April 25, 1967 K. M. KEISER 3,315,929

PORTABLE COLLAPSIBLE TOWER FOR FLUID TANKS AND THE LIKE

Filed Aug. 4, 1964 3 Sheets-Sheet 1

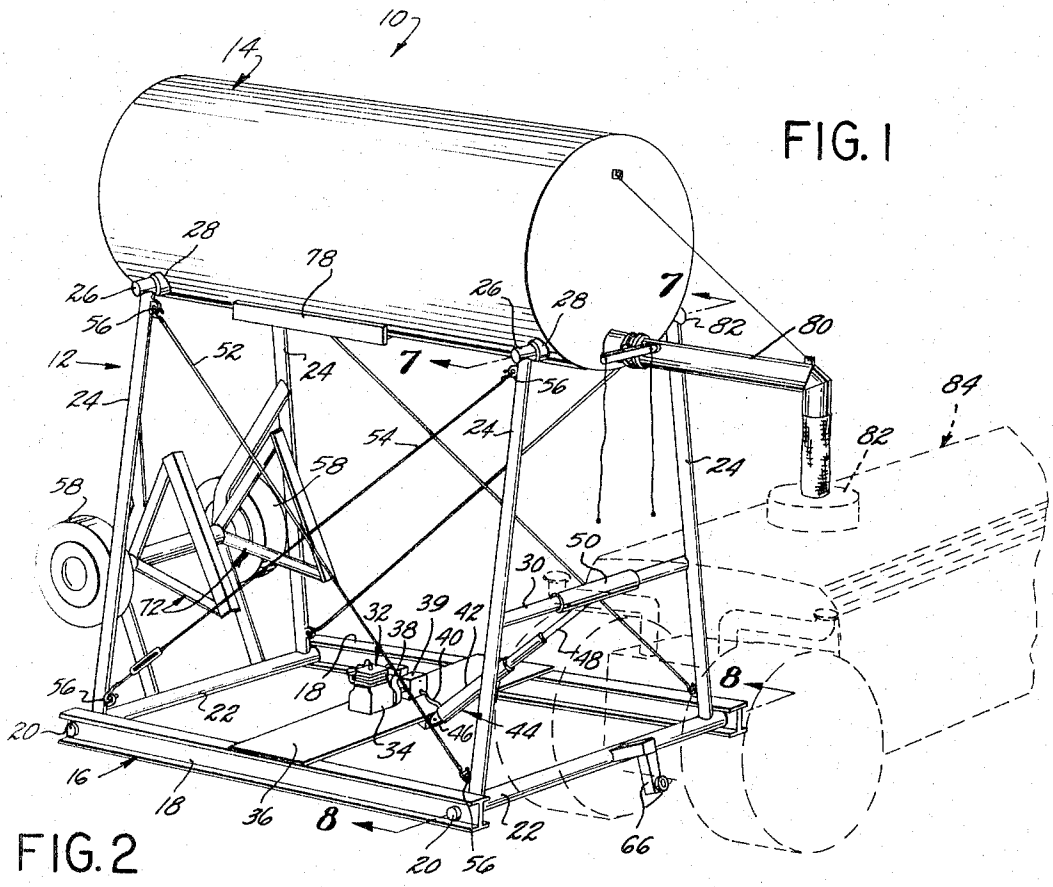


FIG. 1

FIG. 2

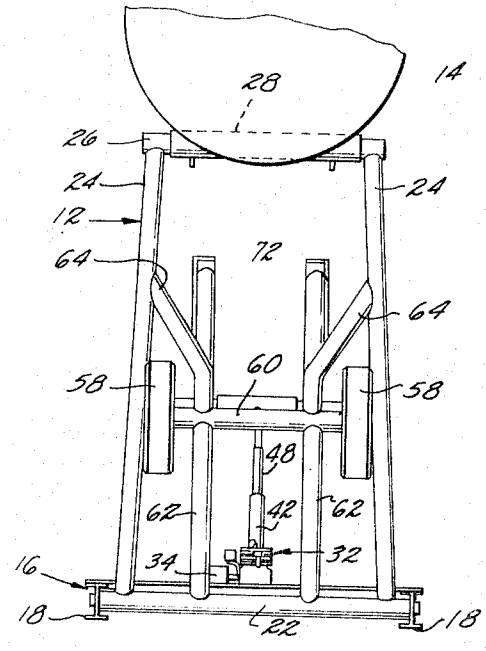
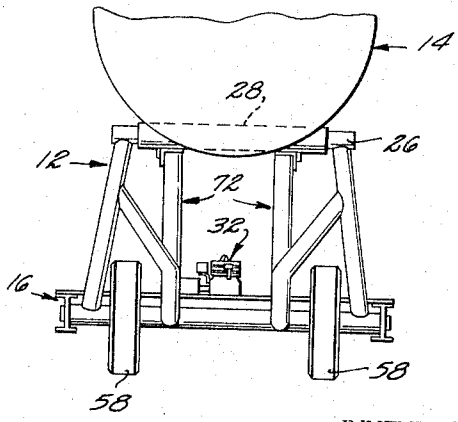


FIG. 3



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3 Sheets-Sheet 2

FIG. 4

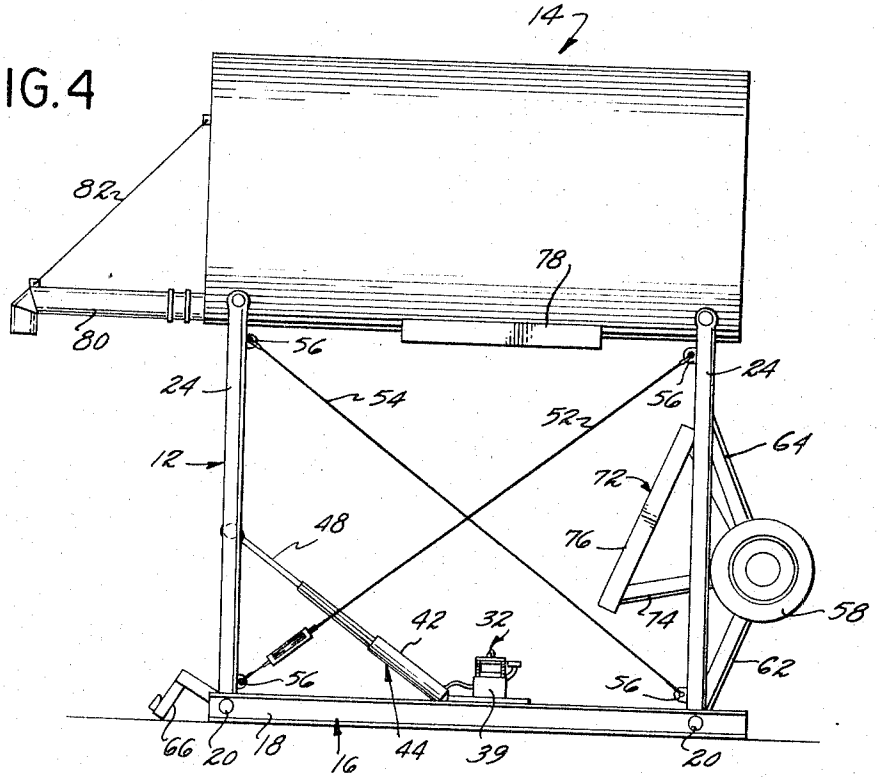
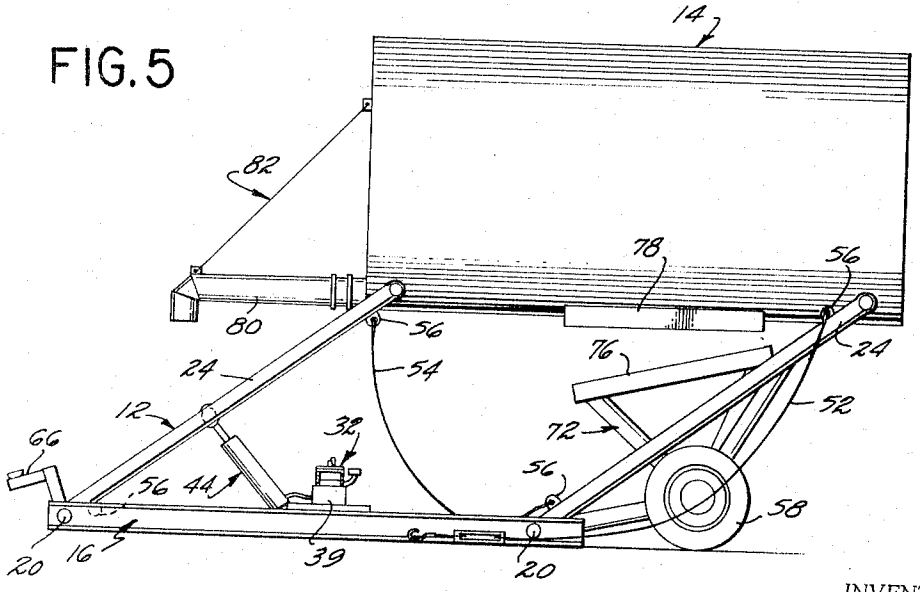


FIG. 5



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Filed Aug. 4, 1964 3 Sheets-Sheet 3

FIG. 6

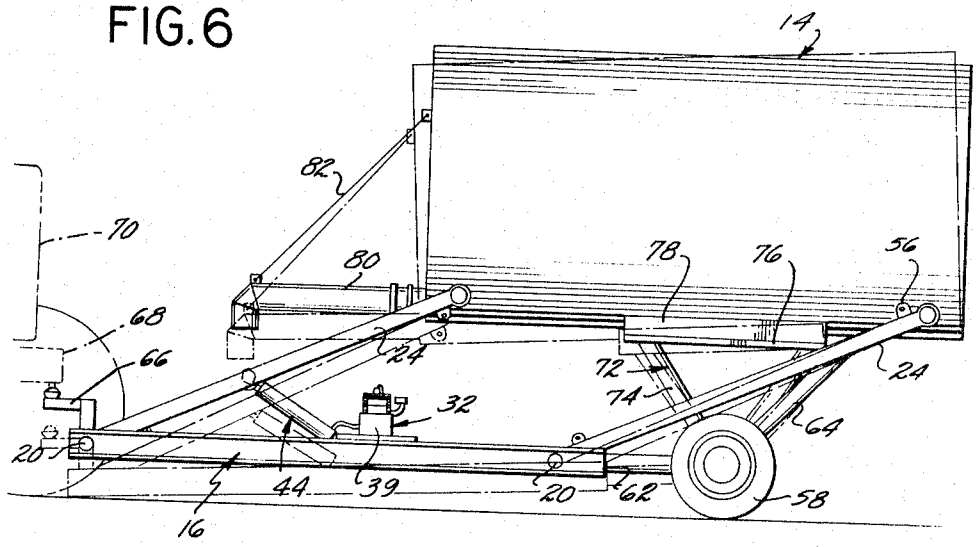
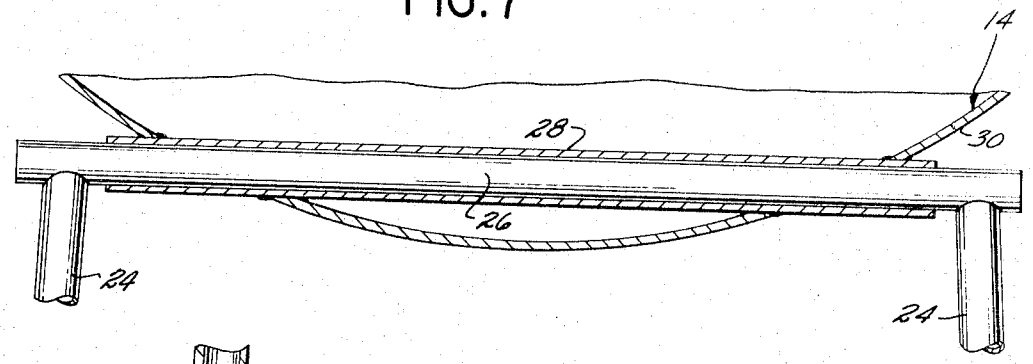


FIG. 7



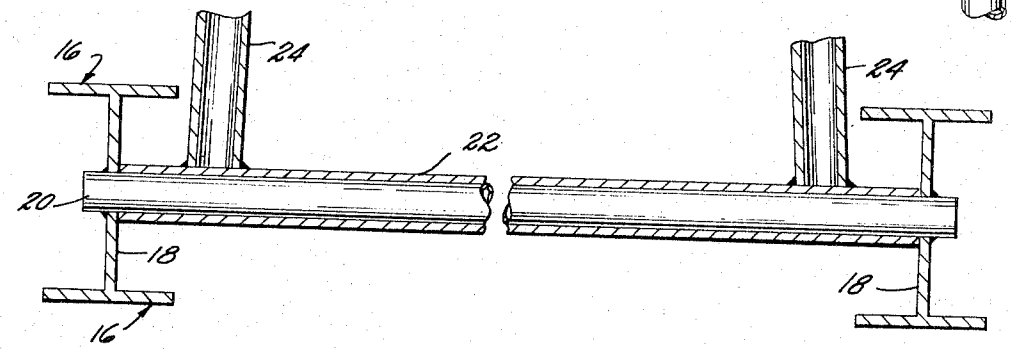


FIG. 8

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PORTABLE COLLAPSIBLE TOWER FOR FLUID TANKS AND THE LIKE

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9 Claims. (Cl. 248—129)

The present invention relates generally to improvements in supporting towers; more particularly, the invention relates to a novel collapsible and portable supporting tower.

In its broader aspects, the invention provides a tower which may be used to support any object in an elevated position above the ground and which is equipped with wheels to permit the tower to be transported from one location to another. A primary feature of the invention resides in the unique construction of the tower whereby the latter may be quickly and easily collapsed at one location for convenience of transportation and subsequently erected at another location. This collapsibility and portability of the tower is achieved with a tower structure which is relatively simple in construction, economical to fabricate, light weight, and compact.

The attached drawings illustrate one useful embodiment of the present supporting tower. This illustrated embodiment of the invention is a water tower of the general type used in the earth moving industry for servicing mobile water trucks. Thus, many earth working operations require periodic wetting of the soil. For example, dirt is frequently added to a land area to raise its surface level. An earth moving operation of this kind is commonly referred to in the trade as a "land fill." One of the major problems associated with such a land fill is maintaining the proper moisture content in the fill dirt to obtain the required degree of relative compaction of the dirt. If the fill dirt in its native state lacks the required moisture content, the land fill contractor is required to supplement the moisture by periodically wetting the dirt as the land fill operation proceeds. Such additional water is deployed over the area being filled by water trucks which are commonly referred to in the trade as "water pulls."

The storage capacity of a water pull is limited with the result that the pull must be refilled many times during the course of a typical land fill. This periodic refilling, or servicing, of the water pull creates a two-fold time loss involving the time required for the water pull to travel from its operating area to the water supply and back to the operating area, and the time required to actually refill of service the pull at the water supply. Moreover, many land fills are of such a magnitude as to require several water pulls. Servicing such a plurality of pulls introduces an additional time loss when it is necessary for the pulls to line up and wait their turn at the water supply or supplies.

These time losses are minimized by using several portable water towers placed at strategic locations around the fill. In this way, the time required for a water pull to travel from its operating area to a water tower and return is reduced and the tendency for the water pulls to line up at a water tower is minimized or eliminated. The use of a plurality of strategically located water towers at a land fill site, therefore, is highly desirable.

In order to be effective, water towers of the character described must satisfy certain requirements. The water towers, for example, must be highly portable so that they may be easily moved from one job to another. Accordingly, the dimensions and weight of the tower, when conditioned for transportation, must fall within the motor vehicle code specifications. The tower must be capable of being towed and landed by a relatively light truck. In addition, the tower should be capable of landing and being erected on a roughly cleared site, such as one which has been graded with a Caterpillar and blade, without auxiliary ditching or hand shoveling. Such landing and erection capabilities of the tower should exist on both level land and on mild slopes. Finally, the tower must be capable of erection to a height such that its water tank is elevated a sufficient distance above the ground to position the down spout of the tank over the fill port of a water pull. Preferably, the tower should be capable of being erected by one man in a minimum of time.

The illustrative embodiment of this invention provides a collapsible, portable water tower of the character described which satisfies all of the foregoing requirements. As will become apparent from the ensuing description, however, the invention is not limited in its applicaton to a water tower; that is to say, the collapsible, portable tower of the invention may be used to support other than a water tank.

It is therefore a general object of the present invention to provide an improved collapsible and portable supporting tower of the character described.

An object of the invention is the provision of a tower of the character described which is ideally suited for use as a collapsible, portable water tower to be erected at a land fill site or other earth working site.

An object of the invention is to provide a tower of the character described which is equipped with its own wheels, whereby the tower can be conveniently moved from one location to another, and which is readily collapsible to a reduced height for ease of transportation.

Another object of the invention is the provision of a tower of the character described which can be easily and quickly erected and collapsed by one man and towed from one location to another by a relatively light truck.

Another object of the invention is to provide a tower generally of the character described, and, in particular, a water tower of the character described, whose dimensions and weight, when conditioned for transportation, fall within the vehicle code specifications.

Other objects, features and advantages of the present invention will become apparent to those versed in the art from a consideration of the following description, the appended claims and the accompanying drawings, wherein:

FIGURE 1 is a perspective view of a water tower according to the invention in its erected position;

FIGURE 2 is a view of the left-hand end of the water tower of FIGURE 1, showing particularly the ground wheels of the tower in the retracted position which they occupy when the tower is erected;

FIGURE 3 is a view similar to FIGURE 2 but showing the tower in its collapsed or traveling position with its ground wheels extended for engaging the ground;

FIGURE 4 is a view of the rear side of the water tower in FIGURE 1;

FIGURE 5 is a view similar to FIGURE 4 illustrating the tower in one intermediate position as it is being lowered to its collapsed or traveling position;

FIGURE 6 shows the tower in its collapsed or traveling position;

FIGURE 7 is an enlarged section taken along line 7—7 in FIGURE 1; and

FIGURE 8 is an enlarged section taken along line 8—8 in FIGURE 1.

The collapsible, portable water tower 10 illustrated in these drawings comprises a collapsible tower 12 proper and a water tank 14 supported on the upper end of the tower. As will appear shortly, the water tank 14 serves a unique dual function, to wit, a structural member of the collapsible tower structure 12 and a water container.

The present invention resides primarily in the unique construction of the collapsible tower structure 12.

This tower structure comprises a rectangular base frame 16 including parallel side frame members, or beams, 18 and parallel, cylindrical end members, or rods, 20. As may best be observed in FIGURE 8, the ends of the rods 20 extend through bores in the web of the side beams 18 and are welded or otherwise rigidly joined to the beam webs, thereby to unite the beams and rods into a rigid frame structure. Rotatable on each rod 20 is a bearing sleeve 22. Welded at one end to each end of each sleeve 22 is a supporting leg 24. The two supporting legs which are secured to each sleeve 22 are located approximately in a common plane containing the axis of the respective sleeve and incline inwardly toward one another, at a small angle, toward their upper ends.

The upper ends of the two supporting legs 24 at each end of the base frame 16 are welded to opposite ends of a cylindrical cross bar, or rod, 26. Rotatable on each rod 26, between the respective supporting bars 24, is a bearing sleeve 28. As may be best observed in FIGURE 7, each sleeve 28 extends through holes in the cylindrical wall 30 of the water tank 14 and across the interior of the tank. The ends of each sleeve are welded to the cylindrical tank wall to rigidly join the respective sleeve to the tank and form a water tight joint between the sleeve and tank. The two forward supporting legs 24, that is the two supporting legs at the right of FIGURE 1, are rigidly joined by a cylindrical cross brace 30.

The center distance between the lower rods 20 is approximately equal to the center distance between the upper rods 26. The four supporting legs 24 are approximately equal in length. It is apparent, therefore, that the tower structure, as thus far described, constitutes a parallel bar mechanism which is rotatable from its position of FIGURES 1 and 4, through the position of FIGURE 5, to the position of FIGURE 6. In the ensuing description, the position of the tower shown in FIGURES 1 and 4 will be referred to as its erect position and the position of the tower shown in FIGURE 6 will be referred to as its collapsed position. It is significant to note that the water tank 14 serves a dual function in the present tower; that is to say, the water tank serves both as a water container and as a structural element of the parallel bar mechanism of the tower. The axis of the tank obviously remains substantially parallel to the plane of the base frame 16 during rotation of the tower between its erect position of FIGURES 1 and 4 and its collapsed position of FIGURE 6.

The water tower 10 is raised from its collapsed position to its erect position by means of an elevating mechanism 32. Various types of elevating mechanisms may be used for this purpose. The elevating mechanism illustrated in the drawings comprises a gasoline powered engine 34 mounted on a supporting plate 36 which is welded or otherwise rigidly attached at its ends to the side members 18 of the base frame 16. Engine 34 drives a hydraulic pump 38 enclosed in a housing containing a hydraulic fluid reservoir (not shown). The outlet of the pump 38 is connected, through a two-way valve 39 and a hydraulic line 40, to the lower end of the cylinder 42 of a hydraulic ram 44. The lower end of the cylinder 42 is pivotally connected at 46 to the leading edge of the engine supporting plate 36. The plunger 48 of the hydraulic ram 44 is secured to a sleeve 50 rotatable on the cross brace 30. In one position of the valve 39, the ram cylinder 42 is directly connected to the pump 38, and in the other position of the valve, ram cylinder 42 communicates with the hydraulic fluid reservoir in the pump housing.

When the engine 34 is operated with the valve 39 in position to deliver hydraulic fluid under pressure to the ram cylinder, the ram plunger 48 is extended to rotate the water tower 10 from its collapsed position of FIGURE 6 to its erect position of FIGURES 1 and 4.

It is apparent that means must be provided for retaining the water tower 10 in its erect position. This may be accomplished in various ways. The tower shown in the drawings, for example, is retained in its erect position by connecting crossed cables 52 and 54 between the supporting legs 24 at each side of the tower. These cables may be anchored to the legs in any convenient way, such as by the illustrated hooks and eyes 56. When the tower is to be lowered, one end of each cable 52 is disengaged from its respective supporting leg 24, as shown in FIGURE 5.

Water tower 10 is equipped with ground wheels 58 to permit the tower to be towed from one location to another. Wheels 58 are rotatably mounted on an axle 60 which is rigidly secured to rear bearing sleeve 22 and to the rear tower legs 24 by struts 62 and 64, respectively. When the tower occupies its erect position, the wheels are located to the rear of the rear tower legs 24, a distance above the lower, ground engaging surface of the base frame 16.

In lowering the water tower, the valve 39 is positioned so that ram cylinder 42 communicates with the hydraulic fluid reservoir, thereby permitting the tower to descend to its collapsed position under the force of gravity. When thus lowering the tower, it may be necessary to give the tower a slight push toward its collapsed position in order to rotate the tower legs 24 from the upright positions which they occupy when the tower is erect. The rate at which the tower descends to its collapsed position may be regulated by the valve 39 or by placing a flow restriction orifice (not shown) in the fluid line between the valve and the fluid reservoir.

In descending from its erect position (FIGURE 4) to its collapsed position (FIGURE 6) under the force of gravity, the structure moves into the position shown in FIGURE 5, wherein the wheels 58 engage the ground, by the action of the parallel bar mechanism which includes the tank. The structure continues its collapsing movement into the position shown in phantom outline in FIGURE 6, wherein the tank 14 is tilted and the rear end of base frame 16 is elevated. The rear of the base frame is thus elevated by the action of the force or weight applied at the rear rod 26, which is a part of the parallel bar mechanism, exerted on rear legs 24 as levers with the axle of wheels 58 as a pivot. This leverage action will be understood from the geometry of the parts. This action is assisted by a downward rearward tank movement which results from the fixed position against the ground of the front end of base frame 16, as will be appreciated by observation of the geometrical relations of the parts.

Rigidly mounted on the axle 60 are a pair of tank supports 72 each including diverging struts 74 and a cross bar 76 fixed to the divergent ends of the struts. The tank supports 72 are so oriented relative to the axle 60 that when the tower is fully collapsed, the cross bars 76 parallel the axis of the water tank 14 and engage bearing plates 78 welded to the tank. Thus, when the tower is fuly collapsed, the weight of the water tank 14 is transmitted through the tank supports 72 and the axle 60 to the ground wheels 58.

In its position shown in phantom outline in FIGURE 6, the water tower is collapsed and supported on its ground wheels. To engage the tower with a towing vehicle, the front end of base frame 16 is raised to position the structure as shown in solid lines in FIGURE 6, and the tongue 66 is engaged with cooperating components on the vehicle 70.

Tank 14 is equipped with a conventional down spout 80. In the drawings, this down spout extends from the forward end of the tank and its outer extremity is vertically supported by a cable 82 attached to the forward end wall of the tank. The tower legs 24 are so longitudinally dimensioned that when the water tower 10 occupies its erect position of FIGURE 1, the elevation of the down spout 80 above the ground is sufficient to

enable the spout to be located over the fill port 82 of a water pull 84, as illustrated in FIGURE 1. The down spout may remain in its same position while the water tower structure is erect, collapsed, or being towed. As indicated in FIGURE 6, the position of the down spout with the structure in collapsed position is such that it need not be dismantled during storage or towing, thereby eliminating the work and time which would otherwise be involved in dismantling and reassembling.

The operation of the present water tower is believed to be obvious from the preceding description. When it is desired to tow the tower from one location to another, one end of the tower stabilizing cables 52 are detached from their respective tower legs 24 and the tower is lowered in a rapid unitary movement to its collapsed position of FIGURE 6, wherein the tower is supported on the ground wheels 58. The tower may then be towed on the wheels by a vehicle 70 having a suitable hitch 68 for connection to the tower hitch 66. Upon arrival at the new location, the tower is elevated to its erect position of FIGURE 1 wherein the base frame 16 rests on the ground and the ground wheels 58 are raised above the ground. The tower is retained in this erect position by re-attaching the cables 52 to their respective tower legs 24.

Those versed in the art will appreciate that the present invention achieves the objects and realizes the advantages hereinbefore mentioned.

Although a specific embodiment of the present invention has been illustrated and described herein, it will be understood that the same is merely exemplary of presently prefered embodiments capable of attaining the objects and advantages hereinbefore mentioned, and that the invention is not limited thereto; variations will be readily apparent to those versed in the art, and the invention is entitled to the broadest interpretation within the terms of the appended claims.

The inventor claims:

1. A portable collapsible tower comprising a normally substantially horizontal base frame having front and rear ends and a lower ground engaging side, front and rear supporting legs at the upper side and adjacent said front and rear ends, respectively, of said frame, said legs having lower ends adjacent said frame and upper ends remote from said frame, a connecting member extending between the upper ends of said legs, pivotal connections between said frame and the lower ends of said legs, pivotal connections between said member and the upper ends of said legs, said pivotal connections having normally horizontal, substantially parallel pivot axes whereby said legs are rotatable forwardly and upwardly relative to said frame to erect positions over the frame and rearwardly and downwardly relative to said frame to collapsed positions wherein said rear legs extend rearwardly of said frame, means for releasably retaining said legs in said erect positions, ground wheels mounted on the rear sides of said rear tower legs intermediate the ends thereof in such manner that said tower is collapsible from its erect position through an intermediate position wherein said frame rests flat on the ground and said wheels engage the ground rearwardly of said frame, and said frame is collapsible beyond said intermediate position to a final position by rotation of said rear legs about the rotation axis of said wheels as a center in a direction to elevate the rear end of said frame out of supporting contact with the ground, and means for retaining said tower in said final position, thus to permit movement of the tower from one location to another.

2. A tower according to claim 1 including power means operative between said frame and certain of supporting legs for effecting rotation of said legs between said collapsed positions and said erect positions.

3. A tower according to claim 1 including hydraulic ram means on said frame operatively connected to said front legs for effecting rotation of said legs between said collapsed positions and said erect positions.

4. A tower according to claim 1 wherein said connecting member comprises a water tank, whereby said tank is vertically movable with said tower between an upper position of use and a lower position of travel, and said tank has a valved outlet through which water may be drained from said tank when said tank is in said upper position of use.

5. A tower according to claim 1 including: a hitch on the front end of said frame for attaching said frame to a towing vehicle in a towing position wherein the front end of said frame is elevated out of supporting contact with the ground, whereby in said towing position, said tower is supported solely by the towing vehicle and said tower wheels.

6. A tower according to claim 1 wherein: said connecting member comprises a water tank, whereby said tank is vertically movable with said tower between an upper position of use and a lower position of travel, said tank has a down spout through which water may be drained from said tank when said tank is in said upper position of use, and said down spout extends from the front end of said tank, whereby said down spout is disposed in the protected position over the front end of said base frame wherein said tank is in said lower position of travel.

7. A tower according to claim 1 wherein: said connecting member comprises a water tank, whereby said tank is vertically movable with said tower between an upper position of use and a lower position of travel, said tank has a valve outlet through which water may be drained from said tank when said tank is in said upper position of use, and said tank being arranged in such a way that the weight of said tank and its contents is effective to collapse said tower to said intermediate position to said final position, whereby said tank and its contents comprises said means for retaining said tower in said final position.

8. A portable collapsible tower comprising a normally substantially horizontal base frame having front and rear ends at a lower ground engaging side, supporting legs at the upper side and adjacent said ends, respectively, of said frame, said legs having lower ends adjacent said frame and upper ends remote from said frame, a connecting member extending between the upper ends of said legs, pivotal connections between said frame and the lower ends of said legs, pivotal connections between said member and the upper ends of said legs, said pivotal connections having normally horizontal, substantially parallel pivot axes, the horizontal spacing between the lower pivot axes being substantially equal to the horizontal spacing between the upper pivot axes, and the spacing between the upper and lower pivot axes at one end of said frame being substantially equal to the upper and lower pivot axes at the other end of said frame, whereby said legs are rotatable upwardly relative to said frame to erect positions over the frame and downwardly relative to said frame to collapsed positions, means for releasably retaining said legs in said erect positions, an axle mounted on said legs at one end of said frame and wheels rotatably mounted on said axle in such manner as to be rotated downwardly into ground engaging positions upon rotation of said legs to said collapsed positions and rotated upwardly away from said ground engaging positions upon rotation of said legs to said erect positions, and supporting means fixed to said axle for rotation into supporting engagement with said connecting member upon rotation of said legs to said collapsed positions and rotation out of supporting engagement with said connecting member upon rotation of said legs to said erect positions.

9. A portable collapsible water tower comprising a normally substantially horizontal base frame having front and rear ends and a lower ground engaging side, a pair of front supporting legs at the upper side and adjacent the front end of said frame, a pair of rear legs at the upper side and adjacent the rear end of said frame, said legs having lower ends adjacent said frame and upper

ends remote from said frame, a water tank extending between the upper ends of said legs, pivotal connections between said frame and the lower ends of said legs, pivotal connections between said water tank and the upper ends of said legs, said pivotal connections having normally horizontal, substantially parallel pivot axes extending crosswise of said frame, the horizontal spacing between the lower pivot axes being substantially equal to the horizontal spacing between the upper pivot axes, and the spacing between the upper and lower pivot axes at the front end of said frame being substantially equal to the spacing between the upper and lower pivot axes at the rear end of said frame, whereby said legs are rotatable upwardly relative to said frame to erect positions over said frame, wherein said water tank is disposed in an elevated position above the frame, and downwardly relative to said frame to collapsed positions wherein said water tank is disposed in a lowered position, means for releasably retaining said legs in said erect positions, power means on said frame and operatively connected to the legs at one end of said frame for elevating the latter to said erect positions, an axle rotatably supporting ground wheels

mounted on said legs at one end of said frame in such manner that said ground wheels are rotated downwardly into ground engaging position upon rotation of said legs to said collapsed positions and rotated upwardly away from said ground engaging positions upon rotation of said legs to said erect positions, and supports rigidly secured to said axle for rotation into vertical supporting engagement with said tank upon rotation of said legs to said collapsed positions and rotation out of supporting engagement with said tank upon rotation of said legs to said erect positions.

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