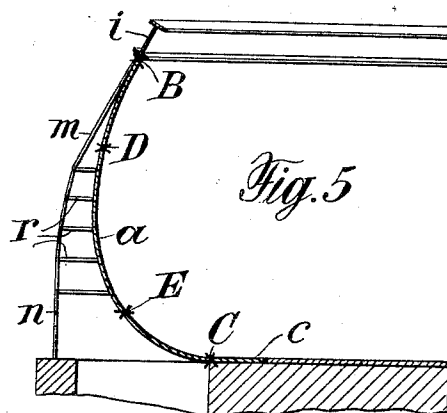
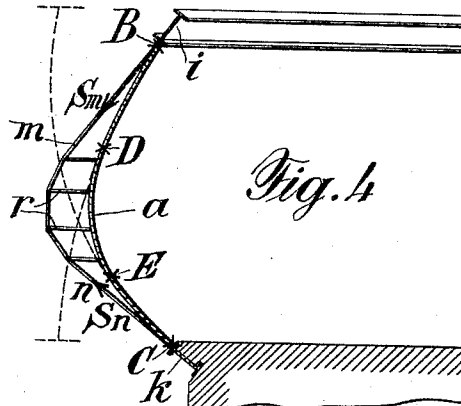
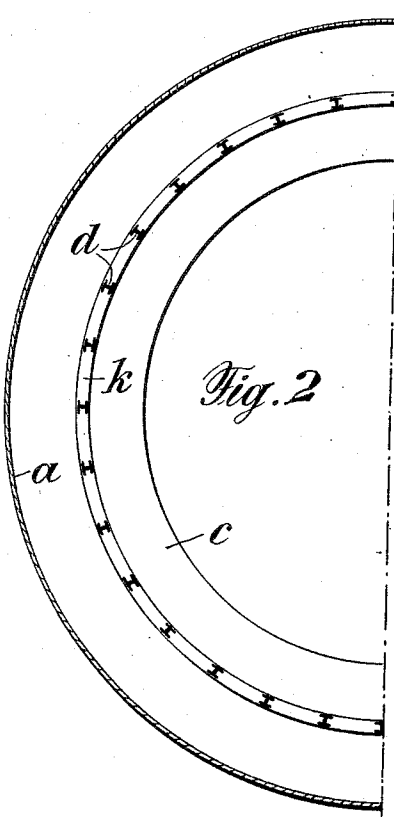
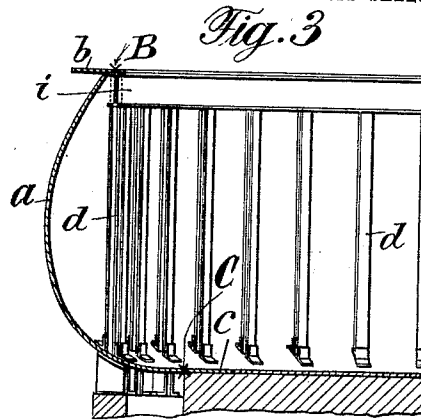
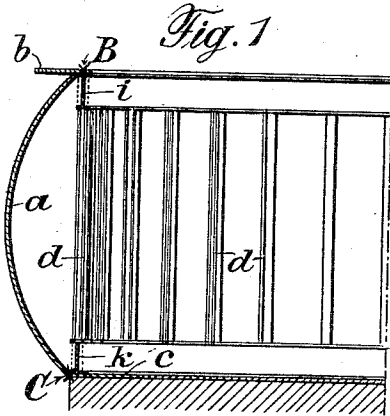


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LIQUID CONTAINER.
APPLICATION FILED JULY 19, 1911.

1,044,672.

Patented Nov. 19, 1912.

2 SHEETS—SHEET 1.



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2 SHEETS—SHEET 2.

Fig. 8.

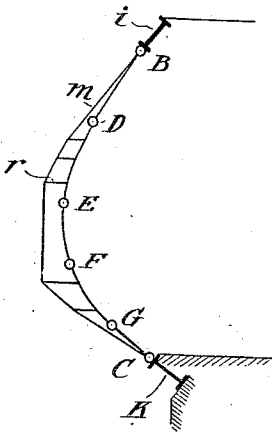


Fig. 9.

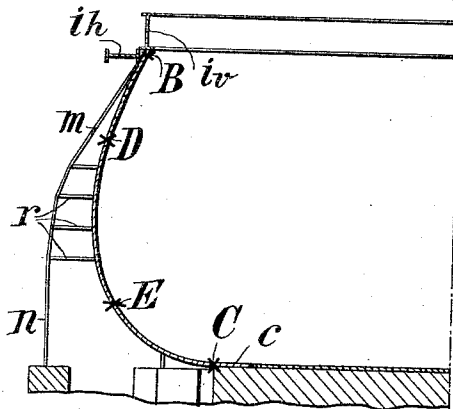
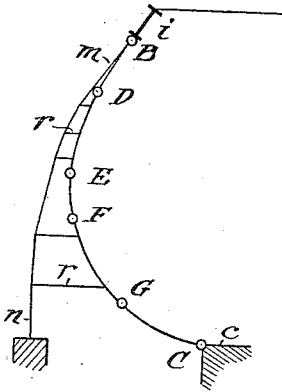


Fig. 6.

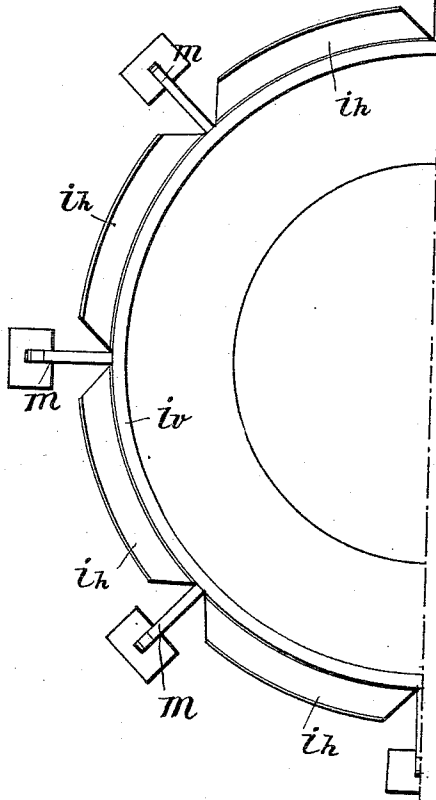


Fig. 7.

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UNITED STATES PATENT OFFICE.

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LIQUID-CONTAINER.

1,044,672.

Specification of Letters Patent.

Patented Nov. 19, 1912.

Application filed July 19, 1911. Serial No. 639,419.

To all whom it may concern:

Be it known that I, KARL LÖHLE, a citizen of the Republic of Switzerland, residing at Zürich, Switzerland, have invented new and useful Improvements in Liquid-Containers; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to letters or figures of reference marked thereon, which form a part of this specification.

This invention relates to wall structures for liquid containers or reservoirs of the type in which the wall surface has the form of a surface of revolution and has its upper and lower peripheral edges braced or supported, so that stresses act in meridional direction. It is customary to make the curvature of the wall that of the funicular or equilibrium curve of the pressure of the liquid, so that the circumferential or tangential tensions in the wall are zero. The support or bracing of the upper and lower parallel rings which constitute the upper and lower edges of the wall is effected in known constructions by means of upper and lower beams held up by means of vertical struts arranged in sufficient number around the container circumference. In the special case in which the wall curvature is tangential to the bottom or lower ring of the container, the lower beams are omitted.

In wall structures of the above type the dimensions of the upper and lower rings increase in the same proportion as the radius of the container, and thus become excessively large for containers of considerable radius.

It is the object of the present invention to provide an improved wall structure, by means of which this drawback is overcome.

The invention consists in an improved liquid container of the above type, in which at least the upper edge of the wall is supported by inclined beams, at least one annular wall zone has radii of curvature smaller than those of the funicular curve of liquid pressure, struts arranged like the sides of a polygon support said inclined beams, and tension members connect the angles of said polygon to said annular zone of the wall. The tension members cause tangential pull stresses in the annular wall

zone, while by the described form of the said zone compression stresses wholly or partly eliminate the tensile stresses developed by the tension members.

In the accompanying diagrammatic drawings—Figures 1, 2 and 3 are views of well-known wall structures. Figs. 4, 5 and 6, illustrate in section three wall structures according to the present invention. Fig. 7 is a partial plan view of the structure shown in Fig. 6. Figs. 8 and 9 illustrate in section two other structures according to this invention.

In known constructions as illustrated in Figs. 1 and 2, the upper and lower parallel rings *b* and *c* are supported by means of upper and lower beams *i* and *k* held up by means of vertical struts *d*. In Fig. 3, in which the wall curvature is tangential to the bottom or lower ring *c* of the container, the lower beams *k* being omitted.

In carrying out my invention the beams *i* and *k* are placed inclined so that they touch the wall curvature at the points B and C, while the struts are arranged not upright but inclined, approximately as extensions of meridional sections through the webs of the beams *i* and *k*, see Fig. 4. The beams *i* are supported by struts *m* and the beams *k* held down by struts *n*. The beams *i* exert on each strut *m* a force S^m . This force S^m is the resultant of the forces of two adjacent beams *i* on the support, and it is necessary to arrange the strut *m* in the direction of the force S^m . The struts *m* and *n* are connected by other struts arranged like the sides of a polygon, of which the angles are connected to the container wall by tension members *r*, which are shown on the drawing to be horizontal. A force is transmitted to the strut *n* which force acts in opposition to the force S^m , which is the resultant of the forces of two adjacent beams *k* on the support.

The tension members *r* cause tangential tensile stresses in the wall zone D, E, which may be largely or entirely eliminated by suitable design of the wall curvature at this part. If the radii of curvature of the wall zone D E are coincident with the radii of the funicular curve of liquid pressure, then the tangential stresses are zero, but if the radii of curvature of the zone D E are smaller than the radii of the funicular curve of liquid pressure, then tangential compres-

sion stresses are produced in the said zone, and by trial the form of the section of D E may be made such that the compression stresses are so large that any desired proportion of the tensile stresses developed by the tension bars r may be eliminated. By this means the material of the ring b and a large part of that for the ring c may be saved. The parts of the wall between the points B and D, and E and C may be derived from the same funicular curve of liquid pressure or may be made up of different curves.

Obviously, there may be more than one pressure zone. In Figs. 8 and 9 are shown two constructions in which the wall has two annular pressure zones, viz. D E and F G, that is, zones in which the radii of curvature are smaller than those of the funicular curve of liquid pressure.

When the wall curvature is to be designed tangential at C to the receiver bottom, the lower members of the struts m are best made vertical, as shown in Fig. 5, and the ring c designed in the usual manner. In this case saving of material is effected in the ring b only. The pressure zone is again D E.

In some circumstances it is of advantage to replace the inclined beam i by a component vertical beam i^v and the horizontal beam i^h as shown in Figs. 6 and 7. The dimensions of the beam i^h depend, with the exception of the load, only on the spacing of the struts m and not on the radius of the container.

I claim—

1. In a liquid container having a wall surface, formed as a surface of revolution having at least one annular wall zone in which the radii of curvature are made smaller than those of the funicular curve of liquid pressure, inclined beams supporting at least the upper edge of the wall, struts arranged like the sides of a polygon supporting said inclined beams, and tension members connecting the angles of the polygon to said annular zone of the wall.

2. In a liquid container having a wall surface, formed as a surface of revolution having at least one annular wall zone in which the radii of curvature are made smaller than those of the funicular curve of liquid pressure to develop tangential compression stresses in said zone, inclined beams supporting at least the upper edge of the wall, struts arranged like the sides of a polygon supporting said inclined beams, and tension members connecting the angles of the polygon to said annular zone of the wall and causing tangential tensile stresses in said annular wall zone, which at least in part neutralize said compression stresses.

In testimony that I claim the foregoing as my invention, I have signed my name in presence of two subscribing witnesses.

KARL LÖHLE.

Witnesses:

JULIUS P. HEINZ,
AUGUST RÜEGG.