Aug. 16, 1966 C. E. WILLIS 3,266,675

TRANSPORTABLE FLUID STORAGE AND DISPENSING MEANS

Filed Oct. 6, 1965 3 Sheets-Sheet 1

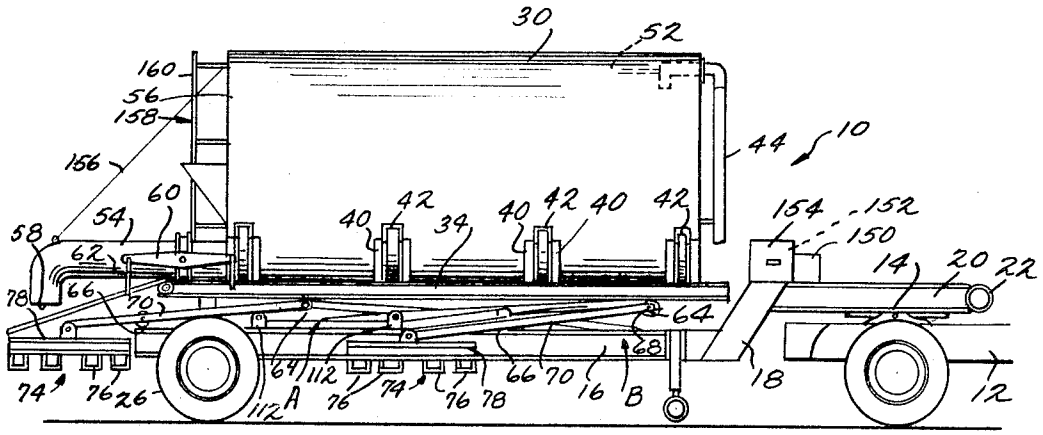


Fig. 1.

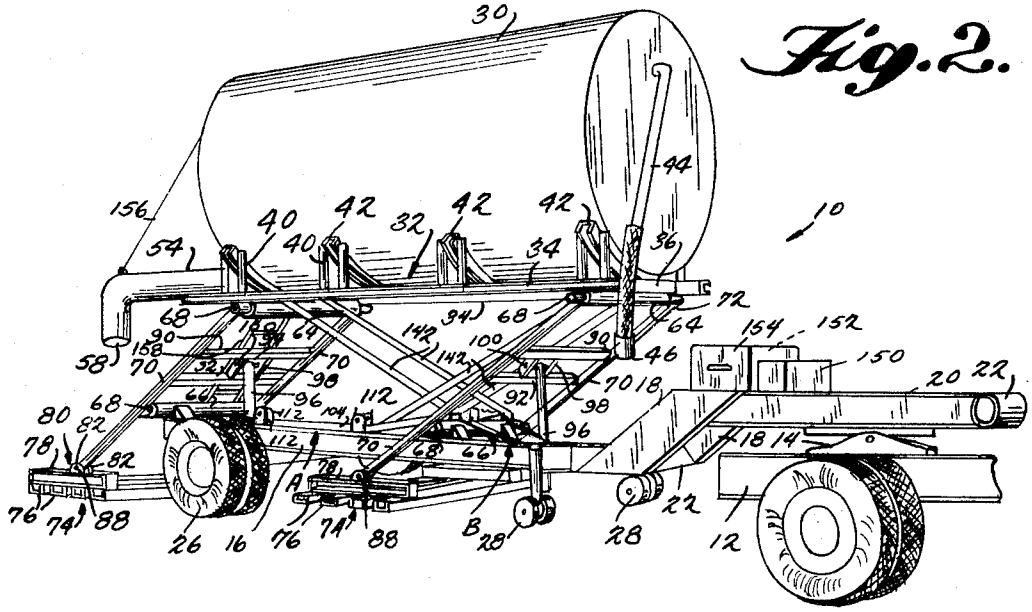


Fig. 2.

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Fig. 3.

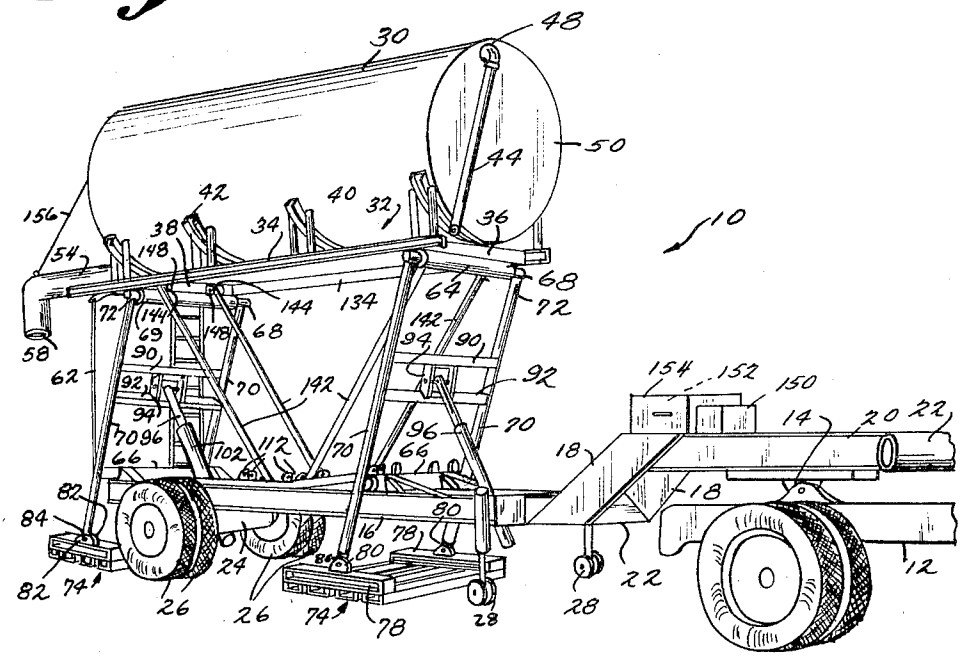
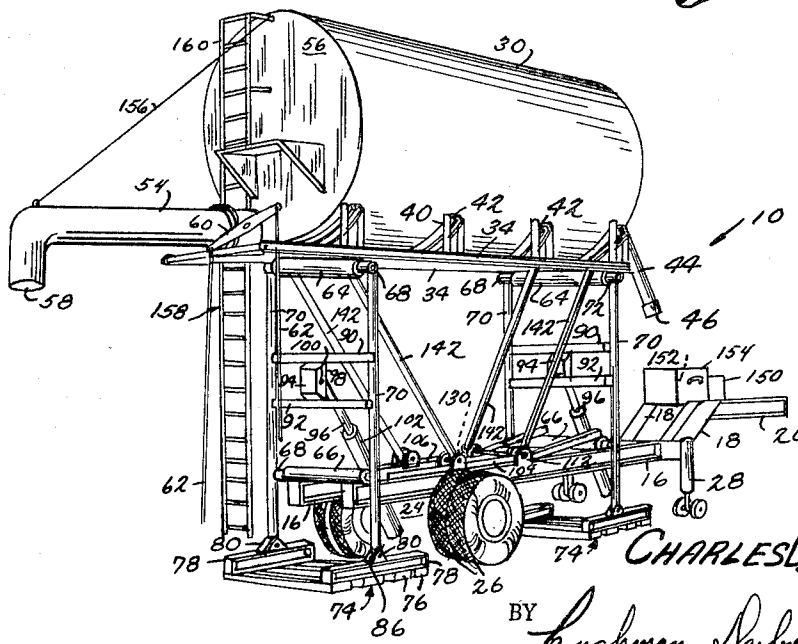


Fig. 4.



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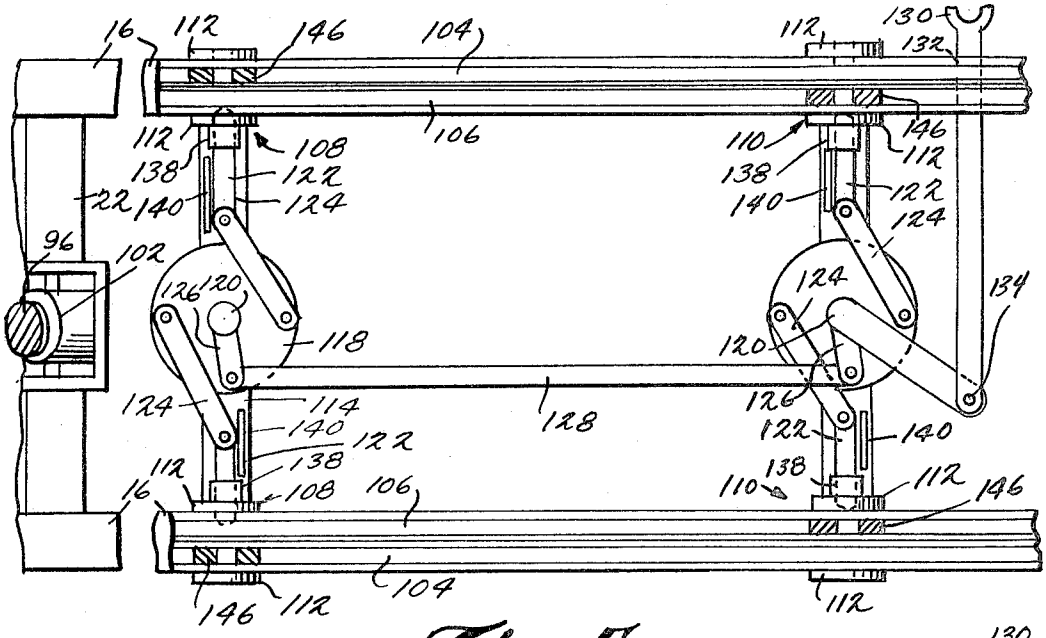


Fig. 5.

Fig. 6.

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TRANSPORTABLE FLUID STORAGE AND DISPENSING MEANS

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13 Claims. (Cl. 222—160)

The present invention relates to mobile storage tanks and more particularly to a vehicle mounted storage tank having self contained simultaneously operable tank elevating and support lowering means.

Mobile storage tanks are well known in the fluid transporting, livestock feeding and construction trades where such tanks are used to deliver fluid products and commodities to the market place or to consumers; to transport water or other fluid feed to animal herds grazing far from permanent or natural feeding facilities; and to constitute temporary facilities for job-site mixing of road building materials, mortar, drilling mud, grout and the like.

Especially in the latter instance where the water or other fluid is to be intermittently dispensed from the tank into concrete mixing trucks, it is advantageous to have the tank and its outlet located above the trucks into which it will dispense so that the dispensing can be done rapidly by gravity feed. However, it is apparent that were a mobile storage tank built so that the heavy storage tank portion thereof were supported 10–30 feet or so above the vehicle portion thereof serious difficulty would be encountered in transporting the mobile storage tank, particularly over rough roads and in off-the-road situations, because of the high center of gravity of such a mobile storage tank compared to its width.

Accordingly, it is an object of the present invention to provide a mobile storage tank having an integral vehicle, having means for elevating the tank for dispensing therefrom and means for lowering the tank into adjacency with the vehicle for transport.

A further object of the invention is the provision in a device of the type described, of structure whereby the folding mechanism which raises and lowers the tank also simultaneously lowers and raises support pads which remove from and replace the support of the vehicle on the vehicle wheels.

Yet another object of the invention involves the provision, in a device of the type described, of a plurality of pivotable diagonal braces for the tank and means operable from a single point for locking and unlocking all of the diagonal braces to prevent and provide for their collapsing respectively.

These and further objects of the present invention will become more clearly apparent, as will the principles and scope of applicability of the invention during the ensuing detailed discussion which relates to the illustrative embodiment of the invention shown in the attached drawings.

In the drawings:

FIGURE 1 is a side elevation view of a vehicle according to the present invention, showing the tank in its lowered position and the support pads in their raised position;

FIGURE 2 is a perspective view of the vehicle from the right front of the trailer portion thereof with the tank and support pads in an intermediate position;

FIGURE 3 is a perspective view, similar to FIGURE 2, showing the tank nearly completely raised and the support pads engaging the ground;

FIGURE 4 is a perspective view of the vehicle from the right rear of the trailer portion thereof with the tank in the raised position thereof and the support pads in the lowered position thereof;

FIGURE 5 is a fragmentary top plan view, drawn to an enlarged scale, of the brace locking arrangement of the vehicle shown in FIGURES 1–4, the locking pins being shown in a withdrawn condition wherein the braces are not locked; and

FIGURE 6 is a fragmentary top plan view similar to FIGURE 5, the locking pins being shown in an extended condition wherein the braces are locked.

The vehicle **10** is shown having the form of a trailer suitable for towing by a tractor **12** via a conventional pivotable hitching arrangement **14**. Accordingly, the vehicle **10** can be left at one location while the tractor **12** is deployed elsewhere to make efficient use of the equipment. Certainly, the present invention would encompass a self-propelled vehicle.

The trailer **10** is shown including a pair of laterally spaced, parallel horizontally extending frame members **16**, for instance comprising 10-inch I-beams having their central webs disposed vertically. Each beam **16** is joined to a forwardly and upwardly projecting frame member **18** of similar material, the frame members **18** in turn being joined at their forward ends to forwardly extending horizontal frame members **20**. The trailer hitch **14** component carried by the trailer is located between and secured to the frame members **20**. A plurality of laterally extending cross members **22** fixedly secured to the longitudinal frame members **16**, **18** and **20**, for instance by welding, complete the trailer frame. When secured to a tractor type vehicle the front end of the trailer **10** is supported on the tractor via the hitching arrangement **14**. The rear region of the trailer is shown supported by a single axle **24** mounting dual wheels **26**, the axle **24** being secured to the tractor frame by conventional means. Obviously, the axle **24** could mount a greater or lesser number of wheels than the four depicted, and more than one axle **24** could be provided, for instance in tandem.

In order to support the trailer **10** when the tractor is separated from it, conventional vertically adjustable landing gear dollies **28** are shown secured to the frame members **16** near the front ends thereof on each side of the trailer.

The tank **30** is generally cylindrical having its longitudinal axis generally parallel to the frame members **16**. In order to provide perspective, the tank **30** illustrated in the drawings is a 6,000-gallon tank. It should be evident that the invention is not dependent on the specific shape and size of the tank **30**, hence tanks of oval, rectangular or other cross-sectional shape and of larger or smaller capacity could be employed without departing from the principles of the present invention. The tank **30** is shown mounted on a conventional skid assembly **32** composed of longitudinal skid members **34**, forward and rear transverse cross-braces **36** and **38** secured to the skid members **34**, and a plurality of longitudinally spaced vertically directed supports **40** each secured at its lower end to one or the other of the skids **34** and at its upper end to the tank **30**. A plurality of arcuate cradle members **42** are shown secured to the underside of the tank extending between and secured to supports **40** on opposite sides of the tank, **30**.

The tank **30** may be provided with separate inlet and outlet means. In the embodiment shown, the tank **30** is fillable through the 4-inch hose **44** connectable at one end **46** to a water or other fluid supply and emptying at the other end **48** into the tank near the top of the tank through the forward bulkhead **50** of the tank. A float valve **52** is shown in the tank operably interposed in the inlet line **44** to maintain a constant head of water in the tank **30** when the end **46** of the hose **44** is connected to a continuous flow of pressurized liquid. The float valve **52** and the manner in which it is connected

in the inlet line are conventional and thus not shown elaborately.

The tank outlet includes a relatively large diameter conduit 54 extending horizontally and rearwardly from the lower region of the rear bulkhead 56 of the tank 30. Near its rearmost extent the conduit undergoes a downward turn so that the conduit outlet 58 is directed downwardly, for instance for dispensing water into concrete mixing trucks. A valve such as a butterfly valve 60 is interposed in the conduit 54 and has an operator such as a chain 62 hanging from it to a point where the valve 60 can be opened and closed from the ground when the tank is in an elevated position as will be described. Typically, in the arrangement shown, the tank outlet would have a volumetric flow capacity 2–10 times that of the tank inlet so that, intermittently, concrete mixing trucks or the like, could be filled rapidly, while the liquid supply in the tank 30 was being replenished continuously unless the tank became filled to the cut off point of the inlet float valve between dispensing operations.

The tank and support pad raising and lowering assemblies to which the present invention is addressed will now be discussed in greater detail.

It should now be noticed that a thick walled steel or the like pipe 64 is secured to the underside of each skid cross brace 36 and 38 so as to be approximately coterminous therewith. Two similar pipes 66 are secured to the frame members 16 to extend parallel to one another transversely of the trailer. Preferably, the distance between the pipes 64 is equal to the distance between the pipes 66 and the latter are secured to the upper plate of the I-beams from which the members 16 are made. As shown the length of the pipes 66 approximates that of the pipes 64 and the pipes 66 project laterally outwardly beyond the frame members 16 on each side of the trailer 10. The rearmost pipe 66 is located adjacent the rearmost ends of the members 16. The pipes 64 and 66 are preferably secured to the cross braces 36, 38 and frame members 16 respectively by welding.

Each pipe 64 and 66 loosely receives a smaller diameter thick walled pipe 68 therein the latter projecting about 6 inches outwardly from each end of each pipe 64 and 66. Four tank legs 70 of thick walled pipe or the like are rigidly secured at their upper ends 72 to the projecting four ends of the two upper pipes 68 and rigidly secured intermediate their upper and lower ends to the projecting four ends of the two lower pipes 68.

A first support pad 74 is pivotally secured to the lower ends of the two rear legs 70 and second support pad 74 is pivotally secured to the lower ends of the two front legs 70. Each support pad 74 is shown including four longitudinally spaced, transversely extending channel irons 76 secured to one another by a longitudinally directed cross-member 78 welded to the top of each channel iron 76. The cross-member 78 of each support pad is typically a section of 6-inch H beam. The cross-members 78 each are shown having an upwardly directed yoke 80 centrally positioned thereon comprised of two ears 82 of metal plate welded to the cross member. Each ear 82 is slotted with a horizontal, transversely directed slot 84 and each leg 70 carries a similarly slotted ear 86 projecting downwardly from its lowermost extent. The legs 70 are secured to the support pads 74 by hinge pins 88, for instance 1.5-inch cold rolled steel pins, received through the slotted yokes 80 and slotted ears 86.

Because the yoke slots 84 are above the center of gravity of each support pad and located substantially on the vertical transverse center line plane of each support pad, the support pads tend to remain level as shown during all stages of operation of the raising and lowering of the tank and support pads.

As best seen in FIGURES 3 and 4, a pair of transverse horizontal cross braces 90, 92 are secured at each end to the two rear legs 70 on either side of the vertical midpoint of the distance between the two pipes 68 secured to the rear legs 70. Similarly a pair of transverse horizontal cross braces 90, 92 are secured at each end to the two front legs 70 on either side of the vertical midpoint of the distance between the two pipes secured to the front legs 70.

Means 94 for pivotally receiving the outer end of the inner section of an extensible hydraulic jack 96 are shown secured centrally between each pair of cross-braces 90, 92 oriented so as to open forwardly of the vehicle 10. Each jack receiving means 94 is shown shaped generally similarly to a mortar mixing trough tipped on end so that the top and bottom are respectively flared upwardly and downwardly and the sides 98 are parallel and extend vertically and forwardly carrying a pivot pin 100 between them which pivotally receives the upper end of a hydraulic jack 96. The outer sleeve 102 of each hydraulic jack 96 is pivotally secured to the vehicle 10 frame along the longitudinal centerline of the frame and about 2.5 feet forwardly of the adjacent pipe 66. The pivot axes for the jack outer sleeves 102 are horizontal and transverse with respect to the longitudinal axis of the trailer 10.

It should now be noticed that two parallel upwardly opening channels or tracks 104, 106 of substantially U-shaped transverse cross-sectional shape throughout most of their length are secured to and extend along the tops of each of the frame members 16. Toward their forward ends the channels or tracks 104, 106 slope upwardly then downwardly in order to bridge the forward pipe 66. As best seen in FIGURES 5 and 6 two longitudinally spaced pairs 108, 110 of two laterally spaced upwardly directed slotted ears 112 are secured to the top of each frame member 16 adjacent the opposite lateral edges of each track pair 104, 106 each slotted ear pair 108 being located as far forwardly of the rear pipe 66 as each pair 110 is located rearwardly of the front pipe 66.

A bar 114 is secured at its ends to the two frame members 16 slightly below the upper surface of the members 16 and in alignment with both slotted ear pairs 108. Similarly, a bar 116 is secured at its ends to the two frame members 16 slightly below the upper surface of the members 16 and in alignment with both slotted ear pairs 110. A vertically directed upwardly opening socket (not shown) is formed in each bar 114, 116 on the longitudinal centerline of the vehicle 10 and in alignment with the slotted ear pairs 108 and 110, respectively. A rotatable table 118 is mounted for concentric rotation with each just-mentioned socket via a shaft 120 rotatably secured in each socket. Generally speaking, the tables 118 each eccentrically mount two oppositely horizontally directed pins 122 which project transversely of the longitudinal axis of the vehicle 10, which are adapted upon angular movement of the tables 118 in one sense (FIGURE 5) to withdraw from the slotted ear pairs 108, 110 and which are adapted upon angular movement of the tables 118 in the opposite sense (FIGURE 6) to project into each ear of said slotted ear pairs 108, 110.

The preferred structure for effecting the movement just outlined comprises two rigid links 124 pivotally secured at one end to each table 118 adjacent diametrically opposed peripheral points on each table for rotation about vertical axes and pivotally secured at the opposite end of each to the laterally inner end of a pin 122, one link 124 being secured to each pin 122. The latter are pivotable with respect to the former about vertical axes.

A horizontally directed crank arm 126 is fixedly secured to the upper end of each shaft 120, the arms 126 being parallel to one another. The opposite outer ends of the two arms 126 are pivotally secured to one another by a horizontal, longitudinally directed link 128, the pivoting motion involved being about vertical axes adjacent the ends of the link 128.

Rotation of the pin inserting and withdrawing structure just described between the positions shown in FIGURES 5 and 6 is effected by pushing and pulling the handle **130** which projects through a slot **132** in the left frame member **16** and is pivotally secured at its inner end via a pivot pin **134** to the outer end of a crank arm **136** welded to and projecting radially from the underside of the frontmost table **118**. It should be apparent that pushing in on the handle withdraws the pins from locking position (effects movement from the FIGURE 6 position to the FIGURE 5 position) and pulling out on the handle moves the pins into locking position (effects movement from the FIGURE 5 position to the FIGURE 6 position).

Other structure involved in the locking and unlocking arrangement includes the provision of an annular sleeve **138** extending coaxially laterally inwardly from the periphery of the slot on each laterally inner ear **112** to act as guides for the pins **122**. It can be seen from FIGURES 5 and 6 that the travel of the pins **122** during their withdrawal is sufficient to withdraw them from the slotted ears **112**, but insufficient to withdraw them from the guides **138**. Upstanding flanges **140** are provided on the opposite lateral margins of the top surfaces of the bars **114, 116** near the ends of the bars **114, 116**. The margin chosen being that toward which the adjacent pin **122** would move during its insertion were it not for the flanges **140**. Accordingly, the flanges **140** in association with the guide **138** keep the pins **122** aligned with the slots in which they are being inserted.

The basic structure of the apparatus according to the invention is completed by four diagonal or oblique braces **142** comprised of metal pipe, channel iron or the like and having a slotted ear **144, 146** at each end. The braces **142** including the ears **144** and **146** are each approximately 1.25 times the length of the leg **70** portions extending between the upper and lower pipes **68**.

The upper slotted ears **144** of the rear two of the braces **142** are pivotally secured to similar slotted ears **148** located at opposite ends of the forward side of the rear tank skid cross-brace **38** by horizontal, transversely extending pivot pins. The upper slotted ears **144** of the forward two of the braces **142** are pivotally secured to similar slotted ears **148** located at opposite ends of the rearward side of the forward tank skid cross brace **36** by horizontal, transversely extending pivot pins. The lower slotted ears **146** of the rear two of the braces **142** are slidingly received in the two laterally inner channels or tracks **104** so that the rear two of the braces **142** extend forwardly and downwardly from their upper ends. The lower slotted ears **146** of the forward two of the braces **142** are slidingly received in the two laterally outer channels or tracks **106** so that the forward two of the braces **142** extend rearwardly and downwardly from their upper ends. When the tank is in its lowered position and the support pads in their raised position as shown in FIGURE 1, the lower ends of the forward two of the braces **142** are approximately at the points marked "A" in FIGURE 2 and the lower ends of the rear two of the braces **142** are approximately at the points marked "B" in FIGURE 2. When the tank is in its raised position and the support pads are in their lowered positions as shown in FIGURE 4, the slotted ears on the lower ends of the forward two of the braces **142** are aligned with the forward slotted ear pairs of the tracks or channels and the slotted ears on the lower ends of the rear two of the braces **142** are aligned with the rear slotted ear pairs of the tracks or channels and all the locking pins **122** can be inserted in one simple motion by pulling the handle **130** outwardly from its FIGURE 5 position to its FIGURE 6 position. This action locks the diagonal or oblique braces thus stabilizing the legs **70** and the raised tank **30**. Lowering the tank and raising the support pads involves a reversal of the steps just described as should be apparent.

The tank **30**, braces **142**, legs **70** and support pads are moved between their FIGURE 1 and FIGURE 4 positions by extension and retraction of the hydraulic jacks. The hydraulic jacks **96** are operated via conventional fluid lines (not shown) connected to a hydraulic pump **150** driven by a gasoline engine **152** or the like. Both the pump **150** and the engine **152** may be mounted on the forward part of the trailer **10** ahead of the tank **30**. A pivotable cover or shroud **154** may be provided for the engine **152**.

As can be seen from FIGURE 1, when the tower is lowered and the support pads raised the vehicle **10** has ample clearance for travel over rough roads and for cross country off-the-road travel.

As can be seen from FIGURES 2–4, the hydraulic jacks pivot about both their upper and lower pivot points during raising and lowering of the tank and FIGURE 3 illustrates that the tower or tank **30** is preferably raised to 75 percent or more of its height before the support pads engage the ground. As the tank continues to be elevated and the support pads continue to lower the trailer frame will rise a few inches removing all of the tank weight from the trailer wheels.

It should also be observed in FIGURE 1 that the rear support pad when raised projects rearwardly to a point vertically below the rearmost extent of the tank downspout to protect the downspout during travel similarly to a rear bumper. A guy wire **156** may be provided between the outer extent of the downspout and the top rear of the tank **30** to support some of the weight of the downspout. A ladder **158** is shown hingedly secured at its midpoint to the lower end of the rear bulkhead of the tank so it will swing up out of the way as the tank is lowered and it engages the rear leg **70** crossbraces and will lower as the tank raises. The upper half **160** of the ladder **158** is rigidly secured to the tank rear bulkhead.

It should now be apparent that the apparatus just described efficiently accomplishes all of the objects set forth at the outset of this specification and clearly illustrates the principles of the invention. Because the specific apparatus shown and described can be considerably modified yet not depart from the invention's principles or fail to achieve its objects, the present invention should be understood as encompassing all modifications as are within the spirit and scope of the following claims.

I claim:

1. A transportable fluid storer and dispenser comprising: a vehicle frame having ground engaging wheel means; fluid storer and dispenser tank means; at least one forward leg and at least one rear leg; means pivotally securing each leg at the upper end thereof to said tank means for pivotal movement about horizontal axes; means pivotally securing each leg at a point thereon intermediate its upper and lower ends to said vehicle frame for pivotal movement about horizontal axes; ground engageable support pads mounted on the lower end of each leg; and means on said vehicle frame for simultaneously elevating said tank means and lowering said support pads to a ground engaging condition by bringing said legs to a substantially vertical condition defining a first position and for simultaneously lowering said tank means into adjacency with said vehicle frame and raising said support pads to a non-engaging condition with respect to the ground by bringing said legs to an approximately horizontal condition defining a second position.

2. Apparatus as set forth in claim 1 further comprising: means defining at least one forward oblique brace and at least one rear oblique brace, said forward brace being pivotally secured at its upper end to said tank means near the securement of said forward leg thereto for pivotal movement about a horizontal axis, said rear brace being pivotally secured at its upper end to said tank means near the securement of said rear leg thereto for pivotal movement about a horizontal axis; each brace being longer than the distance between the means pivotally securing each leg at the upper end thereof and the means

pivotally securing each leg at a point thereon intermediate its upper and lower ends; track means on said vehicle frame, the lower ends of said forward and rear braces being received on said track means for guided sliding movement therealong as said legs are moved between said first and second positions; and means for locking said forward and rear brace lower ends to prohibit sliding movement with respect to said track means, the locking means being actuable when said legs are in said first position to prevent further pivoting of said legs.

3. Apparatus as set forth in claim 2 wherein said locking means is operable from a single point to lock and unlock all of said forward and rear braces.

4. Apparatus as set forth in claim 2 wherein the locking means includes means defining slots through the lower ends of said forward and rear braces alignable with means defining slots through said track means, pins insertable in and withdrawable from said slots, and means for inserting and withdrawing the pins.

5. Apparatus as set forth in claim 4 wherein the means for inserting and withdrawing the pins comprises a mechanical linkage connecting all of the pins and an operator movable between a first position wherein all of the pins are withdrawn and a second position wherein all of the pins are inserted.

6. Apparatus as set forth in claim 2 wherein said track means extend parallel to the longitudinal axis of said vehicle frame and the forward and rear brace upper end pivot axes extend transversely with respect to the longitudinal axis of the vehicle frame.

7. Apparatus as set forth in claim 2 wherein said track means comprise a separate upwardly opening channel for each oblique brace lower end and wherein each forward brace extends rearwardly and downwardly and each rear brace extends forwardly and downwardly when said legs are in the first position thereof.

8. Apparatus as set forth in claim 1 wherein the means for elevating and lowering the tank means and lowering

and elevating the support means comprises a first extensible-contractile hydraulic jack connected to said vehicle frame and to at least one forward leg and a second extensible-contractile hydraulic jack connected to said vehicle frame and to at least one rear leg, and means for extending and contracting said hydraulic jacks.

9. Apparatus as set forth in claim 8 wherein the hydraulic jacks are pivotally secured to said legs and pivotally secured to said vehicle frame for pivoting movement about horizontal axes transverse with respect to the longitudinal axis of the vehicle frame.

10. Apparatus as set forth in claim 1 further including a dispensing spout projecting rearwardly from said tank means, and wherein the support pad mounted on the lower end of each rear leg, when said legs are in the second position thereof, extends rearwardly beyond said vehicle frame to a point subjacent said dispensing spout to protect the spout when the vehicle is transported.

11. Apparatus as set forth in claim 1 wherein a major portion of the weight of said transportable fluid storer and dispenser is borne by said support pads when said legs are in said first position.

12. Apparatus as set forth in claim 11 wherein said support pads are pivotally secured to said legs.

13. Apparatus as set forth in claim 1 wherein said at least one forward leg comprises two substantially identical forward legs spaced transversely of one another with respect to the longitudinal axis of said vehicle frame; wherein said at least one rear leg comprises two substantially identical rear legs spaced transversely of one another with respect to the longitudinal axis of said vehicle frame; and wherein said horizontal axes all extend transversely of the longitudinal axis of said vehicle frame.

No references cited.

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