This invention relates to double deck floating roofs for liquid storage tanks and is concerned more particularly with an improved double deck structure which provides improved drainage from the roof, and enables a stiff roof construction.

The problem of drainage of water from rain or snow from the top of large (100 feet diameter and up) double deck roofs has been a problem, with respect to a large percentage (about 25%) of the area being left with puddles that require several days to dry, the result of such puddles being to ruin the paint and cause corrosion. Therefore, it is highly desirable that a drainage system for such double deck roof structures shall have a minimum drainage run, so that water can be drained off the roof, and disposed of at a desired point without leaving puddles. At the same time, consideration must be given to providing a stiff roof structure and to the cost of the roof structure, and it is desirable to keep the outer portion of greater circumference at a minimum height so as to maintain minimum cost in construction, and to provide increased height of the center portion for greater stiffness and better drainage.

Accordingly, it is a general object of the present invention to provide an improved double deck roof structure for liquid storage tanks of a desired stiffness and having an effective drainage structure with a steep pitch which will dispose of water falling on the roof without undesirable puddles.

Another general object of the invention is to provide an improved method of constructing a floating roof structure of the above type which, in addition to providing effective drainage of the liquid, also provides an additionally stiffening effect in the roof structure.

Another object of the invention is to provide a double deck roof of the above type having substantially funnel-shaped drainage areas or sectors.

Other objects and advantages will be apparent from the following description of a preferred embodiment of the invention, as illustrated in the accompanying drawings, in which:

Figure 1 is a plan view of a tank having a double deck floating roof structure embodying the instant invention, the upper or top deck being partially cut away to illustrate the construction underneath.

Figure 2 is a sectional view taken in a plane indicated by the line 2-2 in Figure 1.

Figure 3 is a schematic plan view of one sector of the roof, showing a topographic map thereof, illustrating the funnel shape of sectors of the structure.

Figure 4 is a partial development view of the intermediate rim or truss, being indicated generally by the curved section line 4-4 in Figure 3.

Referring generally to Figures 1 and 2, the present invention includes a storage tank 10 having a bottom wall 11 and having liquid therein, as indicated by the liquid level 12. Within the tank a double deck floating roof structure is provided of generally circular configuration. The roof structure includes a bottom deck 14 for floating engagement with the liquid in the tank which also provides a base for erecting the supports and rims which control the shape of the drainage surfaces of the top deck 36. Projecting upwardly from the bottom deck 14, an upright cylindrical structure 16 provides an outer rim, secured as by welding to the bottom deck 14. The bottom deck 14 is provided also with an upwardly projecting center support which, in the present instance, is an upright cylindrical structure 18, disposed about a central bottom opening 17 which is closed by a plate 20. Intermediate the cylindrical structure 16 and the center support 18, there is provided a third top deck support structure 19 in the form of a cylindrical structure or truss which projects upwardly from the bottom deck 14, and which has an upper edge of sawtooth construction. Cooperating with the outer rim 16, the center support 18 and the intermediate support structure 19 are a series (four in number) of symmetrical arrays of radial truss structures, rafters, and purlins in a corresponding series of sector-shaped roof or top deck support structure which define the funnel shape of the surface of each sector of the top deck or roof. The sawtooth configuration of the intermediate support structure 19, as seen more clearly in Figure 4, provides alternate high points 21 and low points 22, and radially extending trusses 23 are provided midway between each high point 21 and an adjacent low point 22, there being a pair of trusses 23 for each funnel-shaped sector of the roof supporting structure. Each radial truss may include suitable posts 26 (Figure 2) joined by diagonal cross braces 27, an inner top chord or channel 28 extending between the center support 18 and the intermediate support structure 19, and an outer top chord or channel 29 extending between the intermediate support structure 19 and the outer rim 16. If desired, these radial truss structures, especially the outer portions, may be in the form of solid bulkheads to provide liquid and gas tight compartments for safety. As seen in Figure 1, the roof supporting structure may also include in each sector a pair of purlins 31, and a plurality of radially extending rafters 32 positioned between the purlins 31 and the intermediate support 19, and between the support structure 19 and the outer rim 16. Because of the sawtooth configuration defined by the high points 21 and low points 22 of the intermediate support structure 19, these rafters will have varying pitches depending upon the point of their connection to the intermediate support structure 19.

From the foregoing description, it will be seen that by erecting this roof supporting structure on the bottom deck of the roof, the upper surfaces of these members define in each sector a generally funnel-shaped surface, as illustrated in Figure 3, which shows a typical topographical map of the surface of one sector. It is noted that all points in this defined surface will lead to a more or less central outlet opening 33 adjacent the low point 22 of each sector. The top deck 36 is fabricated preferably from rectangular plates 37, as illustrated more particularly in a portion of Figure 1, which are laid with lapped seams 38, and when applied to the roof structure conform to the outline of its support by varying the shapes of overlapping. Where one of the plates 37 crosses a ridge 38, it may be either preformed in accordance with this location for installation in the top deck, or it may be bent to conform to the desired shape at the time of installation.

Consequently, each sector is defined by high edges extending along a ridge 38 from the outer rim 16 across one of the high points 21 and thence upwardly to the center support 18. From the above description, it will be seen that the plate structure, consisting of the plates 37 when applied to each sector, will form a sector-shaped surface in outline on which all points have a downwa...
slope to a central outlet opening 33 and thus form a funnel-shaped surface in contour which will be free of any puddles. From each outlet opening 33 a discharge pipe 39 extends to a central discharge reservoir formed within the cylindrical structure or center support 18, and a suitable conduit 41 leads from this reservoir to the exterior of the shell or tank 20. It will be noted that the provision of funnel-shaped sectors as drainage surfaces provides a free drainage run from any point thereof to the discharge outlet, and at the same time, because of the removal of limitation on the height of the center support 18, enables a stiffer roof construction at a minimum cost. It will be noted also that the number of discharge outlets required for a double deck floating roof of a given size will be substantially reduced.

While I have shown and described a preferred embodiment of the invention, it will be apparent that the invention is capable of variation and modification from the form shown so that the scope thereof should be limited only by the scope of the appended claims.

I claim:

1. A double deck floating roof for liquid storage tanks of generally circular configuration comprising a circular bottom deck for floating engagement with the liquid in the tank, an upright structure secured around and projecting upwardly from the periphery of said bottom deck to form an outer rim, an upright structure secured to the center of said bottom deck and projecting upwardly therefrom to form a center support, said center support being of greater height than said outer rim, a second cylindrical structure secured to said bottom deck intermediate said center support and said outer rim and forming an intermediate truss, the upper edge of said intermediate rim or truss being of generally sawtooth configuration providing alternate high and low points therearound, at its low points said intermediate truss having of less height than said outer rim or said center support, a top deck structure supported by said outer rim, said center support and said intermediate circular truss, said top deck structure comprising a series of similar surfaces, sector-shaped in outline and funnel-shaped in contour, each having a low point drainage opening adjacent a low point of the upper edge of said intermediate truss, and each having high points with respect to said low point at all edges of the sector shape, and drain means connected to and leading from each of said low points.

2. A double deck floating roof for liquid storage tanks of generally circular configuration comprising a circular bottom deck for floating engagement with the liquid in the tank, an upright structure secured around and projecting upwardly from the periphery of said bottom deck to form an outer rim, an upright structure secured to the center of said bottom deck and projecting upwardly therefrom to form a center support, said center support being of greater height than said outer rim, a second cylindrical structure secured to said bottom deck intermediate said center support and said outer rim and forming an intermediate truss, the upper edge of said intermediate truss and projecting upwardly therefrom to form a center support, said center support being of generally sawtooth configuration, providing evenly spaced alternate high and low points therearound, at its low points said intermediate truss being of less height than said outer rim or said center support, a plurality of similar symmetrically arranged radial truss structures extending from said center support to said outer rim, each radial truss structure being intermediate circular truss substantially midway between adjacent high and low points, a top deck structure supported by said outer rim, said center support and said intermediate circular truss, said top deck structure comprising a series of similar surfaces, sector-shaped in outline and funnel-shaped in contour, each having a low point drainage opening adjacent a low point of the upper edge of said intermediate truss, and each having high points with respect to said low point at all edges of the sector shape, said top deck structure also comprising generally rectangular plates having lapped seams, and drain means connected to and leading from each of said low points.

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