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METHOD OF EXPANDING A RAILWAY TANK CAR

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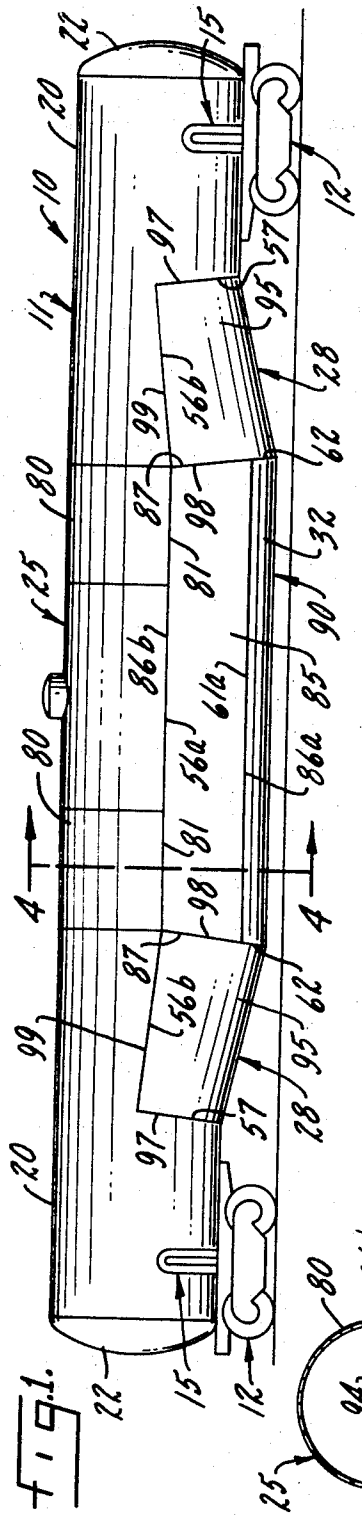


FIG. 1.

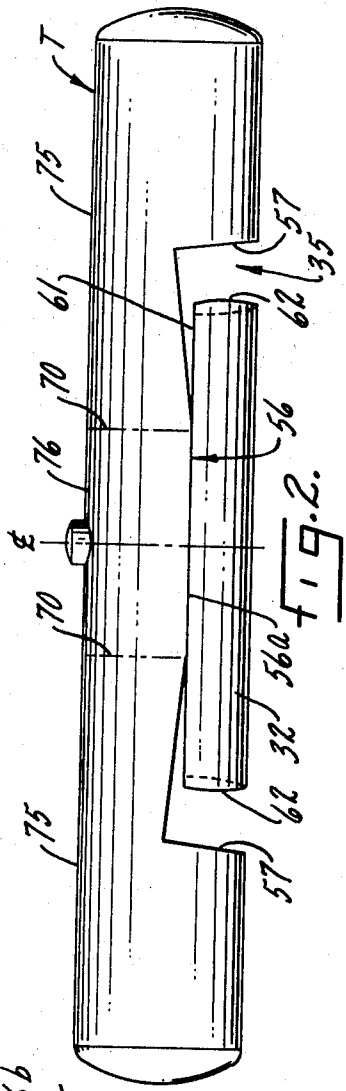


FIG. 2.

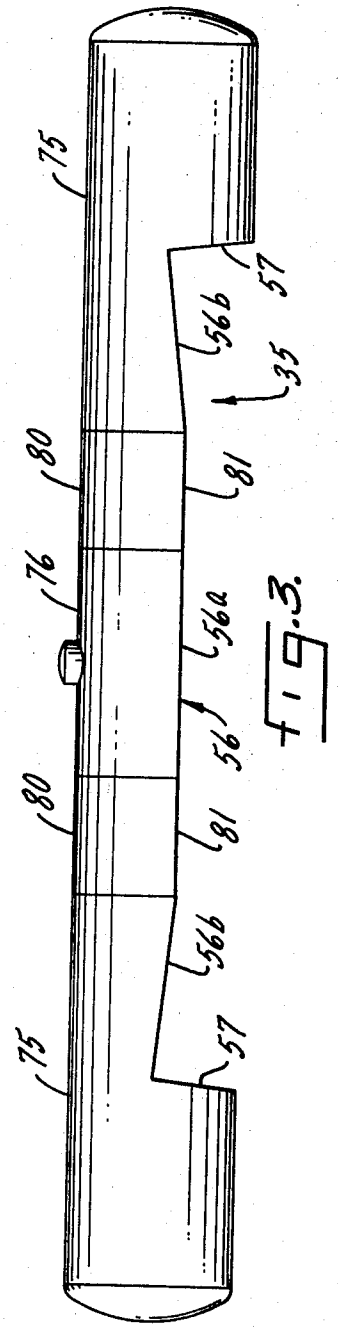


FIG. 3.

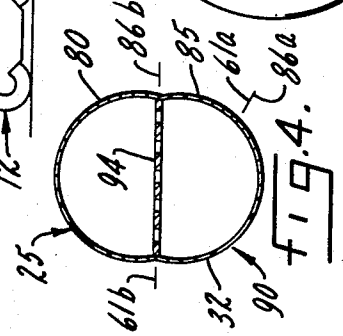


FIG. 4.

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# METHOD OF EXPANDING A RAILWAY TANK CAR

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## ABSTRACT OF THE DISCLOSURE

A method of expanding a circular cylindrical tank car into a double truncated cylinder type car. A segment is cut from the bottom of the tank, combined with segments of a cylinder, and welded in place to form a central tank section having a double truncated cylinder configuration. Segments of a cylinder are then introduced to transition from the remaining cylindrical sections to the central section.

This invention relates in general to railway tank cars. It deals more particularly with a method of constructing a tank car.

A standard size tank car of the type presently being fabricated according to specification for bulk shippers of liquids and the like might be in the 20,000 gallon capacity category. Such cars meet the needs of the great majority of shippers. It has been learned from experience, however, that as the shipping volume of a shipper increases, economics dictate his acquisition and use of tank cars which are capable of transporting substantially greater loads. To meet this requirement, cars in the 30,000 to 50,000 gallon capacity range are also fabricated. These larger capacity cars include conventional cylindrical tank cars, elongated to increase their capacity, and cars of the double truncated cylinder type disclosed in the Schwartz, Jr., et al. Patent No. 3,277,842, assigned to the same assignee as the present invention.

New cars in the larger capacity range can, of course, be manufactured as new equipment for shippers when their needs dictate. However, the old, lower capacity cars, with their customized pipe and valve complexes, cooling and heating conduits, etc., cannot readily be used for other products by different shippers without extensive modification. The lower capacity cars thus become obsolete and an economic liability. This is obviously expensive.

Accordingly, it is an object of the present invention to provide a method of expanding existing railway tank cars to increase their capacity.

It is another object to provide a method of manufacturing a double truncated cylinder tank for a tank car from a conventional right circular cylindrical tank.

It is still another object to provide a method of expanding a tank car by manufacturing a double truncated cylinder tank in the aforedescribed manner and, concurrently, lengthening the tank.

It is yet another object to provide a method of the aforedescribed character which makes maximum use of tank segments from the original right circular cylindrical tank in construction of the double truncated cylinder tank.

It is a further object to provide a method of expanding a railway tank car to increase its capacity wherein expansion to the larger capacity tank requires a minimum of fabrication.

The foregoing and other objects are realized in accord with the method of the present invention by first providing a standard tank car incorporating a right circular cylindrical tank. A longitudinally elongated, substantially semi-cylindrical segment is cut out of the bottom of the tank. This substantially semi-cylindrical segment is



trimmed down to a predetermined length less than the length of the cut-out. The trimmed substantially semi-cylindrical segment is welded along one side edge to a segment of a cylinder specially fabricated for this relationship. The composite substantially semi-cylindrical segment forms the major portion of a cylinder which corresponds identically in cross-sectional configuration to the original tank in the central area of the cut-out. The composite segment is then welded in side-edge-to-side-edge relationship with the original tank in the central area of the cut-out to form a central tank section comprised of opposed, truncated cylinders. Tie members are welded from one weld joint to the other inside the central tank section to strengthen the central tank section at these joints.

Outboard of each end of the cut-out in the tank, right circular cylindrical end tank sections remain. To form a transition section between each end of the central tank section and a corresponding end tank section, a distinctive transition segment of a cylinder is welded along its side edges to corresponding side edges in the cut-out and along its end edges to the corresponding end edges of the cut-out and the composite segment which forms a component of the central tank section.

In addition to expanding a right circular cylindrical tank into a double truncated cylinder tank, the invention also contemplates simultaneously lengthening the tank to additionally expand it, if additional expansion is desired. As such, after the cut-out has been made in the original tank, the tank is "burned" through on both sides of the center line of the tank car in planes perpendicular to the longitudinal axis of the tank. Substantially cylindrical expansion segments are then welded into the tank between the tank segments separated at the burn lines. The tank is thus lengthened. The central and transition tank sections are then completed in the aforedescribed manner.

The invention, together with its organization and method of operation, taken with other objects and advantages thereof, is illustrated more or less diagrammatically in the drawings, in which:

FIGURE 1 is a side elevational view of a double truncated cylinder tank car constructed according to the method of the present invention;

FIGURE 2 is a side elevational view of a right circular cylindrical tank, prior to its being expanded by the method of the present invention into a double truncated cylinder tank for the car illustrated in FIGURE 1;

FIGURE 3 is a side elevational view of the right circular tank illustrated in FIGURE 2, after it has been expanded lengthwise and its bottom section has been cut out according to the method of the invention; and

FIGURE 4 is a sectional view taken along line 4–4 of FIGURE 1.

Referring now to the drawings, and particularly to FIGURE 1, a railway tank car is illustrated generally at **10**. The tank car **10** includes a tank **11** of the type illustrated in the Schwartz et al. patent hereinbefore referred to. The tank **11** is constructed by the method of the present invention and is mounted on generally conventional wheel trucks **12**. The wheel trucks **12** support the tank **11** on bolster assemblies **15**.

The tank **11** includes oppositely disposed, right circular cylindrical end sections **20**. The end sections **20** are capped in a conventional manner at **22**. The tank **11** is supported by the wheel trucks **12** at the end sections **20**.

At the center of the tank **11** is a central tank section **25** having a double truncated cylinder configuration in cross-section, as illustrated in FIGURE 4. The central tank section **25** is joined to each of the end tank sections **20** by a transition section **28**. Each transition section **28** has the configuration of two opposed, segments of a

cylinder intersecting at an angle to each other, and with their axes intersecting.

Referring now to FIGURE 2, to construct the tank **11** by the method of the invention, a tank car having a conventional right circular cylindrical tank T is provided. A longitudinally elongated segment **32** is cut out of the bottom of the tank T by conventional cutting techniques. The segment **32** is cut from the tank T so as to leave a cut-out **35** in the tank bottom, and then cut down in a manner hereinafter described to a predetermined size and shape.

The cut-out **35** is defined by side edges **56** and end edges **57**. The end edges **57** each describe a curve which lies in a plane inclined inwardly from the vertical at a slight angle. Each side edge **56** of the cut-out includes a straight center portion **56***a*, which is horizontal, and bracketing straight end portions **56***b* inclined upwardly from the horizontal at a slight angle.

The tank segment **32** which has been removed from the cut-out **35** is cut or trimmed down from its original size, as will be recognized. The side edges **61** of the segment **32** are trimmed straight to extend parallel to the side edge portions **56***a* of the cut-out **35**. The end edges **62** of the segment **32** are then trimmed to the curve illustrated in dotted lines in FIGURE 2 so that they converge from one side edge **61***a* of the segment **32** to the opposite side edge **61***b* thereof, thus making the side edge **61***b* shorter than the side edge **61***a*. The significance of this relationship will be evident as the method of the invention is further described.

After the segment **32** has been trimmed to size and shape in the foregoing manner, the segmented tank T is further disassembled by being burned through along two lines **70** lying on opposite sides of the center line CL of the tank T. The burn lines **70** lie in vertical planes passing through those points on the side edges **56** of the cut-out **35** where the side edge portions **56***a* and **56***b* meet.

When the tank T has been separated into two end segments **75** and a center segment **76** along the burn lines **70**, cylindrical insert segments **80** of predetermined length, and corresponding in shape and radius of curvature to the tank segment **76**, are introduced between the segments **75**, **76**, in the manner illustrated in FIGURE 3, and welded in place. The tank T is thus elongated by the length of the insert segments **80**. The cut-out **35** in the bottom of the tank T is also elongated by the length of the insert segments **80**, the side edges **81** of which are co-extensive with corresponding side portions **56***a* of the cut-out **35**.

With the tank T elongated in the manner described, another longitudinally elongated, substantially semi-cylindrical segment **85** is fabricated with a radius of curvature identical to the bottom cut-out segment **32**. The new segment **85**, which is seen in FIGURES 1 and 4, has side edges **85** and end edges **87**. It is then welded along its longer, lower edge **86***a* to the longer side edge **61***a* of the segment **32**. A composite tank segment **90** is the product of this joinder and the composite segment **90** has a cross-sectional configuration identical to that of the combined tank segments **76** and **80**.

The composite tank segment **90** is then welded to the tank segments **76** and **80** of the lengthened tank T to form the central section **25** of the expanded tank **11**, as seen again in FIGURES 1 and 4. The side edges **61***b* and **86***b* of the composite tank segment **90** are, as such, welded to corresponding side edges **81**, **56***a*, of the assembled tank segments **76**, **80**. At this point, structural tie means in the form of a perforated metal plate **95** or the like is preferably welded between the horizontally extending weld joints so that it spans the interior of the tank **11** across the open faces of the truncated cylinders.

With the composite segment **90** welded in place in the aforedescribed manner to form the double truncated cylinder central tank section **25** of the tank **11**, only the transition sections **28** of the tank remain to be completed. To such end a pair of identical transition tank



segments **95**, each identical in cross-sectional configuration, is fabricated. Since the configuration of each of these transition segments **95** is identical, together with their assembly into the tank **11**, only one transition segment is discussed in detail. However, corresponding reference numerals are applied to each transition segment **95**.

Each transition segment **95** is a segment of a cylinder in configuration, with a radius of curvature equal to the radius of curvature of the composite segment **90** and the tank segments **75**. The outer end edge **97** of the transition segment is cut to mate with the corresponding end edge **75** of the cut-out **35**. The inner end edge **98** is cut to mate with the corresponding end edge **62**, **87** of the composite segment **90**. Similarly, the side edges **99** of the transition segment **95** are cut to mate properly with the side edge portions **56***b* of the cut-out **35**. The angular relationship between the segment **95** and the weld joints formed by the juncture of these edges during welding is described in detail in the aforementioned Schwartz et al. patent. It is not specific to the method of the present invention.

A new and improved method of expanding a right circular cylindrical tank car has now been shown and described. By employing a tank segment cut from the bottom of the original cylindrical tank to form the major portion of the lower truncated cylinder in a double truncated cylinder tank, an expanded tank is fabricated at minimal cost.

The method of the invention also contemplates lengthening the original tank in its central section as it is expanded into a double truncated cylinder tank, all in the manner described. It should be recognized, however, that expansion into a double truncated cylinder tank might be accomplished without lengthening the tank. In such case, central insert segments **80** would not be introduced into the tank and the composite segment **90** would be shortened.

In the latter instance, where the composite segment **90** needn't be fabricated with the length of the insert segments **80** in mind, the transition segments **95** can be formed from remaining segments of the cut-out **35** at opposite ends of the segment **32**. These remaining segments must be built up along their edges to provide the necessary cylindrical expanse to complete the transition section, of course, but this is less expensive than fabricating new transition segments. Obviously, an even greater saving in cost is effected where the tank is not expanded by extending it through lengthening in the central section of the tank.

The tank car **10** has now been described as the product of an expansion method which may, but doesn't necessarily have to, lengthen the car as well as expand it into a double truncated cylinder tank car. In certain instances, expansion into the double truncated cylinder tank car is actually the second stage of a sequential expansion program over a period of years. The first stage of such expansion is preferably solely a lengthwise expansion by the method disclosed in the co-pending Kruizenga application, Ser. No. 657,556, filed: Aug. 1, 1967, and assigned to the same assignee as the present invention.

While the embodiment described herein is at present considered to be preferred, it is understood that various modifications and improvements may be made therein, and it is intended to cover in the appended claims all such modifications and improvements as fall within the true spirit and scope of the invention.

What is desired to be claimed and secured by Letters Patent of the United States is:

**1.** A method of expanding a railway tank car wherein the original car includes a right circular cylindrical tank, comprising the steps of: cutting a longitudinally elongated, substantially semi-cylindrical segment from the bottom of said tank so as to leave a cut-out in said bottom having longitudinally extending side edges, joining at least a longitudinal edge portion of said substantially semi-cylindri-

cal segment to a supplemental segment of a cylinder to form a larger composite substantially semi-cylindrical segment, joining said composite substantially semi-cylindrical segment along its longitudinally extending edges to said longitudinally extending edges of said cut-out portion of the tank, and joining each end of said composite substantially semi-cylindrical segment to a corresponding right circular cylindrical end section of said tank with transition segment means to form a double, truncated cylinder tank in the central section of said tank.

2. The method of claim 1 further characterized by and including the step of fabricating said composite substantially semi-cylindrical segment from the full width segment cut from said cut-out and said supplemental segment.

3. The method of claim 2 further characterized by and including the step of fabricating said composite substantially semi-cylindrical segment with a cross-sectional configuration substantially identical to the corresponding cross-sectional configuration of the truncated cylinder to which it is joined.

4. The method of claim 1 further characterized by and including forming the major portion of each of said transition segment means from a segment of a cylinder removed from said cut-out.



5. The method of claim 1 further characterized by and including the step of elongating said right circular cylindrical tank in the area of said cut-out after said substantially semi-cylindrical segment has been cut from the bottom of said tank by segmenting said tank perpendicular to its axis and introducing another partial circular cylindrical segment.


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U.S. Cl. X.R.

29—469, 471.1; 105—358; 113—120