May 19, 1959 F. L. MURDOCK, SR 2,887,243

TELESCOPING TANK

Filed Aug. 19, 1957 2 Sheets-Sheet 1

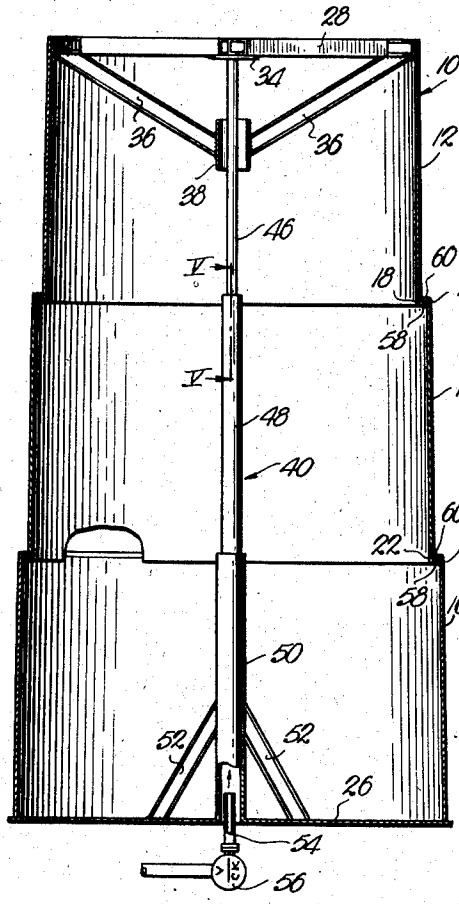


Fig. 1.

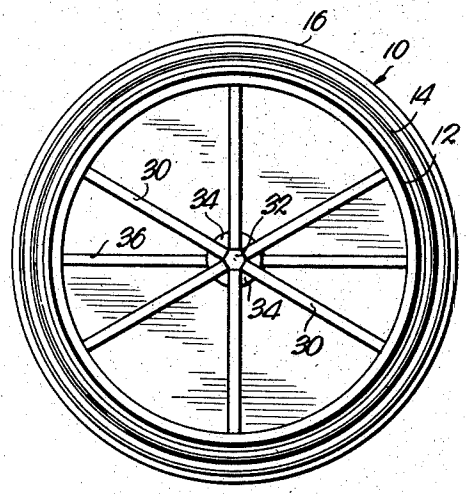


Fig. 2.

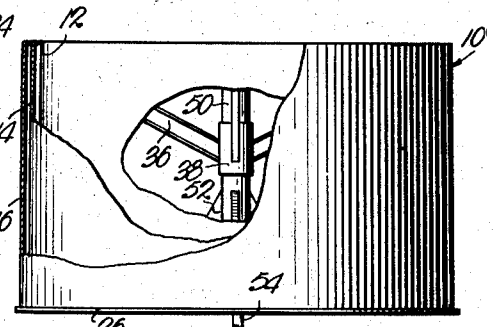


Fig. 3.

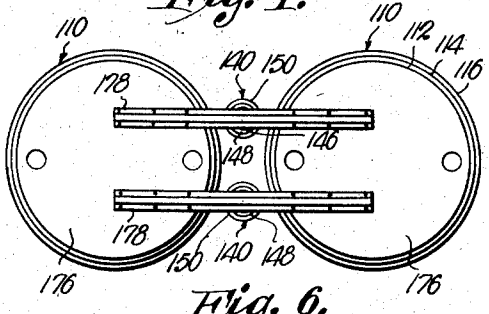


Fig. 6.

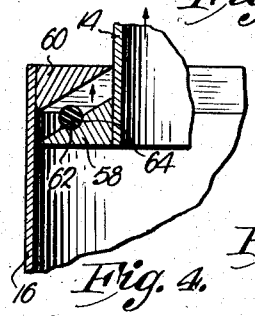


Fig. 4.

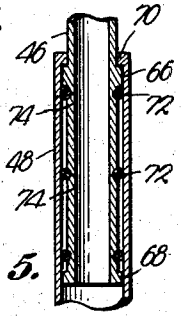


Fig. 5.

INVENTOR.
Forrest L. Murdock, Sr.
BY
ATTORNEY.

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2 Sheets-Sheet 2

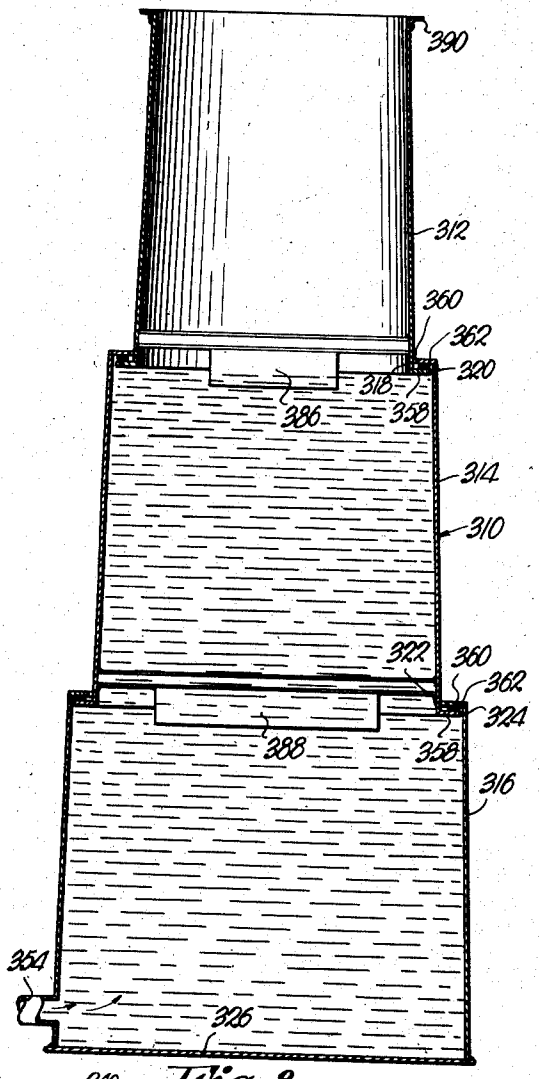


Fig. 8.

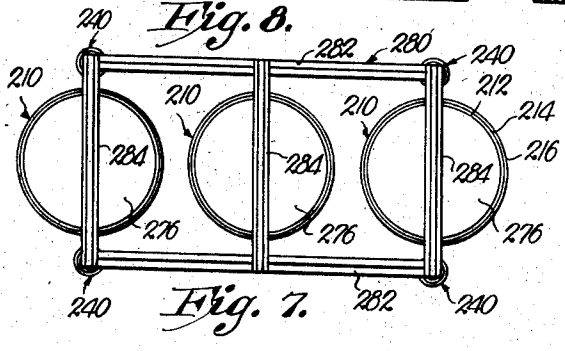


Fig. 7.

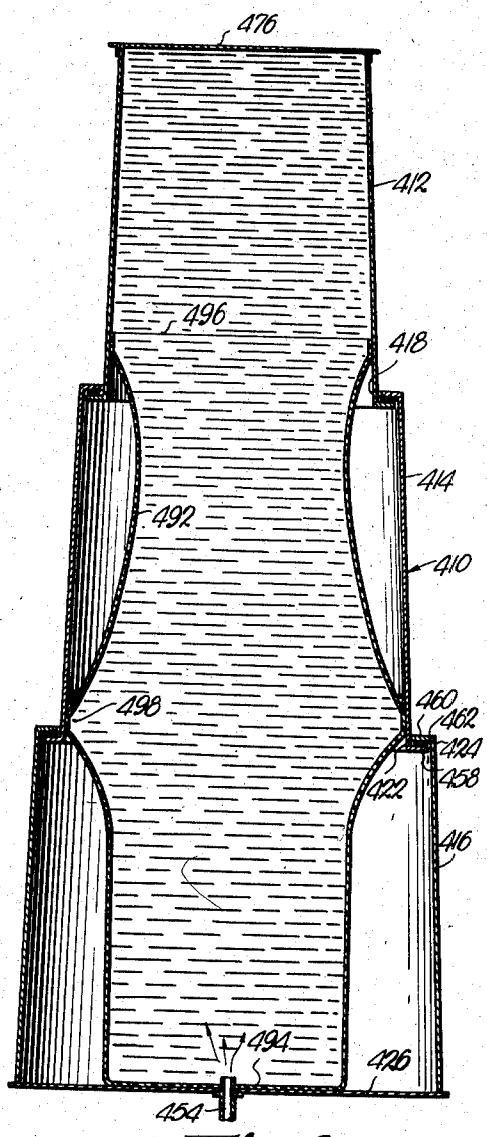


Fig. 9.

INVENTOR.
Forrest L. Murdock, Sr.
BY
ATTORNEY

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2,887,243

TELESCOPING TANK

Forrest L. Murdock, Sr., Tulsa, Okla.

Application August 19, 1957, Serial No. 678,833

2 Claims. (Cl. 220—8)

This invention relates to portable receptacle construction and more particularly, to a collapsible fluid-receiving tank which may be readily transported in its collapsed condition and then erected in an upright position ready for immediate use in a short period of time.

The collapsible tank herein presented is especially adapted for use by oil well cleaning and reconditioning contractors wherein it is necessary that they have available a large capacity liquid tank and which may be collapsed and transported from well to well in a minimum of time and at a relatively small cost.

As the producing life of a flowing or pumping well is extended, the rate of production will be reduced at a rate commensurate with reduction of reservoir pressure and gas depletion, the amount of caving that has occurred, the restriction of sand drainage which is caused by deposition of paraffin and other residues on the surfaces of the well pores, and the proximity of salt water. Many of these factors can be overcome and remedied by cleaning and reconditioning of the well and there are many companies now engaged in the full-time occupation of cleaning and reconditioning clogged and similarly constricted wells which have ceased to flow or cannot be pumped at an adequate rate.

The precipitation of mineral salts from oil field water and the deposition of mud, silt, waxy and asphalt materials cause lost production in the oil well and it is frequently necessary to remove "paraffin" from the well so that it may be brought back into normal production. The term "paraffin" as commonly applied by field men and oil well operators includes mud, silt, sand, asphalt and some water and mineral matter in addition to natural paraffin wax.

Many types of cleaning and reconditioning operations have been suggested and such processes include "blowing" the well with dynamite and nitroglycerine, as well as mechanical reconditioning including bailing, sand-pumping, re-drilling, and reaming, but in many instances these processes are completely unsatisfactory and it is more desirable to utilize methods wherein solvents or other fluids are directed into the well casing so as to loosen, dissolve, or otherwise remove the deposits from the well which are preventing normal flow and which preclude pumping of the oil from the well.

Various liquid methods of cleaning and reconditioning oil wells are known and utilized including introduction of solvents such as hot oil, kerosene, gasoline or a mixture of gas-oil and benzine into the well in order to dissolve the paraffinic substances, the introduction of steam or hot water into the well casing under pressure, circulating hot oil or water through the well, as well as the introduction of certain acids into the well between the casing and the tubing. Other methods of a similar nature which are utilized, include the introduction of heat-producing chemicals such as sodium hydroxide, calcium carbide and water, and aqueous aluminum compositions into the well.

Manifestly, these methods just referred to involving the utilization of liquids, require that the reconditioning contractors have available relatively large liquid-receiving tanks wherein the materials may be stored for ready use at the exact moment needed. Such large tanks are frequently not available at the well site and it, therefore, becomes necessary for the contractor to transport such tanks with his equipment. This involves a considerable number of additional vehicles, as well as a number of men which are needed to erect and disassemble sectional tank assemblies. Although the operators could transport one-piece tanks of considerable volume, this has been found substantially impractical because of the fact that it is usually desirable to mount the tanks upon a tractor-trailer and this necessarily limits the over-all height of the tanks which are disposed upon the trucks because of obstructions encountered such as bridges or the like.

It is, therefore, the most important object of this invention to provide a portable tank which is constructed of a plurality of normally upright, tubular sections disposed in telescoped relationship and which are adapted to be moved to extended positions so as to present an elongated, collapsible fluid-receiving tank.

It is a further important object of this invention to provide a portable tank of the type described which includes structure for moving the telescoped sections into their extended positions under the influence of fluid pressure so that the tank may be erected in a very short period of time.

Another important object of the invention relates to the provision of a collapsible tank as referred to wherein the telescoped sections are movable to and from extended positions with proximal adjacent ends thereof disposed in partial overlapping relationship and wherein there is provided sealing means between the overlapped portions of the sections so as to prevent loss of fluid between the ends when the tank is filled with liquid or the like.

Another important object relates to the provision of interengageable means on the partially overlapped portions of the sections which operate to limit the extent of movement of the telescoped sections with respect to each other and which also receive the sealing means therebetween so as to prevent loss of liquid from the tank.

Other important objects of the invention relate to structure for moving the telescoped sections into their extended positions and which is located externally of the tank so that if desired, the structure may be utilized to move the sections of a plurality of tanks into their extended positions; to the provision of a slightly modified tank which includes float elements thereon so that the telescoped sections are automatically moved into their extended positions as the tank is filled with liquid; and to the provision of a flexible, imperforate liner within another modified form of the tank which falls down into the outermost section of the tank as the inner telescoped sections are moved downwardly into the outer section.

In the drawings:

Fig. 1 is a central, vertical, cross-sectional view of a collapsible, portable tank made in accordance with one form of the instant invention, certain parts being broken away to illustrate details of construction.

Fig. 2 is a plan view of the tank illustrated in Fig. 1;

Fig. 3 is a side elevational view of the tank shown in Fig. 1, the tank being illustrated in its collapsed condition with the inner sections thereof telescoped within the outer section and certain parts thereof broken away and in section to reveal details;

Fig. 4 is a fragmentary, enlarged cross sectional detailed view of a portion of the tank shown in Fig. 1 and illustrating more clearly the construction of overlapped, adjacent ends of a pair of the sections of the tank;

Fig. 5 is a fragmentary, enlarged cross sectional view taken on line V—V of Fig. 1;

Fig. 6 is a plan view of a modified form of the instant invention showing a pair of collapsible, portable tanks;

Fig. 7 is another modified form of the invention illustrating a second way in which structure forming a part of the invention may be utilized to extend the telescoped sections of a plurality of tanks;

Fig. 8 is a central, vertical cross sectional view of another modified form of the invention; and

Fig. 9 is a similar, vertical, central cross sectional view of still another form of tank embodying the concepts of the invention.

The preferred form of the invention which is shown in Figs. 1 to 5 inclusive, comprises a collapsible tank generally designated **10** and which includes a plurality of tubular, upright sections **12, 14** and **16** which are normally disposed in telescoped relationship as shown in Fig. 3, it being noted that section **14** may move into and out of section **16** while section **12** is reciprocable to and from a position within section **14**. The extended positions of sections **12** and **14** are illustrated in Fig. 1, wherein it can be seen that the lowermost portion **18** of section **12** partially overlaps the uppermost portion **20** of section **14** and by the same token, the lowermost portion **22** of section **14** overlaps the upper end portion **24** of section **16**.

The lowermost end of section **16** is closed by a circular bottom wall **26** and an annular channel member **28** is welded to the uppermost end of section **12** on the innermost face thereof. A plurality of radially extending spokes **30** are secured to a central hub **32** and to the innermost face of annular member **28**. Secured to the lowermost part of hub **32** is a circular pressure plate **34** and a plurality of angularly disposed bracing members **36** are secured to the lowermost part of annular member **28** and extend radially toward the axis of section **12**. An upright tubular sleeve **38** is secured to the innermost ends of members **36** and is located on the vertical axis of section **12**.

Means for moving sections **14** and **12** into their extended positions, as illustrated in Fig. 1, comprises structure broadly designated by the numeral **40** which includes a plurality of elongated, tubular members **46, 48** and **50** disposed in telescoped relationship, it being noted that there is a tubular member for each of the sections **12, 14** and **16** respectively.

The uppermost end of tubular member **46** is secured to pressure plate **34** and the lowermost end of tubular member **50** rests on and is secured to bottom wall **26**. A plurality of angularly disposed, radially extending brackets **52** are located within section **16** and extend from and are secured to bottom wall **26** and are welded to tubular member **50** so as to support the same on the vertical axis of section **16**. An inlet conduit **54** passes through bottom wall **26** and communicates with tubular member **50** and a check valve **56** is located in conduit **54** for controlling flow of fluid therethrough. The inside diameter of tubular sleeve **38** is substantially equal to the outside diameter of tubular member **50** and, therefore, when sections **12** and **14** are telescoped within section **16**, sleeve **38** operates to maintain section **12** in correct alignment with respect to section **14** during transportation of tank **10**.

Outwardly extending annular flanges **58** are secured to the lowermost portions **18** and **22** of sections **12** and **14** respectively, and inwardly extending flanges **60** are welded to the uppermost portions **20** and **24** of sections **14** and **16** respectively. As is clear from Fig. 4, flanges **58** and **60** are substantially triangular in transverse cross section and the angular surface of flange **58** is configured so as to substantially conform with the corresponding surface of flange **60**. A sealing ring **62** is provided on each of the flanges **58** and is preferably disposed in a circular groove **64** so that when the annular surfaces of flanges **58** and **60** are brought into proximal relationship, sealing ring **62** is pressed therebetween.

Also, as is evident from Fig. 5, the lowermost ends of

tubular members **46** and **48** respectively are provided with a pair of spaced, outwardly extending circumferential flanges **66** and **68** and the uppermost ends of tubular members **48** and **50** are provided with inwardly extending, circumferential flanges **70**. Each of the lower ends of tubular members **46** and **48** is provided with sealing means between flanges **66** and **68** thereof which preferably comprises a series of spaced, circular sealing rings **72** which are disposed in circumferential grooves **74** formed in tubular members **46** and **48** respectively. The rings **72** are of sufficient cross sectional area to engage the innermost face of a corresponding tubular member **48** and **50** and thus preclude leakage of fluid from within structure **40**.

As heretofore noted, tank **10** is particularly adapted to be disposed upon tractor trailers or similar type vehicles and inasmuch as it is usually desirable to permanently mount tank **10** upon the bed of the vehicle, an opening is provided in the bed of the truck (not shown) so that conduit **54** may pass therethrough and thereby allow wall **26** to lie flat on the truck bed.

Tank **10** is normally transported in the collapsed condition illustrated in Fig. 3 and after the vehicle has reached the well site and it is desired to move sections **12** and **14** into their extended positions as shown in Fig. 1, fluid under pressure, either air or water, is directed into structure **40** after check valve **56** has been opened. As pressure builds up within structure **40** and against pressure plate **34**, tubular member **46** initially moves upwardly within tubular member **48** until flange **58** on section **12** and flange **66** on tubular member **46** engage the flange **60** and the flange **70** on section **12** and tubular member **48** respectively. When this occurs, continued upward movement of sections **46** and **48** causes section **14** to move upwardly from within section **16** until the flange **58** on section **14** and the flange **66** on tubular member **48** engage flange **60** and flange **70** on section **16** and tubular member **50** respectively. When sections **12** and **14** have been moved into their extended positions illustrated in Fig. 1, check valve **56** is closed and the pressure maintained within structure **40** operates to retain sections **12** and **14** in their extended positions. The use of pressurized fluid to move sections **12** and **14** is particularly convenient because well cleaning contractors have available a large amount of equipment for directing fluids under pressure to desired locations and it is only necessary for such operators to connect their compressing or pumping equipment to conduit **54** and thus quickly move sections **12** and **14** to the position shown in Fig. 1. Also, sections **12** and **14** may be quickly collapsed into the telescoped position shown in Fig. 3 by merely opening check valve **56** and allowing the fluid therein to flow through conduit **54** to a point of outlet. The weight of sections **12** and **14** is sufficient to push the fluid out of structure **40** and the sections **12** and **14** automatically telescope.

Although portable tank **10** has been illustrated and described as being open at the top thereof, it can be appreciated that the uppermost end of section **12** may be closed by any suitable means and that inlet and outlet openings be provided in the top thereof. In lieu thereof, conduit means may also be connected to section **16** adjacent the lowermost part thereof so that fluid material may be directed into and removed from tank **10**.

A modified form of the invention is illustrated in Fig. 6 wherein it can be seen that there is provided a pair of portable, collapsible tanks **110**, each of which includes a plurality of upright, tubular sections **112, 114** and **116** disposed in telescoped relationship, it being noted that each of tanks **110** is provided with interengageable flange means at those portions normally disposed in partially overlapped relationship when sections **112** and **114** have been moved to their extended positions. Tanks **110** are also provided with a bottom wall (not shown) and a circular top wall **176** at the uppermost end of section **112**. Means for moving sections **112** and **114** into their ex-

tended positions includes a pair of spaced structures **140** which are located between tanks **110** externally thereof. Each of the structures **140** includes a plurality of tubular members **146**, **148** and **150** which are disposed in telescoped relationship and which are essentially of the same construction as tubular members **46**, **48** and **50** of tank **10**.

A pair of parallel, elongated tie bars **178** are secured to the top walls **176** of each of tanks **110** and also to the uppermost end of a corresponding tubular member **146**. Fluid supply conduits (not shown) are connected to each of the structures **140** respectively and when fluid under pressure is directed into the structures **140**, tubular members **146** and **148** of each of structures **140** is moved into its extended position and which in turn moves sections **112** and **114** into extended positions similar to the positions of sections **12** and **14** of tank **10**. A check valve is also provided in the supply conduits connected to structures **140** to thereby control the flow of fluid thereinto. Operation of structures **140** is similar to the operation of structure **40** of tank **10**.

Another modified form of the invention which utilizes fluid pressure to extend the sections of the portable tanks is illustrated in Fig. 7, wherein three collapsible tanks **210** are disposed in spaced, linear alignment and each of the tanks **210** includes a plurality of upright, tubular sections **212**, **214** and **216** disposed in telescoped relationship in the same manner as the sections **12**, **14** and **16** of tank **10**. Interengageable flange means is also provided on the adjacent ends of sections **212**, **214** and **216** which are partially overlapped when sections **212**, **214** and **216** are moved into their extended positions and sealing means is provided between the flanges for preventing loss of fluid from each of tanks **210**.

Apparatus for moving the sections **212** and **214** of each of the tanks **210** into their extended positions preferably comprises four spaced structures **240** which are similar in construction to the structures **40** of tank **10**. The uppermost end of each of the sections **212** is closed by a top wall **276** and secured to the top walls **276** is a substantially rectangular frame designated generally by the numeral **280** which includes a pair of spaced, elongated, parallel rods **282** extending linearly with the line of tanks **210** and spaced therefrom. A plurality of cross bars **284** interconnect rods **282** and as clearly apparent in Fig. 7, there is a cross bar **284** for each of the tanks **210** and a corresponding cross bar **284** is secured to the top wall **276** of each of the tanks **210**. Structures **240** are disposed at the corners of the rectangle formed by rods **282** and the end cross bars **284** and the uppermost end of each of the innermost telescoped, extensible members of the structures **240** are secured to frame **280** so that when fluid under pressure is directed to the structures **240** from conduit means (not shown) and the extensible members of the structures **240** are moved into their extended positions, the sections **212** and **214** of each of the tanks **210** are moved into their extended positions in the manner previously described with respect to tank **10**. Check valve means (not shown) is also provided in the conduit leading to structures **240** to control flow of fluid into and out of the structures **240**, thereby permitting controlled extension of sections **212** and **214**.

A fourth modified form of the invention is illustrated in Fig. 8 of the drawings, wherein a collapsible, portable tank designated generally by the numeral **310**, includes a plurality of upright, tubular sections **312**, **314** and **316** disposed in telescoped relationship, section **312** being movable to and from a position within section **314** and section **314** being reciprocable to and from a location within section **316**.

The lowermost end of section **316** is preferably closed with a circular bottom wall **326** but the uppermost end of section **312** is preferably left open to allow escape of air as liquid is directed into tank **310**. The lowermost portions **318** and **322** of sections **312** and **314** respectively are provided with relatively narrow, outwardly extending annular flanges **358** and, by the same token, the uppermost portions **320** and **324** of sections **314** and **316** are likewise provided with relatively narrow, inwardly extending annular flanges **360** disposed in a position to interengage with a corresponding flange **358** when sections **312** and **314** are moved into their extended positions as illustrated in Fig. 8. Circular sealing rings **362** are disposed on each of the flanges **358** in a position to be pressed between corresponding flanges **358** and **360** when the flanges are moved into proximal relationship to thereby preclude loss of liquid between adjacent ends of the sections **312**, **314** and **316**.

A float **386** is mounted on the lowermost portion **318** of section **312** and a somewhat larger float **388** is mounted on the lowermost portion **322** of section **314**. A liquid conduit **354** is connected to section **316** and communicates with the interior thereof adjacent bottom wall **326** so that liquids under pressure may be directed into section **316**. Assuming that sections **312** and **314** are disposed in telescoped relationship within section **316** and it is desired to move sections **312** and **314** into their extended positions as illustrated in Fig. 8, liquid under pressure is directed into section **316** and when the level of such liquid rises within section **316** to a level where the buoyancy of float **388** tends to move section **314** upwardly, it can be seen that both sections **312** and **314** are initially moved upwardly under the influence of float **388**. During the time that section **314** is being moved upwardly by float **388**, section **312** is also lifted by section **314** because of the outwardly extending flange **390** engaging the flange **360** of section **314**. When the flange **358** on section **314** engages the flange **360** on section **316**, continued introduction of liquid into tank **310** causes section **312** to be moved upwardly under the influence of float **386**. It can now be ascertained that the sections **312** and **314** are maintained in their extended positions by the buoyancy of floats **386** and **388** and because of the added weight which must be supported by float **388**, this float must be considerably larger than float **386**. It can also be appreciated that as the level of liquid falls in tank **310**, the sections **312** and **314** will successively move downwardly into telescoped relationship proportional to the level of liquid within tank **310**. Sealing rings **362** between each of the flanges **358** and **360** precludes loss of fluid from sections **312** and **314** and the seal will be maintained until the level of liquid falls to a position below the uppermost edge of a respective section **314** or **316**. In this respect, it is to be noted that the floats **386** and **388** must be of sufficient volume so that sections **312** and **314** are maintained in their fully extended positions by the buoyancy of floats **386** and **388** so that sections **312** and **314** respectively will not move downwardly into the section therebelow until the level of liquid has fallen below the uppermost edge of the section located therebelow.

A fifth modification of the instant invention comprises a tank designated generally **410** and which is illustrated in Fig. 9 of the drawings. Tank **410** includes a plurality of upright, tubular sections **412**, **414** and **416** disposed in telescoped relationship, section **412** being reciprocable to and from a position within section **414** and section **414** likewise being movable to and from a location within section **416**. The lowermost end of section **416** is preferably closed by a circular bottom wall **426** while the uppermost end of section **412** may be closed with a circular top wall **476**. The lowermost portions **418** and **422** of sections **412** and **414** respectively are provided with relatively narrow, outwardly extending annular flanges **458** and the uppermost portions **420** and **424** of sections **414** and **416** are similarly provided with narrow, inwardly extending annular flanges **460** which are adapted to interengage with flanges **458**. Disposed on each of the flanges **458** is a circular sealing ring **462** which is in a position to be pressed between corresponding flanges **458**

and 460 when sections 412 and 414 have been moved into their extended positions as shown in Fig. 9.

Located within collapsible tank 410 is an elongated, tubular liner 492 which is formed of substantially imperforate, flexible material such as polymerized synthetic resin and the lowermost end of liner 492 is closed with a bottom 494. As is apparent in Fig. 9, liner 492 is of sufficient length to extend from bottom wall 426 upwardly into section 412 when sections 412 and 414 are located in their fully extended positions. The upper marginal edge 496 of liner 492 is secured to the innermost face of section 412 around the entire circumference thereof adjacent portion 418 and substantially the entire area of the lowermost face of bottom 492 is secured to the uppermost face of bottom wall 426 by suitable means such as an adhesive. Also, that part 498 of liner 492 which is normally adjacent portion 422 of section 410, is joined to the innermost surface of section 414 around the entire circumference thereof.

A fluid supply conduit 454 passes through bottom wall 426 and bottom 494 and communicates with the interior of liner 492. As hereinabove noted, if it is desired to mount tank 410 on a truck bed or the like, an opening may be provided in the truck bed to accommodate conduit 454.

Therefore, when sections 412 and 414 are disposed in telescoped relationship within section 416 and it is desired to direct fluid under pressure into tank 410 to store the fluid, and the capacity of fluid to be stored is greater than the volume of section 416 so that sections 412 and 414 must be moved into their extended positions as illustrated in Fig. 9, sufficient pressure is placed on the fluid being introduced into tank 410 so that the pressure on top wall 476 initially moves section 412 into its extended position and then section 414. Successive extension of sections 412 and 414 is accomplished in the same manner as described with respect to tank 10 but it is again pointed out that section 412 initially moves upwardly within section 414 until flange 458 on portion 418 engages flange 460 on portion 420 whereby upon continued upward movement of section 412, section 414 is moved upwardly until flange 458 on portion 422 engages flange 460 on portion 424.

A check valve (not shown) may also be provided in conduit 454 to control flow of fluid into and out of tank 410. It is apparent that as fluid is allowed to leave tank 410, the sections 412 and 414 will successively telescope into the sections 414 and 416 respectively.

Because of the flexible, imperforate nature of liner 466, fluid is retained within the liner and section 412 and thus leakage of fluid from tank 410 is substantially precluded, but as an added safety measure, it is usually desirable to provide sealing rings 462 between corresponding flanges 458 and 460, sealing rings 462 also operating to cushion the engagement of flanges 458 with flanges 460.

Tank 410 is especially advantageous when it is desired to store either gaseous fluids under pressure or a combination of gaseous fluids and liquids, and also, where chemicals which react with metal are to be employed. In this respect, it may be pointed out that a flexible liner 492 may be provided in tank 410 which covers all of the normally exposed innermost surfaces of tank 410 and thereby preclude any corrosion of the metal used in constructing tank 410.

Having thus described the invention, what is claimed as new and desired to be secured by Letters Patent is:

1. In portable receptacle construction, a plurality of upright, tubular sections normally disposed in telescoped relationship, the lower end of the outermost section and the upper end of the innermost section being closed, and the remaining sections and said innermost section being movable to and from extended positions with proximal adjacent ends of the sections disposed in partial overlapping relationship, there being interengageable means on said adjacent ends of the sections for limiting the extent of movement of said remaining sections and the innermost section with respect to each other as the same are moved to their extended position to thereby present a collapsible elongated tank; a flexible, elongated, tubular liner disposed within said sections, the normally uppermost end of the liner being secured to said innermost section and the lowermost end of the liner being closed and secured to the outermost section; and means communicating with said liner for directing fluid under pressure thereinto whereby the sections are successively moved into their extended positions as the tank is filled.

2. Receptacle construction as set forth in claim 1, wherein the transverse cross sectional diameter of the liner is approximately equal to the inside diameter of said innermost section.

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