

**Dec. 1, 1959**

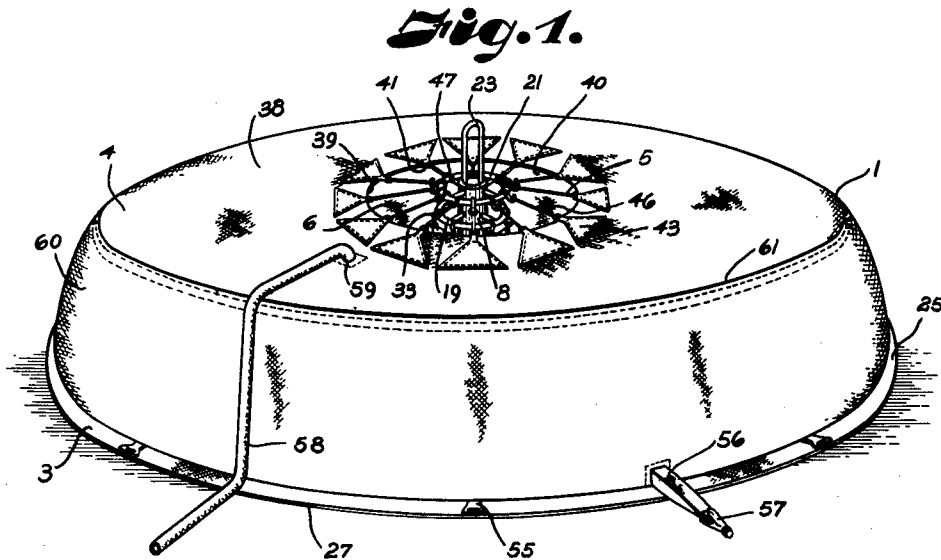
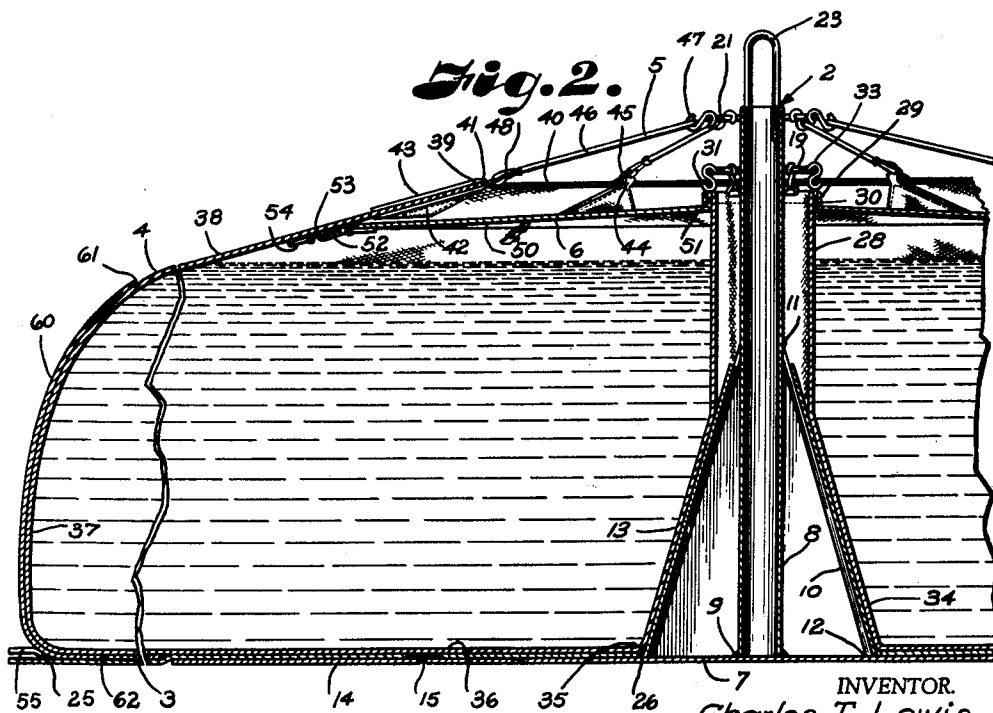
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**2,915,097**

## PORTABLE COLLAPSIBLE TANK

Filed July 23, 1958

2 Sheets-Sheet 1



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PORTABLE COLLAPSIBLE TANK

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2 Sheets-Sheet 2

**Fig. 3.**

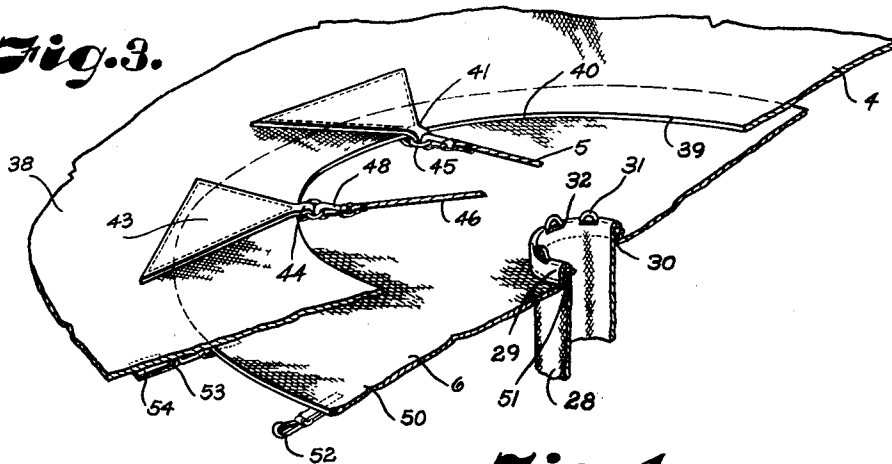


**Fig. 4.**

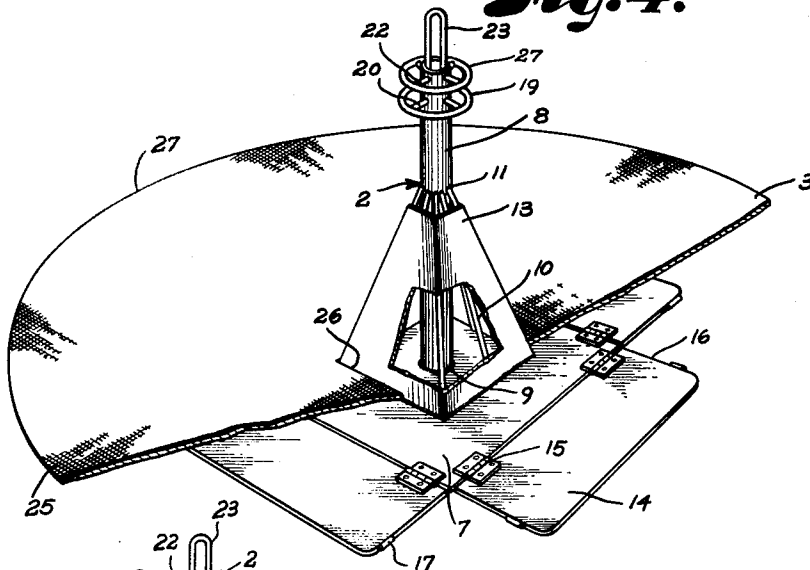
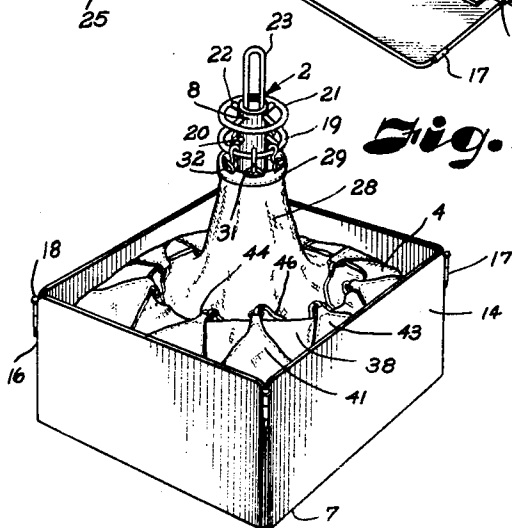


**Fig. 5.**



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## PORTABLE COLLAPSIBLE TANK

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Application July 23, 1958, Serial No. 750,324

8 Claims. (Cl. 150—5)

This invention relates to portable collapsible tanks, and more particularly to a novel, portable collapsible containing structure that is quickly erected for temporary storage of large volumes of flowable materials such as liquids, grain and the like.

Large volumes of storage capacity for temporary storage of flowable material, such as liquids, grain and the like, are frequently required wherein the volume to be stored may vary from a few thousand gallons to well over one hundred thousand gallons. The transportation of round steel storage tanks and the expense of erection thereof has presented a very difficult problem, particularly as the storage may be used only for a few hours at each location. Large collapsible elongate tanks of rubberized fabric have been used, but such tanks, due to the absence of supporting structures and anchors, tend to roll on uneven ground or when subjected to wind, and such tanks tend to creep in response to the tendency of the liquids to spread and stretch the tank to the downhill side. Separate peripheral supporting members have been used with such collapsible tanks to aid in retaining the tank in position with the resultant increased cost.

The principal objects of the present invention are to provide a novel, economical, safe temporary storage of relatively large volume of water or other flowable materials which overcomes the above-mentioned difficulties; to provide such a storage structure that is portable and collapsible, with a support that is held in position by the weight of the material in the tank; to provide such a structure with a post support and flexible tension members from the post to the tank walls to distribute the stress imparted by the volume of flowable material contained in the tank; to provide such a structure with a ground cover sheet extending slightly beyond the normal periphery of the tank to form a load-bearing member between the ground or tank supporting surface and the tank bottom; to provide such a structure wherein the post has a base with foldable extensions and the flexible waterproof fabric of the tank may be folded thereover and the extensions hinged upwardly to form a container for the flexible tank structure to facilitate lifting and transportation thereof from one location to another; to provide such a portable collapsible storage tank with a top closure for the storage compartment; and to provide such a portable collapsible storage tank that is easily and quickly erected for use and then knocked down for transportation to another location and that is economical to repair and maintain.

Other objects and advantages of this invention will become apparent from the following description taken in connection with the accompanying drawings, wherein are set forth by way of illustration and example certain embodiments of this invention.

Fig. 1 is a perspective view of a portable collapsible storage tank embodying the features of the present invention in erected condition.

Fig. 2 is a partial vertical sectional view through the tank structure in erected condition.

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Fig. 3 is a detail partial perspective view of the upper portion of the tank structure and cover with portions broken away to illustrate the structure thereof.

Fig. 4 is a perspective view of the post structure and ground cover sheet.

Fig. 5 is a perspective view of the tank structure in collapsed position for transportation.

Referring more in detail to the drawings:

The numeral 1 designates a portable collapsible storage tank generally consisting of a support or post structure 2, a ground cover sheet 3, a flexible tank wall member 4, radial stress distribution members 5, and top closure 6.

The support or post structure 2 extends upwardly from a tank supporting surface or ground to serve as an anchor member and preferably includes a base or foot plate 7 with an upright tubular post 8 suitably secured to the plate 7 substantially centrally thereof as by welding at 9 and extending upwardly therefrom. The post is reinforced by a plurality of brace rods 10 each of which has upper ends suitably secured to the post as at 11, and the lower ends secured to the base plate 7 in spaced relation to the bottom of the post as at 12. A substantial portion of the brace rods 10 is enclosed by a housing 13 consisting of a plurality of metal sheets which are inclined upwardly and inwardly to form substantially the frustum of a pyramid and provide a smooth support for the adjacent walls of the tank member 4, as later described. Side panels or foot extensions 14 are arranged at each edge of the base plate 7 and hingedly connected thereto by suitable hinge members 15 whereby the side panels 14 may be hinged upwardly to form sides of a box-like structure for containing the components of the tank structure. Each of the side edges 16 of the panels 14 are provided with cooperating tubular members 17 which align when the panels are in upright position whereby the tubular members are adapted to receive pins 18 to hold the panels in upright position during transportation of the unit. All edges of the foot plate 7, housing 13 and panels 14 are preferably smooth and rounded to eliminate any damage or puncturing of the tank member 4. A support or ring member 19 is arranged concentrically of the post 8 and is mounted thereon by spoke-like members 20 whereby the ring member 19 is spaced from the base plate 7 slightly more than the height of the walls of the tank, as later described. Above the ring member 19 is a second ring or support member 21 also mounted on the upper portion of the post 8 by spoke-like members 22. A U-shaped rod or the like is secured to the upper end of the post 8 and extends upwardly therefrom to provide a clevis 23 for attachment of a lifting member for lifting the structure onto a truck or other transporting member.

When the tank is being erected, the entire center post assembly 2 is preferably set on suitable ground, and the panels 14 hinged outwardly to lay flat on the ground. A ground cover sheet 25 is made of suitable flexible material such as fabric treated with a flexible waterproofing material such as synthetic rubber or resin whereby the fabric is substantially waterproof; for example, the fabric may be of nylon covered with a neoprene to make a strong, durable, waterproof fabric. The cover sheet 25 has an opening 26 at the center thereof whereby it can be sleeved over the center post and lie on the base plate 7, and the panels 14 with the inner edges at the opening 26 lying against the lower ends of the housing 13. The outer periphery 27 of the cover sheet extends outwardly from the center post on the ground and substantially corresponds in shape to the shape of the tank and is of slightly larger area. In the illustrated structure, the tank and cover cloth are shown as being circular; however, it can be made oval or other desired shapes, or the entire

tank could have one or more of the center post structures if the length were large relative to the width, as in a long oval structure.

The tank wall member 4, as is illustrated in Figs. 1 and 2, is formed of a suitable flexible waterproof material such as a coated fabric, for example, nylon coated with a synthetic rubber or resin such as neoprene. The tank wall assembly includes a tubular portion 28 slightly larger in diameter than the rings 19 and 21 whereby it may be sleeved over the upper end of the post structure. The upper end of the tubular portion 28 is folded over itself and secured as at 29 to form a loop 30 in which is located a suitable metal ring or cable 31, the loop 30 having spaced openings 32 therein exposing the ring 31. Connectors 33 such as S-hooks, snaps or the like, are connected to the ring 31 at the openings 32 and adapted to be connected to the ring member 19 to support the tubular portion 28 in upright surrounding relation on the post structure. The upper portion of the tubular member 28 is illustrated as being cylindrical with the lower portion 34 being of a cross section to fit over the housing 13 with the inner surfaces of the walls of the portion 34 lying against the outer surface of the housing 13. The tank wall member 4 is preferably formed of strips of the coated fabric of available widths with the marginal edges suitably secured together as by adhesive to form an integral continuous tank wall member of the desired shape. The tubular portion 28 and the lower portion 34 thereof are a portion of the wall member 4 with the lower end of the tubular portion 34 suitably connected or turned outwardly as at 35 in a bottom wall portion 36 whereby said bottom wall portion extends outwardly therefrom to adjacent the peripheral edges of the ground cover sheet and then turns upwardly in a peripheral wall portion 37 with the upper portion thereof curved inwardly and upwardly in a top wall portion 38 which when the tank is filled slopes upwardly and inwardly toward the ring 21, as illustrated in Fig. 2. The top wall 38 terminates in an edge 39 defining a top opening 40. While the top opening 40 may be of any suitable size, it is preferable that it be relatively small, for example, with a diameter of  $\frac{1}{4}$  or less than the diameter of the tank. It is also preferable that the edges 39 be substantially equally spaced from the post 8. A plurality of tabs 41 are substantially equally spaced around the edge 39 of the top wall portion and preferably consist of portions 42 and 43 secured to the inner and outer faces respectively of said top wall portion adjacent the opening 40 and connected to define loops 44 in each of which is preferably secured a ring 45 to define anchoring members for radial support members or flexible members such as wire rope 46. It is preferable that the flexible members each have their inner ends secured by connectors 47 such as S-hooks to the rings 21, the outer ends of said flexible members preferably having snaps 48 for removable connection with the rings 45 on the respective tabs 41.

The tank may be such that the opening 40 may be left open; however, in many instances, the contents of the tank may be such that it is desired to provide a cover thereover to prevent foreign materials from entering through the opening 40 into said contents, prevent liquids from splashing out of the tank and/or to reduce evaporation. Such a splash top closure or cover 50 is disposed within the interior of the tank and has an opening whereby the margins defining the opening are secured to the upper edge portions of the tubular tank portion 28 as at 51. The cover extends outwardly and has its outer margin provided with suitable fastening devices such as snaps 52 which may be removably connected to rings 53 suitably secured as by tabs 54 on the inner surface of the top wall portion 38 of the tank wall structure. While the cover 50 is illustrated as being pulled taut in Fig. 2, it is to be understood that it may also be a larger size whereby it will extend downwardly in the intermediate

portions and substantially float on the surface of the material in the tank. A plurality of spaced tabs 55 are preferably suitably secured as by suitable adhesive to the bottom portion 36 of the tank adjacent the outer periphery thereof whereby said tabs 55 may be grasped during erection of the tank to pull the bottom portion into flat substantially smooth overlying relation to the cover sheet 25.

The tank wall portion 4 preferably has a drain connection 56 arranged in the peripheral portion 37 adjacent the bottom wall portion 36. The drain connection may be of a tubular member formed of similar flexible fabric from which the walls of the tank are formed, said drain connection being suitably secured to the tank wall and with the outer end adapted to be closed as by a clamp 57 while the tank is in use whereby releasing of the clamp from the drain connection will open same and allow the flowable material to be drained from the tank.

For facilitating filling of the tank, a suitable hose or the like 58 or other tubular member is connected as at 59 to the top wall portion 38 outside the periphery of the cover member 50 whereby material to be stored in the tank may be pumped through the fill hose 58 into said tank interior.

The walls of the tank structure 4 are suitably connected and sealed together to form a watertight structure and is such that if abraded or punctured it may be patched or otherwise suitably repaired for continued use. Also, the walls of the tank structure 4, particularly in smaller size tanks, may be a single thickness of suitable flexible fabric such as nylon covered with a neoprene, or may be a plurality of plies of such fabric suitably adhered together in a strong, durable waterproof fabric. However, in large tanks, for economy of material, and yet provide sufficient strength for withstanding the stress applied to said wall portion, it is preferable that an additional peripheral wall ply 60 be applied to the tank wall member. The reinforcing peripheral wall portion 60 extends around the entire periphery of the tank and terminates at its upper edge 61 substantially at the normal full level of the liquid or flowable material in the tank. The lower portion of the reinforcing wall member 60 extends inwardly under the bottom wall portion 36 as at 62 to reinforce the outer portion thereof.

In assembling the components of the tank structure, the base 7 is arranged on the ground with the post 8 extending upwardly therefrom and the panels 14 swung outwardly from the base plate 7. The ground cover sheet 25 is then placed over the center post and laid flat. The fabric tank member 4 is then arranged relative to the center post and the tubular portions 28 and 34 sleeved over said post, and the connectors 33 connected to the ring 19. The cables 46 are then connected to the ring 21 and the fabric tank member folded inwardly around the housing 13 on the base plate 7. The ground cover sheet 25 is then folded inwardly and the side panels 14 turned upwardly and secured together, and the post with the fabric portions and other components of the structure may then be lifted into a truck for transportation to the site where a temporary storage is desired.

At the site, in erecting the tank structure, the center post and portions contained therein are lifted from the truck to the ground at the location for the tank. The pins 18 are removed and the side panels 14 laid flat. The ground cover sheet 25 is then spread outwardly and laid flat on the ground. The fabric tank member 4 is then pulled outwardly, and the tabs 55 on said tank member grasped and pulled until the bottom portion 36 lays substantially flat and smooth on the cover sheet 25. Then the connectors 48 on the cables 46 are connected to the rings 45 on the tabs 44, and if a splash top closure is desired, the connectors 52 are connected to the rings 53 on the tabs 54, and the tank is ready for filling. As the flowable material is pumped through

the hose 58 into the tank interior, the weight of the flowable material entering the tank is applied through the bottom portion 36 on the cover sheet 25 and/or onto the ground and also on the base plate 7 and extensions 14 whereby the greater the contents of the tank the greater the force thereof tending to hold the support structure in position on the ground. As the filling of the tank proceeds, the flowable nature of the contents applies a hoop stress to the peripheral portion 37 of the tank structure, also applies a radial tension in the bottom portion 36, and a radial tension in the top wall portion 38 of the tank member 4. The tension in the top wall member is transmitted through the cables 46 to the post 8. The cables 46 apply the forces from all sides of the post whereby forces on one side of the post tend to counterbalance the forces acting on the other side. When the filling is complete, the tank, when of circular shape, will assume a position substantially as illustrated in Figs. 1 and 2. If the tank is located on an inclined surface whereby there is a tendency for the material in the tank to flow slightly to one side more than the other, and thereby apply additional forces to said one side or downslope side, the weight applied to the base 7 still holds the post in desired position so as to withstand the increased forces, tending to pull the structure to the downhill side. After the tank is emptied and has served its function at a selected location, the cables 46 are disconnected and the fabric portion and ground cover sheet are folded inwardly adjacent the housing 13 and the side panels 14 are turned upwardly and secured together, and the entire structure is ready for transportation to another site of use.

It is to be understood that while I have illustrated and described one form of my invention, it is not to be limited to the specific form or arrangement of parts herein described and shown except insofar as such limitations are included in the claims.

What I claim and desire to secure by Letters Patent is:

1. A portable collapsible tank comprising, a post supported in upright position, a flexible waterproof tank member having an upright tubular portion sleeved over the post with a bottom wall portion extending outwardly from the lower end of the tubular portion then upwardly in a peripheral wall portion and then inwardly in a top wall portion extending inwardly and upwardly and having an opening through which the upper portion of the post extends, means connecting the upper end of the tubular portion of the tank member and the post to support said tubular portion, a plurality of spaced flexible members each having one end connected to the post in upwardly spaced relation to the upper end of the tubular portion and extending radially therefrom, and means connecting the other ends of the flexible members to the top wall portion of the tank member at the edge of said opening and in spaced relation therearound to act in tension for distributing the forces acting on the tank member.

2. A portable collapsible tank comprising, a tank support having an upper surface, an upright post supported to extend upwardly from the tank support, a flexible waterproof tank member having an upright tubular portion sleeved over the post with a bottom wall portion extending outwardly from the lower end of the tubular portion in overlying relation to said upper surface of the tank support and then upwardly in a peripheral wall portion and then inwardly in a top wall portion extending inwardly and upwardly and having an opening through which the upper portion of the post extends, means connecting the upper end of the tubular portion of the tank member and the post to support said tubular portion, a plurality of spaced flexible members each having one end connected to the post in upwardly spaced relation to the upper end of the tubular portion and extending radially therefrom, means connecting the other

ends of the flexible members to the top wall portion of the tank member at the edge of said opening to act in tension for distributing the forces acting on the tank member, a top closure member having a periphery secured to the top wall portion in spaced relation to the edge of the opening therein and extending inwardly therefrom to adjacent said post, and means connecting the inner portion of the top closure member to the upper portion of the tubular portion of the tank member to support the inner portion of said top closure member in closing relation to said top opening.

3. A portable collapsible tank comprising, a post supported in upright position, a flexible waterproof tank member having an upright tubular portion sleeved over the post with a bottom wall portion extending outwardly from the lower end of the tubular portion and then upwardly in a peripheral wall portion and then inwardly in a top wall portion extending inwardly and upwardly and having an opening through which the upper portion of the post extends, means connecting the upper end of the tubular portion of the tank member and the post to support said tubular portion, a plurality of spaced tab members on the bottom wall portion adjacent the peripheral wall portion for pulling the bottom wall portion outwardly from the post, a plurality of flexible cables each having one end connected to the post in upwardly spaced relation to the upper end of the tubular portion and extending radially therefrom, a plurality of tabs on the top wall portion and spaced around the edge of said opening therein, and means connecting the other ends of the flexible cables to said tabs on the top wall portion of the tank member to act in tension for distributing the forces acting on the tank member whereby contents of the tank apply outward forces on the bottom, peripheral and top wall portions which cooperate with the means connecting the tank to the post to shape the filled tank and retain same in place.

4. A portable collapsible tank for positioning on the ground comprising, a post supported in upright position to extend upwardly from the ground, a ground cover sheet of flexible waterproof fabric having a central opening sleeved over the post whereby said cover sheet overlies the ground and extends outwardly from the post, said cover sheet being of a size whereby the periphery thereof has dimensions larger than the tank, a flexible waterproof tank member having an upright tubular portion sleeved over the post and a bottom wall portion extending outwardly from the lower end of the tubular portion in overlying relation to the cover sheet, a peripheral wall portion extending upwardly from the bottom portion and terminating in an inwardly extending top wall portion and having an opening through which the upper portion of the post extends, means securing the upper end of the tubular portion of the tank member to the post, a plurality of flexible cables each connected to the post and extending radially therefrom above the upper end of the tubular portion of the tank member, and means connecting the other ends of the flexible cables to the top wall portion of the tank member around said opening therein to act in tension for distributing the forces acting on the tank member.

5. A portable collapsible tank comprising, a tank support having an upper surface, a post supported in upright position to extend upwardly from said tank support, a ring member secured on the post in vertically spaced relation to the tank support, a second ring member on the post and spaced upwardly from the first ring member, a ground cover sheet of flexible waterproof fabric having a central opening sleeved over the post whereby said cover sheet overlies the upper surface of said tank support and extends outwardly from the post, said cover sheet being of a size whereby the periphery thereof has dimensions larger than the tank, a flexible waterproof tank member having an upright tubular portion sleeved over the post and a bottom wall portion extending out-

wardly from the lower end of the tubular portion in overlying relation to the cover sheet, a peripheral wall portion extending upwardly from the bottom portion and terminating in an inwardly extending top wall portion and having a central opening through which the upper portion of the post extends, a plurality of spaced connectors securing the upper end of the tubular portion of the tank member to the first-named ring member on the post, a plurality of flexible cables each connected to the second-named ring member on the post and extending radially therefrom, means connecting the other ends of the flexible cables to the top wall portion of the tank member around said central opening to act in tension for distributing the forces acting on the tank member, and a top closure member of flexible waterproof fabric secured to the upper end of the tubular portion of the tank member and extending outwardly therefrom, and means connecting the top closure member along the periphery thereof to the top portion of the tank member in underlying relation thereto, and flow means connected to the top wall portion in outwardly spaced relation to the top closure member and having communication with the interior of the tank member whereby flowable material may be moved therethrough into the tank member for filling of same.

6. A portable collapsible tank comprising, a flat base member, an upright post on said base member substantially equally spaced from the side edges of said base member, flat panels hinged on the edges of the base member and extending outwardly therefrom, said panels being swingable to upright position relative to the base member, means for securing said panels in upright position, a flexible waterproof fabric tank member having an upright tubular portion sleeved over the post and a bottom wall portion extending outwardly from the lower end of the tubular portion, a peripheral wall portion extending upwardly from the bottom wall portion and terminating in an inwardly extending top wall portion and having a central opening through which the upper portion of the post extends, a plurality of spaced connectors securing the upper end of the tubular portion of the tank member to the post, a plurality of flexible cables each connected to the post and extending radially therefrom, and means connecting the other ends of the flexible cables to the top wall portion of the tank member at the edge of the central opening to act in tension for distributing the forces acting on the tank member.

7. A portable collapsible tank comprising, a flat base member, an upright post on said base member substantially equally spaced from the side edges of said base member, flat panels hinged on the edges of the base member and extending outwardly therefrom, said panels being swingable to upright position relative to the base member, means for securing said panels in upright position, a ground cover sheet of flexible waterproof fabric having a central opening sleeved over the post whereby said cover sheet overlies the base member and extends outwardly therefrom, said cover sheet being of a size whereby the periphery thereof has dimensions larger than the tank, a flexible waterproof fabric tank member having an upright tubular portion sleeved over the post and a bottom wall portion extending outwardly from

the lower end of the tubular portion in overlying relation to the cover sheet, a peripheral wall portion extending upwardly from the bottom wall portion and terminating in an inwardly extending top wall portion and having a central opening through which the upper portion of the post extends, a plurality of spaced connectors securing the upper end of the tubular portion of the tank member to the post, a plurality of flexible cables each connected to the post and extending radially therefrom, and means connecting the other ends of the flexible cables to the top wall portion of the tank member at the edge of the central opening to act in tension for distributing the forces acting on the tank member.

8. A portable collapsible tank comprising, a flat base member, an upright post on said base member substantially equally spaced from the side edges of said base member, flat panels hinged on the edges of the base member and extending outwardly therefrom, said panels being swingable to upright position relative to the base member, means for securing said panels in upright position, a ring member secured to the post in vertically spaced relation to the base member, a second ring member on the post and spaced upwardly from said first ring member, a ground cover sheet of flexible waterproof fabric having a central opening sleeved over the post whereby said cover sheet overlies the base member and extends outwardly therefrom, said cover sheet being of a size whereby the periphery thereof has dimensions larger than the tank, a flexible waterproof fabric tank member having an upright tubular portion sleeved over the post and a bottom wall portion extending outwardly from the lower end of the tubular portion in overlying relation to the cover sheet, a peripheral wall portion extending upwardly from the bottom wall portion and terminating in an inwardly extending top wall portion and having a central opening through which the upper portion of the post extends, a plurality of spaced connectors securing the upper end of the tubular portion of the tank member to the first-named ring member on the post, a plurality of flexible cables each connected to the second-named ring member on the post and extending radially therefrom, means connecting the other ends of the flexible cables to the top wall portion of the tank member at the edge of the central opening to act in tension for distributing the forces acting on the tank member, and a top closure member of flexible waterproof fabric secured to the upper end of the tubular portion of the tank member and extending outwardly therefrom, means connecting the top closure member along the periphery thereof to the top wall portion of the tank member in underlying relation thereto, and flow means connected to the top wall portion in upwardly spaced relation to the top closure member and having communication with the interior of the tank member whereby flowable material may be moved therethrough into the tank member for filling of same.

#### References Cited in the file of this patent

#### UNITED STATES PATENTS

|           |        |               |
|-----------|--------|---------------|
| 1,580,194 | Glass  | Apr. 13, 1926 |
| 2,378,126 | Blair  | June 12, 1945 |
| 2,378,161 | Sawyer | June 12, 1945 |