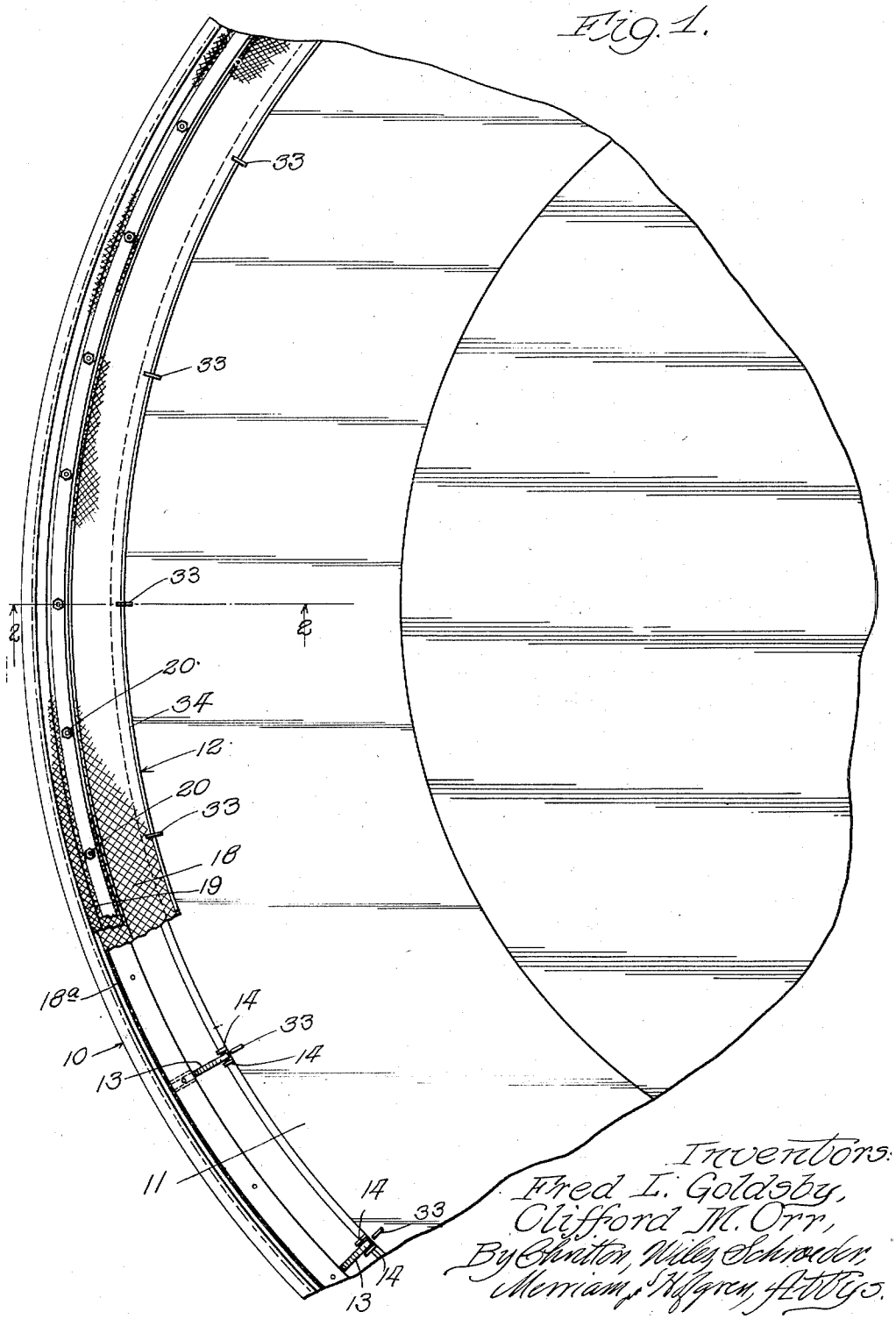
Jan. 16, 1951 F. L. GOLDSBY ET AL 2,537,986

SEAL FOR FLOATING ROOF TANKS

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Fig. 1.



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Fig. 2.

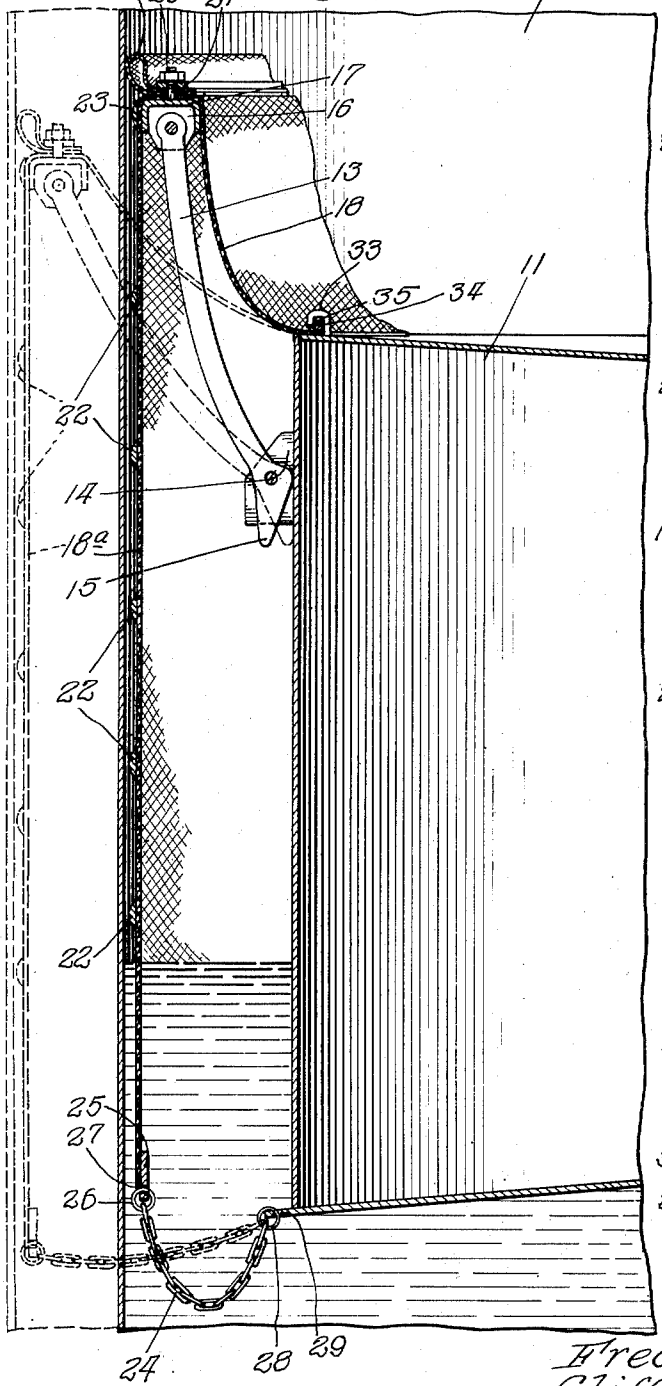
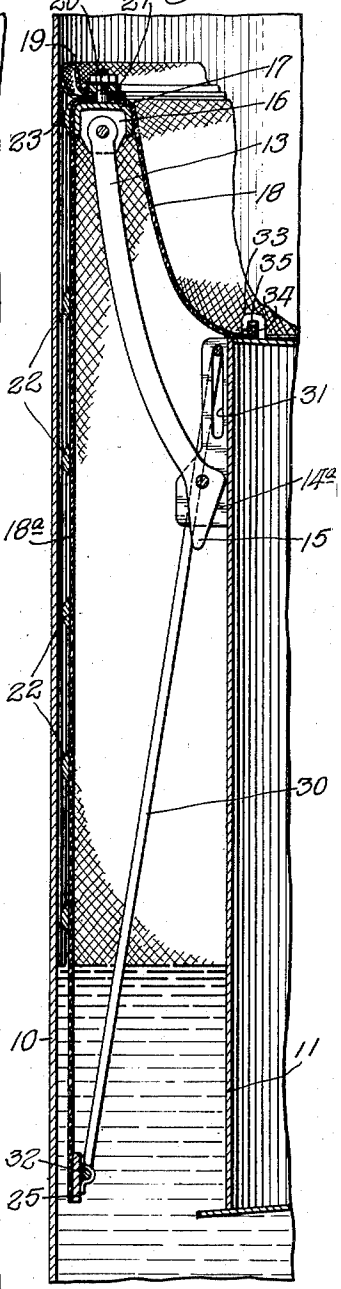


Fig. 3.



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2,537,986

SEAL FOR FLOATING ROOF TANKS

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4 Claims. (Cl. 220—26)

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This invention relates to a floating roof tank, and particularly to a seal for a floating roof tank for sealing the area between the tank shell and the floating roof.

It has become common practice to store volatile liquids in a tank having a roof that floats on top of the liquid. The roof rises and falls as the contents of the tank is increased and decreased. In these tanks there is an annular area between the edge of the roof and the inner surface of the tank shell. It is necessary to provide sealing means to seal this area off, in order to prevent evaporation of the stored liquid and contamination by water, dirt, and the like. We have invented an improved seal that is easy to install and is light in weight. The new seal provides a positive sealing action between the edge of the floating roof and the inner surface of the tank shell, and can adjust itself to varying distances between the edge of the roof and the shell.

The invention will be described as related to the embodiments shown in the accompanying drawings. Of the drawings Fig. 1 is a fragmentary plan view of a floating roof tank embodying this invention with portions broken away for clarity of illustration; Fig. 2 is a vertical section taken along line 2—2 of Fig. 1; and Fig. 3 is a view similar to Fig. 2, but showing an alternate embodiment of the invention.

The floating roof tank shown in the accompanying drawings comprises a substantially cylindrical shell 10, a floating roof 11 therein, and a seal 12 extending between the edge of the roof and the inner surface of the shell.

The seal structure comprises a plurality of spaced, upwardly-extending curved arms 13 fastened to the vertical edge of the floating roof. The arms 13 are rotatably mounted between spaced pairs of brackets 14. The bottom of each arm 13 is formed with a downwardly-extending portion 15 adapted to press against the side of the roof and limit outward rotation of the arms 13. These downwardly-extending portions 15 may have any desired angular relationship with the main body of the arms, depending upon the rotational distance of arms 13 that is desired. As shown by dotted lines in Fig. 2, the roof sides of the portions 15 rest against the roof when rotational movement has reached the desired maximum. The curved arms 13 may also be mounted on top of the roof with the seal fabric suspended from them.

At the top of each curved arm 13 there is located a hingedly mounted support 16 carrying an inverted U-shaped channel 17. This channel is of annular shape, extending around the tank,

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and is made of slightly smaller diameter than the shell 10. Sealing action between the shell 10 and the roof 11 is attained by means of the flexible sealing member 18 extending from the top edge of the roof over the annular channel 17, and down along the shell 10. The sealing member, which is preferably a fabric impregnated with an impervious, flexible solid material, may be made in two sections with one section 18 extending between the roof and the channel 17, and the other section 18a extending from the channel down along the shell. It is preferred, however, that the two sections 18 and 18a be made of one continuous strip.

There is also provided a secondary seal 19 attached to the channel 17 and normally pressing against the inner surface of the shell 10. This secondary seal is preferably made of a fabric impregnated with a flexible impervious material. The two edges of the secondary seal 19 and the flexible sealing members 18 and 18a are fastened to the channel 17 by means of bolts 20 passing through the channel 17, sealing member 18, secondary seal 19, and an annular pressure bar 21 which may be merely an additional thickness of fabric or loop of fabric.

The portion 18a of the flexible seal 18 that hangs down along the shell is preferably provided with a plurality of spaced wear strips 22 extending horizontally around the seal 18a, although they may also extend vertically. The wear strips 22 as shown are continuous circumferential strips preferably made integral with the seal 18a, and have raised surfaces. At the top of the seal 18a there is provided another wear strip 23 located opposite the support channel member 17. The wear strips 22 and 23 are made of an abrasion-resistant material.

The flexible seal 18a may hang freely from the supporting channel 17, but it is preferred that a weight be provided on the bottom of the seal in order to give a positive hold-down action. As shown in Fig. 2 this weight comprises spaced chains 24 with each chain extending from the bottom of the seal 18a to the bottom portion of the roof 11. As shown, the seal 18a has a continuous reinforcing bar 25 at the bottom of a length slightly less than the smallest circumference of the shell, and the chain 24 is attached by means of a ring 26 held in a hole 27 through the bottom of the seal 18a and the reinforcing bar 25. The other end of the chain 24 is attached to the roof by means of a second ring 28 held in a hole 29 located in a lateral extension of the bottom of the roof.

In Fig. 3 an alternate means is shown for hold-

ing down the seal 18a. This comprises a plurality of rods 30 extending from the bottom of the seal 18a to a point near the top of the roof. The upper end of each rod 30 is held in a vertical slot 31 located in the upper part of a bracket 14a. The bottom end of each rod 30 is rotatably held against a reinforcing bar 25 located at the bottom of the seal 18a by means of a clamp 32.

The chains 24 and the rods 30 not only serve as weighting means to hold down the seal fabric but also serve as pull-downs to loosen the seal fabric if it sticks to the shell when the roof starts down after a period of rest.

The roof edge of the seal 18 may be attached to the roof in any desired manner. As shown, the attaching means comprises spaced hooks 33 holding a rod 34 clamped against the edge of the seal 18 by a wedge 35 driven between each hook 33 and rod 34.

When the floating roof tank contains liquid irregular settlement of the foundation, wind, and other factors may cause the tank shell to get out of round. The seal shown and described herein readily adapts itself to such out-of-roundness because supporting arms 13 are rotatably mounted, and the weight of the seal causes the upper ends of the arms to move outward toward the shell. Two possible positions of a supporting arm 13 are shown in Fig. 2, with the second position being shown in dotted lines.

Having described our invention as related to typical embodiments of the same, it is our intention that the invention be not limited by any of the details of description unless otherwise stated, but rather be construed broadly within its spirit and scope as set out in the accompanying claims.

We claim:

1. In a floating roof tank having an outer shell and a floating roof therein, sealing means comprising a plurality of hangers pivoted to the side walls of the roof and extending upwardly above the top of the roof toward the shell, carrier means fastened to the shell ends of the hangers, and a flexible impervious sealing member extending from the roof over the carrier means and over the hangers and hanging down along the inner surface of the shell into the liquid within the tank.

2. The sealing means of claim 1 wherein there

is provided a secondary sealing member carried by the carrier means and normally pressing against the inner surface of said shell.

3. The sealing means of claim 1 wherein the portion of the sealing member hanging down along the shell is provided with a plurality of raised buffers extending toward the shell.

4. In a floating roof tank comprising a cylindrical outer shell and a cylindrical floating roof therein, a sealing means comprising a plurality of upwardly extending hanger arms spaced around the roof and extending from the edge of the roof toward the shell, said hanger arms being hingedly connected to the side walls of the roof and extending above the top thereof, an annular carrier member hingedly attached to the outer ends of the hanger arms, a flexible impervious sealing member extending from the roof over the carrier member and over the hanger arms and hanging down along the inner surface of the shell between the roof and the shell, said sealing member being arranged loosely between the roof and the carrier member, a plurality of raised buffers extending toward the shell on the portion of the sealing member hanging down from the carrier member, stop means carried by the roof ends of the hanger arms to limit outward rotational movement of said hanger arms, weighting and pull-down means attached to the bottom portion of the sealing member to aid in holding down said member, and an annular secondary sealing member carried by the carrier means and normally pressing against the inner surface of the shell.

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REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
1,660,021	Wiggins	Feb. 21, 1928
1,865,969	Schurmann	July 5, 1932
1,871,289	Wiggins	Aug. 9, 1932
1,930,053	Hampton	Oct. 17, 1933
2,318,135	Wiggins	May 4, 1943
2,426,755	Ulm	Sept. 2, 1947

Certificate of Correction

Patent No. 2,537,986 January 16, 1951

FRED L. GOLDSBY ET AL.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows:

Column 4, line 47, list of references cited, for the patent number "1,930,053", read *1,930,953*;

and that the said Letters Patent should be read as corrected above, so that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 5th day of June, A. D. 1951.

[SEAL]

THOMAS F. MURPHY,
Assistant Commissioner of Patents.