Jan. 6, 1970 E. A. PHILLIPS 3,487,532

TANK CAR

Filed Aug. 1. 1967

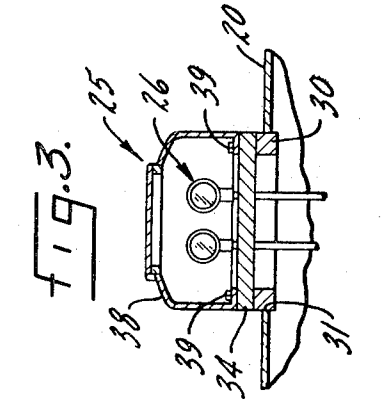


FIG. 3.

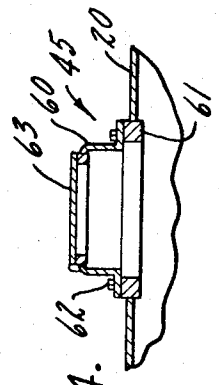


FIG. 4.

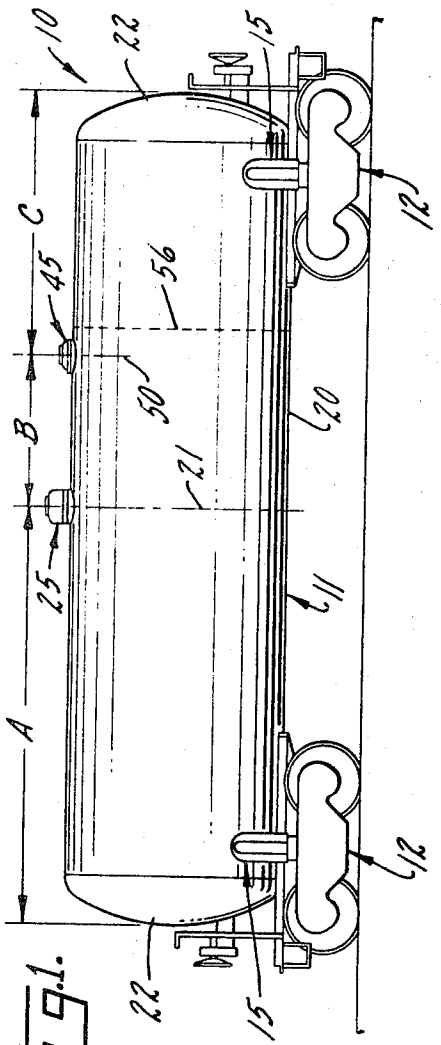


FIG. 1.

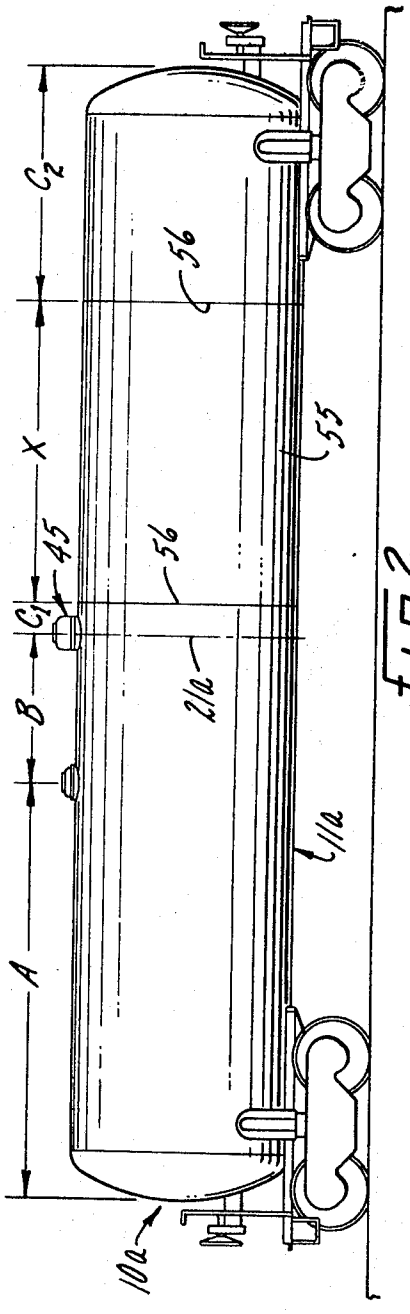


FIG. 2.

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United States Patent Office 3,487,532
Patented Jan. 6, 1970

3,487,532

TANK CAR

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Filed Aug. 1, 1967, Ser. No. 657,543
Int. Cl. B23p *17/00, 21/00;* B21d *51/00*
U.S. Cl. 29—415 2 Claims

ABSTRACT OF THE DISCLOSURE

A tank car and method of expanding the car. The tank car has a first nozzle assembly containing valve and gauge equipment on the center line of the car. A second nozzle assembly comprising merely an access manway and cover is spaced a predetermined distance from the car center line, also on top of the car. The predetermined spacing is precalculated from formula based on the length of an insert segment introduced to lengthen the car on that side of the car center line opposite the second nozzle assembly. The insert segment is introduced after segmenting the car in a plane perpendicular to its axis. The second nozzle assembly is then on the new center line of the car. The valve and gauge equipment is transferred to the second nozzle assembly, while the first nozzle assembly is transformed into an access manway, all without welding or cutting.

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

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 fit 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. Such cars include conventional cylindrical tanks, elongated to increase their capacity, and the cars of the double truncated cylinder type disclosed in the Schwartz 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, smaller diameter, 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 shorter, smaller diameter, lower capacity cars thus become obsolete and an economic liability. This is obviously expensive.

An answer to this problem of obsolescence has recently been found in expanding lower capacity tank cars into larger cars having a greater carrying capacity. For example, a tank car incorporating a right circular cylindrical tank may be expanded lengthwise by cutting the tank into sections on a plane perpendicular to the longitudinal axis of the tank and introducing an insert or extension tank section before welding the sections together again. In this light, the shorter, lower capacity cars presently being manufactured are, with an eye toward future expansion, being made in larger diameters so that ultimate expansion will be more effective.

Expansion of a railway tank car in the aforedescribed manner has many salutary advantages which opt for its use. There are, however, some drawbacks to the use of

this method. For example, it is highly desirable that a tank car "nozzle" containing pressure gauges, valves, and valve controls and the like be disposed on the longitudinal center line of the car. This is because gauging equipment must be at the center to assure a true reading regardless of car attitude. In addition, commodity loading equipment on docks is uniformly spaced. If an expansion section is introduced to the car at one side of the center line, the nozzle is necessarily moved off-center and must be relocated.

Accordingly, it is an object of the present invention to provide a new and improved tank car incorporating a tank which affords a center mounted nozzle assembly for valves and other fittings both when the tank is in its original, unexpanded form, and after expansion of the tank by lengthening.

It is another object to provide a method of constructing and expanding the tank of a railway tank car by lengthening so that a tank car nozzle containing valves and other fittings remains on the center line of the car in both the originally manufactured and the expanded tank car.

The foregoing and other objects are realized in accord with the present invention by providing a railway tank car incorporating a right circular cylindrical tank having a first nozzle assembly enclosing valve and gauge equipment and the like on the center line of the tank, and a second nozzle assembly serving primarily as a personnel access manway which is readily modifiable for enclosing said equipment spaced a predetermined distance to one side of the center line on top of the tank. This predetermined distance is calculated by a formula based on the length of the tank and the length of the section added to the tank to expand it. Constructed according to the formula, the tank, when expanded, has the second nozzle assembly positioned precisely on its center line. The second nozzle assembly is then readily modified for receipt of the valve and gauge equipment, etc., and the first nozzle assembly takes over the role of the second nozzle assembly in becoming a personnel access or manway opening and an open-hatch loading port for non-pressure products when the tank is used to transport them.

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 drawing, in which:

FIGURE 1 is a side elevational view of a tank car embodying features of the present invention prior to expansion by lengthening according to the method of the invention;

FIGURE 2 is a side elevational view of the tank car in FIGURE 1 expanded by lengthening according to the method of the invention;

FIGURE 3 is an enlarged sectional view taken through the first nozzle assembly on the tank car illustrated in FIGURE 1, with parts broken away; and,

FIGURE 4 is an enlarged sectional view taken through the second nozzle assembly on the tank car illustrated in FIGURE 1, with parts broken away.

Referring now to the drawing, and particularly to FIGURE 1, a railway tank car embodying features of the present invention is seen generally at **10**. The tank car **10** includes a right circular cylindrical tank **11** constructed according to the invention and mounted on generally conventional wheel trucks **12**. The wheel trucks **12** support the tank **11** in a well-known manner on body bolsters **15**.

The tank **11** is fabricated in the shape of a right circular cylinder **20** out of steel plate, for example. The center line of the tank **11** is at **21**. Each end of the tank cylinder **20** is capped in a conventional manner at **22**.

A first nozzle assembly **25** is mounted on top of the tank cylinder **20** at the center line **21** of the tank. As illustrated in FIGURE 3, the first nozzle assembly **25** contains valve and pressure gauge equipment **26**. This equipment **26** is on the center line of the tank car to assure accurate gauging and proper alignment with loading facilities at a dock.

The first nozzle assembly **25** comprises a conventional saddle ring **30** welded into an appropriately sized aperture **31** cut in the cylinder **20** of the tank **11** at the center line **21**. Overlying the saddle ring **30** and connected thereto by suitable attachment means is a base plate **34** for the valve and gauge equipment **26**. The valve and gauge equipment **26** is mounted on the base plate **34**.

Overlying the base plate **34** is a protective housing **38** of suitable configuration. The housing **38** is secured to the base plate **34** by attachment bolts **39**.

The second nozzle assembly **45** is positioned on the originally fabricated tank cylinder **20** according to a formula based upon the length of the original tank **11** and the length of the tank insert section to be added. To demonstrate this formula and the calculations involved, refer to FIGURES 1 and 2 wherein the tank **11**, both before and after expansion, is broken down in length into components. Each length component is identified by a reference letter.

Referring particularly to FIGURE 1, the length of the tank **11** to the left of the center line **21** is designated as A. The length of the tank **11** to the right of the center line **21** comprises the distance B between the center line **21** and the center **50** of the second nozzle assembly **45**, and the distance C between the second nozzle assembly center **50** and the right end of the car tank **11**. The position of the center **50** of the second nozzle assembly **45** on the longitudinal axis of the tank **11** is determinate of the lengths B and C. The length of the basic, unexpanded car **10**, as illustrated in FIGURE 1, is thus equal to A plus B plus C.

Assume now that it is desirable to expand the length of the tank **11** by a predetermined amount X. Referring to FIGURE 2, a right circular cylindrical tank insert section **55** of that predetermined length X is fabricated. The tank cylinder **20** is then burned through in a plane **56** perpendicular to the axis of the cylinder at a point somewhere between the second nozzle assembly **45** and the wheel truck **12** at a corresponding end of the tank **11**. The cylindrical insert section **55** is then welded between the separated tank cylinder sections at the parting line **56**. With the second nozzle assembly **45** having been positioned on the tank **11** according to the formula of the invention, the expanded tank **11***a* has the second nozzle assembly **45** positioned at the new center line **21***a* of the expanded car **10***a*.

Now, reverting to fabrication of the original car **10**, assume that the length X which the car **10** will subsequently be expanded by is known when the tank car is initially assembled. This length X determines the positioning of the nozzle assembly **45** relative to the nozzle assembly **25** according to the invention. More precisely, it will be seen that the dimensions of the unexpanded tank **11** illustrated in FIGURE 1 can be equated as follows:

(1) $$A=B+C$$

Referring then to FIGURE 2, by incorporating the length X of the insert section **55** with that of the length of the remainder of the expanded car tank **11***a*, the overall length of the expanded car can be equated as follows:

(2) $A+B=C+X$, where $C=C_1+C_2$

From Equation 2 above, we can then derive:

$$X=A-C+B$$

From Equation 1 above, we can also derive:

$$B=A-C$$

Combining Equations 1 and 2, we then conclude that:

$$X=2B \text{ or } B=X/2$$

It will thus be seen that the distance B at which the second nozzle assembly **45** must initially be spaced from the first nozzle assembly **25** when the tank car **10** is originally fabricated is equal to the distance $X/2$ or one-half of the length of the proposed expansion. After expansion of the car in the manner illustrated in FIGURE 2, the second nozzle assembly **45** is at the new center line **21***a* of the expanded car tank **11***a*. It is only necessary at this time to exchange the equipment of the nozzle assemblies **25** and **45** and place the valve and gauge equipment **26** at the new center line **21***a* of the car.

In order to move the equipment **26** in the nozzle assembly **25** to the second nozzle assembly **45**, the second nozzle assembly **45** is first disassembled. In this light, the second nozzle assembly **45** includes only a manway housing **60** bolted to a saddle ring **61** in a conventional manner by suitable bolts **62**. A removable manway cover **63** closes the manway housing **60**. The second nozzle assembly **45** thus ordinarily provides access to the tank **11** for personnel to clean or inspect the tank.

To modify the second nozzle assembly **45** for receipt of the equipment **26**, the housing **60** is removed with its cover **63**. The entire subassembly of the base plate **34**, housing **38**, and equipment **26** are then moved from the first nozzle assembly **25** onto the saddle ring **61** of the second nozzle assembly **45**. The base plate **34** is attached to the saddle ring **61** in a suitable manner. The equipment **26** is integrated up in a suitable manner.

The manway housing **60** and cover **63** are then mounted on the saddle ring **30** of the first nozzle assembly **25**. It will be noted, in this regard, that components of the two nozzle assemblies are readily exchanged without cutting or welding. Identical saddle rings **30** and **61** readily receive and mount exchanged components without welding. The rings **30** and **61** are not moved.

While several embodiments described herein are at present considered to be preferred, it is understood that various modifications and improvements may be made therein.

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

1. A method of constructing a tank assembly for a railway tank car which does not employ a tank assembly underframe, wherein the tank assembly includes a generally circular, cylindrical tank which is expanded longitudinally to increase the length of the tank and its capacity and whereby a fitting nozzle assembly is mounted on the longitudinal center line of the tank both before and after expansion, comprising the steps of:

(a) providing a first nozzle assembly on the tank at its longitudinal center line,

(b) predetermining the length to which the tank will subsequently be expanded longitudinally,

(c) mounting a second nozzle assembly on the tank spaced longitudinally from said first nozzle assembly at a distance equal to one-half of the proposed predetermined expansion length,

(d) cutting the tank into two sections at a point between said second nozzle assembly and a corresponding end of the tank,

(e) and introducing a circular, cylindrical section of said predetermined length between said two sections to expand said tank,

(f) whereby said second nozzle assembly is then on the longitudinal center line of the expanded tank.

2. A method of constructing a tank assembly for a railway tank car wherein the tank assembly includes a generally circular, cylindrical tank which is expanded longitudinally to increase the length of the tank and its capacity and whereby a fitting nozzle assembly is mounted on the longitudinal center line of the tank both before and after expansion, comprising the steps of:

(a) providing a first nozzle assembly on the tank at its longitudinal center line and constructing said first nozzle assembly with valve equipment and the like therein,

(b) predetermining the length which the tank will be expanded longitudinally,

(c) mounting a second nozzle assembly on the tank spaced longitudinally from said first nozzle assembly a distance equal to one-half of the proposed predetermined expansion length and constructing said second nozzle assembly with manway means therein,

(d) cutting the tank into two sections at a point between said second nozzle assembly and a corresponding end of the tank,

(e) introducing a circular, cylindrical section of said predetermined length between said two sections to expand said tank, whereby said second nozzle assembly is then on the longitudinal center line of the expanded tank,

(f) and modifying said second nozzle assembly by introducing thereto the equipment from said first nozzle assembly after expansion of the tank while modifying said first nozzle assembly to serve as manway means.

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U.S. Cl. X.R.

29—416, 469; 105—358; 113—120