June 29, 1937. I. C. DAVIS 2,085,419

RAILWAY TANK CAR

Filed Jan. 11, 1934 5 Sheets-Sheet 1

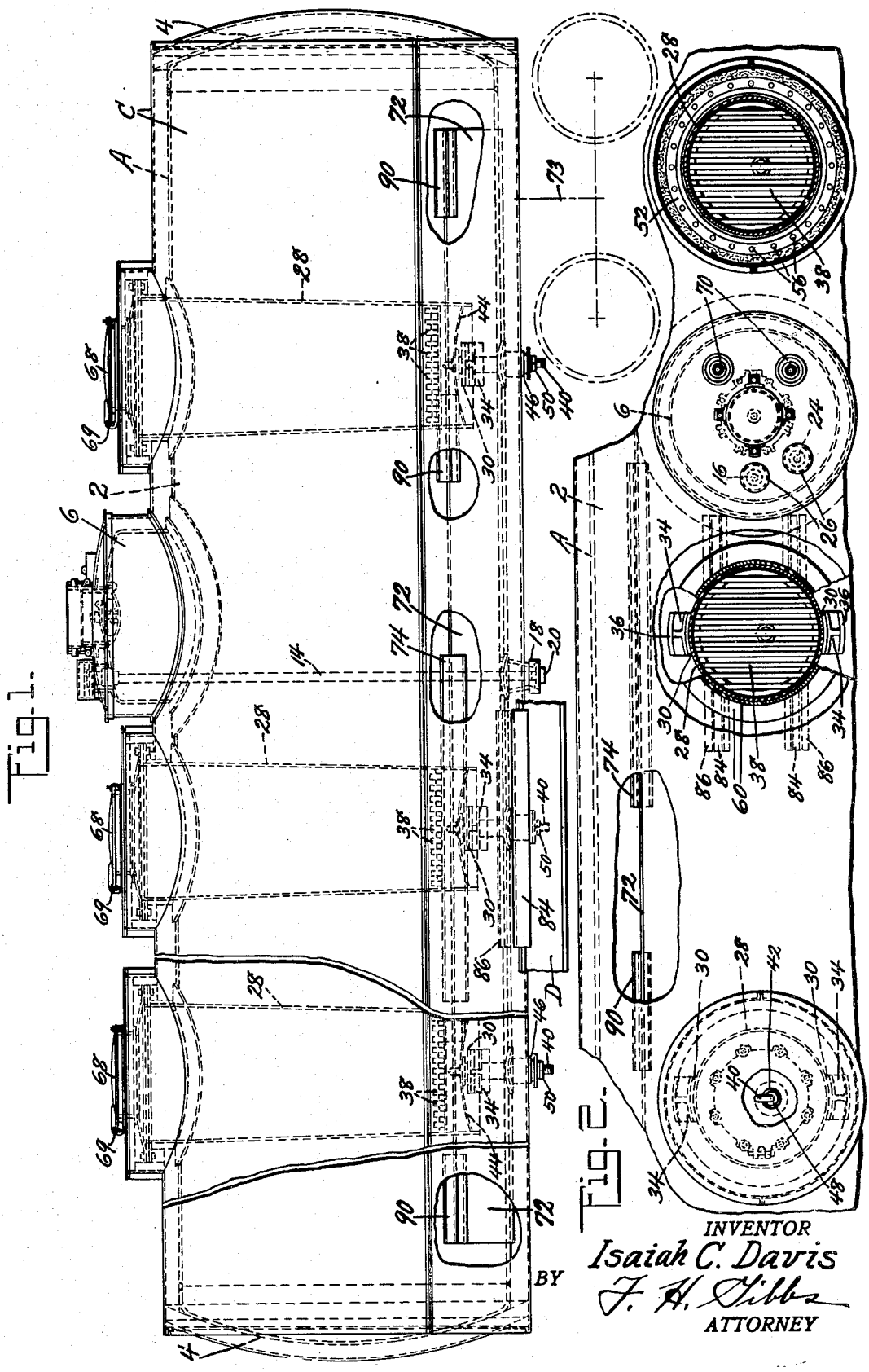


Fig. 1.

Fig. 2.

INVENTOR
Isaiah C. Davis
BY J. H. Tibbs
ATTORNEY

June 29, 1937. I. C. DAVIS 2,085,419

RAILWAY TANK CAR

Filed Jan. 11, 1934 5 Sheets-Sheet 2

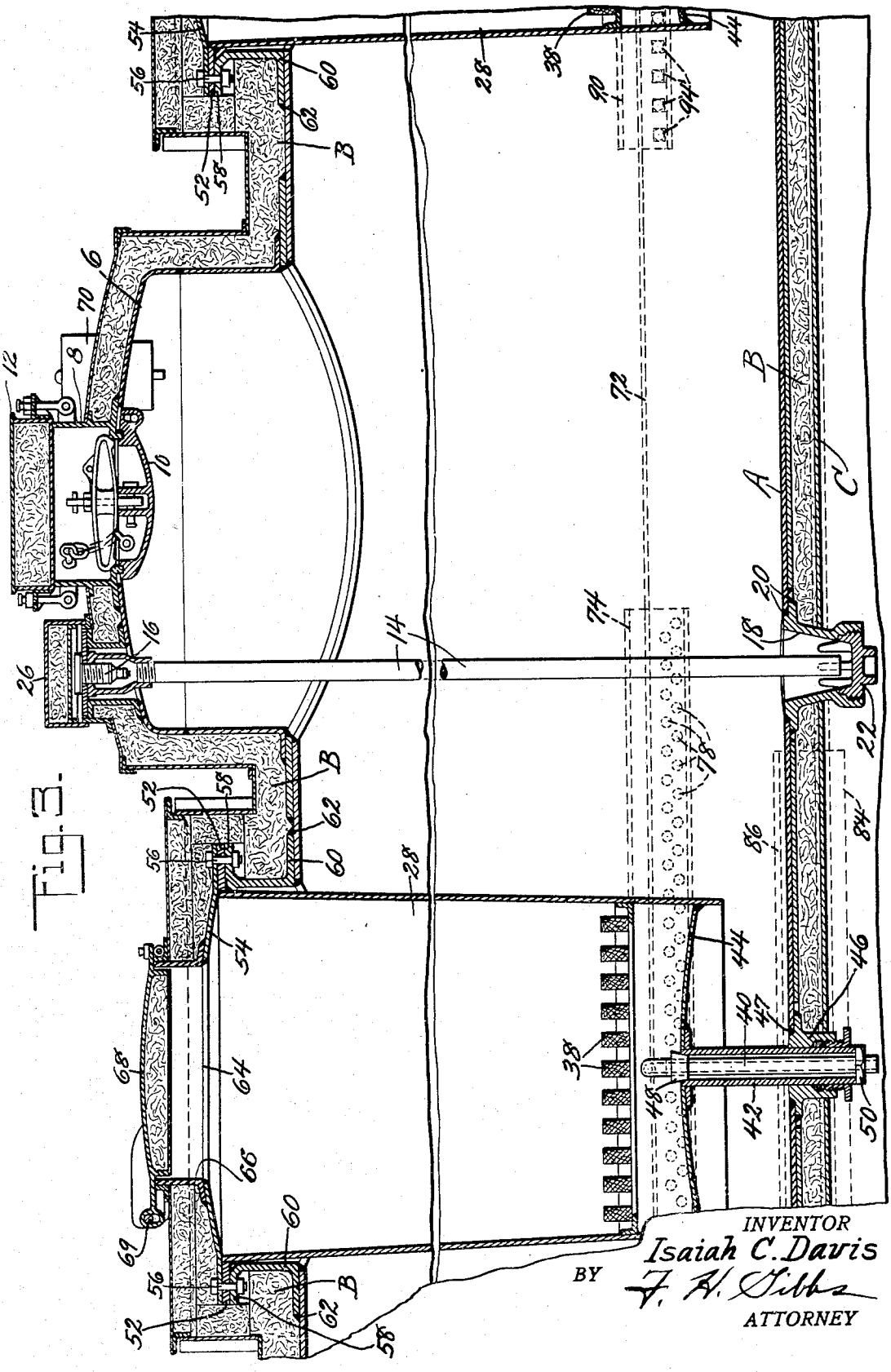


Fig. 3.

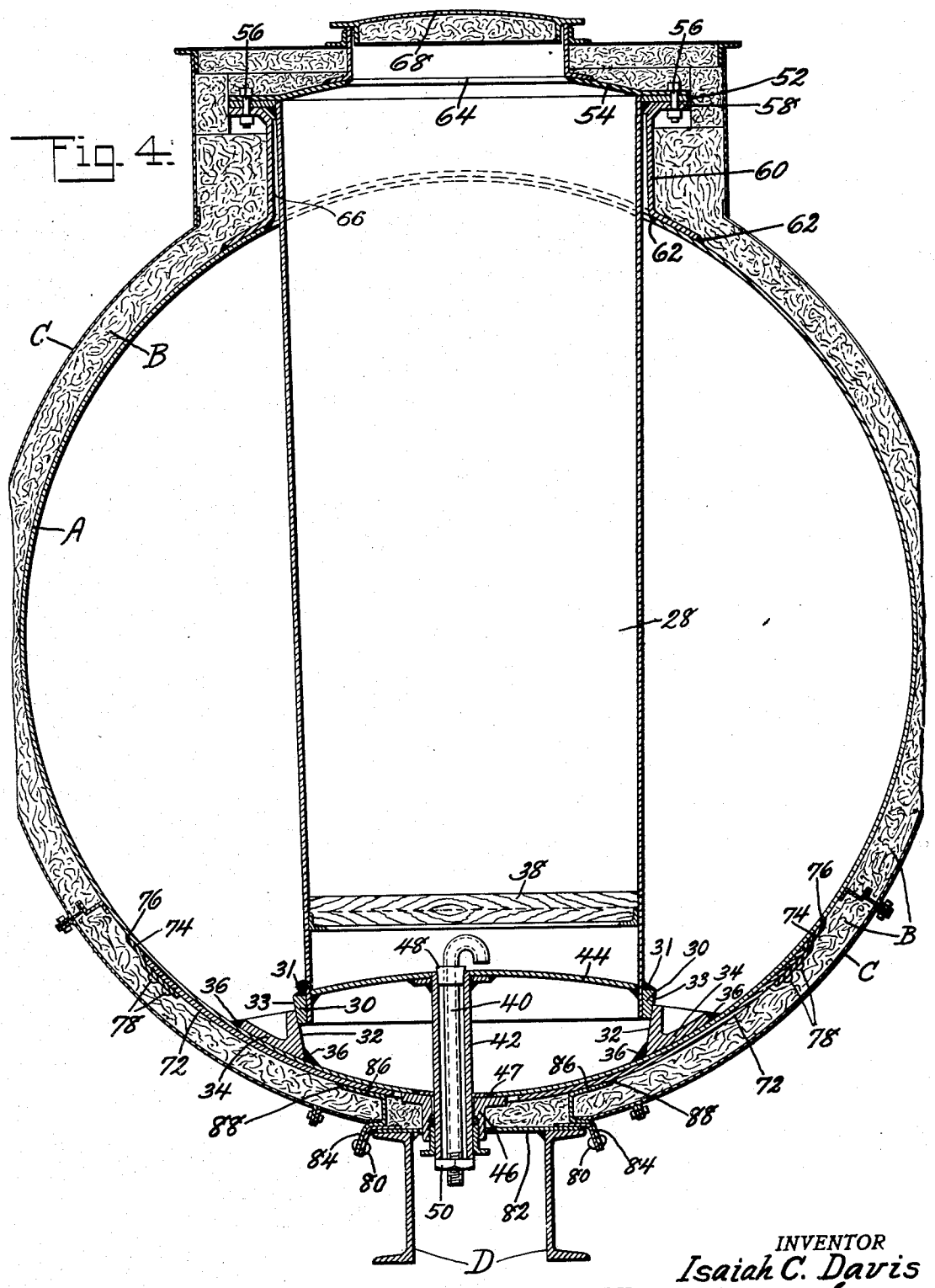
INVENTOR
Isaiah C. Davis
BY
F. H. Sibbs
ATTORNEY

June 29, 1937. I. C. DAVIS 2,085,419

RAILWAY TANK CAR

Filed Jan. 11, 1934 5 Sheets-Sheet 3

Fig. 4.



INVENTOR
Isaiah C. Davis

BY
J. H. Gibbs
ATTORNEY

June 29, 1937. I. C. DAVIS 2,085,419

RAILWAY TANK CAR

Filed Jan. 11, 1934 5 Sheets-Sheet 4

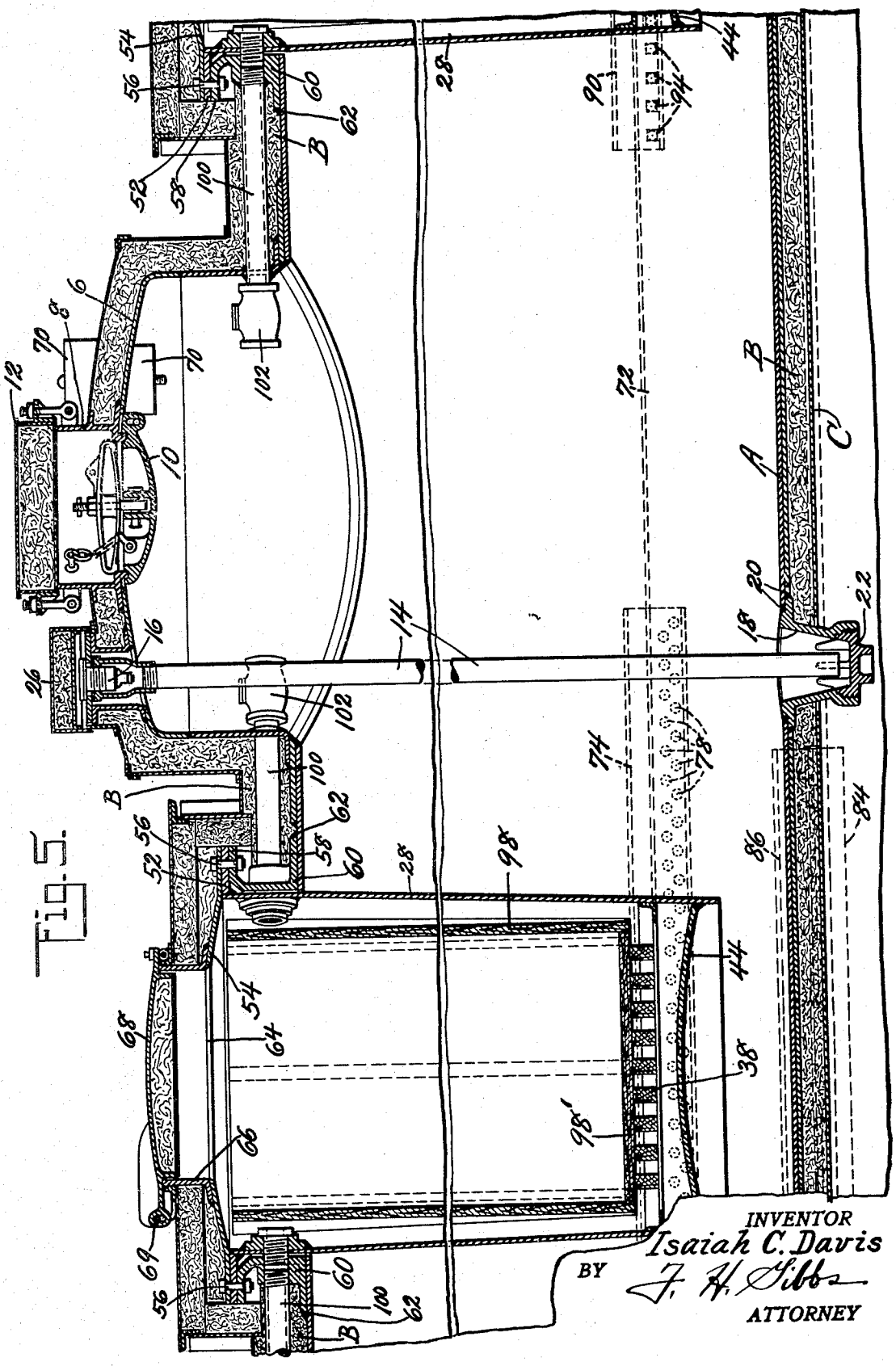


Fig. 5.

INVENTOR
Isaiah C. Davis
BY J. H. Sibbs
ATTORNEY

June 29, 1937. I. C. DAVIS 2,085,419

RAILWAY TANK CAR

Filed Jan. 11, 1934 5 Sheets-Sheet 5

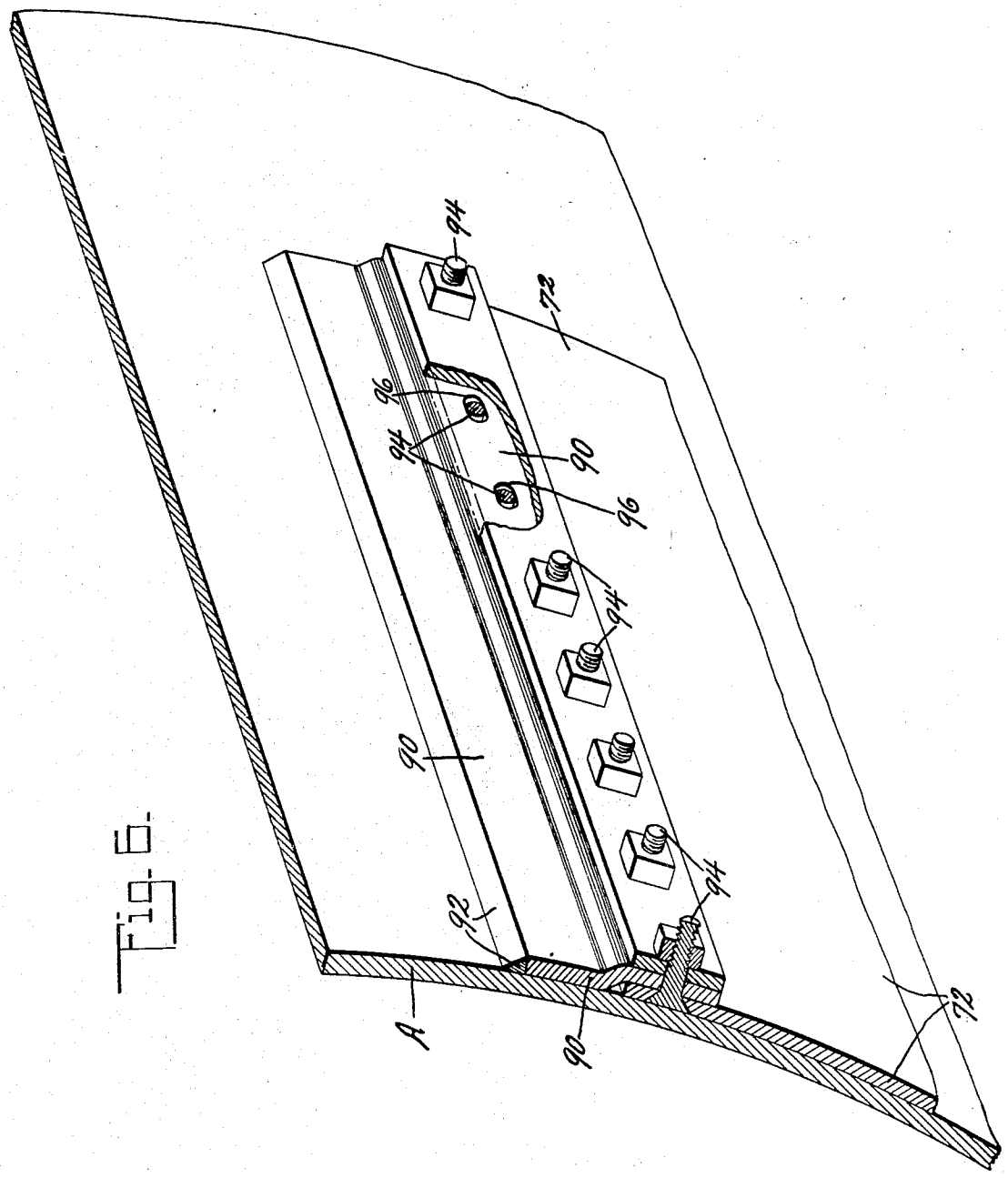


Fig. 6.

INVENTOR
Isaiah C. Davis
BY J. H. Gibbs
ATTORNEY

Patented June 29, 1937 2,085,419

UNITED STATES PATENT OFFICE

2,085,419

RAILWAY TANK CAR

Isaiah C. Davis, Berwick, Pa., assignor to American Car and Foundry Company, New York, N. Y., a corporation of New Jersey

Application January 11, 1934, Serial No. 706,192

15 Claims. (Cl. 62—15)

This invention relates generally to railway car tanks and has particular reference to tanks adapted primarily for the transportation of liquid lading which must be maintained at a substantially predetermined temperature.

One object of the present invention is the provision of a new and improved refrigerated railway car tank.

Another object of this invention is the provision of a railway car tank having removable refrigerant-holding containers therein.

Still another object of this invention is the provision of a new and improved car tank having a plurality of vertically arranged removable ice bunkers therein.

Another object of this invention is the provision of a car tank having means therein adapted to hold a heat exchange medium whereby liquid lading within the tank is maintained at a desired and predetermined temperature.

A further object of this invention is the provision of a new and improved supporting means for car tanks.

A still further object of this invention is the provision of a new and improved anchor means for railway car tanks.

The present invention also contemplates the provision of a railway car tank formed of relatively light material such, for example, as aluminum and a supporting means for the car tank of such a nature as to prevent distortion of said tank when in service.

Other objects and advantages of this invention will be apparent from the following description taken in conjunction with the accompanying drawings, in which

Figure 1 is a broken side elevation of a car tank of the present invention;

Fig. 2 is a fragmentary top plan view of the tank shown in Figure 1 with certain parts broken away to show other parts in section;

Fig. 3 is an enlarged sectional view through a part of the tank shown in Figure 1;

Fig. 4 is a sectional view through the car, the view being taken through one of the ice bunkers;

Fig. 5 is a sectional view through a part of a tank showing a modified form of the invention; and

Fig. 6 is a detailed view showing the attachment of the tank supporting plate to the tank at the end portions of the latter.

Referring now more particularly to Figs. 1 to 4, inclusive, in which similar characters of reference designate similar parts in the several views, the car of the present invention comprises generally a tank A insulated as shown at B and having an external sheathing C, the tank being mounted on a suitable underframe (not shown) which is provided with center sills indicated generally at D.

The tank A is preferably of welded construction and includes a cylindrical body 2 and ends 4. The tank is preferably constructed of a plurality of sheets welded together and designed for the transportation of liquids which are to be maintained in cool condition, such, for example, as beer or beverages generally or other liquids maintained under pressure. In view of the particular type of lading for which this tank is primarily designed, the tank is preferably formed of metal possessing corrosion-resistant properties greater than steel, such as aluminum or other like metal.

The tank is provided with a dome 6 having a dome ring 8 providing a manhole opening, and with inner and outer dome covers 10 and 12, respectively. Extending through the dome is a filling and discharge pipe 14, the upper end of which is provided with a valve 16 while the lower end is arranged in a sump 18 welded as at 20 to the lower portion of the tank and having a removable base plate 22. A pressure equalizing valve 24 is arranged adjacent the valve 16 and covers 26 are provided for each of said valves.

Arranged vertically in the tank in longitudinally spaced relation are a plurality of ice bunkers 28 which are gradually reduced in diameter from the upper end portions thereof toward the bottom, as more clearly shown in Figs. 1 and 4. Secured to the lower end portions of the bunkers 28 as by welding at 31 are a plurality of lugs 30 having beveled engaging faces 33 which are adapted to wedgingly cooperate with correspondingly beveled retaining flanges 32 of positioning shoes 34 secured to the interior of the bottom of the tank as by welding as shown at 36. In the form of the invention shown in Figs. 1 to 4, inclusive, a grate 38 is arranged within each bunker 28 and is adapted to support water ice, meltage from the ice being discharged out of the tank through a drain pipe 40 arranged within a tube 42 welded to and depending from the bottom 44 of the bunker and projecting through the bottom of the tank and through a stuffing box 46 welded to the bottom of the tank as shown at 47. The drain pipes 40 are each provided with a collar 48 arranged in the upper end portion of the tube 42, and the lower end portions of said pipes are each threaded to receive a securing nut 50 which bears against the lower end of the tube and which may be adjusted to effect sealing of the

tube 42 by the collar 48 to prevent leakage from the bunker through said tube 42.

The bunkers 28 extend through openings formed in the upper portion of the tank and their upper end portions are connected as by welding to annular supporting elements 52 to which the upper end walls 54 of the bunkers are connected by bolts 56; said supporting elements resting upon and being connected to the upper flanges 58 of channel members 60 by said bolts 56. Suitable sealing means, such as a gasket, are placed between the element 52 and flange 58 and being gripped by the bolts 56 will form a gas and liquid tight joint. As clearly shown in the drawings, the channel members 60 surround the bunkers 28 at their upper end portions and rest upon the upper portion of the tank and are secured thereto as by welding as shown at 62.

The upper end walls 54 of the bunkers 28 are provided with filling openings 64 surrounded by cover-supporting rings 66 having covers 68 hingedly connected therewith as shown at 69.

The tank is also provided with safety valves 70 at the dome which are operative in response to pre-determined gas pressure within the tank.

Since the tank of the present invention is formed of relatively light material such as aluminum it has been found advisable to longitudinally reinforce the tank at its lower portion and as can be more clearly seen in Fig. 4, a steel supporting plate 72 is provided which is curved to the contour of the lower portion of the tank and is of a length sufficient to extend beyond the truck bolsters, indicated diagrammatically at 73 (Fig. 1). Being of steel this plate 72 possesses ample strength to support the tank in such a manner as to prevent distortion thereof, said plate 72 being curved to thus constitute substantially a bed plate for the tank.

Intermediate the ends of the tank the plate 72 is provided with relatively long connecting elements 74 on opposite sides thereof which are welded as at 76 to the tank and which are rigidly connected to the plate 72 by fasteners such as the rivets 78. These connecting elements 74 are preferably formed of material which may be readily welded to the material of the tank. For example, in an aluminum tank the connection 74 will be of aluminum, and so forth.

Connected as at 80 to the center sill cover plate 82 are tank anchor elements 84 which are so formed as to provide supporting flanges 86 upon which the tank is supported through the plate 72, said elements 86 being welded as at 88 to the plate 72 or being otherwise suitably connected therewith.

At its end portions the tank is provided with relatively short connecting elements 90 welded to the tank as shown at 92 and connected to the plate 72 at its end portions by bolts 94 extending into slots 96 in said plate; this construction permitting the necessary lengthwise expansion and contraction of the tank relative to plate 72, all as clearly shown in Fig. 6.

In the form of the invention shown in Fig. 5, parts similar to those shown in the remainder of the figures of the drawings are indicated by similar reference characters. The tank of Fig. 5 is designed for cooling by solid carbon dioxide or other refrigerant which passes from a solid state to a vapor state without an intermediate liquid stage. In this form of the invention the drain pipe may or may not be provided although it may be advisable to provide one in order to clean the ice bunker, but if provided the lower end thereof is closed by a suitable cap to prevent discharge or escape of gas to the outside air. The specific example shown in Fig. 5 omits the use of the drain pipe although this is not to be considered as limiting the invention to the specific construction shown.

In the form of the invention shown in Fig. 5 each bunker 28 is provided with an interiorly arranged bunker formed of suitable insulating material such as balsa wood, hair felt, cork board, or the like, which is formed of a side wall 98 and a bottom 98', said interior bunker being supported on the wooden grating 38. It will be apparent that the solid carbon dioxide in the interior bunkers will sublime and spill over the upper end of said interior bunkers, the gas being utilized to build up and maintain required gas pressure within the tank in addition to providing the necessary refrigerating effect on the lading. Obviously, if desired, the interior bunkers may be omitted whereby the bunkers 28 are in direct heat exchange relation with the solid carbon dioxide and also in direct heat exchange relation with the lading in the tank. For transmitting carbon dioxide gas into the lading zone of the tank, gas pipes 100 are embedded in the insulation B and have their inlet ends extended into the bunkers 28 at the upper end portions of the latter. The discharge ends of the pipes 100 are arranged within the interior of the tank and are provided with check valves 102 which are operative to prevent back pressure of gas in the tank such as would cause passage of the gas from the interior of the tank into the bunkers. Obviously excess gas within the tank will be vented through the safety valves 70. The provision of the check valves 102 obviously permits opening of the bunker covers 68 for purpose of re-icing without the escape of gas from the interior of the tank to the outside air.

From the above description it is believed that the construction and operation of the car of the present invention will be fully apparent to those skilled in the art. The present invention provides a relatively light-weight car tank which is reinforced or braced against distortion by the supporting plate 72 which extends longitudinally of the bottom of the tank. Should occasion require the replacement or repair of the ice bunkers 28 this may be easily effected by the removal of the bolts 56 whereupon the complete bunker may be withdrawn from the tank.

In the description specific mention has been made of the car of the present invention as being designed for the purpose of refrigerating liquid lading or, in other words, maintaining liquid lading in a cool condition. It is not to be understood that this invention is specifically limited to the use of a cooling medium as in some instances it may be desirable to maintain liquid lading at a temperature above that of the outside air. For example, in the transportation of liquid lading in very cold zones during the colder months of the year it is obvious that it is unnecessary to supply a refrigerant in the bunkers 28 as, because of the extreme cold temperature outside of the tank the refrigerant would be of little use and the extremely cold temperature might result in freezing the lading or reducing the temperature of the lading beyond a predetermined or desired degree. Such a condition may prevail with either beer or milk or the like in which freezing temperatures are undesirable and detrimental. The construction of the tank

of the present invention provides for the maintenance of liquid lading at a predetermined temperature and the bunkers **28** are elements for retaining a heat exchange medium, whether it be one adapted for reducing the temperature of the lading or for increasing such temperature or, in other words, for maintaining the lading at a predetermined and desired temperature and, within the spirit of the invention should it be desired to heat the lading a suitable heating element may be inserted and retained within any or all of the bunkers **28** so as to prevent lowering of the temperature of the lading beyond a predetermined degree. Examples of the use of a heating medium are not specifically illustrated as they may assume any preferred or desired form such, for example, as charcoal stoves, electric heating elements, or the like.

The present invention therefore, considering the description hereinbefore, comprises a car tank having means therein adapted to receive and retain a heat exchange medium; said means being in direct heat exchange relation with the lading in the tank.

The drawings illustrate certain embodiments of the invention but it is to be understood that the drawings are for illustrative purposes only and various changes in the form and proportions of the construction may be made within the scope of the appended claims without departing from the spirit of the invention.

What is claimed is:

1. In a railway car tank for liquid lading, a body, and means for maintaining the lading at a low temperature comprising refrigerant-holding containers within the body and suspended vertically from the upper portion thereof, and positioning elements in the bottom portion of the tank with which said containers are engaged.

2. In a refrigerated railway car tank for liquid lading, a body, and lading refrigerating means comprising refrigerant-holding containers suspended from the upper portion of the body, and positioning elements on the bottom of the body with which the lower end portions of the containers are wedgingly engaged.

3. In a refrigerated railway car tank for liquid lading, a body having a dome, safety valves in said dome, and means for maintaining the lading at a low temperature comprising longitudinally spaced refrigerant-holding containers arranged vertically in the tank on opposite sides of the dome, positioning elements within the tank at the lower portion thereof with which said containers are wedgingly engaged, the upper end portions of said containers projecting through the upper portion of the tank, and supporting elements supported on the upper portion of the tank and surrounding the upper end portions of said containers and connected therewith.

4. In a refrigerated railway car tank for liquid lading, a body, and lading refrigerating means comprising refrigerant-holding containers suspended within the body from the upper portion of the latter, positioning elements in the body at the lower portion thereof with which said containers are engaged, and drains extending from said containers and discharging below the body.

5. In a railway car tank for liquid lading, a closed body, closed containers holding solid carbon dioxide suspended from the upper portion of the body and arranged within said body in sealing relation therewith, conduits leading from said containers to the interior of the body to permit passage of gas from said containers into the body thereby maintaining pressure within the body, and check valves at the discharge end portions of said conduits preventing reverse flow of gas.

6. In a railway car tank for liquid lading, a tank shell, a plurality of openings in said shell, dome rings attached to the shell and surrounding said openings, means for maintaining the lading at a low temperature comprising refrigerant-holding containers extending into the tank through said openings, and means supporting said containers on said dome rings to close and seal said openings.

7. In a railway car tank for liquid lading, a tank shell, a plurality of openings in said shell, dome rings attached to the shell and surrounding said openings, means for maintaining the lading at a low temperature comprising refrigerant-holding containers extending a substantial distance into the tank through said openings, and means supporting said containers on said dome rings whereby said containers may be readily removed from the tank, said means and container sealing said openings.

8. In a railway car tank for liquid lading, a tank shell, an opening in said shell, a dome ring attached to the shell and surrounding said opening, means for maintaining the lading at a low temperature comprising a refrigerant-holding container extending into the tank through said opening, and means supporting said container on said dome ring to close and seal said openings.

9. In a refrigerated tank car, a tank shell, a refrigerant-holding container suspended at least in part within the tank, a tubular element attached to said container and extending through the bottom of said shell, and drain means removably sealed within said tubular element.

10. In a refrigerated tank car, a tank shell, a refrigerant-holding container suspended within the tank from the upper portion thereof, a tube rigidly attached to said container, said tube extending through the tank shell in sealing relation therewith, and drain means removably sealed within said tube.

11. In a refrigerated railway car tank for liquid lading, a closed body, closed containers holding solid carbon dioxide suspended from the upper portion of the body and arranged within said body and in sealing relation therewith, said containers extending a substantial distance into the lading zone of the car for direct refrigeration of the lading, and conduits leading from said containers to the interior of the body to permit passage of gas from said containers into the body thereby maintaining pressure within the body.

12. In a tank car, a body, a plurality of substantially vertically arranged refrigerant holding containers removably suspended within the body from the upper portion of the latter, and means at the bottom portion of the body with which said containers are engaged in such a manner as to restrain said containers against shifting movement.

13. In a tank car, a tank body, vertically arranged refrigerant holding containers in said body, container supporting means at the upper portion of the body, said containers having supporting flanges connected with said supporting means, and means at the lower portion of the body with which said containers are engaged to restrain said containers against shifting movement.

14. In a railway car tank for liquid lading, a closed body, closed containers holding solid carbon dioxide suspended from the upper portion of the body and arranged within said body, means at the lower portion of the body with which the lower end portions of the containers are engaged whereby to be restrained against shifting movement, and conduits leading from said containers to the interior of the body to permit passage of gas into the body to maintain a pressure therewithin.

15. In a railway car tank for liquid lading, a closed body, closed containers holding solid carbon dioxide suspended from the upper portion of the body and arranged within said body, means at the lower portion of the body with which the lower end portions of the containers are engaged whereby to be restrained against shifting movement, conduits leading from said containers to the interior of the body to permit passage of gas into the body to maintain a pressure therewithin, and check valves at the discharge end portions of said conduits for preventing reverse flow of gas.

ISAIAH C. DAVIS.