tanks, more particularly to a floating roof for such tanks containing volatile liquids, and provides an efficient method of sealing the floating roof to the side wall of the tank. My present application is a continuation in part of my earlier application No. 581,756, filed August 14, 1922. The invention will be fully understood from the following description in which

Fig. 1 shows in section a tank with the floating roof made according to my invention;

Fig. 2 is an enlarged vertical sectional view of the edge of the roof showing the improved method of sealing the roof to the side walls;

Fig. 3 is a partial plan view of Fig. 2; and

Fig. 4 illustrates in vertical section a modification of the sealing method.

Referring particularly to Figs. 1, 2 and 3, the reference numeral 1 designates the shell of the storage tank which is made of sheet steel according to the usual practice. The roof plate 2 is a flat circular plate of smaller diameter than the shell 1, and is provided with suitable strengthening means 2^a as may be required. A vertical steel wall or ramp 3 is rigidly fastened around the perimeter of the roof plate 2, extending upward and curving outward at the top to form an upper rim 4. The rim 4 is annular in shape, extending around the perimeter of the roof and to within a few inches of the side walls of the shell 1. Near the tank wall, floats 5 are regularly spaced around the perimeter of the roof plate and float in the liquid contained within the tank. Supporting arms 6 are fastened to the upper surfaces of the floats 5, and support a lower curved plate 7, which is a continuous annular plate that may be made conveniently in sections and bolted or riveted together.

The upper curved rim 4 and the lower curved plate 7 are respectively concaved on the lower and upper sides, and thus adapted to hold a permanently inflated annular member 8 therebetween. The member 8 is made of canvas impregnated or coated with rubber or similar impervious material, and when in position is under sufficient pressure to cause it to form a seal between the roof and the wall of the tank. The member 8 may be of one piece, or preferably of several non-communicating fluid chambers.

The lower curved plate 7 is pressed upward by the buoyant force of the floats 5. In this manner the annulus 8 is distorted somewhat from its normally circular cross-section, and is pressed tightly against the side walls of the shell 1 forming a tight sliding seal.

The roof is therefore free to move upward or downward with the surface of the liquid, and the flexible annular member 8 at all times forms a tight joint with the tank wall. The ramp 3 is of sufficient height so that the annulus 8 is supported in the gas space and preferably does not come in contact with the liquid in the tank. A supporting structure 2^b is provided to hold the roof plate above the bottom of the tank when the liquid is pumped out of it. Guide arms 9 extend from ramp 3 and are perforated with holes 10 which allow the supporting arms 6 to slide easily therethru. A float chamber guide 9^a is secured to the bottom of the floating tank roof 2.

In Fig. 4 a modification of my invention is shown in which two inflated members 8 and 8^a are mounted one above the other. The float 5^a is attached to a lever arm 11 which is pivoted to a guide strap 12 at 13 and to the supporting arm 6^a at 14. The action is exactly as has been described above. The buoyant force acting on floats 5^a is transmitted to the lower curved plate 7, and the two annular members 8 and 8^a are distorted and pressed against the shell wall 1. Weights may be used to distort the inflated member or members. In such modification, the lever 11 will be a lever of the first class, instead of the second class.

In the construction shown in Fig. 4, the two annular members take the place of the single annulus; but the two are preferred for the reason that any irregularity in the tank wall, such as a rivet or strap, may prevent one of the annular members from making a tight joint, and in this case the other member will seal the roof to the side wall.

In Fig. 4 such a condition is illustrated in that a rivet 15 prevents the annular mem-

ber 8 from making the joint which is, however, made by the other annulus 8a.

In the operation of my invention the liquid may be pumped in or out of the tank by the usual pipe connections (not shown). The roof rises and falls with the liquid level, and a tight sliding joint is made between the roof and the side walls by the annular member 8. If the flexible annulus is pushed in at one point by a rivet or other projection on the side wall of the tank, the floats 5 will be depressed by an equivalent amount and when the irregularity is passed over, the buoyant force of the floats will push the annulus again in place against the side walls 1.

There are other modifications of my invention. The annulus may be made of materials other than canvas and rubber, and the tube may be similar to a pneumatic tire with an outer casing and an inner inflated tube. The inflated member may be of a cellular structure, and cross-sections other than circular are contemplated. The invention has been particularly described in connection with a storage tank for liquids, but the seal may be utilized to make a self adjusting roof for gas holders in which the roof is allowed to ride freely within the side walls, and the seal will be made as described by the distortion of one or more inflated members.

My invention is not to be limited by the illustrations of my disclosure, but only by the following claims in which I intend to claim all novelty inherent in my invention.

I claim:

1. A floating tank roof comprising a roof plate, an upper rim fastened thereto, a flexible inflated member below said rim, and means actuated by the liquid in the tank for distorting said member and thereby making a joint between roof plate and side walls of the tank.

2. A floating tank roof, according to claim 1, in which the means for distortion of the inflated member comprises a plurality of floats.

3. A floating tank roof, according to claim 1, in which means are provided for supporting the inflated member out of contact with the liquid contained in the tank.

4. A floating tank roof, according to claim 1, in which the means for distorting the inflated member comprises a plurality of bodies floating within the tank in partial independence of the roof.

5. A method according to claim 7, in which said distortion is accomplished by pressure transmitted from bodies floating within said tank.

6. A method for sealing a floating roof to the side walls of a tank, which comprises placing an inflated member in the annular space between the roof plate and side walls, and distorting the inflated member by the buoyant force of floating bodies so as to make a tight joint between said plate and said walls.

7. A method for sealing a floating roof to the side walls of a tank to permit free rise and fall of the roof, which comprises placing an inflated member in the annular space between roof plate and side walls, and distorting the inflated member by the buoyant force of liquid within the tank so as to make a tight joint between said plate and side walls.

In testimony that I claim the foregoing as my invention, I affix my signature.

CHARLES H. HAUPT.