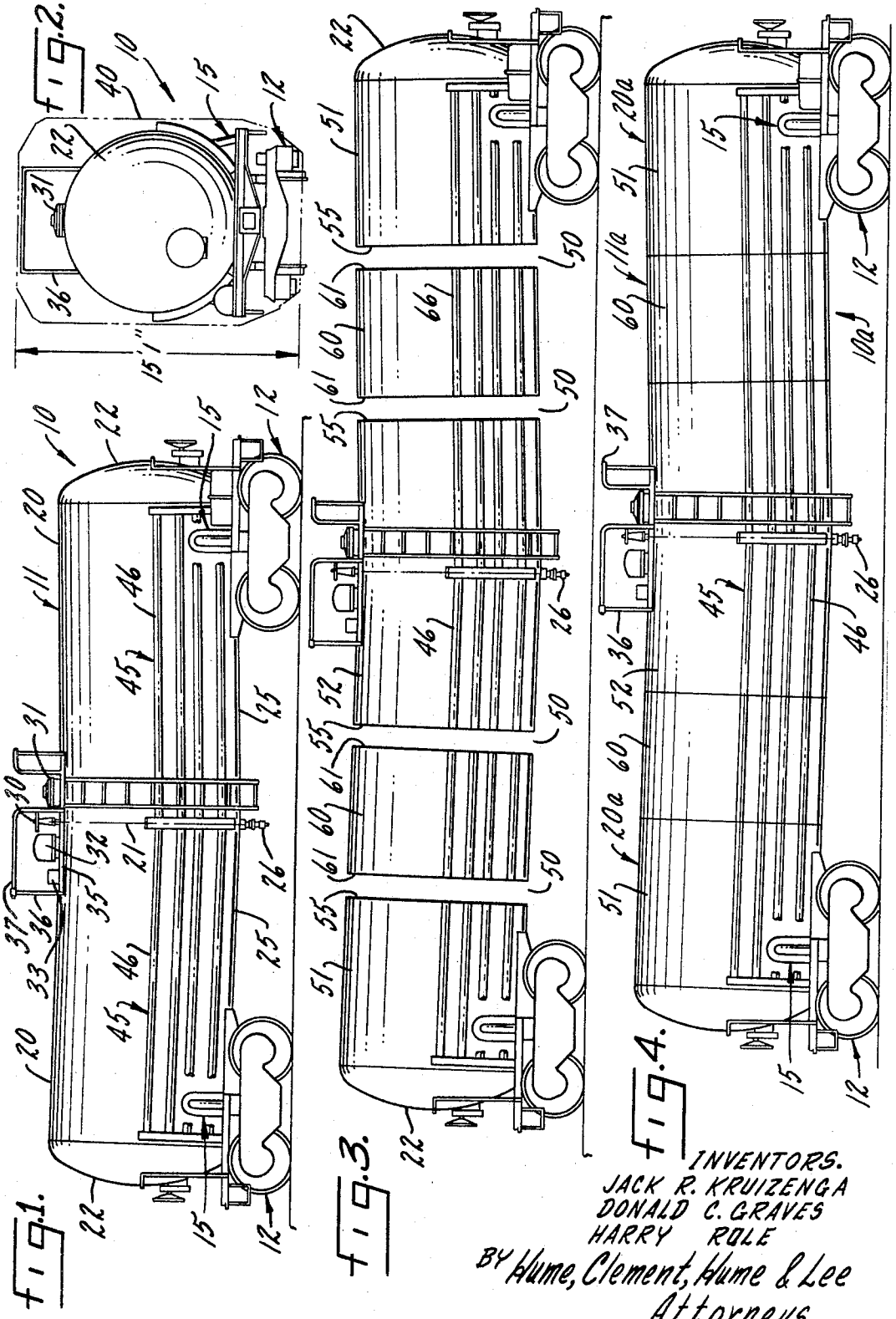
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METHOD OF EXPANDING A RAILWAY TANK CAR BY LENGTHENING SAME

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METHOD OF EXPANDING A RAILWAY TANK CAR BY LENGTHENING SAME

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ABSTRACT OF THE DISCLOSURE

A tank car and method of expanding the car. The tank car incorporates a tank constructed of opposed, right circular cylindrical sections inclined downwardly from their outer ends to a mitre joint at the tank center. The car is expanded by segmenting each of the sections in a plane perpendicular to its axis and introducing right circular cylindrical insert segments. Heater or coolant conduits are also segmented and lengthened with insert segments.

This invention relates in general to railway tank cars. It deals particularly with an improved tank car construction and a method of expanding the tank car.

Tank cars are conventionally designed either for pressure or gravity unloading of their contents. Gas pressure, air for example, is employed to force the contents out of right circular cylindrical, top unloading tank cars. On the other hand, for gravity unloading of sluggish liquid commodies or the like, a tank is normally provided with a sloping bottom. In some instances, gas pressure is also employed to assist in unloading such a sloping bottom flow tank.

It has heretofore been common practice to provide a sloping bottom in the tank of a railway tank car by either constructing a trough along the base of the tank or fabricating the tank itself out of oppositely disposed frusto-conical end sections positioned so that the base of the tank slopes downwardly toward the center of the car while the top of the tank is level. In either of these constructions, as well as in other variations of sloping bottom tank cars presently employed, certain drawbacks are inherent, however.

One drawback is engendered by the fact that it is now frequently desirable to expand a car which is already in service by lengthening it in order to increase its capacity. This is due to the fact that as the shipping volume of a shipper increases, he frequently decides to move to cars which are capable of transporting substantially greater loads, in lieu of acquiring additional lower capacity cars. Although new cars in a larger capacity range could, of course, be manufactured, the old, lower capacity cars with their customized pipe and valve complexes, cooling and heating conduits, etc., can actually be expanded and put into service faster and, especially much more economically than building a new tank car, since, insofar as economics are concerned, these old tank cars with their customized equipment cannot readily be used for other products by different shippers, for example, without extensive modification.

Unfortunately, expanding the tank of a sloping bottom tank car of conventional construction by lengthening it is a complicated and expensive project. If the tank car is a frusto-conical type, for example, any attempt to separate and space sections of the car and interpose insert sections other than at the center of the car necessarily destroys the symmetry of the tank since a cylindrical insert must be employed to match the separated annular edges on the frusto-conical sections. The separated ends of outside or inside coolant or heater coils are difficult to match with

coil sections provided on the tank insert sections. If frusto-conical insert sections are introduced at the car center, the car fittings such as valves, etc., are disrupted.

In the case of a trough bottom tank car, problems also exist if an attempt is made to expand the car by lengthening it. Specially constructed insert trough sections must be provided. Furthermore, these insert trough sections are necessarily parallel to the base of the car, thus inhibiting drainage of the expanded car. Otherwise, they will not mate properly with the separated trough sections on the car sections.

It is an object of the present invention to provide a method of simply and economically expanding a sloping bottom type tank car.

It is yet a further object to provide a method of expanding a sloping bottom type tank car by lengthening it with the insertion of right circular cylindrical tank sections.

The foregoing and other objects are realized in accord with the present invention by providing a sloping bottom type tank car comprised of circular cylindrical end sections connected at a mitre joint on the vertical center line of the tank car; and a method of expanding a sloping bottom type tank car by lengthening it. The circular cylindrical end sections are inclined downwardly toward the center of the car, whereby the uppermost extremity of the car at its center line is depressed. Accordingly, a nozzle access or top fittings platform on the top of the car at its center line can be made with a substantially higher and more effective safety railing while still remaining within the profile limits defined by the Association of American Railroads. If it is desirable that the tank car carry heater or coolant conduits, each elongated conduit section may be identical to each other and extend generally parallel to the axis of the corresponding tank section in welded relationship on its lower surface.

To expand the aforedescribed sloping bottom type tank car according to the method of the present invention, each of the circular cylindrical end sections are "burned" through at a point between their respective ends on planes perpendicular to the axes of corresponding sections. If the tank car carries heater or coolant conduits of the type in which the tank wall defines one wall of the conduit, the conduits are also burned through. Right circular cylindrical tank insert sections are then introduced between the segments of the tank split at the burn lines. These circular cylindrical insert sections are simply and expediously mated with adjacent edges of the segmented tank sections along the burn line to expand the tank car in over-all length by the length of the insert segments. Heater or coolant conduit sections of suitable length are easily welded in place. The center of the tank car is, as will be recognized, depressed even further than it was on the original tank car, making it possible to employ a higher and more effective safety railing on the top fittings platform while still falling within the maximum profile permitted by regulations of the Association of American Railroads.

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

FIGURE 1 is a side elevational view of a sloping bottom type tank car embodying features of the present invention;

FIGURE 2 is an end elevational view of the tank car illustrated in FIGURE 1;

FIGURE 3 is an exploded side view showing the tank car sections after they are burned through and insert sections are in place prior to welding in the method embodying features of the present invention; and

FIGURE 4 is a side elevational view of a sloping bot-

tom type tank car expanded by lengthening according to the method.

Referring now to the drawings, and particularly to FIGURES 1 and 2, a railway tank car embodying features of the present invention is seen generally at **10**. The tank car **10** includes a non-insulated sloping bottom type tank **11** constructed according to the invention and mounted on generally conventional wheel trucks **12**. The wheel trucks **12** support the tank **11** on body bolsters **15**.

The tank **11** is fabricated of steel plate and comprises two half-tank sections **20** joined along a center line **21**. According to the invention, each tank section **20** is a right circular cylinder inclined downwardly from its outer end to joinder at the center line **21** of the tank. The tank half sections **20** are each end capped in a conventional manner at **22**.

The downwardly inclined tank sections **20** are welded together in a mitre joint along the center line **21**. The base **25** of each tank section **20** is thus inclined downwardly toward a bottom outlet assembly **26** on the center line **21** of the tank so that the lading carried by the tank, even in the form of relatively sluggish liquids, flows easily to the outlet when it is tapped. The inclination of each tank section is preferably at a rate of one-quarter inch per foot although greater inclinations might be employed where extremely sluggish liquids are involved.

Mounted on top of the tank **11** at the mitred joint center line **21** is the conventional equipment including the bottom outlet control valve assembly **30** for the outlet **26**, a manway assembly **31**, an overhead loading-unloading assembly **32**, including loading-unloading valve and pressure valve, etc., and a safety valve or vent assembly **33**. This equipment is accessible from a platform **35** surrounding these components and secured to the top of the tank **11** in a well-known manner.

Surmounting the platform **35** is a safety railing structure **36** designed to provide security for personnel working on top of the platform. Such platforms **35** and railing structures **36** are broadly conventional and virtually universally employed on tank cars.

It is, of course, necessary that the steel pipe top rail **37** of the railing structure **36** extend to a substantial height to provide ideal safety conditions. In fact, approval of the Department of Transportation is required on rail **37** height. The height of a car, which includes the height of the rail is however limited by the maximum size car profile permitted by regulations of the Association of American Railroads, hereinafter referred to as the A.A.R.

In the published regulations of the A.A.R. regarding tank car width, height, and length, etc., at page 139, the maximum height of a railway tank car permitted for operation on all roads throughout the United States is depicted on a car profile, identified as plate B, dated Mar. 1, 1964. This profile, which is reproduced at **40** in FIGURE 2, is that profile which any railway car cross-section must remain within in order to operate on all the United States railroads. As will be noted, the maximum overall height of a car permitted for use on all roads is 15'1".

Ordinarily, the greater the capacity of a car, the higher the tank **11** becomes. As a result, safety rails **37** surmounting the platforms **35** on these cars are necessarily lowered to less than a completely safe height. The present invention contributes to overcoming this problem.

By making the tank **11** out of mitered, right circular cylindrical tank sections, an improved sloping bottom type tank is produced. In a forty foot tank, for example, the center of the tank is actually depressed five inches. The center of gravity of the tank is lowered, improving its stability. In addition, even relatively high capacity, large diameter tanks **11** will have a low profile at their center line **21**. Accordingly, the rail **37** can be extended to the maximum height of the profile permitted by the A.A.R.

The use of right circular cylindrical tank sections **20** in construction of the tank **11** according to the present invention has other advantages. For example, the construction and arrangement of heater or coolant conduit assemblies **45**, if they are employed on the car **11**, is simpler. Each of the conduit pipes **46**, for example, is actually mounted on the inner surface of the corresponding tank section **20** with conventional "pig tail" supports (not shown) in generally parallel relationship to each other and to the axis of the corresponding circular cylindrical tank section. For ease of description and illustration, however, an assembly **45** is shown on the *outer* surface of the car; an arrangement which would normally be employed only on insulated cars.

A sloping bottom type tank car **10** constructed according to the present invention is also easily and economically expanded by lengthening. A method of expanding the tank car **11** by lengthening it according to the present invention is illustrated in FIGURES 3 and 4.

To expand the tank car **10** by the method of the invention, each tank section **20** of the tank **11** is "burned" through by conventional cutting methods in a plane perpendicular to the axis of the section. As illustrated in FIGURE 3 at **50**, this burn-through is made substantially mid-way in each section **20** to avoid damaging tank fittings, body bolsters **15**, etc.

The tank **11** has thus been separated into three separate segments; the outer end segments **51** and a center segment **52**. Substantially circular cylindrical annular edges **55** on the open ends of the outer and center segments **51** and **52** face each other in opposed relationship. The heater conduits **46** are burned through and separated in substantially the same manner. In practice the conduits **46** are cut back from the edges **55** to provide clearance for automatic welding, X-raying, and local stress relieving of the girth seams.

Each of the end tank segments **51** are then separated axially from the center segment **52** a distance slightly greater than one-half the distance which the tank **11** is being expanded. According to the invention, a right circular cylindrical tank insert section **60** is then introduced between the oppositely disposed edges **55** of each end segment **51** and the center segment **52** of the tank **11**. The tank insert sections **60** are fabricated so that their diameters correspond identically to the diameter of each of the sections **20** of the tank **11**. Accordingly, the circular edges **61** of the insert sections **60** are in registry with the corresponding opposed edges **55** of the tank segments **51** and **52**.

Mounted on the inside surface of each of the insert sections **60** are heater conduit sections **66**. The heater conduit sections **66** are positioned on corresponding inserts in parallel relationship at precisely the same spacing as the conduits **46** on the tank **11**. The sections **66** are also cut back from the insert edges for reasons hereinbefore discussed. The open ends of opposed conduits **46** and conduit sections **66** are aligned with each other when the inserts **60** are in position between the tank segments **51** and **52**.

With the tank inserts **60** in the aforedescribed position, the segments **51** and **52** are welded to them along corresponding, registered edges **55** and **61**, to complete an elongated tank car **10***a*, as seen in FIGURE 4. At the same time, the heating conduits segments **66** are welded, at their corresponding free ends, to the free ends of the heating conduits **46** remaining on the tank segments **51** and **52** by introducing suitable conduit segments. The result is an elongated tank car **10***a*.

Although the angle of inclination of each of the elongated tank sections **20***a* remains the same as those of the segments **20** in the original tank **11**, the over-all increase in length of the car lowers the over-all height of the car at its center line **21**. If six foot tank inserts **60** are employed, the tank center line **21** is lowered another one and one-half inches. With the lowered center line, it is possible to provide the car with a safety rail **37** which is raised an additional one and one-half inches. Because of the center of the tank **11***a* being lowered, however, the

profile of the tank car **10***a* still falls within the profile **40** prescribed by the A.A.R., as illustrated in FIGURE 2.

The tank car **10** which has been described includes a non-insulated tank **11**, as has been pointed out. The tank could be of the insulated type, however, including an inner container and an outer shell with insulation therebetween. In such case, the outer shell and insulation is cut away at the burn site before the inner container is burned through. Furthermore, although heater or coolant conduits are shown on the tank **11**, they might or might not be employed. The invention is applicable to non-insulated or insulated type cars, employing or not employing heater or coolant conduits.

In addition, the heater or coolant conduits **46** have been described as being only generally parallel to each other and to the corresponding tank section axis. In other words, these conduits **46** might equally as well be disposed slightly askew to each other for one reason or another; ease of welding to the tank side, for example. The invention method would be equally applicable.

While several embodiments described herein are 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 scope and spirit 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 by lengthening it, comprising the steps of: fabricating the car initially of oppositely disposed right circular cylindrical tank sections inclined downwardly toward and joined at a center line, separating each of said sections on a plane extending perpendicular to the axis of the corresponding sections at a point between said center line and the outer end of the section to make three separate segments including two outer end segments and a center segment of said tank, introducing a right circular cylindrical tank insert segment having a diameter equal to the diameter of each of said tank sections between said center segment and each of said end segments, and welding said segments together at their adjacent annular edges to form a tank car expanded in length from the original tank car.

2. The method of claim **1** further characterized by and including the step of originally fabricating said tank with heater conduits on the sides of said tank sections, attaching heater conduit sections to corresponding tank sections in generally parallel relationship to each other and to the axes of corresponding segments, separating said heater pipe conduit sections when said tank is separated into segments, and providing heater pipe conduit insert segments corresponding in spacing to said separated heater conduit sections so that said conduit insert sections align with the conduit sections on said tank segments, and welding said heater pipe conduit insert sections and sections together.

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CHARLIE T. MOON, Primary Examiner

U.S. Cl. X.R.

29—469, 471.1; 105—358; 113—120

UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 3,479,724 November 25, 1969

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It is certified that error appears in the above identified patent and that said Letters Patent are hereby corrected as shown below:

Column 6, after line 24, insert

2,715,377	8/1955	Gary--------	29-512X

Signed and sealed this 7th day of July 1970.

(SEAL)
Attest:

Edward M. Fletcher, Jr.
Attesting Officer

WILLIAM E. SCHUYLER, JR.
Commissioner of Patents