Dec. 17, 1935. V. WILLOUGHBY 2,024,411

MULTIUNIT TANK CAR

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Fig. 6.

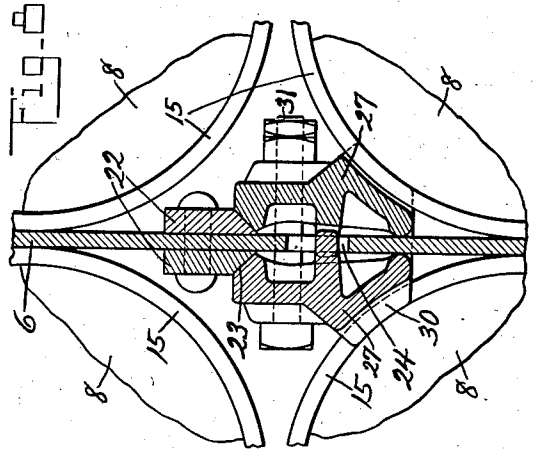
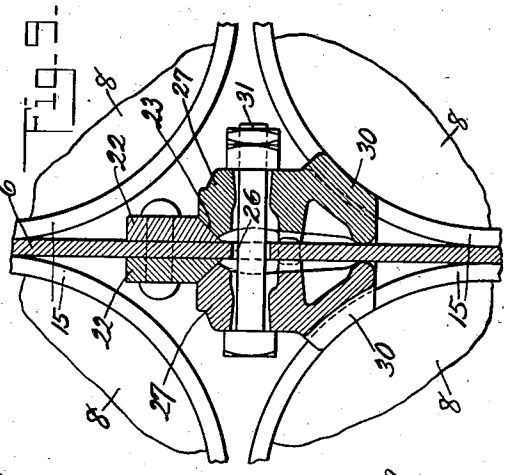


Fig. 7.



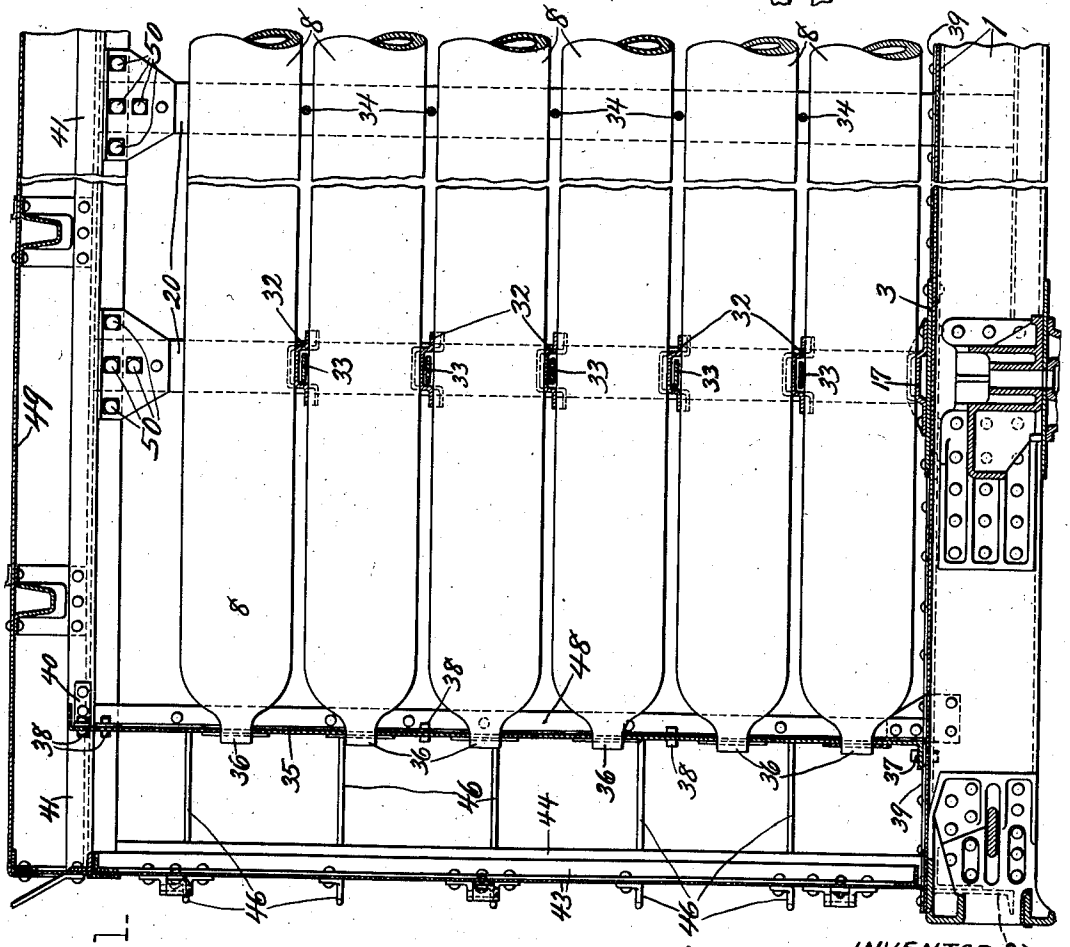


Fig. 1.

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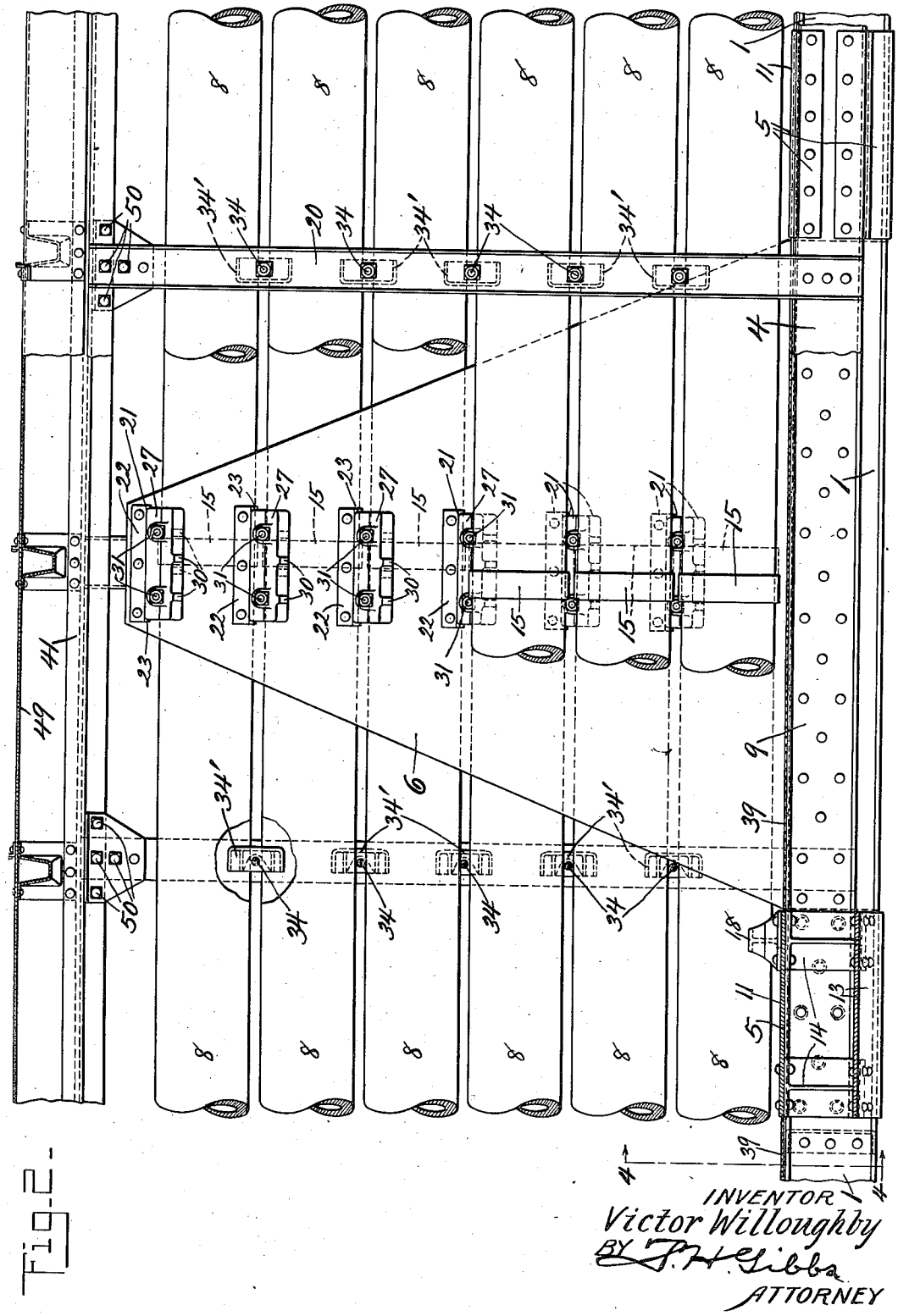

Fig. 2.

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MULTIUNIT TANK CAR

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Fig-3-

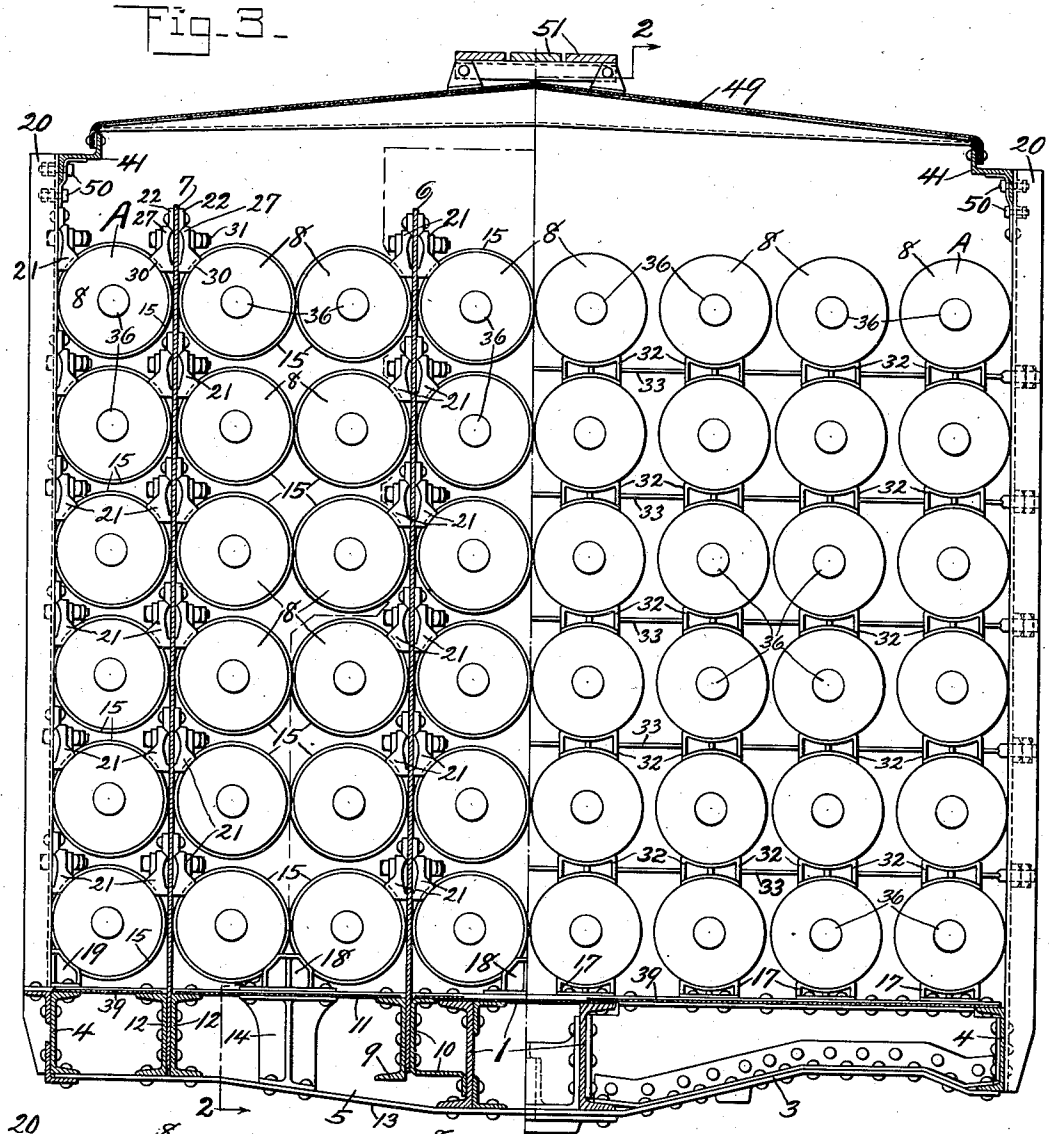
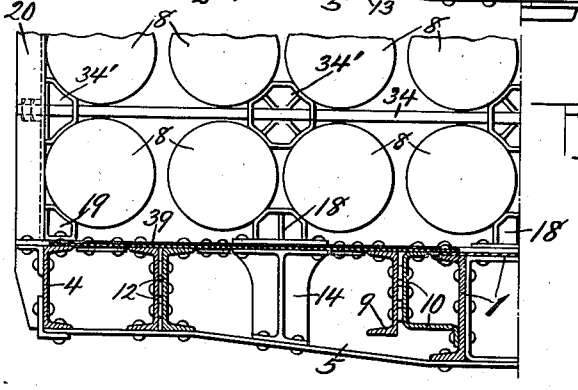


Fig-4-



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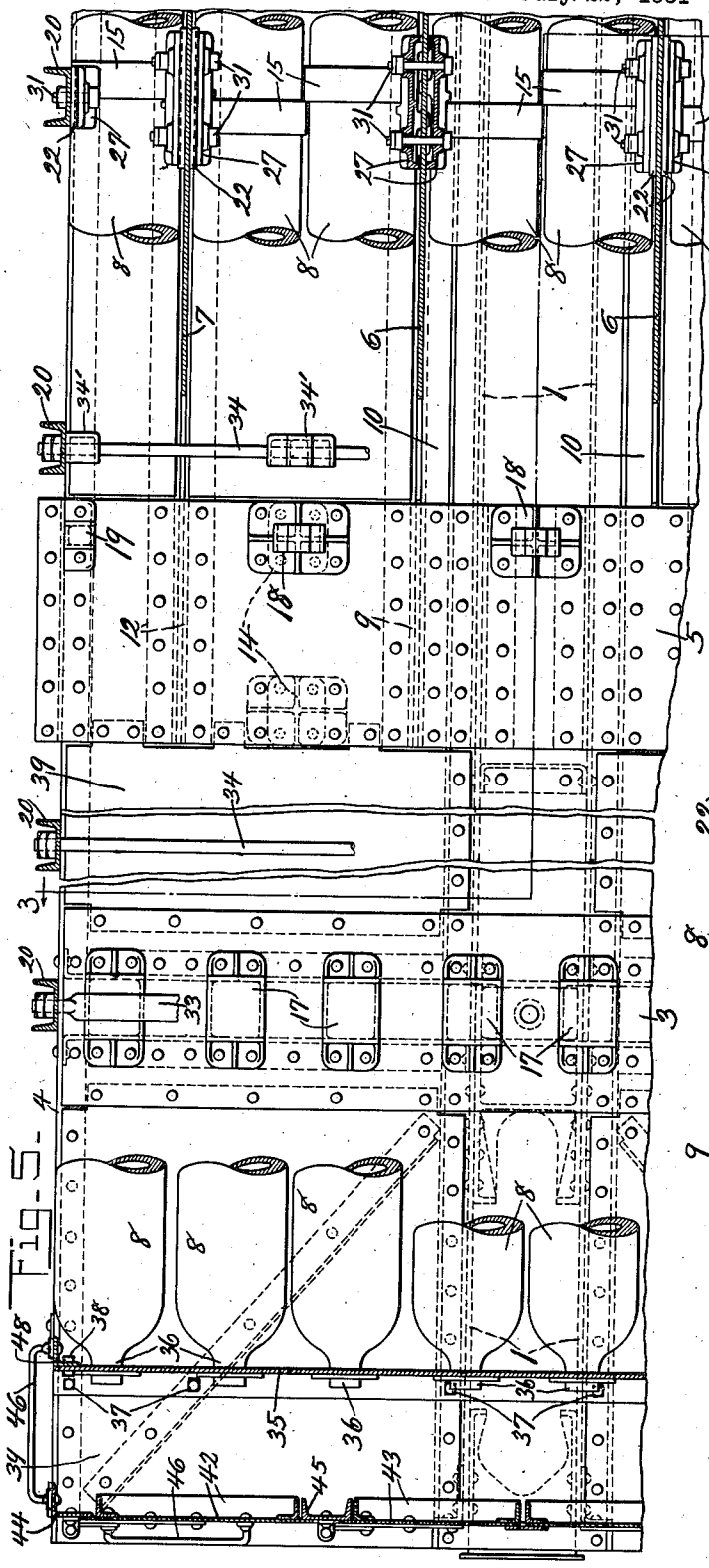

Fig. 5.

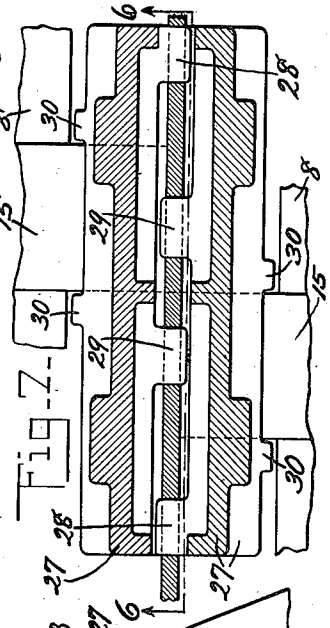

Fig. 7.

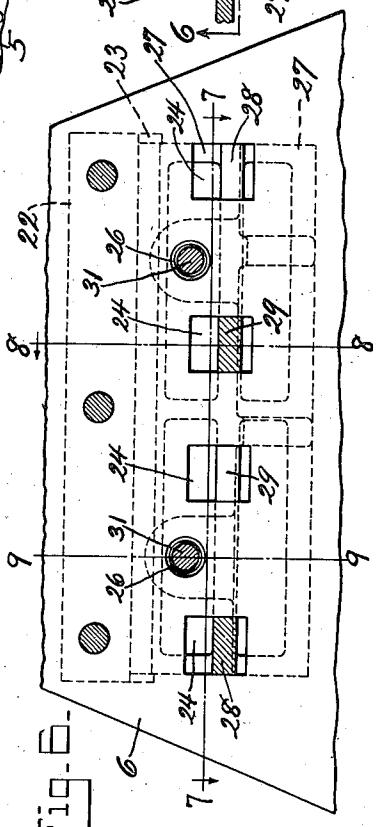

Fig. 6.

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Patented Dec. 17, 1935 2,024,411

UNITED STATES PATENT OFFICE

2,024,411

MULTIUNIT TANK CAR

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Application July 22, 1931, Serial No. 552,373

25 Claims. (Cl. 105—360)

This invention relates generally to multiple unit tank cars and more particularly to a car adapted to carry a large number of tanks of relatively small diameter and of considerable length such as are customarily used for the transportation and storage of fluids especially gases such as helium although it will of course be understood that the arrangement of parts and principles employed herein are applicable to tanks of various sizes, shapes and numbers.

One object of the invention is to provide an improved arrangement for supporting the tanks so that they are effectively held against shifting and in one specific aspect of the invention this is accomplished by interlocking the tanks with each other and anchoring the interlocked tanks to the car frame.

A further object is to provide an arrangement and construction of parts whereby the tanks may be easily loaded and unloaded without interference from the interlocking elements or undue delay being caused by the anchoring means.

A more specific object of the invention is to provide interlocking tank elements in the form of rings or bands shrunk or otherwise secured to the tanks preferably at their intermediate portion although under certain conditions the interlocking elements could be placed at any point or points along the length of the tanks. While bands are specifically shown as completely encircling the tanks it will of course be understood that the elements may extend only partially around the tanks and thus be in the form of lugs or projections which could be welded or otherwise secured to the tanks.

Another object is to provide anchoring means arranged so as not only to facilitate loading and unloading of the tanks but also to effectively distribute the anchoring stresses to the car frame.

Other objects and advantages will be more apparent to those skilled in the art from the following description of the accompanying drawings in which:

Fig. 1 is a vertical longitudinal section through one end of the car and beyond the point of anchorage.

Fig. 2 is a section at the point of anchorage, taken on line 2—2 of Fig. 3, the right end of view being shown in elevation.

Fig. 3 is a transverse section taken on the line 3—3 of Fig. 5 and showing the tanks in end elevation at the right and at the left showing the tanks and their anchoring bands.

Fig. 4 is a transverse section taken on the line 4—4 of Fig. 2 and showing a modified form of tank saddles, used adjacent the anchorage point.

Fig. 5 is a horizontal section of one quarter of the car, the section being taken above the second tier of tanks with a portion of all of the tanks omitted to show details of the underframe and superstructure.

Fig. 6 is an enlarged elevation of a portion of one of the vertical brace gussets showing the rectangular openings therein for the reception of lugs formed on the wedging elements, said lugs being shown in section taken on the line 6—6 of Fig. 7.

Fig. 7 is a horizontal section taken on line 7—7 of Fig. 6.

Figs. 8 and 9 are vertical transverse sections taken on line 8—8 and 9—9 of Fig. 6.

In the specific embodiments of the invention, which are shown herein merely for purposes of illustration, there is provided a car whose underframe includes a center sill 1, end sills 2 and usual body bolsters 3 connected by side sills 4. Crossbearers 5 are provided at suitable points, two of which are shown in Fig. 2 to be relatively close together near the center of the car for the purpose of supporting anchorage means including vertical brace gussets 6 and 7. These gussets are wide at their base and taper to a narrower width at their top near the upper horizontal row of tanks 8. In the car as shown, 48 tanks are provided and to insure suitable anchorage for all of the tanks two brace gussets such as 6 and 7 are each disposed to one side of the center sill. The inner brace 6 is secured between a longitudinal underframe channel member 9 and a longitudinal bracket 10, this bracket in turn being riveted to the web of the adjacent channel of the center sill. Channel 9 and bracket 10 are also secured to the underside of the top cover plate 11 of the crossbearers. From this construction it is seen that any stresses set up in the anchorage gusset will be distributed through the center sill, crossbearers and side sills thus avoiding undue localization of stresses which would result in abnormal torsional effects and wear and tear on the car frame in addition to permitting possible weaving of the tanks.

The outer brace gusset 7 is held in position by extending down between and being secured to two channels 12 which are connected to the upper and lower plates 11 and 13 of each of the two central crossbearers. To provide as few different parts as possible it will be noted that channels 9 and 12 are the same. A brace 14

is inserted in each of the crossbearers and secured to the top and lower plates thereof.

From the arrangement so far described it is seen that each brace gusset has a vertical row of tanks 8 on each side thereof. The tanks are locked or held against shifting by providing a band, flange or other suitable projection 15, Figs. 7–9 on the outside of the tanks near the center thereof. In the case of a band being used it is preferable to shrink on the same. The vertical rows of tanks are disposed with the bands in vertical alinement while in the transverse rows the bands are staggered so as to overlap one another. The outer single vertical row of tanks A are held solely by wedges engaging these bands and to be presently described while similar wedges are also used for the inner rows of tanks, these wedges being carried by the gussets.

The bolsters are provided with a plurality of spaced saddles 17 adapted each to receive one of the lower tanks as shown clearly in Fig. 3. Secured to the crossbearers are saddle members 18 disposed between adjacent tanks and having oppositely arranged seating surfaces for engaging said adjacent tanks, also as shown in Fig. 3. Adjacent the side sills 4, half saddles 19 are provided for the outer tanks while side stakes 20 in the form of channels are secured to the side sills to support said outer row.

To load the car the lower row of tanks will be placed first on the underframe saddles with the bands of the inner pairs of tanks longitudinally staggered and in overlapping abutting engagement with each other as previously described. The tanks will then be secured or anchored in position by the provision of a wedging device generally indicated at 21 as shown more particularly in Figs. 6–9. This device comprises longitudinal wedge plates 22 riveted to each other on opposite sides of the brace gussets 6 and 7 respectively, the lower edges of these plates being beveled as at 23. A series of square openings 24 specifically four in number as shown in Fig. 6 are provided in the brace gusset just below the plates 22 while bolt holes 26 are also provided in the gusset. A cooperating wedging element or block generally indicated at 27 is of substantially elongated formation having a pair of lugs 28 and 29 projecting inwardly through a pair of the openings 24 and engaging the edges thereof to prevent longitudinal shifting of the wedge or anchor block. These blocks are also provided with wedge surfaces cooperating with the wedge surfaces 23. The outer face of each wedge is provided with ears 30 adapted to be disposed on each side of the tank band 15. It will be noted that there are two of the wedge blocks, one on each side of the gusset, and these are held in position by a pair of bolts 31. While the wedge blocks are identical still the pair of lugs 28 and 29 on each block will be in staggered relation when the respective blocks are placed or disposed on opposite sides of the gusset, this being due to the lugs 28 and 29 being nonsymmetrical with respect to the transverse center of the blocks. The same is also true of the band engaging lugs 30. Due to the circular cross section of the tanks it is seen that ample space is provided, between the adjacent quadrants of any four tanks, in which the wedging device may be disposed. The outer lower tank is secured in position by a similar wedging arrangement except that only one wedge block and plate such as 22—27 is secured to the side stakes 20 and this wedge block has no lugs 28 or 29. With the lowermost transverse row of tanks in position the next row will then be placed with their bands in vertical alinement with the bands of the lower tanks. This row will then be clamped in position and this procedure continues until all of the tanks have been placed in position. After each transverse row of tanks is positioned saddles 32 are placed upon the tanks and tie rods 33 will extend from each side stake to the other and through suitable openings in the saddles. Also, if desired, tie rods 34 may be used to connect certain of the side stakes while supplemental saddles 34' may be used with the tie rods 34 and disposed between the adjacent quadrants of the tank shells.

Means are provided at the neck ends of the tanks as an additional supporting means and for the purpose of providing against longitudinal shifting, said means comprising a bulkhead 35 formed with openings into which the necks 36 of the tanks extend as shown in Fig. 1, the bulkhead being supported by a floor 39 and being detachably secured in position by bolts 37 connected to the floor and by bolts 38 connected to angles 48 arranged adjacent the ends of the car and connected to the side sills 4 and to side plates 41. For connecting the angles 48 to the side plates, angle brackets 40 are secured to the side plates as clearly shown in Fig. 1.

Disposed in front of the bulkheads 35 is a suitable framework providing hinged doors 42 and 43 at one end of the car supported respectively on a vertical angle member 44 and a channel member 45, but at the opposite end of the car however, due to the application of the usual hand brake (not shown), the doors 43 are omitted and the ends permanently closed by plates riveted to the channels 45 and to a vertical member, at the transverse center of car, such as a Z-bar or any other section desired. The space between the bulkhead 35 and the doors provides room for any suitable and desirable valve mechanism or control equipment for the tanks.

To suitably cover the tanks and yet to permit easy removal thereof by being vertically lifted from the car there is provided a roof 49 secured to one leg of the longitudinal Z-bar side plates 41, the other leg of which is removably secured as by bolts 50 to the side stakes 20. The roof 49 obviously serves as a tie member between the side stakes on opposite sides of the car. Ladders 46 are provided at each end of the car to serve as an approach to a suitable running board 51 which is mounted on the top of the roof and is removable bodily therewith. While it is preferable to have a closed type underframe as shown in Figs. 3 and 5 wherein the floor 39 entirely closes the same, still if desired, under certain conditions an open type underframe may be employed wherein all of the other remaining elements are the same as shown in Fig. 3.

What is claimed is:

1. A multiple unit tank car having an underframe provided with a center sill and longitudinally spaced crossbearers disposed near the center thereof, means for supporting a plurality of tanks on said underframe, and means for anchoring said tanks including a brace gusset connected to said center sill and crossbearers and extending vertically upward.

2. A multiple unit tank car having a frame, a plurality of tanks removably supported thereby, and flanges formed on said tanks near the center thereof whereby said flanges may be staggered

relative to each other and brought into overlapping engagement, and means engageable with said flanges for anchoring the tanks to the car frame.

3. A multiple unit tank car having a frame, a plurality of tanks removably supported thereby, and flanges formed on said tanks near the center thereof whereby said flanges may be staggered relative to each other and brought into overlapping engagement, and means for anchoring the tanks to the car frame including a brace member carried by said frame and projecting upwardly adjacent one of the tanks and means carried by said brace-member engaging the flange on said tank which is adjacent to said brace member.

4. A multiple unit tank car having a frame, a plurality of tanks removably supported thereby, and flanges formed on said tanks near the center thereof whereby said flanges may be staggered relative to each other and brought into overlapping engagement, and means for anchoring the tanks to the car frame including brace members carried by said frame and projecting upwardly adjacent two of transversely spaced tanks and means carried by said brace members engaging the flanges on the tanks adjacent said brace members.

5. A multiple unit tank car having a frame, a plurality of tanks removably supported thereby, and flanges formed on said tanks near the center thereof whereby said flanges may be staggered relative to each other and brought into overlapping engagement, and means for anchoring the tanks to the car frame including a brace member carried by said frame and projecting upwardly adjacent one of the tanks and wedging means carried by said brace member engaging the tank flange on said tank which is adjacent said brace member.

6. In a multi-unit tank car, an underframe including side sills and a center sill, a plurality of parallel rows of vertically alined tanks supported by the underframe and arranged on opposite sides of the center sill, and spaced vertical braces secured to the underframe between the side sills and center sill arranged between adjacent rows of tanks and to which the tanks are connected.

7. In a multi-unit tank car, an underframe provided with a center sill, side sills, and crossbearers, a plurality of rows of tanks supported by the underframe on opposite sides of the longitudinal center line of the latter, and anchoring means for said tanks including gussets supported by the crossbearers on opposite sides of the longitudinal center line of the underframe and extending upwardly between adjacent rows of tanks.

8. In a multi-unit tank car, an underframe comprising a center sill, side sills and crossbearers, side stakes secured to the side sills and extending upwardly therefrom, a plurality of parallel rows of vertically alined tanks supported by the underframe and confined between said side stakes, gussets supported by the underframe and arranged between adjacent rows of tanks, and ties between said stakes.

9. In a multi-unit tank car, an underframe including a center sill, side sills and crossbearers, a plurality of tanks supported by the underframe and arranged in parallel horizontal rows, saddle elements on said tanks for supporting upper tanks in superposed relation whereby the tanks are arranged in vertically alined rows, side stakes connected to the side sills, side plates to which the upper ends of said stakes are connected, and ties extending between and connecting said side stakes, said ties being arranged between adjacent horizontal rows of tanks and extending through the saddle members to position the latter.

10. A multi-unit tank car comprising an underframe provided with a center sill, side sills and crossbearers, a plurality of rows of vertically alined tanks arranged on each side of the center sill in parallel relation and extending longitudinally of the underframe, and means for anchoring the tanks against shifting comprising vertical gussets positioned between adjacent rows of tanks and secured to the crossbearers, and removable clamping elements connected to said gussets and engaging the tanks.

11. In a multi-unit tank car, an underframe provided with a center sill, side sills and crossbearers, a plurality of rows of vertically alined tanks supported by the underframe on opposite sides of the longitudinal axis of the latter, and anchoring means for clampingly holding the tanks against shifting including gussets extending longitudinally of the underframe and secured to the crossbearers on opposite sides of the longitudinal axis of the underframe between adjacent rows of tanks.

12. In a multi-unit tank car, an underframe, a plurality of parallel arranged rows of vertically alined tanks supported by the underframe, means on the tanks in abutting relation to retain the tanks against relative horizontal movement, wedge elements carried by a car part and engaging the tanks to restrain the latter against vertical movement, side stakes rising upwardly from the underframe and between which said tanks are confined, and tie rods connecting opposite stakes.

13. In a multi-unit tank car, an underframe, a plurality of parallel arranged rows of vertically alined tanks supported by the underframe and extending longitudinally thereof, saddles on the tanks for supporting adjacent tanks in superposed relation, side stakes rising upwardly from the underframe and arranged adjacent the outer vertical rows of tanks, and tie rods connecting said stakes extending through said saddles to retain the latter in position.

14. In a multi-unit tank car, an underframe, a plurality of parallel rows of vertically alined tanks supported by the underframe, gussets secured to the underframe and extending upwardly between adjacent rows of tanks, and clamping elements removably secured to the gussets and adapted to engage the tanks to restrain the latter against vertical movement.

15. In a multi-unit tank car, an underframe, a plurality of parallel rows of vertically alined tanks supported by the underframe, gussets secured to the underframe and extending upwardly between adjacent rows of tanks, and cooperating means on said tanks to restrain the latter against relative horizontal shifting longitudinally of the underframe.

16. In a multi-unit tank car, an underframe having side sills, a plurality of parallel rows of vertically alined tanks supported by the underframe, side stakes overlapping and connected to the side sills and between which said rows of tanks are arranged, and an end bulkhead supported by the underframe and adapted to engage one end of each of said tanks to restrain the latter against shifting longitudinally of the underframe.

17. In a multi-unit tank car, an underframe, side stakes extending upwardly therefrom, side plates secured to the upper end portions of said stakes, a plurality of rows of vertically alined tanks supported by the underframe, the tanks extending longitudinally of the latter and said rows being arranged in parallel relation, saddles on the tanks for supporting adjacent upper tanks, and a bulkhead detachably connected to the underframe and side plates with which the end portions of the tanks are engaged to restrain the tanks against longitudinal shifting.

18. A multi-unit tank car comprising an open body having an underframe, side stakes rising upwardly from the underframe, side plates connecting the upper ends of the side stakes, a roof detachably secured to the side plates, a plurality of rows of vertically alined lading holding tanks supported by the underframe and confined between said side stakes, and means including elements supported by car body parts and engaging the tanks for restraining the latter against shifting.

19. A multi-unit tank car comprising an open body having an underframe, side stakes rising upwardly from the underframe, side plates connecting the upper ends of the side stakes, a roof detachably secured to the side plates, a plurality of rows of vertically alined tanks supported by the underframe and confined between said side stakes, and cooperating means on adjacent tanks for restraining the latter against relative shifting longitudinally of the underframe.

20. A multi-unit tank car comprising an open body having an underframe, side stakes rising upwardly from the underframe, side plates connecting the upper ends of the side stakes, a roof detachably secured to the side plates, a plurality of rows of vertically alined tanks supported by the underframe, adjacent tanks of adjacent rows being horizontally alined whereby the tanks are arranged in horizontally and vertically alined rows, saddles supported by lower tanks for supporting upper tanks, and means interposed between the horizontal rows of tanks and supported from the underframe for clamping the latter to the saddles.

21. In a multi-unit tank car, an underframe comprising a center sill and side sills, a plurality of tanks supported by the underframe and arranged in horizontal parallel rows, the individual tanks of said rows extending parallel to the longitudinal axis of the underframe, and an open body comprising spaced pairs of side stakes overlapping and secured to the respective side sills, rigid members connecting the upper end portions of adjacently arranged stakes, and tie members extending transversely of the car between adjacent rows of tanks and connecting the pairs of stakes.

22. In a multi-unit tank car having an underframe, an open body comprising side stakes rising upwardly from opposite side portions of the underframe, oppositely arranged side plates connecting the upper portions of the stakes, a roof detachably secured to said side plates, and a plurality of tie members connecting oppositely arranged side stakes at different points throughout their length.

23. In a multi-unit tank car having an underframe, a plurality of rows of vertically alined tanks supported by the underframe, an open body within which said tanks are confined comprising side stakes rising upwardly from the underframe, side plates connecting the upper end portions of the stakes, and a roof extending between and connected to the side plates and serving as a tie member between the side stakes, saddles supporting the tanks, and ties connecting opposite stakes and with which the saddles are engaged whereby to be restrained against shifting.

24. A multi-unit tank car comprising an open body having an underframe, side stakes rising upwardly from the underframe, side plates connecting the upper ends of the side stakes, a roof detachably secured to the side plates, a plurality of rows of vertically alined tanks supported by the underframe, adjacent tanks of adjacent rows being horizontally alined whereby the tanks are arranged in horizontally and vertically alined rows, spaced vertical braces secured to the underframe between the side sills and center sill and arranged between adjacent vertical rows of tanks, saddles supported by lower tanks upon which upper tanks are supported, and means secured to said vertical braces engaging upper tanks in such a manner as to clampingly hold lower tanks in the saddles.

25. A multiple unit tank car having a frame, a plurality of tanks removably supported by the frame and provided with mutually lapping projections arranged substantially in contacting relation, and anchor means interlocked with the projections for restraining the tanks against relative vertical and horizontal shifting movement.

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