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H. SCHMUCKLER

POLYGONAL TANK

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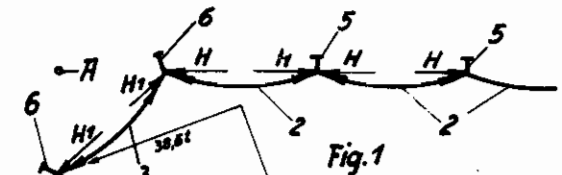
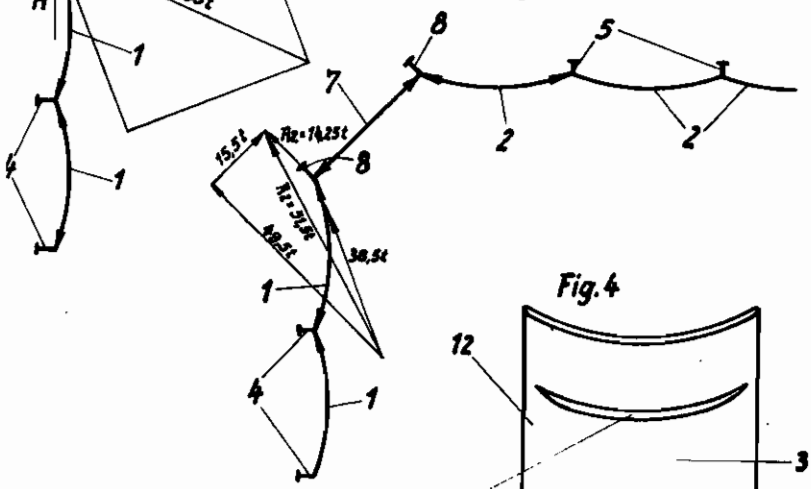
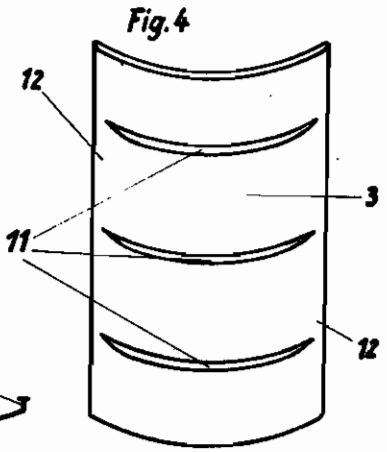
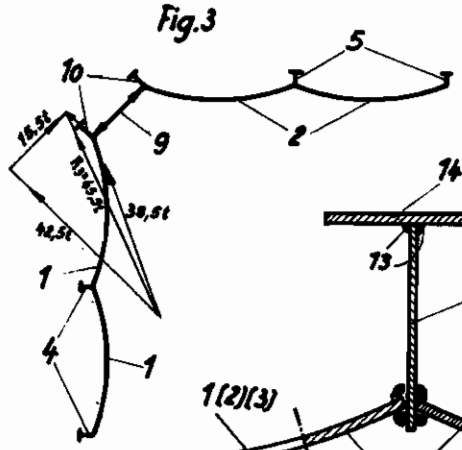
333,240

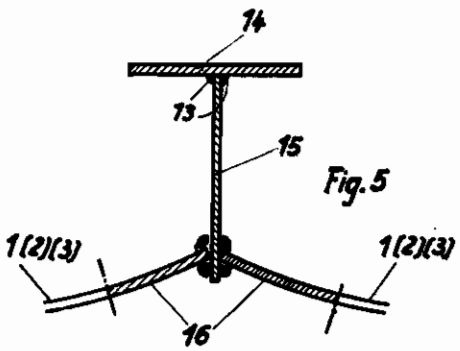
2 Sheets-Sheet 1











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2 Sheets-Sheet 2

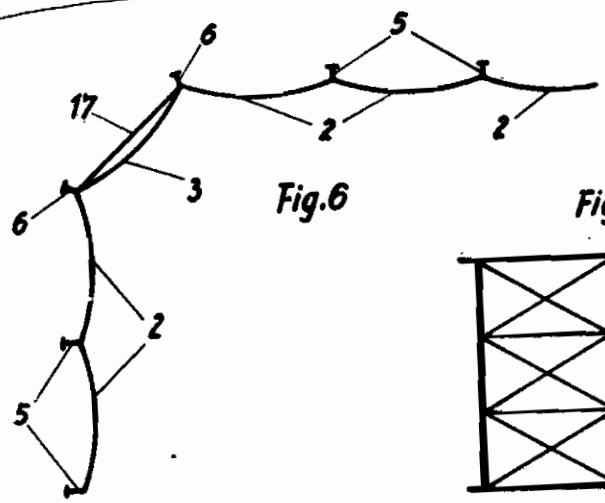

Fig.6

Fig.7

Fig.8

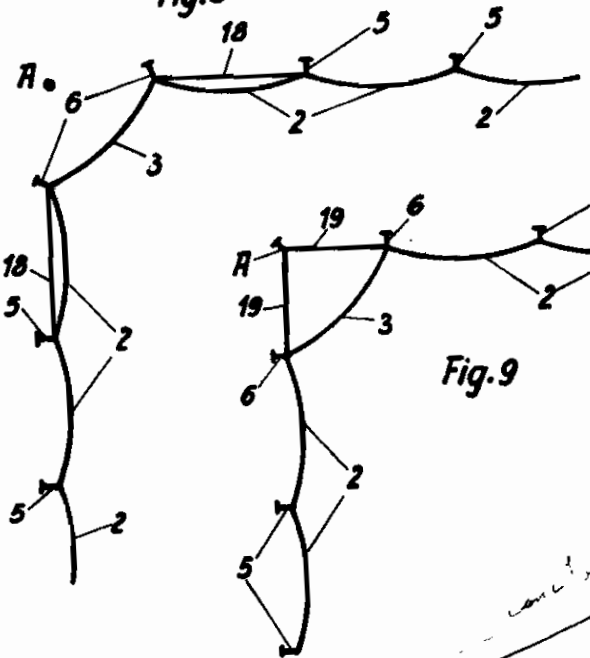

Fig.9

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ALIEN PROPERTY CUSTODIAN

POLYGONAL TANK

Hans Schmuckler, deceased, late of Berlin, Germany, by Walter Grimpe, executor, Berlin-Wilmersdorf, Germany; vested in the Alien Property Custodian

Application filed May 3, 1940

This invention relates to a polygonal tank or vessel comprising arched plates.

Hitherto, rectangular or polygonal tanks have been made, for instance, of flat sheet metal walls and reinorcing girder members. Tanks of this kind, owing to the low resistance moment of the sheet metal, require a plate thickness growing substantially from the upper edge of the tank towards the bottom. Moreover, the wall plates and, more particularly the bottom plates, which are exposed to the heaviest stress, had to be specially reinforced or stiffened by section iron, connected thereto, for instance, by riveting.

It is an important object of the present invention to provide a construction of a tank, saving material and simplifying transport and assemblage of its component parts.

Where arched sheets are used, the reinforcing section iron may be dispensed with. Moreover, owing to the elimination of the bending moments, the stress upon the arched plates is reduced to such an extent that the same plate thickness may be used from top to bottom of the tank.

Also, apart from the considerable savings in material, arched plates do not require any transverse seams, so that no caulking is required. The arched plates may be welded directly to the girders which take up the inner pressure acting upon the tank. In case of riveting, suitable riveting flanges may be provided on the arched plates.

While arched plates are thus very advantageous from some aspects, some difficulties are arising with regard to the corners of the tank, i. e., both at the vertical corner edges between two adjacent walls of the tank as well as at the horizontal corner edges between a side wall of the tank and its bottom.

Each arched plate is acting as a two joint arch, and the horizontal thrusts occurring therein are neutralizing each other in the inner sections.

It is an object of the present invention to provide means for taking up the unilateral horizontal thrusts set up in the corner points of the tank where the horizontal thrusts do not neutralize or balance each other.

With these and further objects in view, as may become apparent from the within disclosures, the invention consists not only in the structures herein pointed out and illustrated by the drawings, but includes further structures coming within the scope of what hereinafter may be claimed.

The character of the invention, however, may be best understood by reference to certain of its structural forms, as illustrated by the accompanying drawings in which:

Fig. 1 is a horizontal cross section through the corner of a polygonal tank, having the invention applied thereto.

Figs. 2 and 3 are similar sections of two modifications.

Fig. 4 is a perspective view of an arched or corner plate having the invention applied thereto, on an enlarged scale.

Fig. 5 is a cross section through a girder by which the interior pressure of the fluid in the tank is taken up.

Figs. 6, 8, and 9 are horizontal cross sections through the corner of further modifications of polygonal tanks.

Fig. 7 is a view of a detail.

Similar reference numerals denote similar parts in the different views.

For a better comprehension of the invention the same has been illustrated in connected with a rectangular water tank having a height of 9 meters.

As will be hereinafter shown, at the corner points of a polygonal tank consisting of arched plates, corner plates are provided in an oblique direction with respect to the walls of the tank, advantageously at an angle of 45°; said corner plates, together with corner girders, having particularly high bending strength and a higher resistance than the rest of the girders and being arranged obliquely to the walls, for taking up the outwardly directed components of load.

Referring now the drawings in greater detail, and first to Fig. 1, it will be noted that one side wall is formed of arched plates 1, and a second side wall, extending at right angles thereto, is formed of arched plates 2, while girders 4 and 5 are provided to take up the interior pressure of the fluid in the tank.

Corner plates 3 are provided at the corners A between the two side walls, advantageously at an angle of 45° with respect to said walls. In the embodiment of Fig. 1, said corner plates are also formed as arched plates and adapted to take up the outwardly directed components of the load, with the aid of stiffening members and corner girders 6 arranged in an oblique position with respect to the side walls. As will be seen from the parallelogram of forces indicated in Fig. 1, the forces H from the arched plates neutralize each other, while the forces H and H_1 are composed to a resultant R_1, that has to be taken up by the corner girders 6, which to this end are

advantageously disposed in the direction of the resultant R_1, as shown in Fig. 1.

Referring now to the embodiment shown in Fig. 2, it will be seen that the corner plate is in this case formed as a plane sheet 7, which, as will be understood, has to be reinforced by members taking up the forces acting in the direction of its plane and at right angles thereto. It will be noted from the resultant R_2, amounting to 51.5 tons, as compared to the resultant R_1 of 55 tons in Fig. 1, that the force set up in this case is lower, which means an advantage of this design over the construction of Fig. 1.

The girders 8 at the corner, Fig. 2 might be disposed in the direction of the resultant R_2, but for constructional reasons they will be preferably arranged perpendicularly to the plane of sheet 7, as shown in the drawing. As indicated by the analysis of forces in Fig. 2, only 49,5 tons are acting upon a girder which is so disposed, as against 55 tons in Fig. 1.

A very advantageous embodiment is shown in Fig. 3, comprising a plane corner plate 9 having a substantially smaller width than the arched plates or the sheet 7 of Fig. 2. As indicated by the diagram of forces, Fig. 3, the resultant in this case is much less than in the embodiments of Figs. 1 and 2, namely 45,5 tons only. As a result, the forces acting upon the corner girders 10, Fig. 3, amounting to 42,5 tons only, are less than the forces acting upon the corner girders 8, Fig. 2.

In the embodiment of Fig. 6, the corner plate 3 is formed as an arched plate, and stiffened by means of a special girder 17 extending over the whole width of the corner plate.

Fig. 7 shows by way of example the construction of the girder in the form of a lattice girder.

In the embodiment shown in Fig. 8, the corner plate is relieved by the provision of a girder 16 on the side wall plates 2 adjacent to the corner plate 3, while in the construction shown in Fig. 9, the corner plate 3 is relieved by the provision of girders 19 extending to the corner point A.

According to a preferred form of the invention, the arched plates of the side walls and, if desired, also the corner plates 3, 7 or 9, resp., may be reinforced or stiffened by means of ribs 11, Fig. 4, formed of the material by a pressing operation and tapering at the marginal regions 12 of the sheets.

According to a further feature of the invention, the girders 4, 5, 6 and 8 and 10 which take up the interior pressure of the fluid in the container are T-shaped in cross section, as shown by the two members 14 and 15, Fig. 5, which are welded together at 13. This T-profile together with the adjacent strips 16 of the sheets 1, 2, 3 of the walls which are not stressed statically forms a double-T-girder.

The invention has been described above with reference to polygonal tanks made of sheets and girders of iron, but it should be noted that the invention applies to tanks of concrete or reinforced concrete material as well.

The present invention renders it practically possible to produce barrel-shaped tanks, more particularly, of larger dimensions, which so far, probably owing to the difficulties involved in the construction of the corners, did not find practical application.

Compared to the tanks now used in practice the novel tanks made in accordance with the present invention offer the following advantages:

1. Considerable savings of material owing to reduced wall thickness of the sheets. A calculation on a practical example has proved a reduction of 60% material, as compared to a tank made of flat sheets.

2. Considrable savings in freight, owing to the fact that the sheets, as a result of the avoidance of the joints, may be shipped in full length directly from the roller mill to the building site.

3. Simplified assemblage and erection.

4. Better appearance compared to round tanks, especially where the smooth surfaces 7, or 9, resp., are provided between the arched plates, in accordance with Figs. 2 and 3.

The method and apparatus of the present invention have been described in detail with reference to specific embodiments. It is to be understood, however, that the invention is not limited by such specific reference but is broader in scope and capable of other embodiments than those specifically described and illustrated in the drawing.

WALTER GRIMPE.