Jan. 13, 1953 F. D. MOYER 2,625,314

LADDER FOR FLOATING ROOF TANKS

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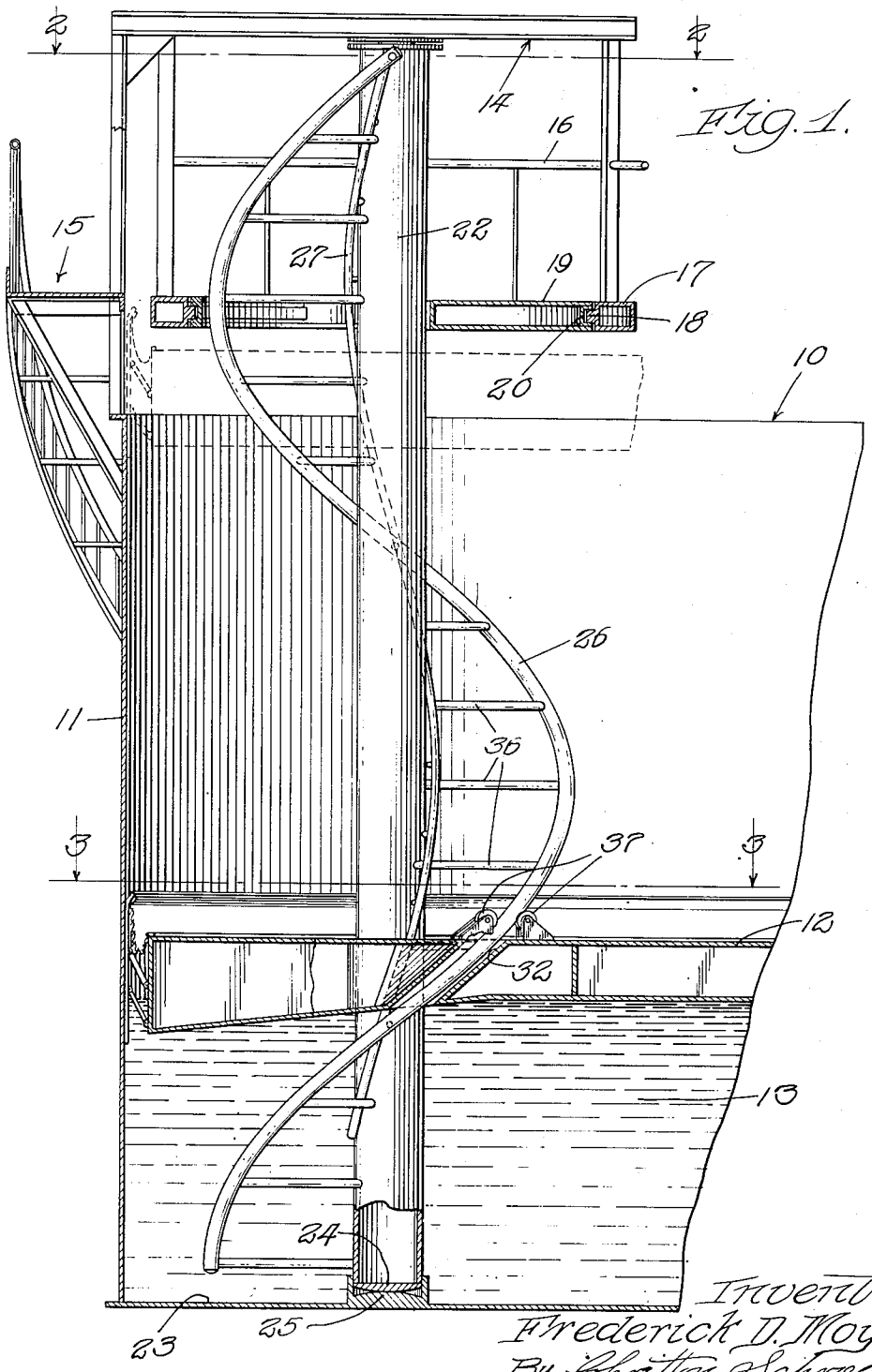


Fig. 1.

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Fig. 2.

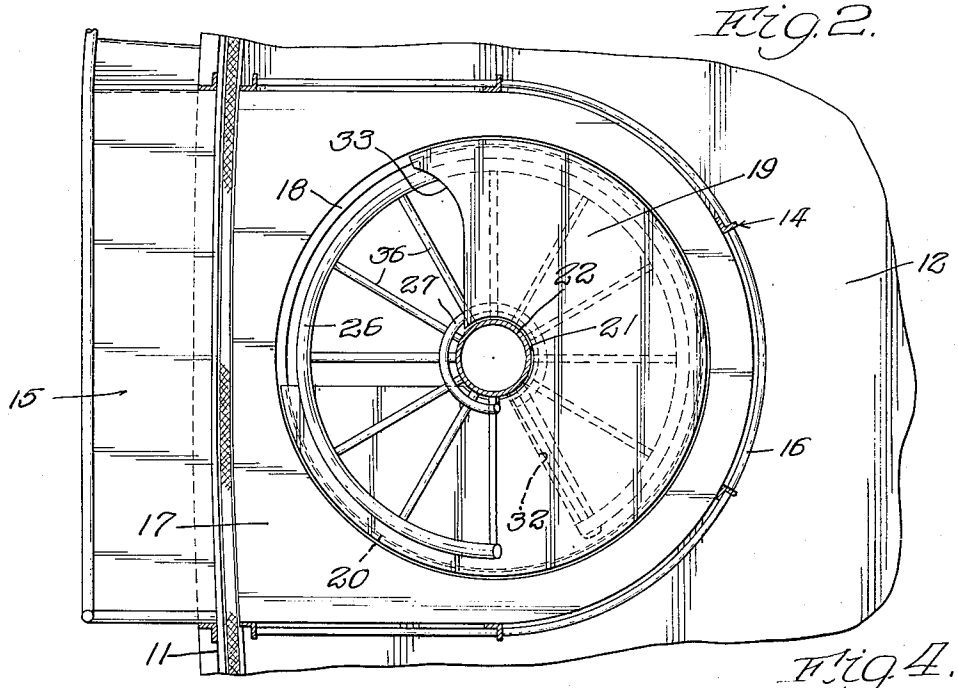


Fig. 3.

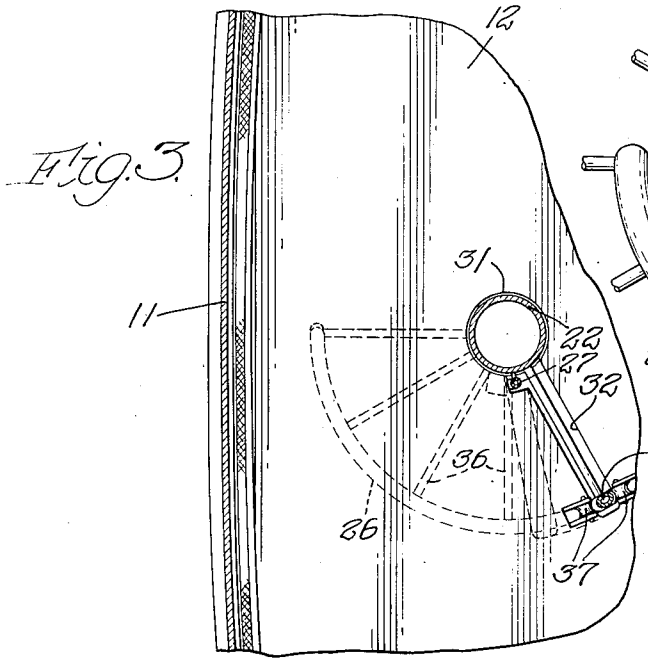
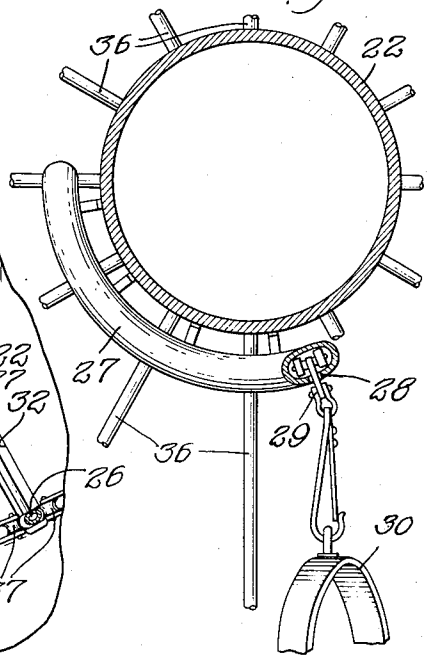


Fig. 4.



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Fig. 5.

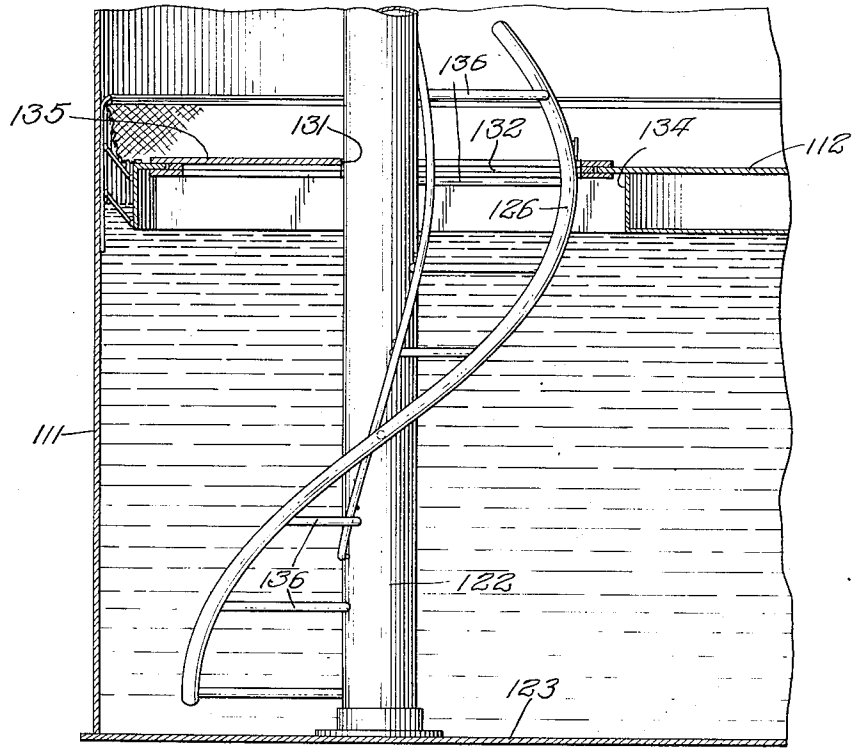
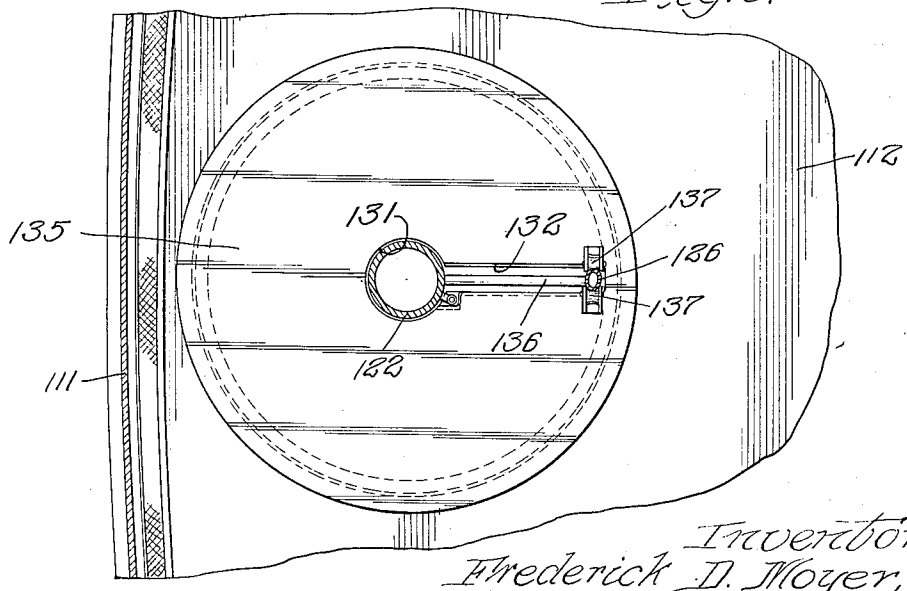


Fig. 6.



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UNITED STATES PATENT OFFICE

2,625,314

LADDER FOR FLOATING ROOF TANKS

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7 Claims. (Cl. 228—1)

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This invention relates to a ladder and more particularly to a ladder having a variable usable length adapted for use as a means of descent between two stations whose distance from each other is variable.

While the ladder of this invention is adaptable for use as a means of descent from one station to another station where the distance between the stations is variable, it will be described and shown as used in conjunction with a floating roof storage tank. In such tanks the roof is designed to float upon the liquid stored and rises and falls with changes of the liquid level within the tank. It is necessary that means be provided for descent from the top of the side wall of the tank to the floating roof for purposes of gauging, inspection, cleaning, painting and other reasons. It has been customary to provide such a tank with a straight ladder hinged at its top to the side wall of the tank and provided with rolls at its bottom to roll across the roof as the roof moves vertically within the tank. Such ladders have many disadvantages due to the fact that their angular position changes with movements of the roof. Such ladders are often dangerous to use and generally are far from the most efficient means for descending to the roof.

I have invented and am herein disclosing and claiming a ladder which, when used with a floating roof tank is in the form of a spiral descending from the side walls to the upper surface of the roof. The particular pitch of the spiral may be chosen as desired and once determined remains fixed at all times. The ladder serves not only to provide a means of descent to the roof but also serves to prevent rotation of the roof within the tank.

The invention will be described in conjunction with the embodiments shown in the accompanying drawings, in which:

Fig. 1 is a vertical section through a portion of a floating roof tank showing the ladder which is the subject of this invention; Fig. 2 is a horizontal section along line 2—2 of Fig. 1; Fig. 3 is a horizontal section along line 3—3 of Fig. 1; Fig. 4 is an enlarged detail view of the safety handrail; and Figs. 5 and 6 are vertical and horizontal sections, respectively, showing a modified form of the device.

Referring to the drawings, 10 indicates a liquid storage tank having a side wall 11, a floating roof 12 floating upon liquid 13 within the tank. A platform, generally designated as 14, is located adjacent the upper edge of the side wall and may be reached from the ground by a spiral stairway

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15. The platform is provided with guard rails 16 and a stationary standing portion 17. The portion 17 is provided with a circular opening 18 in which there is an annular portion 19 mounted for rotation in a horizontal plane by means of the rollers 20. Extending through a circular opening 21 in the portion 19 is a post 22 which extends downwardly to the bottom 23 of the tank. The post 22 is provided at its lower end with a convex bearing portion 24 resting against a similar bearing 25 attached to the bottom of the tank. A spiral ladder 26 is secured to the post and extends from a point above the standing portion 17 down to a location adjacent the bottom of the tank. Associated with the ladder is a safety guard rail 27 provided with a slot 28 in which is located a traveling safety snap 29 attachable to a safety belt 30. This additional safety feature is provided to permit a workman descending to the roof to use both hands for purposes other than guiding himself on the ladder and to prevent injuries due to missteps.

The floating roof 12 is provided with a circular opening 31 through which the post 22 extends and with a diagonally slotted portion 32 through which the ladder extends. As the ladder is secured to the upper end of the post above the portion 19, an opening 33 is provided in that portion through which a man on the ladder may descend from the standing portion to the roof. The post is held for rotation at its upper end by attachment to the portion 19 and is rotatably mounted at its lower end on the bearings 24 and 25. The ladder 26 is attached only to the post 22 and is therefore rotatable with the post. Vertical movement of the roof brings the ladder into contact with the rollers 37 positioned at the slot 22 to rotate the ladder and post.

In the embodiment shown in Figs. 5 and 6, the post 122 is fixed to the bottom 123 of the tank so that no rotation of the post or of the ladder 126 takes place during vertical movement of the roof. A circular opening 134 is provided in the roof in which opening a plate 135 is mounted for rotation on a horizontal plane. The plate 135 is provided with an opening 131 through which the post extends and with a slot 132 through which the ladder extends. In this embodiment the ladder does not rotate with vertical movement of the roof but at all times remains stationary and fixed relative to the tank and to the upper platform (not shown). The upper platform is similar to platform 14 except that it has no rotatable portion. The annular plate 135, however, is rotated with movement of the roof by the rollers

137 bearing against the ladder and permits the roof to move vertically within the tank.

In the embodiments shown, the ladder is provided with treads 36 and 136 although it is clear that other means may be provided, such as steps or a continuous ramp, and by the term "ladder" as used in the specification and claims I mean to embrace such other forms of walks. It is also clear that my invention may be used in conjunction with structures other than the particular type shown and may be advantageously employed in any device where means of descent are desired between two stations the distance between which is variable.

While I have shown and described my invention in its preferred embodiments, 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.

I claim:

1. In a liquid storage tank having a floating roof, means of descent from the side wall of the tank to the roof comprising a platform adjacent the upper portion of the side wall, a spiral ladder extending downwardly from the platform through the roof, and means operatively connected with said ladder and roof to cause relative rotation therebetween during vertical movement of the roof.

2. Apparatus of the character described in claim 1, in which the platform is provided with a rotatable portion with the ladder connected to said portion and said second means including a slot in the roof through which the ladder extends.

3. In a liquid storage tank having a floating roof, means of descent from the side wall of the tank to the roof comprising a platform adjacent the upper portion of the side wall, a vertical post connected to the platform and extending downwardly to the bottom of the tank, a spiral ladder attached to the post and extending from the platform downwardly through the roof, and means operatively connected with said ladder and roof to cause relative rotation therebetween during vertical movement of the roof.

4. Apparatus of the character described in claim 3, in which the platform is provided with a rotatable portion with the post connected to said portion and said second means including a slot in the roof through which the ladder extends.

5. In a liquid storage tank having a floating roof, means of descent from the sidewall of the tank to the roof comprising a platform adjacent the upper portion of the sidewall, a rotatable portion in the roof, said portion having a diameter less than the diameter of the roof and being provided with a slot therein, and a spiral ladder extending downwardly from the platform and through the slot.

6. Apparatus of the character described in claim 5 including a vertical post connected to the platform and extending downwardly through the center of said rotatable portion to the bottom of the tank and in which said ladder is attached to the post.

7. In a structure having a stationary platform secured thereto and a movable platform therebeneath, means for descent from the stationary platform to the movable platform, comprising: a spiral ladder extending from the stationary platform downwardly through a slot in a portion of the movable platform, said stationary platform having a portion about the ladder with a ladder access opening therein, and means, including said ladder, responsive to vertical movement of the lower platform to impart relative rotary movement between said platform portions.

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