Aug. 2, 1949. H. A. SCHMITZ, JR 2,477,831

LOW PRESSURE CONTAINER

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FIG. 1.

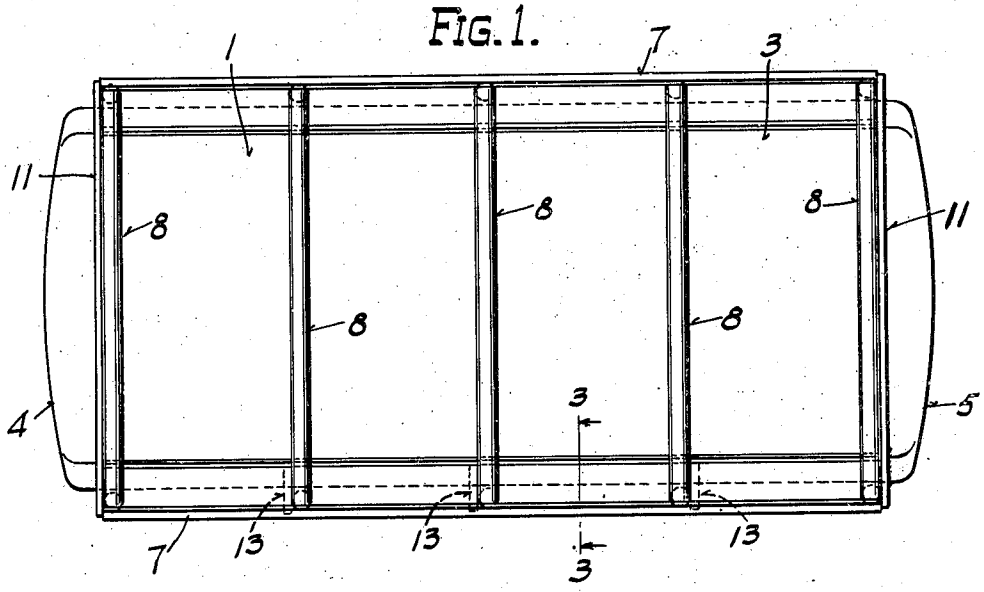

FIG. 2.

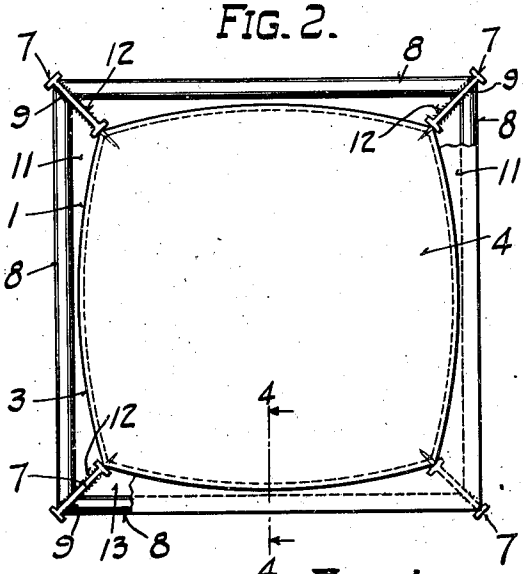

FIG. 3.

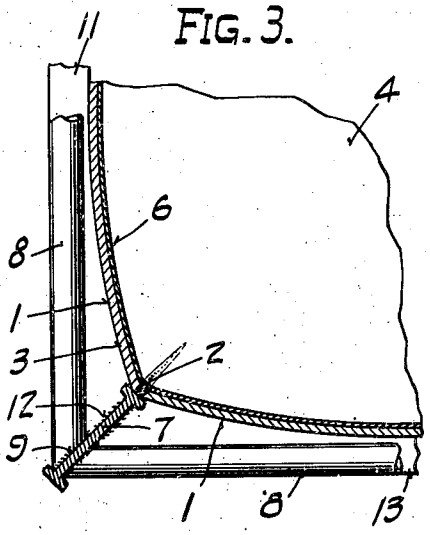

FIG. 4.

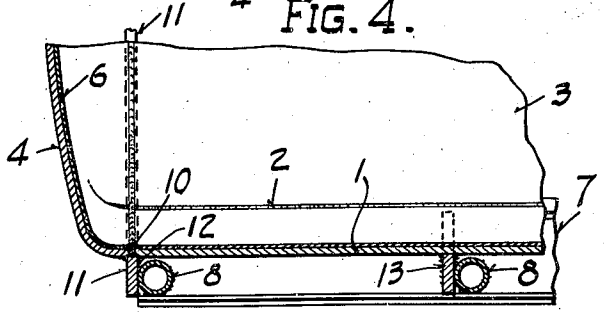

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FIG. 5.

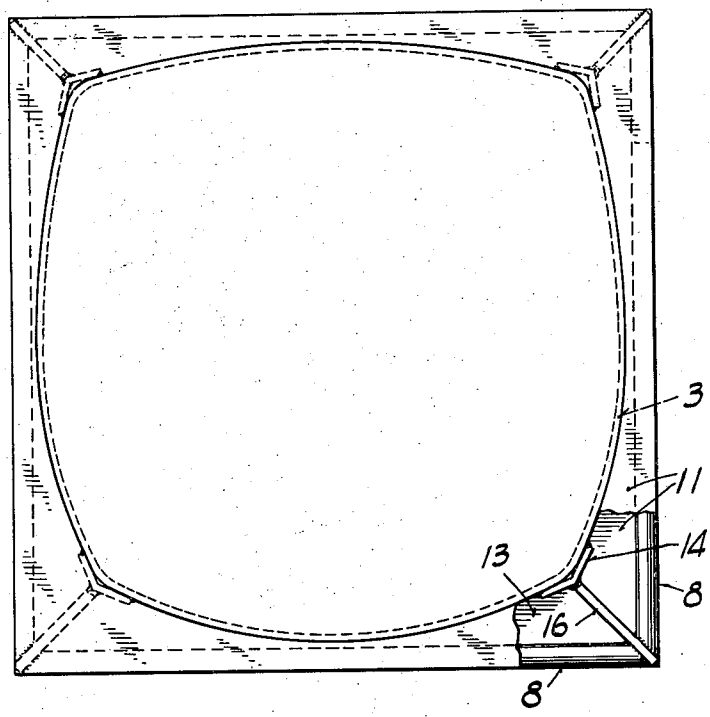


FIG. 6.

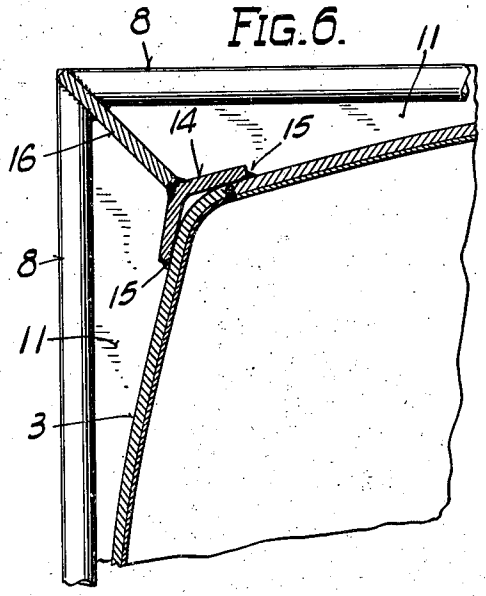
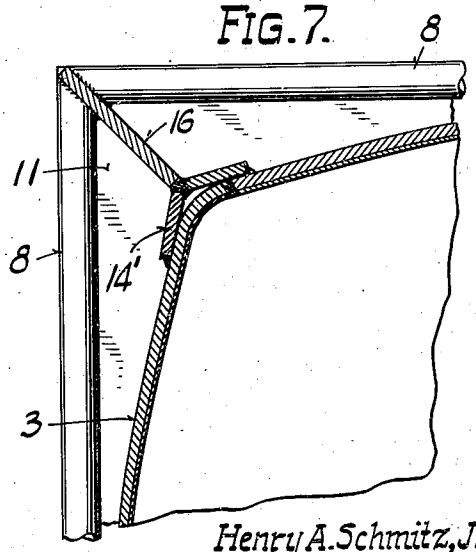


FIG. 7.



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LOW PRESSURE CONTAINER

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6 Claims. (Cl. 220—1)

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This invention relates to a low pressure container or tank and has been applied in the construction of beer fermenters.

One object of the present invention is to provide a low pressure container that is constructed in a manner to economize space and utilize the maximum volumetric capacity of the building in which a group of containers may be located.

Another object is to provide a supporting frame that will support a pressure container of substantially rectangular section.

Another object is to provide a container and supporting structure that is readily insulated.

Another object is to provide a container that may be readily erected in the field and which utilizes the metal most efficiently.

Another object is to provide a container of the class referred to that is easy to clean and which presents a neat appearance.

In general the invention is directed to a container comprising a shell of substantially rectangular section having outwardly curved walls with longitudinal corners supported by longitudinal structural members or the like of substantial width and which are welded to the corners. A series of columns disposed between the adjacent structural members and secured thereto prevent inward movement of the beams in service, and a plate between the head and shell at each end of the vessel to which the ends of the members are welded ties all the structural members of the tank together.

Other objects and advantages of the invention will become apparent from the following description and accompanying drawing.

In the drawing:

Figure 1 is a side elevation of a low pressure container and supporting structure;

Fig. 2 is an end view of Figure 1;

Fig. 3 is a detail sectional view taken on line 3—3 of Fig. 1 and showing a joint between an I-beam and two wall members;

Fig. 4 is a detail section taken on line 4—4 of Fig. 2;

Fig. 5 is an end view similar to Fig. 2 showing a modified form of construction;

Fig. 6 is a detail sectional view of a corner weld and support for the modified form of container; and

Fig. 7 is a similar section of a different type of support for the container.

The low pressure container comprises, in general, four separate outwardly curved or arched wall members 1 joined at their longitudinal meeting edges by welds 2 to provide a generally long

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horizontal shell 3 closed at opposite ends by dished end heads 4 and 5. A suitable lining 6 on the inside of wall members 1 and heads 4 and 5 prevents injury to the metal of the container from corrosion by contained fluid.

The outward curvature of each wall member 1 of shell 3 is preferably sufficient to provide each wall member as a separate segment or section of a generally large circle or cylinder. This curvature combined with the supporting structure to be described herein provides a shell capable of withstanding internal fluid pressure to the same amount as that of a larger cylindrical tank of the same wall thickness and curvature.

The wall members 1 are braced by I-beams 7, or the like, which extend on the outside of shell 3 substantially the length thereof at the respective joints 2 between the wall members. Welds 2, besides joining wall members 1 together, also secure the inner end of the respective I-beam 7 to shell 3 of the vessel at each longitudinal joint area between the wall members. Each weld extends the length of the container.

The I-beams 7 are radially disposed along the longitudinal edges and have a web of sufficient width to absorb the load tension in wall members 1 at the joint areas where the members intersect. The I-beams serve to support the container under pressure in service and prevent excessive deflection that would injure the metal of the container or the lining.

In order to counteract any tendency of I-beams 7 to move inwardly toward the center of the tank under tensioning of wall members 1, a series of pressure receiving columns 8 maintain the I-beams in spaced relation and are joined thereto by welds 9. Each set of columns 8 is preferably arranged in a plane tangential to the adjacent tank wall but out of contact therewith to prevent any loss of heat through the columns from contained fluid. The four sets of columns 8 constitute a rectangular frame surrounding the container.

The heads 4 and 5 are dished to better enable them to withstand pressure in service and are assembled and joined to shell 3 by circumferential butt welds 10.

A flat fin-like plate 11 encircles the container at each end and is welded into the joint 10 between each head and shell 3.

Plate 11 extends outwardly from the joint 10 between the head and shell a distance substantially the height of I-beams 7 and columns 8 and each I-beam is welded to the plate by welds 12 at its ends.

The respective plates 11 at each end of the container act as stiffening members for the entire container since the plates join the heads, shell and I-beams together at the respective circumferential joints 10 between the heads and shell. If desired fins 13 may be welded to the bottom of the tank and extend alongside the transverse columns 8 to reinforce the bottom.

The container may be finally completed by burying I-beams 7 and columns 8 in suitable insulation, not shown, and then employing an outer cover material to confine the insulation and beam structures. The space occupied by the container is rectangular with a maximum volume of fluid content, thereby providing for efficient grouping of like containers in a building.

In Fig. 5 the modified form of tank is shown as having its side walls constructed as a development of a tear-drop shape to compensate for the stress in the lower portion of the wall resulting from the weight of liquid in the tank. The curvature of the side wall is on a progressively shorter radius from the top to the bottom as shown. This form of construction is designed for heavy liquids or mashes and provides a substantially equal stress in the side walls at all points. Similar results could be provided by the use of a tapered wall thickness with the thicker portion at the bottom.

In the same manner, it may be desirable to construct the bottom of thicker plate than the top or of a different curvature to compensate for the weight of the mash. The maximum efficiency is obtained in a structure wherein the top is designed to withstand only the internal fluid pressure while the sides and bottoms are designed to withstand such pressure plus the weight of the liquid involved.

This modified construction is also suitable for open top tanks where no internal pressure is applied and only the weight of the contained mash is considered.

In Figure 6 the container is supported at the longitudinal corners by an angle strip 14 fillet welded at 15 to the wall members 1 of the container. A plate 16 is welded to the center back side of strip 14 and extends radially outward to receive the columns 8. Fig. 7 shows a similar construction except that the strip 14' is constructed of two flat strips welded together at their meeting edges and joined to plate 16.

The containers may be erected in the field and it is possible where containers are disposed side by side to employ a single set of vertical columns 8 to support the beams 7 of adjacent containers.

The inside corners between the plates or wall members 1 may be rounded to facilitate cleaning.

The invention provides a durable low pressure container that finds ready employment particularly where it is desirable to obtain maximum volumetric capacity out of available space, as in brewery fermenters.

Various embodiments of the invention may be employed within the scope of the accompanying claims.

I claim:

1. A low pressure fluid container, comprising a shell of generally rectangular cross section having ends closing the same and in which each wall of the rectangle is curved outwardly as a segment of a generally cylindrical structure having a diameter substantially greater than the maximum cross-sectional dimension of the shell and the adjacent walls are joined at their longitudinal meeting edges, a longitudinal beam member secured on the outside of the shell at each corner joint between the walls, and column members circumferentially of the outside of the shell extending between adjacent beam members and rigidly securing the same against radially inward movement to thereby maintain the walls of the container under tension when subjected to internal fluid pressure.

2. A low pressure fluid container, comprising a shell composed of separate wall members extending longitudinally thereof and each curved outwardly as a segment of a generally cylindrical structure having a diameter substantially greater than the maximum cross-sectional dimension of the shell and having a thickness and strength corresponding to that required in such larger structure to withstand the same internal fluid pressure, welds joining the corresponding longitudinal meeting edges of said wall members at corners of the shell, a head closing each end of the shell, and a frame encircling said container and securing the wall members under circumferential tension when loaded to prevent collapse of same.

3. A low pressure fluid container, comprising a shell composed of separate wall members extending longitudinally thereof and each curved outwardly as a segment of a generally cylindrical structure having a diameter substantially greater than the maximum cross-sectional dimension of the shell and having a thickness and strength corresponding to that required in such larger structure to withstand the same internal fluid pressure, welds joining the corresponding longitudinal meeting edges of said wall members at corners of the shell, a head closing each end of the shell, a longitudinal beam secured to each longitudinal corner of the shell to strengthen the same, and column-like members joining said beams and extending circumferentially of the shell on the outside thereof between corresponding beams to secure the latter rigidly in place and prevent collapse of the same inwardly when the container is subjected to internal fluid pressure.

4. A low pressure fluid container, comprising a shell composed of separate wall members extending longitudinally thereof and each curved outwardly as a segment of a generally cylindrical structure having a diameter substantially greater than the maximum cross-sectional dimension of the shell and having a thickness and strength corresponding to that required in such larger structure to withstand the same internal fluid pressure, welds joining the corresponding longitudinal meeting edges of said wall members at corners of the shell, a head closing each end of the shell, a longitudinal beam secured to each longitudinal corner of the shell to strengthen the same, and column-like members joining said beams and extending circumferentially of the shell on the outside thereof between corresponding beams to secure the latter rigidly in place and prevent collapse of the same inwardly when the container is subjected to internal fluid pressure, and an end plate at each end of the container welded thereto at the joint between the corresponding head and shell and welded to the ends of said beams.

5. A brewery fermenting tank or the like, adapted to be grouped with like tanks in a building and shaped to provide volume capacity greater than would be possible with cylindrical tanks and to provide suitable space for insulation be-

tween the tanks, comprising a shell of generally rectangular cross section with heads closing its ends and composed of four longitudinally extending walls joined by welds at the respective corners, each longitudinal wall of the shell being curved outwardly as a segment of a cylinder having a diameter greater than the maximum cross-sectional dimension of the shell, and a rectangular framework surrounding and supporting said shell and including longitudinal beams welded to the shell at each corner thereof, and a plurality of circumferentially extending column-like members spaced longitudinally of the beams and secured to corresponding beams at their ends to rigidly secure the same against collapse, said column-like members being spaced from the walls of the shell and together with said beams defining a rectangular shaped space surrounding said shell for receiving insulation.

6. A low pressure fluid container of the class described made up of separate top, bottom and side wall members, each curved on a substantially larger radius than the general radius of the container, end walls therefor, and means joining and rigidly holding the members at their longitudinal meeting edges and securing said end walls thereto, the curvature of the top and bottom members having a single radius to constitute the same as cylindrical segments, and the curvature of the side wall members being developed with a varying radii, greatest in the upper portion and smallest in the lower portion, to provide more equal stress in the wall resulting from the internal fluid pressure and the weight of the liquid contained in the container.

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