

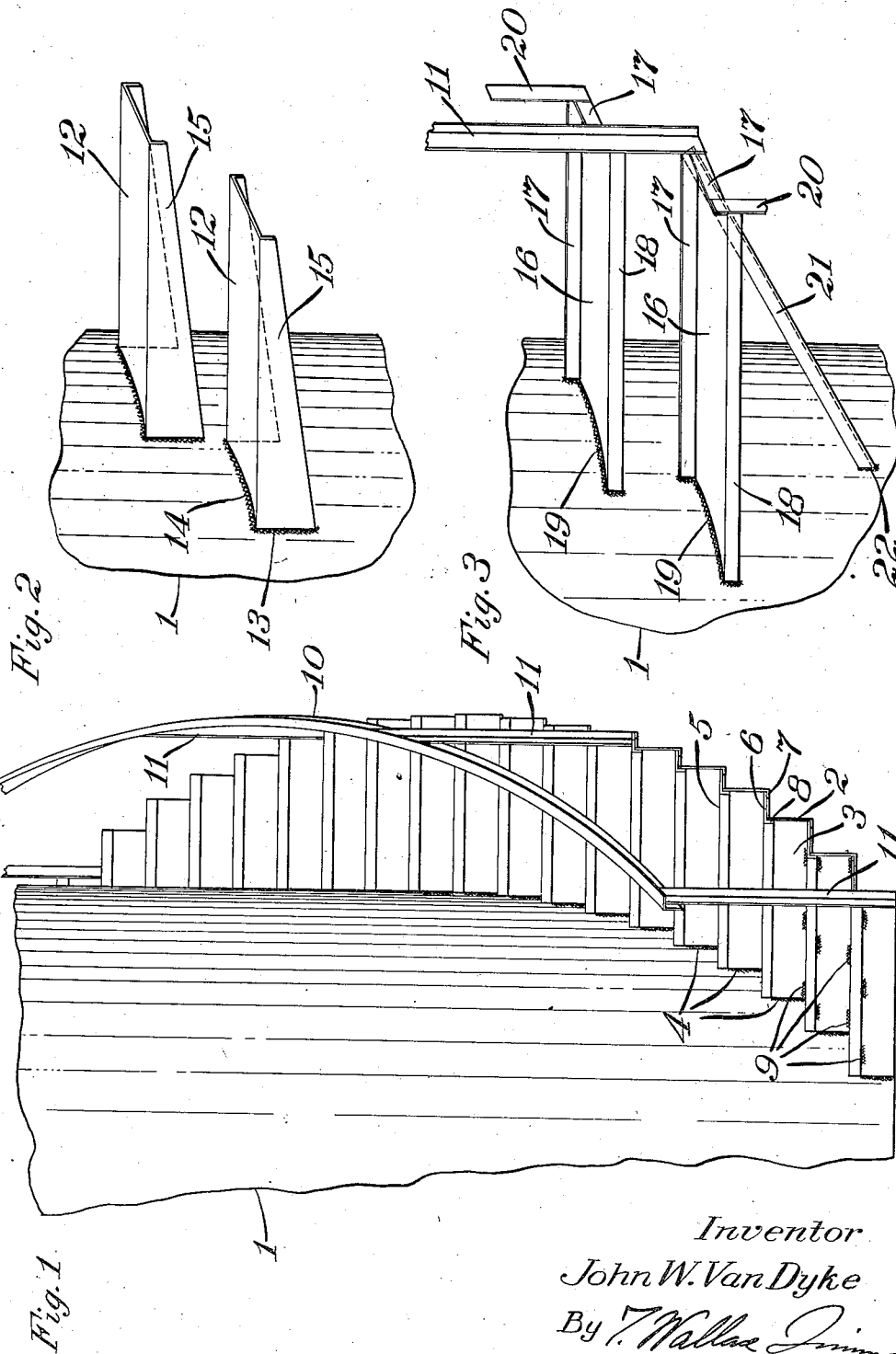
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STAIR STRUCTURE FOR TANKS

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STAIR STRUCTURE FOR TANKS

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This invention relates to improvements in stair structures and more particularly to self-supporting stair structures which may be installed on vessels, such as tanks for the storage of petroleum or other fluids. My improved stair structure is adapted for installation upon any vessel, and especially upon cylindrical metal tanks or vessels of irregular shape.

A particular object of this invention is the construction of a stair structure for tanks involving the use of a minimum quantity of material and the expenditure of minimum time and labor in its fabrication.

A further object of this invention is the construction of a stair structure for tanks which will occupy a minimum amount of space adjacent such tanks.

Heretofore, the usual stair structure installed upon metal vessels, and particularly vertical, cylindrical tanks, consisted of a metal stringer, either attached to or spaced from the tank wall, conforming to the curvature thereof and extending spirally from the top to the bottom of the tank on an angle of the order of 45°. A second stringer, corresponding in shape and curvature to the first mentioned stringer and horizontally spaced therefrom, was held in position parallel to the first stringer by means of supports extending from the tank wall and/or from the ground. Between the stringers there were interposed a plurality of riser plates and treads forming the steps of the stair structure. One or more guard rails were employed in this structure, such rails being supported by rail posts extending vertically from the stringers.

In another type of construction, there were provided two channel irons or stringers, horizontally spaced one from the other and attached at the periphery of the tank top. These stringers sloped downwardly away from the tank and were anchored in a foundation some distance from the bottom of the tank. Interposed between the stringers and suitably attached thereto were a plurality of riser plates and treads forming the steps, and guard rails supported from the stringers were usually provided.

In the types of stair structure above described, involving the employment of stringer or channel irons and ground supports therefor, an undesirably large quantity of material is required for its construction, the structure is cumbersome and, in many instances, occupies an excessive amount of ground space; and the labor involved in fabricating the structure is unnecessarily great, expensive and time consuming.

My improved stair structure, described and illustrated hereinafter in which the stairs are principally supported upon the wall of the tank, obviates to substantial extent the undesirable features mentioned above. In the accompanying drawing, Fig. 1 shows a section of a vertical, cylindrical tank provided with my improved stair structure, while Figures 2 and 3 illustrate modifications thereof which are within the scope of my invention.

Referring to Fig. 1 of the drawing, 1 represents a section of a cylindrical metal tank wall to which the longer webs 2 of the L-shaped risers or supporting plates 3 are attached, preferably by welding, at 4, the longer webs 2 being positioned substantially vertically as shown. The risers or supporting plates 3 are disposed at successively increasing elevations on the tank wall in spaced vertical planes, and are adapted to support the substantially horizontal tread plates 5 which are also of L-shaped construction. As will be seen from the drawing, the tread plates 5 are likewise disposed in spaced parallel planes, the longer webs 6 of the treads 5 extending over the shorter, horizontal webs or flanges 7 of the risers or supporting plates 3, while the shorter, vertical webs or flanges 8 of the tread plates 5 extend over the longer webs 2 of the risers 3. The tread plates 5 may be secured to the risers or supporting plates 3, for example, by welding at any one or more selected spots 9. Said tread plates may likewise, if desired, be secured, by welding or other means, to the tank wall at the position where the plates abut against the tank. The stair structure may be provided with a guard rail 10 supported by the rail posts 11, which are preferably attached to the risers or supporting plates 3 by welding.

Fig. 2 of the drawing shows a modification of my stair structure, wherein a series of tread plates 12 are attached directly to the tank wall 1, for example, by welding along the abutting edges 13 and 14. This type of tread plate may be formed simply by shearing a metal plate of suitable thickness into the desired shape and thereafter folding the edges downwardly to form the supporting flanges 15, such flanges preferably being of greater depth at the end portions abutting the tank wall than at the unsupported or exterior end portions. If desired, a guard rail may be mounted at the unsupported end portions of the tread plates, in a manner similar to that shown in Fig. 1.

Fig. 3 of the drawing illustrates another modification of my stair structure in which a series of tread plates 16, provided with upwardly extending flanges 17 and downwardly extending

flanges 18, are directly attached to the tank wall 1, preferably by welding along the abutting end portions 19. To the outer extremities of the tread plates 16, there are attached the tread spacer bars 20, and the guard rail post 11 for supporting a rail 10, such as is shown in Fig. 1. This modification of my stair structure, having less support at the abutment with the tank wall 1 than the structures illustrated in Figures 1 and 2, generally requires an auxiliary supporting means, such as the angle brace 21 attached to the tank wall at 22, for example, by welding, such brace extending therefrom to the outer extremity of the tread plate 16 and attached thereto by welding or other means. The angle braces 21 are usually attached to every 7th tread plate; more, however, or less of such braces may be employed as necessary.

While I have shown, in the accompanying drawing, tread plates fabricated from ordinary metal plates, I may employ perforated or corrugated tread plates or grids designed to prevent slipping of persons ascending or descending the stair structure. The structure illustrated in Fig. 2 is particularly adapted for use with tanks or other vessels in regions where foreign substances, such as ice and snow, would tend to accumulate as heavy deposits upon the stair structure. By providing tread plates without upwardly projecting riser plates, webs or combings, such tread plates may be maintained substantially free of undesirable accumulations.

In the modification of my stair structure described herein, I prefer to employ welding as a means for attaching the various elements of my structure, one to another, and to the tank wall, since welding eliminates the necessity of drilling holes for bolting or riveting, and reduces the possibility of leaks developing in the tank or other vessel. However, it is to be understood that, if necessary or desirable, riveting or bolting may be employed in lieu of welding for joining the steps in series.

While it is contemplated that as ordinarily constructed the stairs or treads will be entirely supported upon the wall of the tank, exclusive of the support afforded by the ground upon which the foot of the stair structure rests, it will be apparent that the employment of additional slight supporting means is ineffectual to escape the scope of the claims so long as the treads or stairs are principally or primarily supported upon the tank or wall. The term "principally supported" as used throughout the specification and claims is therefore to be construed to include structure in which such minor additional support may be provided in addition to the primary support afforded by the bond of the stairs to the tank or wall.

It will be seen that, in accordance with my invention, there is provided a self-supporting stair structure of simple design, economical of fabrication, and requiring a minimum of space for installation. Modifications of this structure may, of course, be resorted to without departing from the spirit of the invention or the scope of the appended claims.

What I claim is:

1. In combination, a vessel of relatively large diameter having a vertical wall and a self-supporting stair structure therefor, comprising a plurality of substantially horizontal tread members forming stairs, said tread members being attached by welding along one of their transverse edges directly to the wall of said vessel

and at circumferentially located spaces about the vessel and said tread members being principally supported upon the wall of the vessel.

2. In combination, a vessel of relatively large diameter having a vertical wall and a self-supporting stair structure therefor, comprising a plurality of substantially horizontal tread members forming stairs, said tread members being attached by welding along one of their transverse edges directly to the wall of said vessel, a guard rail and means for supporting said rail on said tread members and at circumferentially located spaces about the vessel and said tread members being principally supported upon the wall of the vessel.

3. In combination, a metal tank of relatively large diameter having a vertical wall and a self-supporting stair structure therefor, comprising a plurality of substantially horizontal tread members disposed spirally about the wall of said tank, said tread members being attached by welding along one of their transverse edges directly to the metal wall of said tank and at circumferentially located spaces about the tank and said tread members being principally supported upon the wall of the tank.

4. In combination, a metal tank of relatively large diameter having a vertical wall and a self-supporting stair structure therefor, comprising a plurality of substantially horizontal tread members extending radially outward from the wall of said tank, said tread members being directly attached, by welding at their respective transverse edges, to the metal wall of said tank and at circumferentially located spaces about the tank and said tread members being principally supported upon the wall of the tank.

5. In combination, a metal tank of relatively large diameter and a self-supporting stair structure therefor, comprising a plurality of tread members, each tread member consisting of an inverted channel-shaped plate having a substantially horizontal tread surface and depending, tapered flanges, said tread members having respectively relatively elongated lateral edges welded to the tank wall at circumferentially located spaces and said tread members being principally supported upon the wall of the tank.

6. In combination, a metal tank of relatively large diameter and a self-supporting stair structure therefor, comprising a plurality of substantially horizontal tread members disposed at progressively different elevations to provide a stair structure and supported upon a plurality of substantially vertical riser members attached by welding an edge of each vertical riser member directly to and extending radially outward from the wall of said tank, said riser members being disposed at circumferentially located spaces about the tank and being principally supported upon the wall of the tank.

7. In combination, a metal tank of relatively large diameter and a self-supporting stair structure therefor, comprising a plurality of substantially horizontal tread members disposed at different elevations spirally about the tank wall and welded respectively upon a plurality of substantially vertical riser members attached by welding directly to and extending radially outwardly from the wall of said tank, said riser members being disposed at circumferentially located spaces about the tank and being principally supported upon the wall of the tank.

8. In combination, a substantially vertical wall

and a self-supporting stair structure therefor, comprising a plurality of substantially horizontal tread members disposed at progressively different elevations to form a stair structure on the wall and supported upon a plurality of substantially vertical riser members attached by welding one edge thereof directly to and extending radially outwardly from the wall of said tank, a guard rail and means for supporting same on said riser members, said riser members being principally supported upon the wall at laterally spaced locations thereon.

9. In combination, a substantially vertical wall having a lateral metal surface, and a stair structure including a horizontal tread having a depending flange extending substantially at right angles to the tread and having a substantially vertical edge attached by welding to the metal wall surface for supporting the tread member thereon, the treads of said stair structure being principally supported upon the wall at laterally spaced locations thereon.

JOHN W. VAN DYKE.