Oct. 3, 1933. H. C. BOARDMAN 1,928,640

CONTAINER

Filed July 27, 1931 2 Sheets-Sheet 1

Fig. 1.

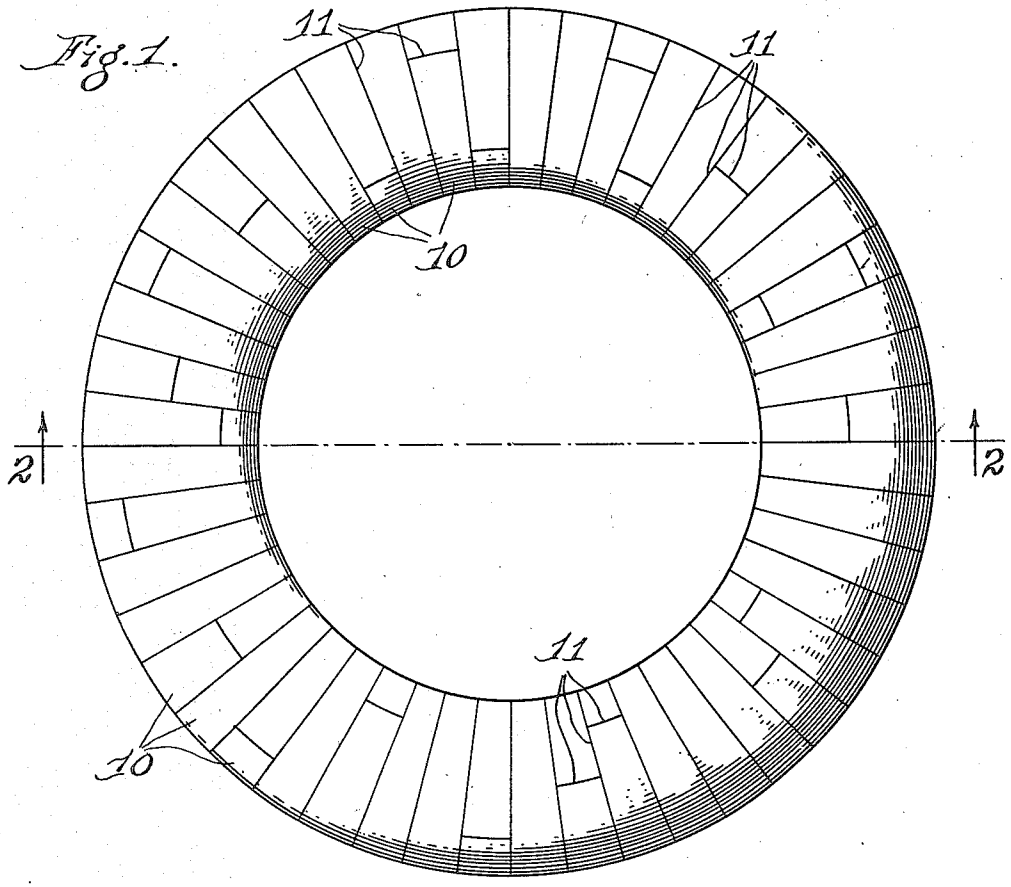
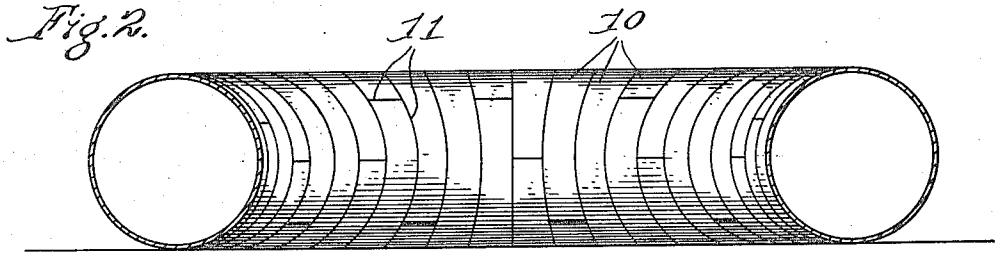


Fig. 2.



Inventor:
Harry C. Boardman.
By Dyrenforth, Lee, Christy & Wiles.
Attys.

Oct. 3, 1933. H. C. BOARDMAN 1,928,640

CONTAINER

Filed July 27, 1931 2 Sheets-Sheet 2

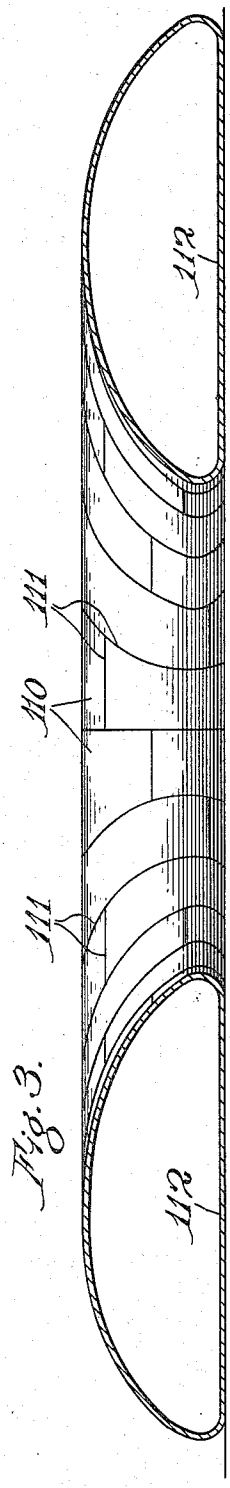


Fig. 3.

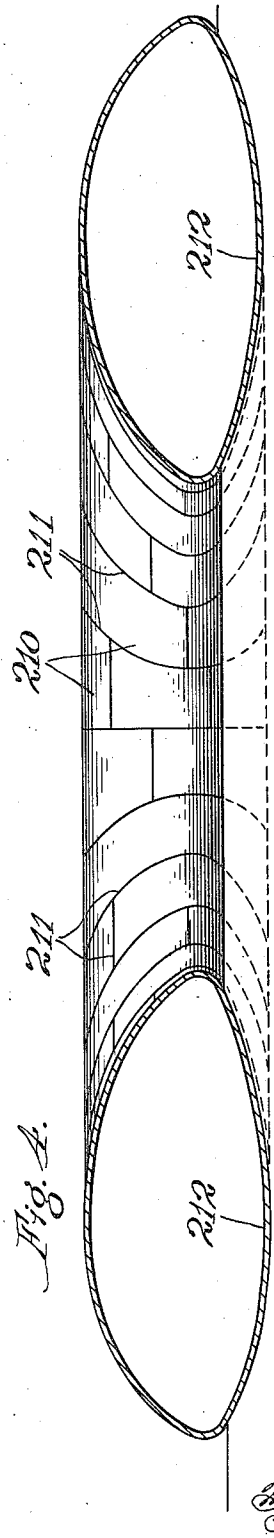


Fig. 4.

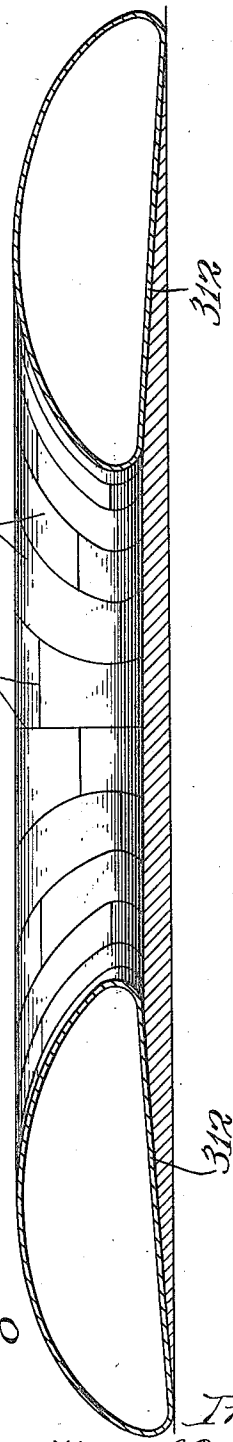


Fig. 5.

Inventor:
Harry C. Boardman.
By Dyrenforth, Lee, Christian & Wiles.
Attys.

Patented Oct. 3, 1933

1,928,640

UNITED STATES PATENT OFFICE

1,928,640

CONTAINER

Harry C. Boardman, Chicago, Ill., assignor to Chicago Bridge & Iron Company, a corporation of Illinois

Application July 27, 1931. Serial No. 553,424

4 Claims. (Cl. 220—1)

This invention relates to improvements in containers and more especially containers adapted for holding gases, liquids, or liquids and gases, under pressure. My invention is especially applicable for use in connection with sheet metal containers of relatively large size.

By the use of my invention, containers of the character referred to may be built so that the sheet metal plates thereof require a relatively small amount of dishing. That is, in the practice of my invention the sheet metal plates of which the container is formed are all rolled so that the curvature thereof lies substantially in one plane. In some cases such curvature will also conform to a single fixed radius.

It is well known that containers of the character referred to, designated a hold pressure, must have curved walls instead of flat ones. For example, in the case of holding gas pressure only, where there is no weight of liquid or liquid head to be considered, the ideal shape is spherical. Containers of this shape, however, are rather expensive to build, and the support of the same is difficult. A cylindrical container is much cheaper and easier to build and support; and is just as good as far as holding pressure is concerned, except for the problem of closing the ends. The plates of a cylindrical container need not be dished at all and may be rolled with a curvature in one plane only and that on a fixed radius. When it comes to closing the ends, however, the same difficulty is experienced as in connection with the making of a sphere. That is, the ends must be substantially spherical in shape, which requires the dishing of the plates the same as in the case of the plates of a sphere. The principal feature of my invention is the making of a container for holding gases under pressure in such shape that this difficulty of closing the ends is eliminated.

Although I have referred to containers for holding gases under pressure, my invention is also useful with some modifications in connection with the making of containers adapted to be partly filled with liquids, for example, volatile liquids, where there is also a certain amount of internal or gas pressure to be held.

In those forms of devices embodying the features of my invention shown in the accompanying drawings—

Figure 1 is a top plane view; Fig. 2 is a view taken as indicated by the line 2—2 of Fig. 1; Fig. 3 is a view similar to Fig. 2 showing a modified form; Fig. 4 is a view similar to Fig. 2 showing another modification; and, Fig. 5 is a view similar to Fig. 2 showing a third modification.

As shown in the drawings, the containers illustrated in Figs. 1 and 2 are primarily adapted for holding gases only. The container here shown is in the shape of a torus, or a solid generated by the revolution of a circle about an axis in its plane (extended). In simple language, the container is in the shape of a doughnut. As shown in Figs. 1 and 2, the torus is made of a plurality of sheet metal plates 10, 10 with their adjacent edges fastened together to form seams 11, 11 by welding, riveting, or any other desired method. It will be seen that each of the plates 10 requires very little dishing. These plates may be made relatively narrow and long so that such dishing is not of much consequence. By increasing the diameter of the torus it is evident also that the amount of dishing in the plates may be decreased. That is, as the diameter of the torus is increased, the container becomes more nearly cylindrical so that the plates 10 forming the shell or wall thereof may be made by curving the same substantially in one plane. In general, it may be stated that the container is substantially cylindrical in shape, but curved so that its ends are joined; thus eliminating the difficulty of closing the ends by curved or spherical walls. Each of the plates 10 is preferably relatively long and narrow, and the separate plates 10 are radially arranged in forming the torus, instead of circumferentially arranged. By radially arranged, I mean that a vertical central section of the torus will cut the plates lengthwise instead of cross-wise.

The modified forms shown in Figs. 3, 4 and 5 are especially adapted for holding volatile liquids in which the gas pressure is to be confined. A detailed description of these forms is not necessary. It will suffice to say that they are substantially the same as the containers shown in Figs. 1 and 2, except that the torus is somewhat flattened. This flattening is advisable in cases where there is to be some liquid in the container. I need not describe the exact curvature of the section. Such curvature may be substantially as shown in either of Figs. 3, 4 or 5. If desired, the curvature may be the same as the curvature of the cross-section of the container shown in Horton Patent No. 1,622,787 of March 29, 1927.

In Figs. 3, 4, and 5, the sheet metal plates are indicated respectively by 110, 210 and 310; and the seams by 111, 211 and 311, respectively. The container of Fig. 3 is provided with a substantially flat bottom 112; that of Fig. 3 with a

curved or rounded bottom 212. The container of Fig. 5 has a flat bottom 312 that is slanted upwardly and inwardly. It will be found that if the curvature of the section be computed from the formula

$$r_2 = \frac{T}{P - \frac{T}{r_1}}$$

as explained in the patent above referred to, a flat bottom will not be horizontal. This is due to the fact that a horizontal plane tangent to the lowest point of the inner portion of the curve is not co-existent with a horizontal plane tangent to the lowest point of the outer portion of the curve. The bottom, therefore, will slant upwardly and inwardly as shown in Fig. 5.

While I have shown and described certain embodiments of my invention, 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 my invention as disclosed in the appended claims, in which it is my intention to claim all novelty inherent in my invention as broadly as permissible, in view of the prior art.

What I regard as new, and desire to secure by Letters Patent, is:

1. A closed pressure container in the shape of a torus with its wall formed of sheet metal plates, said plates being relatively long and narrow and radially arranged.

2. A closed pressure container in the shape of a flattened torus with its wall formed of sheet metal plates, said plates being relatively long and narrow and radially arranged.

3. A closed pressure container in the shape of a flattened torus with rounded bottom with its wall formed of sheet metal plates, said plates being relatively long and narrow and radially arranged.

4. A closed pressure container in the shape of a flattened torus with its bottom slanted upwardly and inwardly and with its wall formed of sheet metal plates, said plates being relatively long and narrow and radially arranged.

HARRY C. BOARDMAN.