

July 7, 1964

S. H. MOYES ETAL
RAILWAY TANK CARS

3,139,842

Filed June 23, 1961

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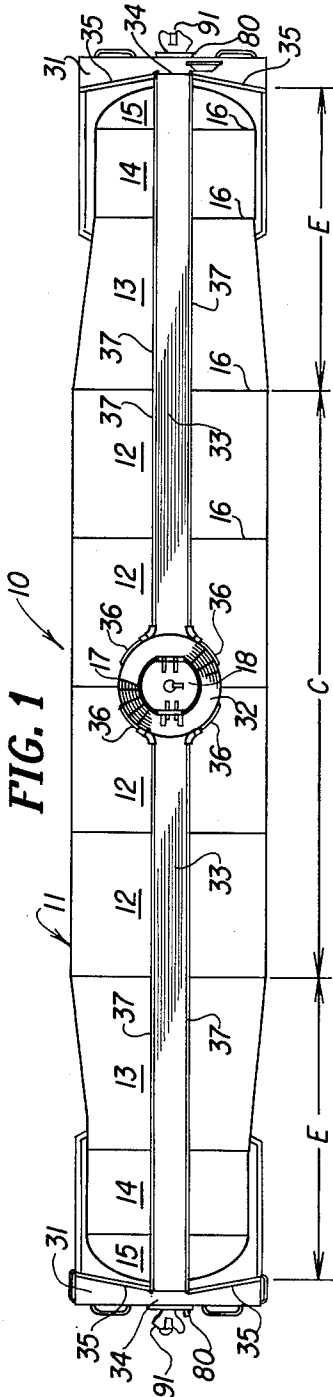
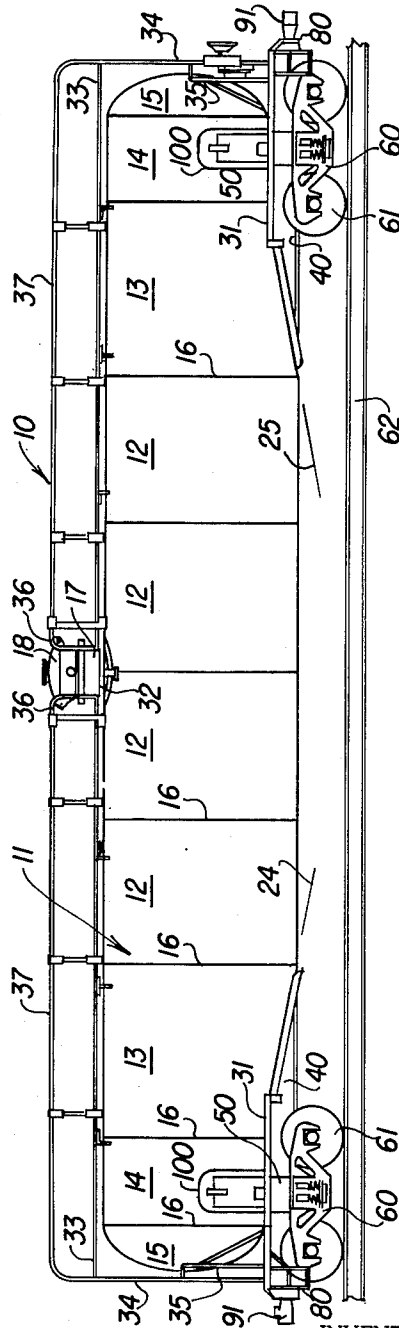


FIG. 2



INVENTOR.

Stuart H. Moyes

BY

William A. Taylor

Prangley, Baird, Clayton,
Miller & Vogel Attys.

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S. H. MOYES ETAL

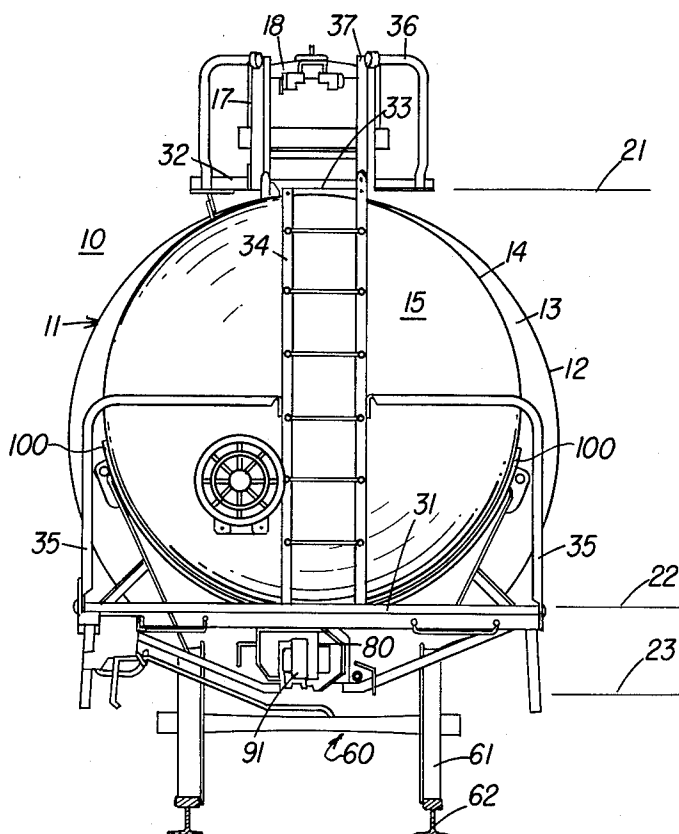
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FIG. 3



INVENTOR.

Stuart H. Moyes

BY William A. Taylor

Prangley, Baird, Clayton,
Miller & Vogel Attys

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FIG. 4

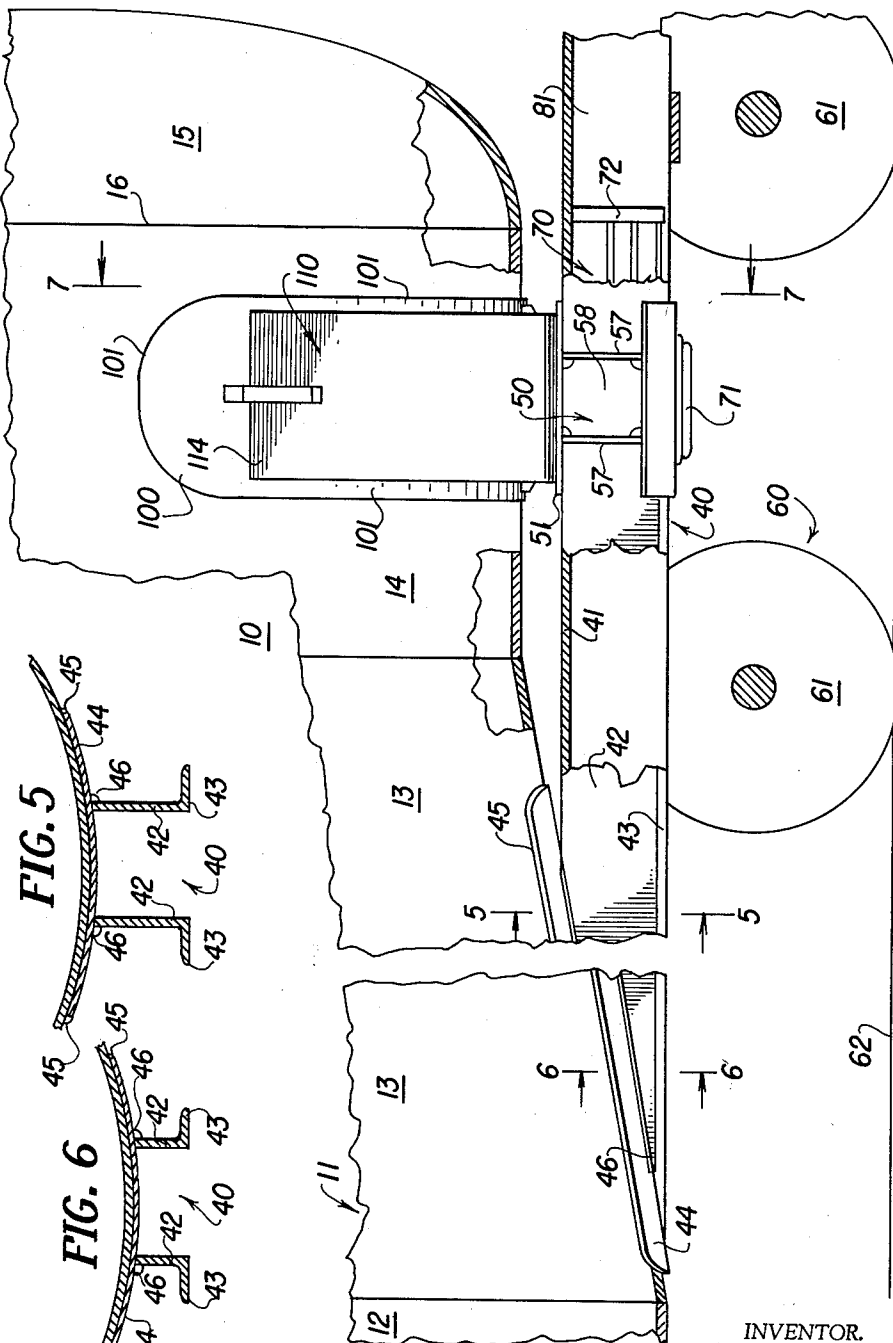


FIG. 5

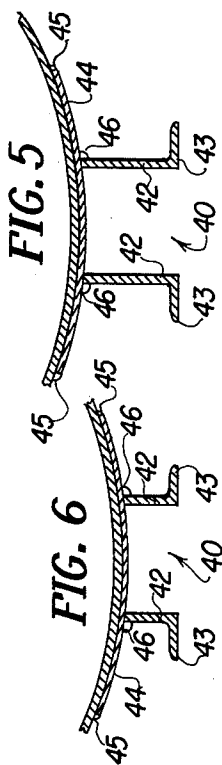
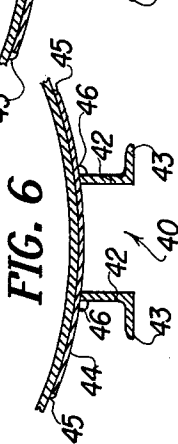


FIG. 6



INVENTOR.

Stuart H. Moyes

BY

William A. Taylor

Brangley Baird, Clayton,
Miller & Vogil

Attys.

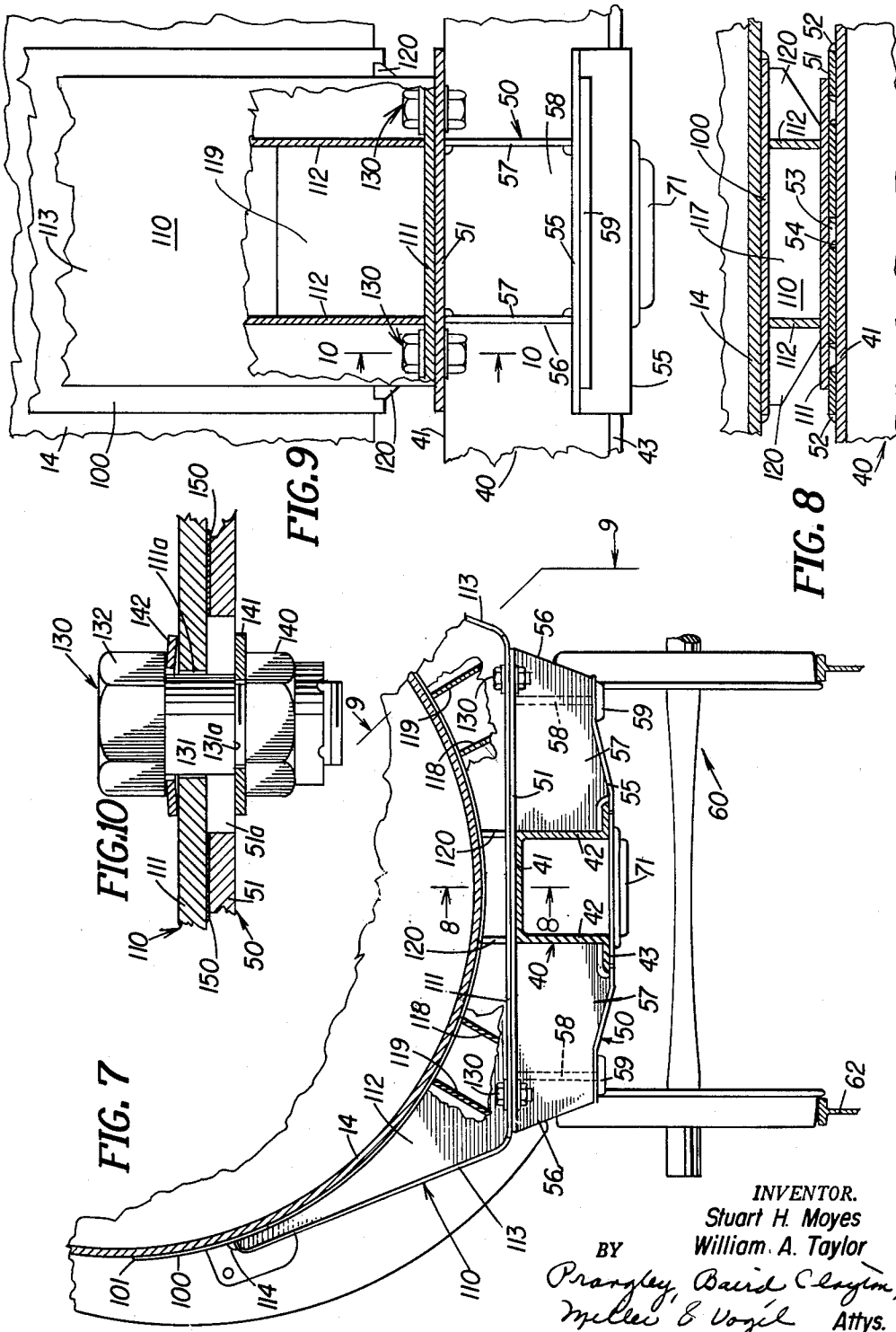
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INVENTOR.
Stuart H. Moyes
William A. Taylor
BY
Pringley, Baird, Clayton,
Miller & Vogel Attys.

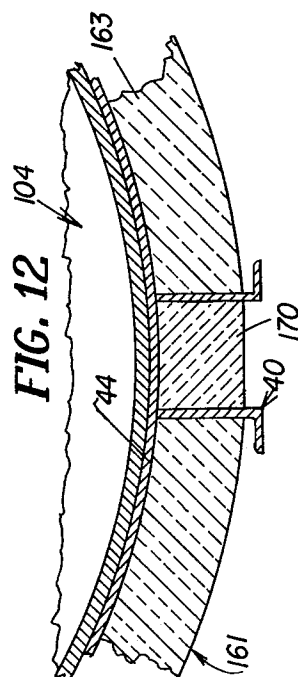
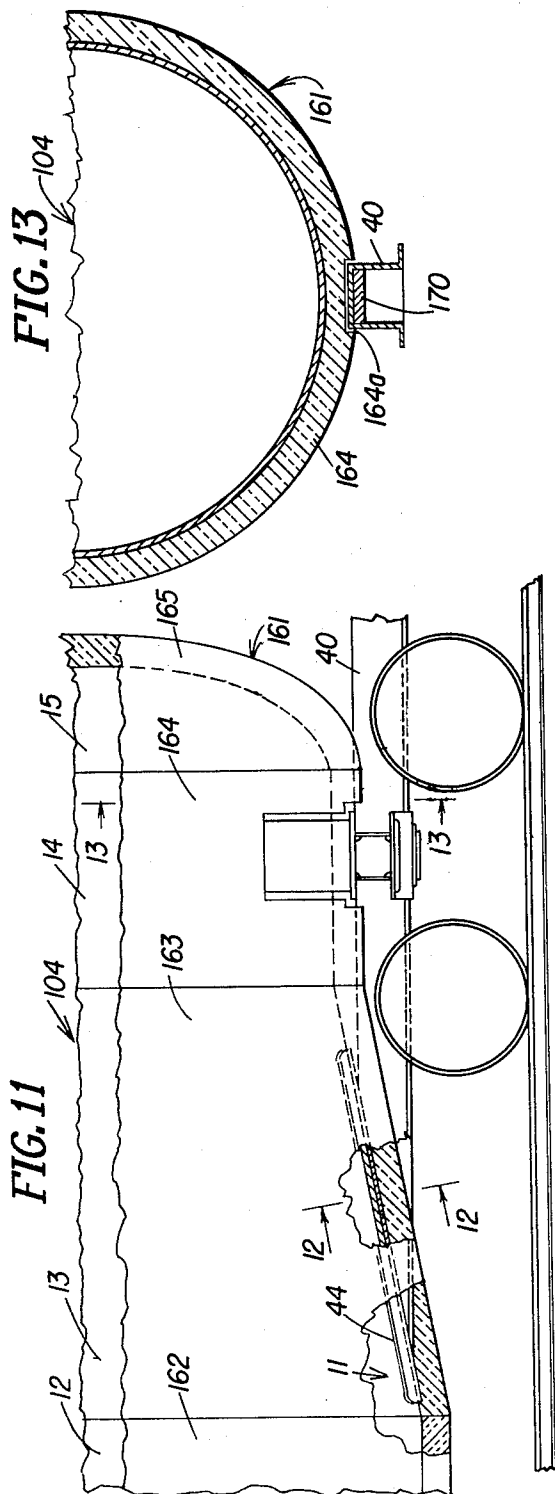
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INVENTOR.
Stuart H. Moyes
BY William A. Taylor
Orangley Baird Clayton,
Miller & Vogil Attys.

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RAILWAY TANK CARS

Stuart H. Moyes, Griffith, Ind., and William A. Taylor, Midlothian, Ill., assignors to General American Transportation Corporation, Chicago, Ill., a corporation of New York

Filed June 23, 1961, Ser. No. 119,168
3 Claims. (Cl. 105—360)

The present invention relates to railway tank cars, and particularly to such railway tank cars comprising longitudinally extending tubular body shells of self-supporting rigid construction and of fish-belly configuration and incorporating no underframes or center sills extending longitudinally from end to end thereof, and more specifically to improved railway tank cars of the character of that disclosed in the copending application of John F. Krause, Jr., Serial No. 106,256, filed April 28, 1961.

It is a general object of the invention to provide a railway tank car of the type noted that comprises a pair of longitudinally aligned stub draft sills respectively arranged below the opposite ends of the body shell thereof, wherein the longitudinal center lines of the stub draft sills are located well above the lower plane of the central portion of the body shell and the extreme inner ends of the stub draft sills are respectively rigidly connected to the adjacent parts of the central body portion of the body shell, a pair of laterally extending body bolsters respectively rigidly connected to the intermediate portions of the stub draft sills, a pair of pedestal structures respectively arranged below the lower portions of the opposite ends of the body shell and respectively rigidly connected thereto and respectively disposed in superimposed relation with respect to the body bolsters, and a pair of connections respectively arranged between the lower portions of the pedestal structures and the upper portions of the body bolsters, wherein each of the connections accommodates limited relative longitudinal movements between the adjacent one of the pedestal structures and the adjacent one of the body bolsters while preventing any substantial lateral movements therebetween, whereby substantially all of the longitudinal draft forces exerted between the stub draft sills and the body shell are applied through the inner ends of the stub draft sills, thereby substantially to eliminate rotational draft torques exerted between the stub draft sills and the body shell and applied through the pedestal structures.

Another object of the invention is to provide a railway tank car of the character noted, wherein the connections between the lower portions of the pedestal structures and the upper portions of the body bolsters are of improved and simplified arrangement so as to prevent friction and galling therebetween incident to longitudinal movements therebetween.

A further object of the invention is to provide a railway tank car of the character described, wherein the connections between the lower portions of the pedestal structures and the upper portions of the body bolsters accommodate longitudinal movements between the opposite ends of the body shell and the central body portion thereof incident to expansion and to contraction thereof resulting from the loading of the body shell with either hot or cold ladings, thereby to prevent internal stresses between the opposite ends of the body shell and the stub draft sills.

A still further object of the invention is to provide in a railway tank car including a body shell of fish-belly configuration, a unified stub draft sill and body bolster and pedestal structure that is of improved and simplified construction and arrangement.

Further features of the invention pertain to the particular construction and arrangement of the elements of the

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railway tank car, whereby the above-outlined and additional operating features thereof are attained.

The invention, both as to its organization and method of operation, together with further objects and advantages thereof, will best be understood by reference to the following specification, taken in connection with the accompanying drawings, in which:

FIGURE 1 is a plan view of a railway tank car embodying the present invention;

FIG. 2 is a side elevational view of the railway tank car shown in FIG. 1;

FIG. 3 is an enlarged end elevational view of the railway tank car shown in FIGS. 1 and 2;

FIG. 4 is a greatly enlarged fragmentary side elevational view, partly in section, of one end of the railway tank car, as shown in FIGS. 1 to 3, inclusive;

FIG. 5 is a greatly enlarged lateral sectional view of the stub draft sill and the superimposed reinforcing plate incorporated in the one end of the railway tank car, this view being taken in the direction of the arrows along the line 5—5 in FIG. 4;

FIG. 6 is another greatly enlarged lateral sectional view, similar to FIG. 5, of the stub draft sill and the reinforcing plate, this view being taken in the direction of the arrows along the line 6—6 in FIG. 4;

FIG. 7 is a greatly enlarged lateral sectional view of the stub draft sill and the body bolster and the pedestal structure incorporated in the one end of the railway tank car, this view being taken in the direction of the arrows along the line 7—7 in FIG. 4;

FIG. 8 is a still further enlarged longitudinal sectional view, taken through the stub draft sill and the body bolster and the pedestal structure, this view being taken in the direction of the arrows along the line 8—8 in FIG. 7;

FIG. 9 is a still further enlarged longitudinal sectional view, taken through the pedestal structure above the body bolster, this view being taken in the direction of the arrows along the line 9—9 in FIG. 7;

FIG. 10 is a greatly enlarged sectional view, taken through the junction between the pedestal structure and the body bolster, illustrating one of the fastening devices incorporated in this connection, this view being taken in the direction of the arrows along the line 10—10 in FIG. 9;

FIG. 11 is an enlarged fragmentary side elevational view, partly in section, of a modified form of the railway tank car, as shown in FIGS. 1 to 3, inclusive, and illustrating a heat-insulating jacket carried by the exterior of the body shell thereof;

FIG. 12 is a greatly enlarged lateral sectional view of the railway tank car, this view being taken in the direction of the arrows along the line 12—12 in FIG. 11; and

FIG. 13 is an enlarged lateral sectional view of the railway tank car, this view being taken in the direction of the arrows along the line 13—13 in FIG. 11.

Referring now to FIGS. 1 to 3, inclusive, of the drawings, the railway tank car 10 there illustrated and embodying the features of the present invention comprises a longitudinal extending tubular body shell 11 of large volume and of fish-belly construction. More particularly, the body shell 11 is of self-supporting rigid welded steel plate construction, including a central portion "C" and two identical end portions "E," as shown in FIG. 1. The central portion "C" is formed of four cylindrical central sections 12; and each of the end portions "E" is formed of a frusto-conical intermediate transition section 13, a cylindrical end section 14 and a convex end head 15. Each of the central sections 12 is of relatively large diameter; each of the end sections 14 is of relatively small diameter; the inner end of each of the transition sections 13 is of the relatively large diameter of the adjacent cen-

tral section 12; and the outer end of each of the transition sections 13 is of the relatively small diameter of the adjacent end section 14. The tops of the four central sections 12, the tops of the two intermediate transition sections 13 and the tops of the two end sections 14 are disposed in a substantially horizontal upper plane, indicated at 21 in FIG. 3; the bottoms of the two end sections 14 are disposed in a substantially horizontal intermediate plane, indicated at 22 in FIG. 3; the bottoms of the four central sections 12 are disposed in a substantially horizontal lower plane, indicated at 23 in FIG. 3; and the bottoms of the two transition sections 13 are respectively disposed in two generally upwardly and oppositely outwardly inclined planes, respectively indicated at 24 and 25 in FIG. 2. The contiguous edges of the adjacent sections 12, 13 and 14 and the end heads 15 are welded together to form fluid tight joints therebetween, as indicated by the weld lines 16.

In a constructional example of the body shell 11 that is adapted to contain approximately 30,000 gallons of liquid lading, the overall length of the body shell 11 between the inside surfaces of the end heads 15 is approximately 61 ft. $\frac{1}{8}$ in. Each of the central sections 12 has a length of 7 ft. 6 in. and an internal diameter of 118 in. and is formed of $\frac{15}{16}$ in. steel plate. Each of the end sections 14 has a length of 4 ft. 4 in. and an internal diameter of 99 in. and is formed of $\frac{13}{16}$ in. steel plate. Each of the transition sections 13 has a length of 8 ft. $11\frac{5}{16}$ in. and an internal diameter at the inner end thereof of 118 in. and an internal diameter at the outer end thereof of 99 in. and is formed of $\frac{15}{16}$ in. steel plate. Each of the end heads 15 has a length between the inner end thereof and the bend line thereof of 2 in. and a length between the bend line thereof and the inside surface thereof of 2 ft. $\frac{3}{4}$ in. and an internal diameter at the inner end thereof of 99 in. and is formed of $\frac{13}{16}$ in. steel plate.

Also the body shell 11 is provided at the top central portion thereof with an upstanding substantially cylindrical dome structure 17 formed of steel plate and suitably welded into the two adjacent central sections 12; which dome structure 17 is provided with a removable cover 18, also formed of steel plate, and accommodating access into the interior of the body shell 11 through the upstanding dome structure 17. Two lower platforms 31 formed of fabricated steel elements are respectively carried by the body shell 11 at the opposite ends thereof; a substantially annular work platform 32 formed of fabricated steel elements is carried by the top central portion of the body shell 11 in surrounding relation with respect to the upstanding dome structure 17; and a pair of longitudinally extending catwalk platform structures 33 formed of fabricated steel elements are carried by the top of the body shell 11 and extend outwardly from the opposite sides of the annular work platform 32 and terminate at the opposite ends thereof respectively above the lower work platforms 31. Also, the opposite ends of the lower work platforms 31 respectively carry a pair of upstanding ladder structures 34 that respectively interconnect the lower platform structures 31 and the adjacent outer ends of the upper catwalk platform structures 33. Further, the outer ends of the lower platform structures 31 carry suitable upstanding handrail structures 35 respectively interconnected with the ladder structures 34; the upper substantially annular work platform 32 carries suitable upstanding handrail structures 36; and the catwalk platform structures 33 carry suitable upstanding handrail structures 37. The outer ends of the handrail structures 37 are interconnected with respect to the ladder structures 34, while the inner ends of the handrail structures 37 are interconnected with respect to the handrail structures 36.

Also, the railway tank car 10 comprises a pair of longitudinally spaced-apart and aligned substantially centrally disposed stub draft sills 40 respectively arranged

below the opposite ends of the tank body shell 11; which stub draft sills 40 are respectively provided with a pair of laterally extending body bolsters 50 that are respectively operatively connected to a pair of supporting trucks 60 that, in turn, are provided with flanged wheels 61 supported by the associated rails 62 of a cooperating railway track, as best illustrated in FIG. 2.

Referring now to FIGS. 4 to 7, inclusive, one end of the railway tank car 10 is there illustrated; and it will be observed that the adjacent stub draft sill 40 disposed therebelow is of hollow construction essentially comprising an inverted substantially U-shaped steel channel including a top wall 41, a pair of laterally spaced-apart side walls 42 and a pair of laterally outwardly extending flanges 43 respectively carried by the lower edges of the side walls 42. The central portion of the stub draft sill 40 carries the body bolster 50, as explained more fully hereinafter, and is positioned below the adjacent end section 14 of the body shell 11; the inner end of the stub draft sill 40 projects below the adjacent transition section 13 of the body shell 11; and the outer end of the stub draft sill 40 projects outwardly beyond the adjacent end head 15 of the body shell 11. More particularly, the bottom of the transition section 13 is reinforced by an associated plate 44 of substantially arcuate configuration; which reinforcing plate 44 is formed of $\frac{1}{2}$ in. steel plate and is rigidly connected, as by welding, as indicated at 45 in FIGS. 4, 5 and 6, about the perimeter thereof to the adjacent lower surface of the transition section 13. The stub draft sill 40 is disposed entirely above the lower plane 23 of the bottom of the central section 12 and the inner end thereof is downwardly tapered and disposed in engagement with the reinforcing plate 44 and rigidly connected thereto, as by welding, as indicated at 46 in FIGS. 4, 5 and 6.

Referring now to FIGS. 4, 7, 8 and 9, the body bolster 50 is fabricated of $\frac{1}{2}$ in. steel plate and essentially comprises a laterally extending top plate 51 disposed in engagement with the top wall 41 of the central portion of the stub draft sill 40 and rigidly connected thereto, as by welding, as indicated at 52 in FIG. 8. The top plate 51 of the body bolster 50 has a number of laterally extending slots 53 formed therein which also receive weldments, as indicated at 54 in FIG. 8, thereby positively to insure a rigid connection between the top plate 51 and the top wall 41 of the stub draft sill 40. Also the body bolster 50 comprises a laterally extending bottom plate 55 underlying the flanges 43 carried by the side walls 42 of the stub draft sill 40; which bottom plate 55 is suitably welded to the adjacent surfaces of the flanges 43 in any suitable manner, not shown. Further, the body bolster 50 comprises a pair of laterally extending arms 56, each including a pair of longitudinally spaced-apart upstanding side plates 57 and an upstanding end plate 58. In each of the arms 56, the side plates 57 are arranged below the top plate 51 and above the bottom plate 55 and laterally outwardly with respect to the adjacent side wall 42 of the stub draft sill 40; and furthermore, the end plate 58 is also arranged below the top plate 51 and above the bottom plate 55 and between the side plates 57. The upper and lower ends of the side plates 57 are respectively rigidly connected to the upper and lower plates 51 and 55, as by welding; the inner ends of the side plates 57 are rigidly connected to the adjacent portions of the side wall 42 of the stub shaft 40, as by welding; and the end plate 58 is connected mutually to the top and bottom plates 51 and 55 and to the side plates 57, as by welding. Accordingly, the composite bolster 50 is of rigid construction and is rigidly connected to the intermediate portion of the stub draft sill 40 and includes the two oppositely directed and laterally extending arms 56, as described above. The arms 56 of the body bolster 50 respectively carry a pair of laterally spaced-apart bearing plates 59 respectively disposed adjacent to the

outer ends thereof that are adapted to cooperate with the usual truck side bearings, not shown, carried by the bolster, not shown, of the associated truck 60, so as to limit tipping of the body shell 11, in the usual manner.

Referring now to FIGS. 4 and 7, the intermediate portion of the stub draft sill 40 incorporates a bolster center brace structure 70, that is of conventional construction, and that includes a lower centering plate 71 and rear draft lugs 72. For example, the bolster center brace structure 70 may be of the construction and arrangement of that disclosed in U.S. Patent No. 2,355,524, granted on August 8, 1944, to Fred J. Garlock and John R. Mull. Of course, it will be understood that the centering plate 71 cooperates with the center bearing, not shown, carried by the bolster of the truck 60, in the usual manner, and that the body bolster 50 and the bolster of the truck 60 are connected together by a center pin, not shown, in the usual manner.

As indicated in FIGS. 1, 2 and 4, the extreme outer end of the stub draft sill 40 is hollow and constitutes a draft arm that receives striking plate structure 80 that is of conventional construction and incorporates the usual front draft lugs, not shown; which striking plate structure 80 may be of the construction and arrangement of that disclosed in U.S. Patent No. 2,706,051, granted on April 12, 1955, to Carl F. Nystrom.

The bolster center brace structure 70 and the striking plate structure 80 are arranged in longitudinally spaced-apart relation to provide a hollow pocket 81 therebetween in the draft arm, as best shown in FIG. 4; which pocket 81 receives the usual friction draft gear that terminates in a forwardly projecting coupling, indicated at 91 in FIGS. 1 and 2. Of course, it will be understood that the longitudinal draft forces applied to the coupling 91 are transmitted by the draft gear, not shown, to the cooperating rear draft lugs 72 and front draft lugs, not shown, thereby to effect the cushioned transmission of the longitudinal draft forces to the stub draft sill 40, for the usual draft purpose.

Referring now to FIGS. 1, 2, 3, 4, 7, 8 and 9, a pair of longitudinally spaced-apart saddle plates 100 respectively embrace the adjacent lower portions of the end sections 14 of the body shell 11, and each of the saddle plates 100 is formed of $\frac{1}{2}$ in. steel plate and rigidly connected to the adjacent lower portion of the end section 14, as by welding, about the periphery thereof, as indicated at 101 in FIGS. 4 and 7. A pair of longitudinally spaced-apart and laterally extending pedestal structures 110 are respectively arranged between the saddle plates 100 and the body bolsters 50.

Referring now to FIGS. 4, 7, 8 and 9, the pedestal structure 110 is fabricated of $\frac{1}{2}$ in. steel plate and essentially comprises a laterally extending bottom plate 111 disposed in superimposed relation with respect to the top plate 51 of the adjacent body bolster 50 and slidably supported thereby, as explained more fully hereinafter. The pedestal structure 110 also includes a pair of longitudinally spaced-apart and laterally extending upstanding side plates 112 arranged between the bottom plate 111 and the adjacent saddle plate 100, each of the side plates 112 being substantially arcuate-shaped and rigidly connected at the respective upper and lower ends thereof, as by welding, not shown, to the adjacent saddle plate 100 and to the adjacent bottom plate 111. Also, the pedestal 110 comprises a pair of outside cover plates 113 interconnecting the opposite ends of the bottom plate 111 and the opposite upper portions of the saddle plate 100. The lower end of each of the outside plates 113 is rigidly connected to the adjacent outer end of the bottom plate 111 and to the adjacent outer ends of the side plates 112, as by welding, not shown; and also the upper end of each of the outside plates 113 is rigidly connected to the adjacent upper portion of the saddle plate 100, as by welding, as indicated at 114 in FIG. 7. Further, the pedestal 110 incorporates a plurality of

gusset plates 117, 118 and 119 arranged between the side plates 112 and rigidly connected thereto, as by welding; and finally, the pedestal structure 110 includes a plurality of gusset plates 120 arranged exteriorly of the side plates 112 and extending between the bottom plate 111 and the saddle plate 100 and suitably rigidly connected thereto, as by welding, at the edges thereof to the abutting ones of the elements mentioned.

Accordingly, it will be understood that the pedestal structure 110 is of rigid construction and is rigidly connected to the adjacent saddle plate 100 that is, in turn, rigidly connected to the adjacent end section 14 of the body shell 11; and the pedestal structure 110 is disposed in interposed relation with respect to the adjacent body bolster 50 and the adjacent saddle plate 100, thereby to support the adjacent end section 14 of the body shell 11 upon the body bolster 50.

More particularly, the bottom plate 111 of each of the pedestals 110 is directly supported upon the top plate 51 of the adjacent one of the body bolsters 50 and is secured in place by four connections, each essentially comprising a bolt 130, as best shown in FIG. 10; which connections accommodate limited relative longitudinal movements between the pedestal structure 110 and the body bolster 50, while preventing any substantial lateral movements therebetween. This is accomplished by the arrangement of the shank 131 of each of the bolts 130 through a substantially circular opening 111a provided in the adjacent bottom plate 111 of the pedestal structure 110 and through a longitudinally extending slot or opening 51a provided in the adjacent top plate 51 of the body bolster 50, as clearly illustrated in FIG. 10. More specifically, the bolt 130 comprises an enlarged head 132 that may be of conventional hexagon configuration; and the shank 131 carries at the outer end thereof a nut 140 that may also have a hexagon configuration. Preferably, the nut 140 is of the "lock-nut type" and cooperates with an adjacent washer 141 surrounding the shank 131 of the bolt 130 and disposed in engagement with the adjacent lower face of the upper plate 51 of the body bolster 50. Also, a spring washer 142 is arranged adjacent to the head 132 of the bolt 130 and disposed in engagement with the adjacent upper face of the lower plate 111 of the pedestal structure 110; which spring washer 142 may be of the "Belleville" type. Also, it is mentioned that the shank 131 of the bolt 130 is of the "shouldered type" providing a shoulder 131a thereon that engages the adjacent upper face of the washer 141 that, in turn, surrounds the outer threaded end section of reduced diameter of the shank 131, upon which the lock-nut 140 is arranged. Accordingly, the lock-nut 140 clamps the washer 141 in place onto the shoulder 131a provided upon the shank 131 of the bolt 130, and the two assembled plates 51 and 111 are secured together between the washer 141 and the spring washer 142, with the spring washer 142 in engagement with the underface of the head 132 of the bolt 130. This arrangement maintains a constant resilient clamping force between the washers 141 and 142; whereby the spring washer 142 maintains a substantially constant and resilient clamping force between the assembled plates 51 and 111.

Accordingly, the four connectors described above accommodate ready longitudinal sliding of the lower plate 111 of the pedestal structure 110 upon the upper plate 51 of the body bolster 50, while preventing any substantial lateral movements between the two plates 111 and 51, by virtue of the configuration of the elongated slots or openings 51a provided in the plate 51. Also, the upper surface of the plate 51 carries a suitable layer of molybdenum disulfide, or the equivalent, indicated at 150, so as to lubricate the engaging or facing surfaces of the plates 51 and 111 and so as to prevent friction and galling therebetween.

In the constructional example of the railway tank car

10 embodying the body shell 11 of the dimensions, as previously explained, the overall longitudinal distance between the outer surfaces of the striking plate structures 30 is 64 ft. 2½ in., and the distance between the center pins at the body bolsters 50 is 54 ft. 3 in. The tops of the sections 12, 13 and 14 are disposed 147⅞ in. above the plane of the rails 62; the centers of the end sections 14 of the body shell 11 are disposed 97 in. above the plane of the rails 62; the bottoms of the end sections 14 of the body shell 11 are disposed 46⅛ in. above the plane of the rails 62; the bottoms of the center sections 12 of the body shell 11 are disposed 27⅞ in. above the plane of the rails 62; the tops of the stub draft sills 40 are disposed 41⅞ in. above the plane of the rails 62; the center lines of the draft gears carried by the stub draft sills 40 are disposed 34½ in. above the plane of the rails 62; the bottoms of the flanges 43 of the stub draft sills 40 are disposed 28⅞ in. above the plane of the rails 62; the bottoms of the centering plates 71 carried by the central portions of the stub draft sills 40 are disposed 25¾ in. above the plane of the rails 62. Also, in the railway tank car 10, the trucks 60 are of the 100-ton roller bearing type having a 2½ in. spring travel and provided with the wheels 61 of 36 in. diameter.

Considering now the general mode of operation of the railway tank car 10, it is pointed out that the longitudinal draft forces are transmitted from the couplers 91 to the associated draft gears and thence to the stub draft sills 40 via the front or rear draft lugs, depending upon the direction of the draft forces. The draft forces transmitted to the stub draft sills 40 are then transmitted to and from the body shell 11 for the draft purpose. More particularly, substantially all of the draft forces exerted between the stub draft sills 40 and the body shell 11 are applied through the upwardly and outwardly inclined bottoms of the transition sections 13 and through the adjacent extreme inner ends of the stub draft sills 40 via the reinforcing plates 44, since the four connections, respectively including the four bolts 130, as previously described, accommodate longitudinal movements of the draft sills 40 with respect to the associated pedestal structures 110. Accordingly substantially none of the draft forces are applied through the lower portions of the end sections 14 and through the intermediate portions of the stub draft sills 40, via the saddle plates 100 and the pedestal structures 110 and the body bolsters 50. Moreover, since the center lines of the stub draft sills 40 are located well above the lower plane 23 of the center sections 12 of the body shell 11, there are substantially no rotational movements or rotational draft torques applied between the stub draft sills 40 and the body shell 11. In fact, in the present example, the stub draft sills 40 are located wholly above the lower plane 23 of the center sections 12 of the body shell 11, thereby positively preventing the undesirable rotational movements or rotational torques mentioned between the stub draft sills 40 and the body shell 11. Of course, it will be understood that the rotational draft torques mentioned are objectionable as they would produce undesirable shearing stresses between the body bolsters 50 and the pedestal structures 110 and between the pedestal structures 110 and the saddle plates 100.

When the railway tank car 10 is arranged in a coupled train of railway cars, the longitudinal draft forces are applied from the preceding railway car to the stub draft sill 40 at one end of the railway tank car 10 and thence into the body shell 11; and from the body shell 11, the longitudinal draft forces are applied to the stub draft sill 40 at the other end of the railway tank car 10 and thence to the succeeding railway car. Accordingly, the longitudinal draft forces are transmitted through the body shell 11 of the railway tank car 10 between the railway cars disposed at either end thereof in the coupled string of railway cars, notwithstanding the circumstance that the railway tank car 10 comprises no longitudinally extending underframe or center sill whatsoever extending between the opposite ends thereof.

Considering further the operation of the railway tank car 10, it will be appreciated that the pedestal structures 110 have utility in supporting the opposite end sections 14 and the opposite end heads 15 of the body shell 11 and in preventing undesirable lateral movements, as well as tipping movements, of the opposite ends of the body shell 11. Incident to tipping of the body shell 11 about the longitudinal axis thereof, the tipping or tilting movements are transmitted from the body shell 11 through the saddle plates 100 and the pedestal structures 110 and the body bolsters 50 to the stub draft sills 40; and more particularly, these movements of the body bolsters 50 are limited by the engagements of the corresponding bearing plates 59 carried thereby with the usual truck side bearings, not shown, carried by the bolsters, not shown, of the associated trucks 60, thereby to limit the tipping or tilting mentioned of the body shell 11, in the usual manner.

The present constructions of the pedestal structures 110 respectively carried by the end sections 14 of the body shell 11 and of the body bolsters 50 respectively carried by the stub draft sills 40 are very advantageous in that they lend themselves to the building of a wide variety of body shells 11 of different lading capacities and corresponding physical dimensions. Specifically, each of the stub draft sills 40 and the corresponding body bolster 50 carried thereby constitute a standard construction, while each of the pedestals 110 constitutes a variable construction appropriate to support the corresponding end section 14 of the body shell 11. More specifically, the dimensions of the pedestal 110 are related to the dimensions of the end section 14 of the body shell 11, so as to accommodate different sizes of the body shell 11. In each case, the bottom plate 111 of the pedestal structure 110 is mounted upon the top plate 51 of the adjacent body bolster 50 and secured in place for longitudinal sliding movements thereupon by the connections, including the several bolts 130. As noted, this arrangement accommodates standardization of the stub draft sill 40 and the body bolster 50 carried thereby in a series of the railway tank cars 10 including body shells 11 of variable volumes, as required, by the particular service in which the railway tank cars 10 are employed.

Referring now to FIGS. 11, 12 and 13, a modified form of the railway tank car 10A is there illustrated that may be fundamentally of the construction and arrangement of the railway tank car 10, as previously described, except that the railway tank car 10A further comprises a suitable heat-insulating jacket 160 carried by the exterior surfaces of the body shell 11 so as to prevent the transmission of heat between the ambient and a lading contained in the body shell 11 that is either hot or cold with respect to the ambient; whereby this form of the railway tank car 10A is especially adapted for the transporting of hot or cold ladings. The heat-insulating jacket 161 may be constructed of any suitable material and may be preformed in a plurality of sections that generally conform to the sections 12, 13, 14 and 15 of the body shell 11 and subsequently assembled and secured in place upon the corresponding sections 12, etc., in any suitable manner. As illustrated in FIG. 11, the heat-insulating jacket 161 includes the sections 162, 163, 164 and 165 respectively carried by the corresponding sections 12, 13, 14 and 15 of the body shell 11; which sections 162, etc., are secured in place in any suitable manner, not shown. On the other hand, the heat-insulating jacket 161 may be formed generally of one-piece construction utilizing a foamed synthetic organic resinous material, such, for example, as foamed polyurethane.

The heat-insulating jacket 161 has a normal thickness in the general range 4 to 8 in., a thickness of about 6 in. being illustrated for the purpose of the present description. Accordingly, the lower portion of the section 164 of the heat-insulating jacket 161 is notched-out, as indicated at 164a in FIG. 13, in order to accommodate the adjacent stub draft sill 40, and the stub draft sill 40 com-

pletely penetrates the section 163, as best shown in FIG. 12. In order to prevent a serious interruption of the heat-insulating characteristic of the heat-insulating jacket 161, a suitable layer of heat-insulating material 170 is arranged within the hollow stub draft sill 40, as shown in FIGS. 12 and 13, and suitably secured in place in any suitable manner, not shown; which layer of heat-insulating material 170 may be identical with the material of the heat-insulating jacket 161, as previously described.

Considering now the general mode of operation of the railway tank car 10A, when it is filled with a lading that is either hot or cold with respect to the ambient, it is apparent that the body shell 11 will either expand or contract, as it is contacted by the respective ladings mentioned; whereby the body shell 11 moves longitudinally relative to the stub draft sills 40 that may be assumed to be at the ambient temperature. However, these longitudinal movements of the end sections 14 of the body shell 11 with respect to the adjacent stub draft sills 40 cause no substantial stresses between the adjacent pedestal structures 110 and the adjacent body bolster 50 by virtue of the fact that the pedestal structures 110 are connected to the body bolster 50 by the connections, including the bolts 130, that are especially designed to accommodate such relative longitudinal movements, as previously explained.

This construction and arrangement of the pedestal structures 110 and the cooperating body bolsters 50 is very advantageous by virtue of the fact that the relative longitudinal movements of the end sections 15 in the body shell 11 in a railway tank car of the present large volume may be as much as 1 in. when either a hot lading or a cold lading is loaded into the body shell 11. In other words, if it were not for the longitudinal sliding connections between the pedestal structures 110 and the body bolsters 50, exceedingly great stresses would be exerted therebetween by virtue of either an expansion or a contraction of the body shell 11 relative to the stub draft sills 40, resulting from the loading of either a hot lading or a cold lading into the body shell 11. Of course, the heat-insulating jacket 160 prevents the transmission of heat between the ambient and the hot or cold lading contained in the body shell 11.

In view of the foregoing, it is apparent that there has been provided a railway tank car of improved construction and arrangement that does not incorporate the usual longitudinally extending underframe or center sill extending from end to end thereof and that comprises instead a pair of longitudinally spaced-apart stub draft sills respectively disposed at the opposite ends thereof. Also, the railway tank car comprises an improved connection, arrangement and disposition of the stub draft sills with respect to the adjacent ends of the body shell, that is of fish-belly configuration, so that substantially all of the longitudinal draft forces are applied between the pair of stub draft sills and through the body shell, without causing any substantial rotational draft moments or forces between the stub draft sills and the body shell of the railway tank car. Moreover, the railway tank car comprises the pair of pedestal structures rigidly secured to the opposite end portions of the body shell and disposed in superimposed relation with respect to the pair of body bolsters rigidly secured to the intermediate portions of the stub draft sills, whereby the opposite end portions of the body shell are adequately supported through the pedestal structures upon the body bolsters. Further, the lower portions of the pedestal structures are respectively connected to the upper portions of the body bolsters so as to accommodate relative longitudinal movements between the pedestals and the respectively adjacent body bolsters, while preventing any substantial lateral movements therebetween. The last-mentioned arrangement is very advantageous as it not only prevents the transmission of any substantial longitudinal draft forces between the stub draft sills and the end portions of the body shell, but it also accommodates

expansion and contraction of the body shell relative to the stub draft sills that becomes particularly important when the body shell is utilized to transport a lading that is either hot or cold with respect to the ambient. Finally, the construction and arrangement of the body shell readily accommodates the carrying upon the exterior surface thereof of a suitable heat-insulating jacket, when the railway tank car is to be employed in service involving the transportation of ladings that are either hot or cold relative to the ambient.

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

What is claimed is:

1. A railway tank car comprising a longitudinally extending tubular body shell and defining independently of other structural elements a complete fluid-tight enclosure, said body shell being of self-supporting rigid construction including a substantially cylindrical central section of relatively large diameter and a pair of generally frusto-conical intermediate transition sections and a pair of substantially cylindrical end sections of relatively small diameter and a pair of end heads, the inner ends of said intermediate transition sections being respectively joined to the opposite outer ends of said central section and the outer ends of said intermediate transition sections being respectively joined to the opposite inner end of said end sections and said end heads being respectively joined to the outer ends of said end sections, the top of said central section and the tops of said intermediate transition sections and the tops of said end sections being disposed in a substantially horizontal upper plane, the bottom of said central section being disposed in a substantially horizontal lower plane and the bottoms of said end sections being disposed in a substantially horizontal intermediate plane and the bottoms of said intermediate transition sections being respectively disposed in two other planes generally upwardly and oppositely outwardly inclined from said lower plane, whereby said body shell is of fish-belly configuration, a pair of longitudinally aligned stub draft sills respectively arranged adjacent to the opposite ends of said body shell and respectively provided with hollow outer ends adapted respectively to receive a pair of draft gears, the intermediate portions of said stub draft sills being respectively arranged below said end sections and the inner ends of said stub draft sills extending toward said intermediate transition sections, a pair of reinforcing plates respectively rigidly connected to the upwardly and outwardly inclined bottoms of said intermediate transition sections, the inner ends of said stub draft sills being respectively rigidly connected to the respectively adjacent ones of said reinforcing plates, said body shell constituting the only connection between said stub draft sills for the transmission of the total draft force therebetween, a pair of laterally extending body bolsters respectively rigidly connected to the intermediate portions of said stub draft sills, a pair of pedestal structures respectively arranged below the lower portions of said end sections and respectively rigidly connected thereto and respectively disposed in superimposed relation with respect to said body bolsters, each of said body bolsters including a top plate, each of said pedestal structures including a bottom plate, the bottom plate of each of said pedestal structures being supported upon the top plate of the adjacent one of said body bolsters for ready longitudinal sliding movement with respect thereto, means resiliently urging together the top plates of said body bolsters and the associated bottom plates of said pedestal structures, and a pair of connectors respectively connecting together the top plates of said body bolsters and the associated bottom plates of said pedestal structures, said connectors

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respectively including means accommodating limited relative longitudinal sliding movements between said top plates and the associated ones of said bottom plates thereby to accommodate substantial longitudinal expansion and contraction of said end sections with respect to each other and to the respective ones of said draft sills while being resiliently urged together by said resilient means without the creation of any substantial shear stresses in said pedestal structures and preventing any substantial lateral movements between said top plates and the adjacent ones of said bottom plates, whereby substantially all of the draft force exerted between said stub draft sills and said body shell is applied through the inner ends of said stub draft sills and through said reinforcing plates, thereby substantially to eliminate rotational draft torques exerted between said stub draft sills and said body shell and applied through said pedestal structures.

2. The railway tank car set forth in claim 1, wherein lubricant is arranged between the top plate of each of said body bolsters and the bottom plate of each of said pedestal structures so as to minimize friction therebe-

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tween incident to longitudinal sliding movements therebetween.

3. The railway car set forth in claim 1, wherein each of said connectors essentially comprises a fastener extending through aligned holes respectively formed in the top plate of the adjacent one of said body bolsters and in the bottom plate of the adjacent one of said pedestal structures, and wherein at least one of said holes is elongated in the longitudinal direction so as to accommodate said limited longitudinal sliding movements between the top plate of the adjacent one body bolster and the bottom plate of the adjacent one pedestal structure.

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