

Sept. 6, 1932.

E. G. HALLQUIST

1,875,594

RAILWAY TANK CAR UNDERFRAME

Filed Oct. 22, 1930

5 Sheets-Sheet 1

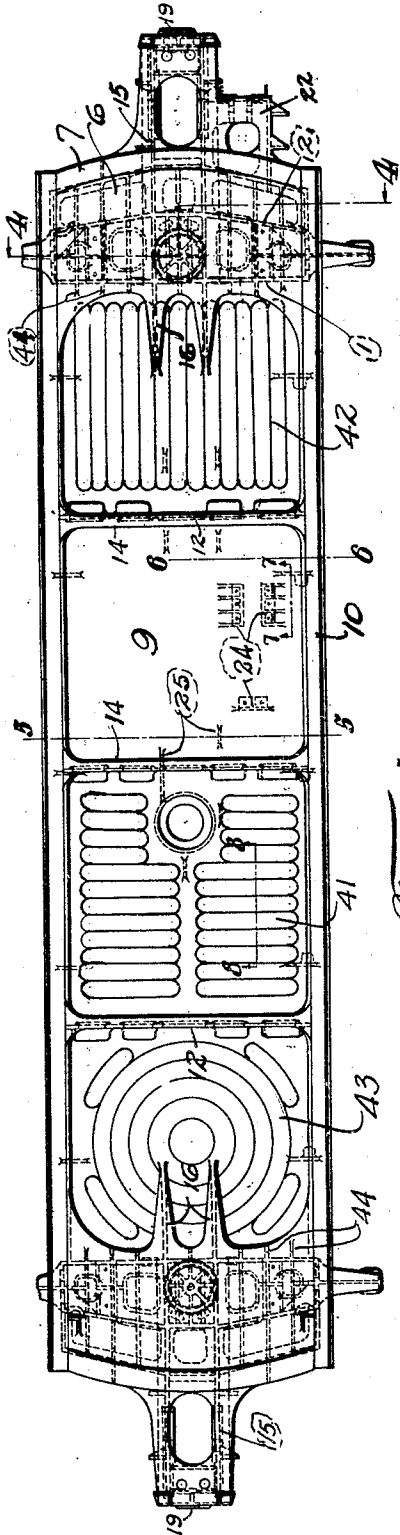


Fig. 1.

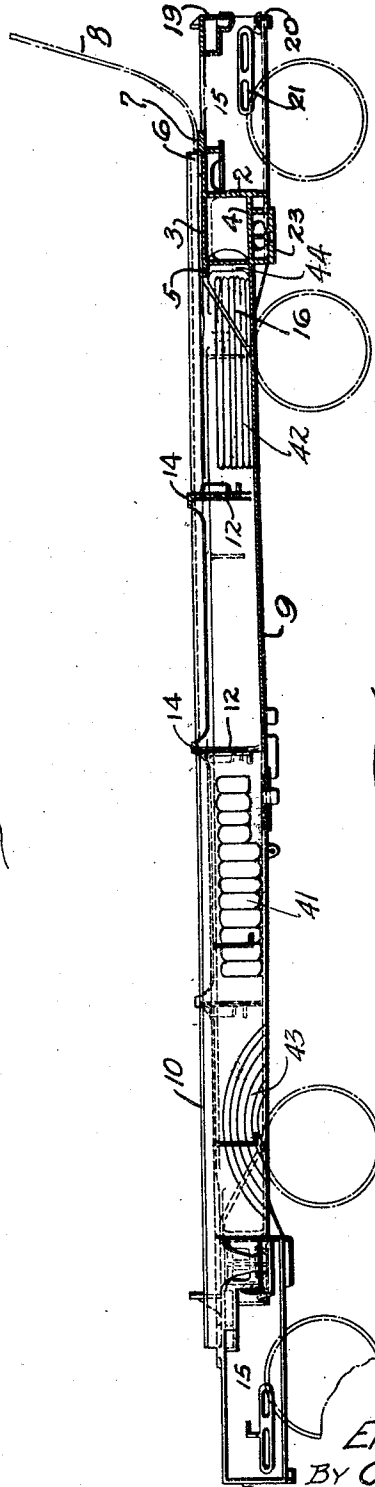


Fig. 2.

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5 Sheets-Sheet 2

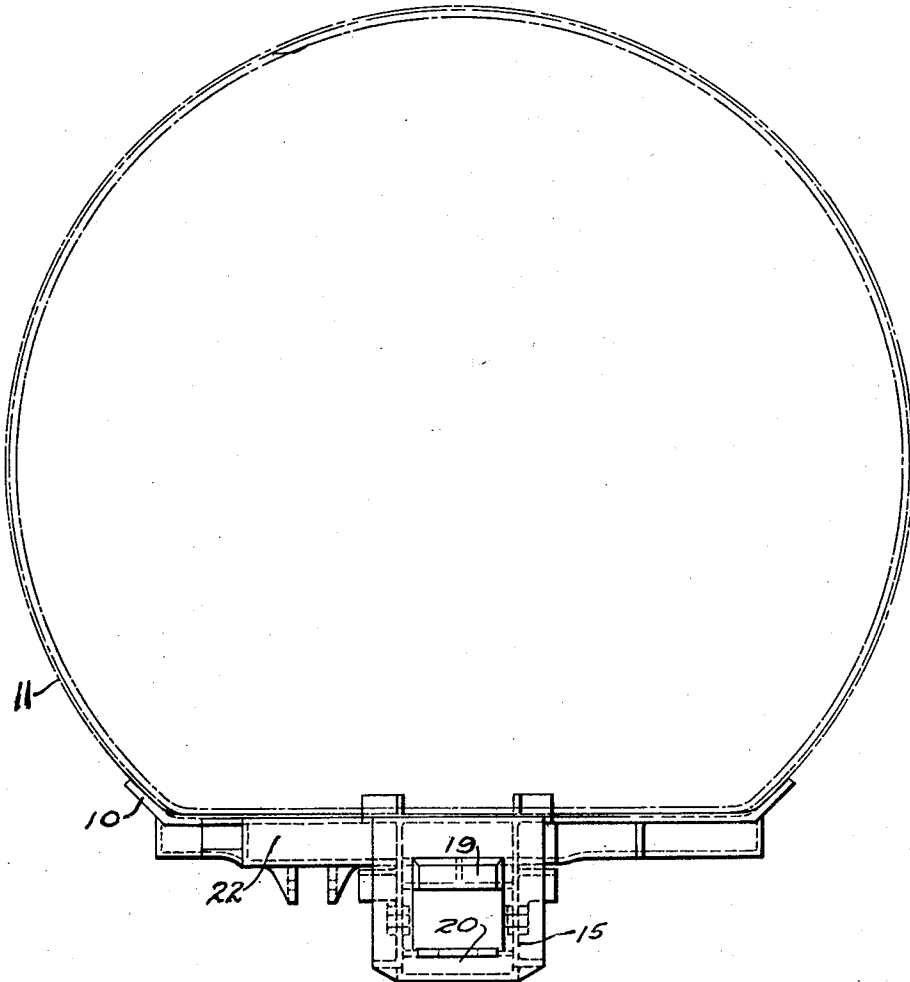


Fig. 3.

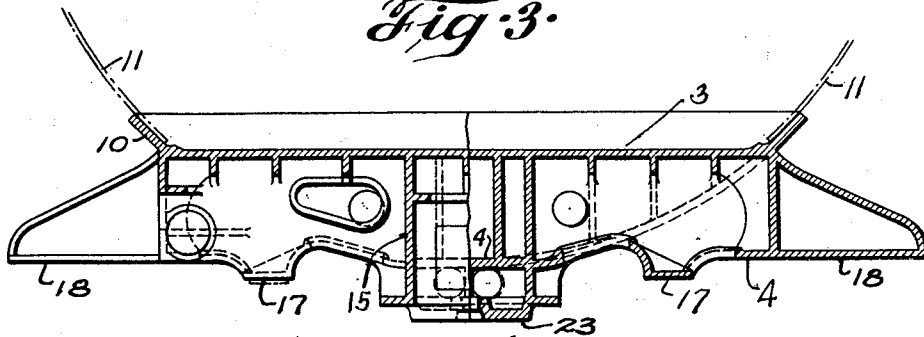


Fig. 4.

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5 Sheets-Sheet 3

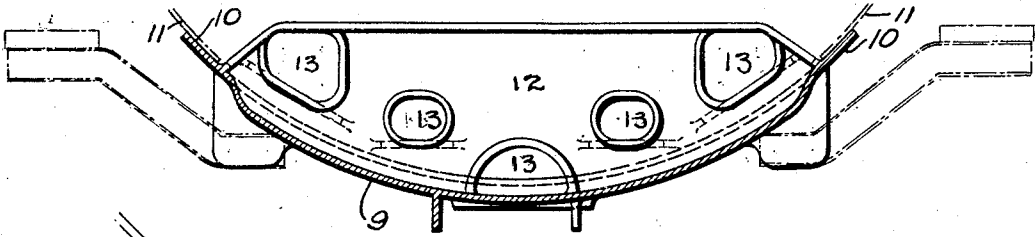


Fig. 5.

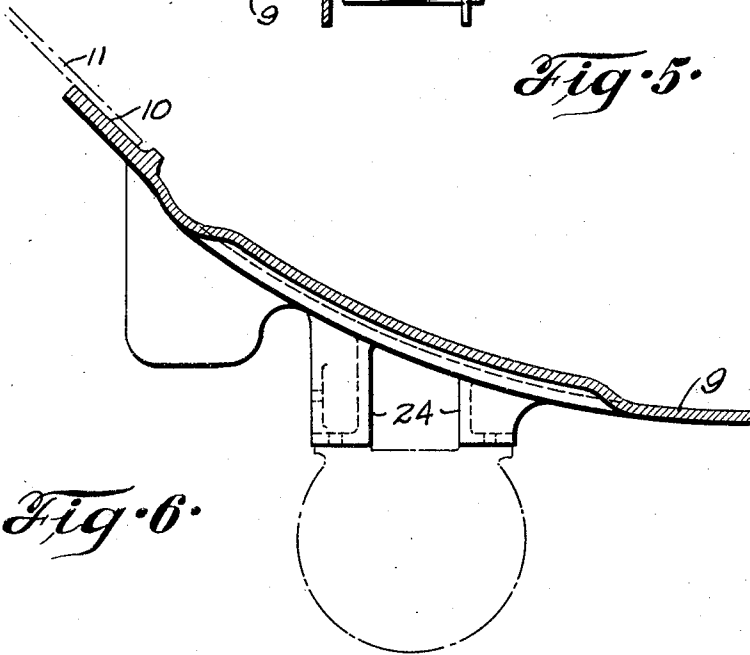


Fig. 6.



Fig. 8.

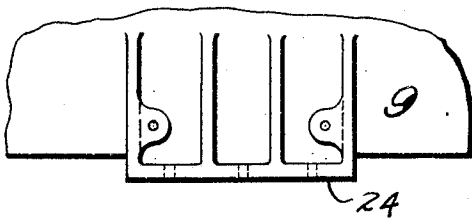


Fig. 7.

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5 Sheets-Sheet 4

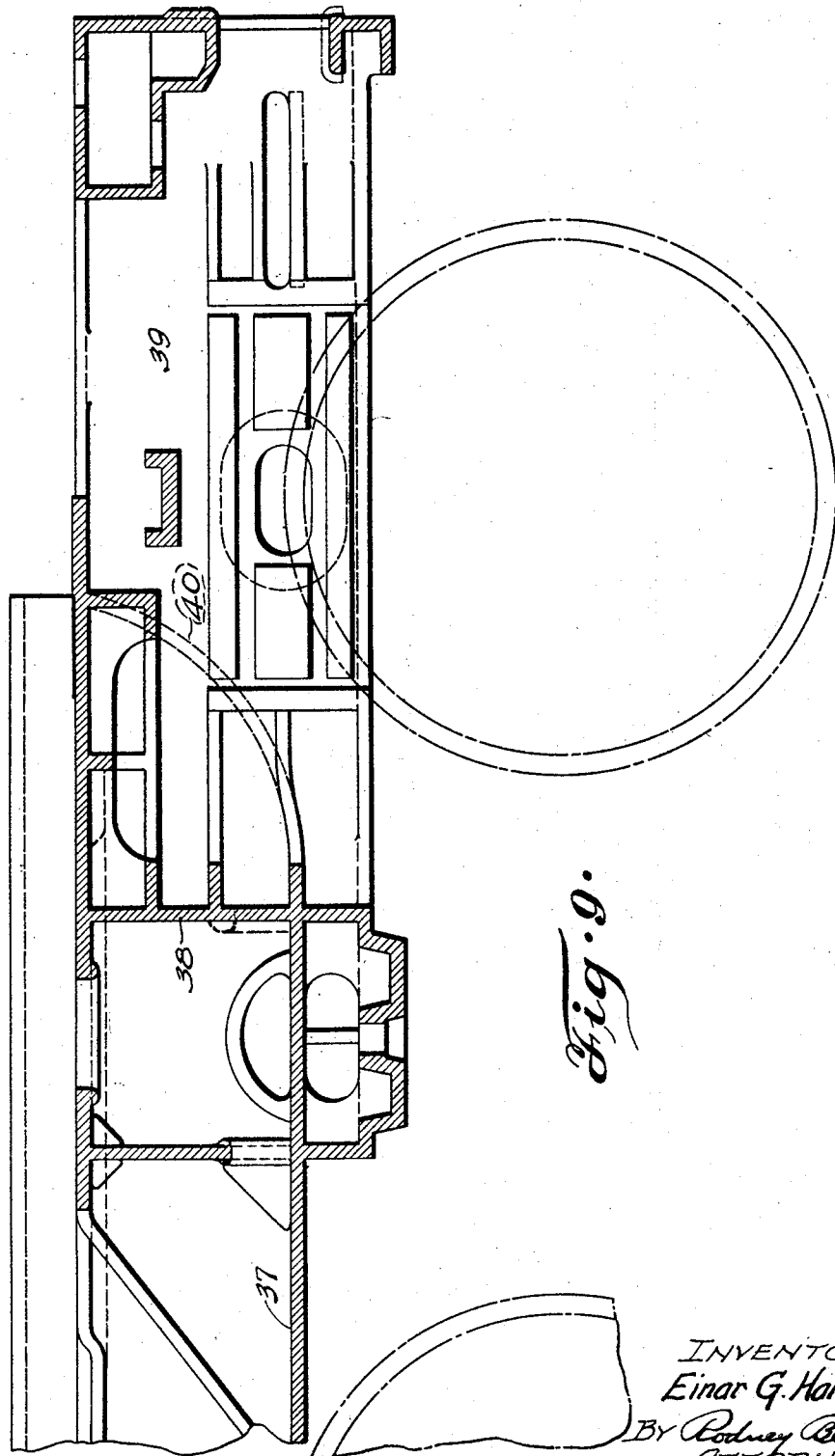


Fig. 9.

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5 Sheets-Sheet 5

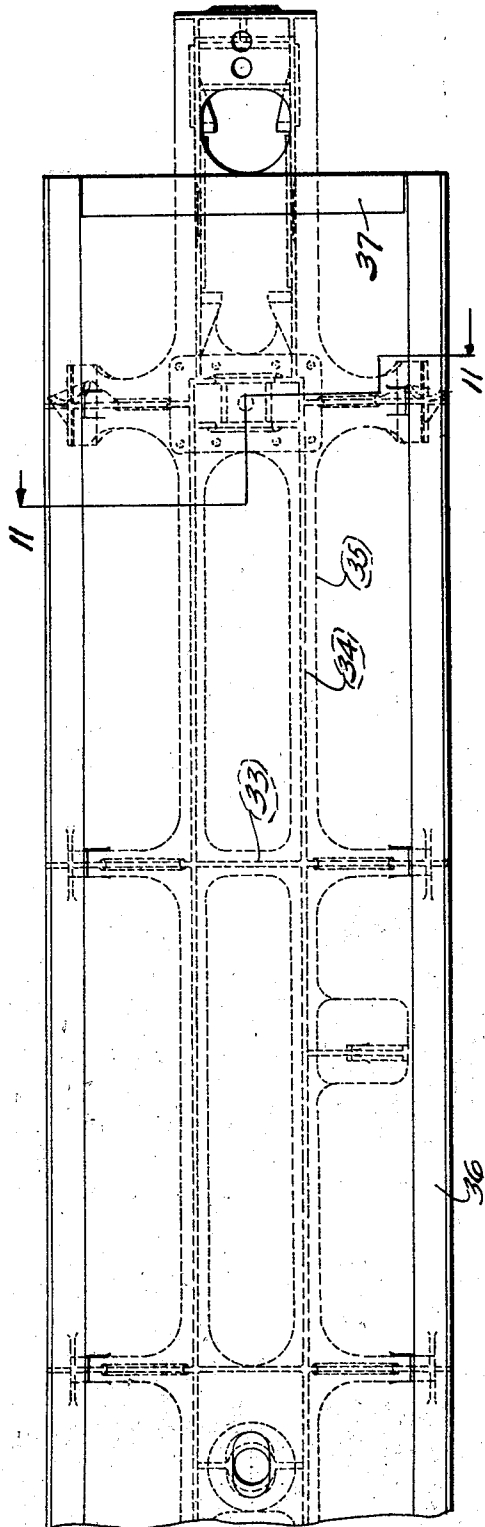


Fig. 10.

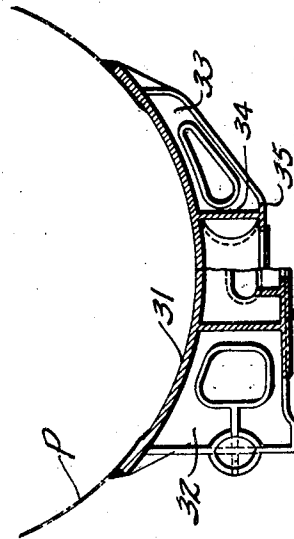


Fig. 11.

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UNITED STATES PATENT OFFICE

EINAR G. HALLQUIST, OF EDWARDSVILLE, ILLINOIS, ASSIGNOR TO GENERAL STEEL CASTINGS CORPORATION, OF GRANITE CITY, ILLINOIS, A CORPORATION OF DELAWARE

RAILWAY TANK CAR UNDERFRAME

Application filed October 22, 1930. Serial No. 490,526.

My invention relates to railway rolling stock and consists in a novel underframe structure particularly adapted for use in tank cars although adapted also for use in locomotive tenders.

The main object of my invention is to provide a rigid, strong, economical, underframe which will form itself a portion of the vehicle tank, thereby eliminating the necessity of constructing a complete tank and mounting it upon a complete and separately constructed underframe. Another object of my invention is to form the underframe of very simple structure which is particularly advantageous in casting the frame. Preferably my invention is embodied in a one piece casting structure in which a wide web plate of deep arcuate form extends between the bolsters and forms the sole load carrying and force transmitting member of the underframe. In this respect my present invention differs from prior structures which have utilized the underframe as a part of the tank and have included side sills or center sills, or both, in addition to a horizontal web which formed the tank bottom.

A further object of my invention is to combine an arcuate underframe web with superstructure plates to form a cylindrical member extending substantially the full length of the car thereby forming a unit in which the superstructure contributes to withstanding the horizontal buffing and pulling forces, the vertical loads, and all other forces which are applied to the car body or tank.

In the accompanying drawings which illustrate my invention:

Figure 1 is a top view of the underframe.

Figure 2 is in part a side elevation, and in part a vertical section on the longitudinal frame.

Figure 3 is an end view of the underframe.

Figures 4, 5 and 6 are vertical transverse sections on the corresponding section lines of Figure 1.

Figures 7 and 8 are detailed longitudinal vertical sections taken on the corresponding section lines of Figure 1.

Figure 9 is a longitudinal vertical section through the end of a modified underframe.

Figure 10 is a top view of a portion of another modified underframe.

Figure 11 is a vertical transverse section taken on the line 11—11 of Figure 10.

The main feature of my underframe is a web or plate extending substantially from end to end of the vehicle tank and forming the bottom quadrant thereof. Integral with this web are elements cooperating with portions of the web to form box shaped bolsters, each comprising an inner vertical wall 1, an outer vertical wall 2, a top wall 3 and a bottom wall 4.

Intermediate the bolsters, the web is arcuate in section, as indicated at 9, and the sides terminate in outwardly inclined flanges 10 to which the tank superstructure side sheets 11 may be secured. The end portions 6 of the web are substantially flat with outwardly curved edges and include pads 7 which may be machined to provide a smooth mounting surface for the superstructure end plate 8. Elements 10 and 7 are approximately on a level with the top wall of the bolster and with each other and form a substantially continuous element around the web periphery. The intermediate portion of the web curves downwardly near the longitudinal center line of the underframe to a level adjacent that of the bottom walls of the bolster. The radius of web portion 9 corresponds substantially to that of the tank superstructure so that the complete car forms a cylinder extending substantially from end to end, the superstructure plates being welded or riveted to the flanges provided on the underframe and serving to reinforce the underframe. This arrangement, together with the superstructure, eliminates the necessity of the usual longitudinal sills between the bolsters as the width and depth of the arcuate portion of the web provides a section of sufficient strength.

The arcuate portion of the web is reinforced at intervals with transverse ribs 12 which preferably extend above the level of the side edges of the web and are provided with suitable openings 13 through which liquid and steam pipes may pass. These transverse members also form diaphragm elements

for preventing undue surging and splashing of the contents of the tank.

Extending outwardly from each bolster is a pair of draft sills 15 arranged to accommodate the usual draft rigging and the outer wall 2 of the bolster forms a stop for the draft gear. The draft sills 15 extend through the box shaped bolster and project inwardly beyond wall 1 from which they are tapered downwardly, as indicated at 16, and merge with the arcuate portion 9 of the web.

The bolster structure includes brackets 17, for mounting side bearing elements, jacking plate brackets 18, and center plates 23. The inner wall 1 of the bolster is suitably reinforced by a flange 5 and vertical ribs 44.

Each pair of draft sills 15 includes an integral striking plate 19, coupler carrier 20 and draft gear yoke pin slots 21, and a bracket 22 is formed integrally with one of the draft sills and the adjacent portion of the corresponding bolster to mount a hand brake gear and a step and provides a platform for the brakeman operating the same.

Integral brackets 24 are formed on the lower surface of web 9 for mounting the air brake cylinder and reservoir and various lugs 25 may be provided at intervals for mounting the brake rigging, etc.

Where the underframe with a web of large area as shown consists of a cast structure with a web of large area it is necessary to provide against excessive shrinkage strains which might be set up when the metal is poured. For this purpose I corrugate the web 9 as indicated in Figure 8. While the arcuate member may be considered as a large corrugation in itself and may therefore take care of some stresses set up in the cooling of the metal, I have found it advisable to provide additional corrugations to meet the conditions existing in casting the underframe. These corrugations also strengthen the web and better adapt it for acting as a load carrying and force transmitting member. These corrugations may be varied in depth and length and may run transversely of the car as indicated at 41, lengthwise as shown at 42, concentric as shown at 43, or may assume other forms.

In this preferred structure, the web forms the sole longitudinal member of the underframe between the bolsters but it is within the spirit of my invention to add longitudinal vertical elements resembling sills for reinforcing the arcuate web. Such a modification is shown in Figures 10 and 11 in which the main member of the underframe is the arcuate web 31 extending substantially the full length of the tank and forming the top walls of the bolsters, the remaining portions of the bolsters including the vertical web 32 depending from the web 31. Similarly, intermediate braces or transoms 33 depend from the web plate 31. This structure also

includes longitudinal elements 34 depending from the web plate and provided with flanges 35 and extending beyond the bolsters to form draft sills which project beyond the ends of web plate 31. A pad 36 extends throughout the length of the web plate and the ends of the latter are provided with similar pads 37. Superstructure plates P are welded directly to these pads and combine with the arcuate web plate to form a cylindrical tank.

In Figure 9, I illustrate another modification of my invention in which the lower central portion 37 of the web plate extends to the outer wall 38 of the bolster and the space between the draft sills 39 in front of wall 38 mounts the draft rigging. The side portions of the web plate 37 at the sides of draft sills continue a short distance beyond the bolster and then curve upwardly, as well as outwardly, as indicated at 40, and thereby provide additional capacity beyond the bolster.

Various other modifications in the details of the car structure may be made without departing from the spirit of my invention and I contemplate the exclusive use of structures, similar to those described in detail herein, which come within the scope of my claims.

I claim:

1. In a railway vehicle underframe, bolsters, and a web extending between said bolsters and forming a substantially continuous arc from side to side and forming the lower portion of a tank and also forming the main longitudinal element of the underframe between said bolsters.

2. In a railway vehicle underframe integral structure, bolsters of box section, and an arcuate web extending between said bolsters with its sides substantially at the level of the tops of said bolsters and with its downwardly curved intermediate portion extending substantially to the level of the bottoms of said bolsters, said web forming the main member of the underframe between the bolsters for carrying loads and transmitting longitudinal forces.

3. In a railway vehicle underframe, bolsters, and an arcuate web extending between said bolsters and forming the lower portion of a tank and also forming the main longitudinal element of the underframe between said bolsters, there being integral members extending across said web at intervals to brace it transversely of its length.

4. In a railway vehicle underframe, bolsters, and an arcuate web extending between said bolsters and forming the lower portion of a tank and also forming the main longitudinal element of the underframe between said bolsters, there being integral vertical members extending across said web at intervals to brace it transversely of its length and to

form the lower portions of anti-splash elements of the tank structure.

5 5. In a railway vehicle underframe, bolsters, and an arcuate web extending between said bolsters and forming the lower portion of a tank and also forming the main longitudinal element of the underframe between said bolsters, there being integral vertical members extending across said web at intervals and projecting above the level of the top edges of said arcuate web and serving to brace said web transversely of its length.

10 6. In a tank car underframe, spaced bolsters, an arcuate web extending between said bolsters and cooperating with the top plates of said bolsters to form the car tank bottom and the sole underframe element intermediate said bolsters for carrying the car load, and sills extending outwardly from the intermediate portions of said bolsters for mounting draft rigging, the center portion of said web curving downwardly to a level adjacent to the level of the bottom of said sills.

25 7. In a tank car underframe, spaced box shape bolsters, and an arcuate web extending between said bolsters, sills on the outer sides of said bolsters arranged to mount draft rigging and extending through the bolsters and merging with said web on the inner side of the bolsters.

30 8. In a tank car underframe, spaced bolsters, a web extending between said bolsters and constituting a substantially continuous arc from side to side and forming the main load carrying and force transmitting member between said bolsters, and draft sills extending outwardly from said bolsters with their inner ends merging with said web.

40 9. In a tank car underframe spaced bolsters of box shape cross section, an arcuate web extending between the inner walls of said bolster and forming the main longitudinal member of the underframe and the bottom of the car tank between the bolsters, and a flange extending outwardly from the top of each bolster and forming the bottom of the end portions of the car tank, there being openings connecting the tank proper and the interior of said bolsters whereby the latter provides additional capacity for the vehicle.

50 10. In a railway vehicle underframe, spaced bolsters, each having a top plate and a vertical plate, a web plate extending between said bolsters and forming a concave recess below the top of said bolsters, a substantially horizontal flat plate extending outwardly from the top of each bolster toward the ends of the underframe, all of said plates being substantially imperforate and forming the bottom of a tank.

65 11. In a railway vehicle underframe integral structure, spaced bolsters, each having a top plate and a vertical plate, a web plate extending between said bolsters and forming a

concave recess below the top of said bolsters, all of said plates being substantially imperforate and forming the bottom of a tank, a reinforcing flange extending inwardly from the upper portions of each of said bolsters, and substantially vertical reinforcing ribs on said vertical plate and extending between said flange and said web plate.

70 12. In a railway vehicle underframe, spaced bolsters with substantially flat horizontal top walls, and an imperforate web plate extending between said bolsters and, with said top walls, forming the bottom of a tank, the side edge portions of said plate being located at substantially the same level as said top walls and the intermediate portion of said plate between said bolsters forming a recess extending below the top of said bolsters.

75 13. In a railway vehicle underframe, a pair of bolsters and an imperforate web plate adapted to form the bottom of a tank, the side edge portions of said plate being located at substantially the same level as the top of said bolsters and the intermediate portion of said plate between said bolsters forming a recess extending below the top of said bolsters, and substantially straight upwardly and outwardly extending flanges along each side of said plate and extending the full length thereof, said flanges being adapted to mount tank superstructure sheets.

85 14. In a railway vehicle underframe, a pair of bolsters and an imperforate web adapted to form the bottom of a tank, each bolster top wall forming at least a portion of each of the web end portions, the intermediate portion of said web between said bolsters forming a recess extending below the top of said bolsters, substantially straight outwardly extending flanges on the sides of said web for mounting tank side sheets, and arcuate elements on the ends of said web for mounting superstructure end sheets.

90 15. In a railway vehicle underframe, a pair of bolsters and an imperforate web plate adapted to form the bottom of a tank, the end portions of said plate being located at the same level as the top of said bolsters, and the intermediate portion of said plate between said bolsters being inclined upwardly and outwardly on each side of the longitudinal center of said underframe from a point spaced below the top of said bolsters.

100 16. In a railway vehicle, a tank structure including an underframe and superstructure plates, said underframe including a pair of bolsters and an arcuate web plate extending between said bolsters, said web plate together with said superstructure plates forming a cylindrical structure of substantially uniform diameter adapted to transmit the longitudinal buffing and pulling forces applied to the vehicle.

115 17. In a railway vehicle, an underframe in-

- cluding a web member having a substantially continuous arcuate form from side to side and extending substantially from end to end of the underframe, and superstructure sheets secured to the edges of said web member and forming therewith a cylindrical tank adapted to transmit all of the buffing and pulling forces applied to the vehicle.
18. In a railway underframe, a pair of bolsters having top members, longitudinal sills extending from the ends of the underframe to said bolsters, said sills having top members, an imperforate plate adapted to form a tank bottom and comprising a depressed portion extending between said bolsters and portions merging with the top members of said bolsters and draft sills to transmit longitudinal forces between said bolsters.
19. In a railway vehicle underframe, a pair of box shaped bolsters having top members, draft sills extending from said bolsters to the ends of said underframe, said draft sills having top members, an imperforate plate adapted to form the bottom of a tank and comprising a portion extending between said bolsters and portions merging with said top members of said bolsters and draft sills, the outer wall of said box shaped bolsters forming a draft gear stop.
20. In a railway vehicle underframe, a pair of bolsters and a main imperforate portion adapted to form the bottom of a tank, and comprising a continuous plate including the tops of said bolsters and extending outwardly to the ends of the tank bottom and including a concave portion between said bolsters and portions of a vertical wall of each bolster between the tops of the bolster and said concave portion.
21. A vehicle underframe comprising spaced bolsters and a single web plate having a continuous arcuate form from side to side and constituting the sole member extending between said bolsters.
22. In a railway vehicle, a cylindrical tank structure comprising an underframe and superstructure, a portion of said underframe having a web plate of substantially the same arcuate contour from side to side as said superstructure which, together with said superstructure, is adapted to transmit all of the buffing and pulling forces applied to said tank structure.
23. A railway vehicle underframe including a web plate extending longitudinally of the underframe and having a continuously arcuate cross section from side to side and adapted to transmit all of the longitudinal forces applied to the underframe.
24. A railway vehicle underframe including a longitudinally extending corrugated web plate and having an arcuate cross section.
25. In a railway vehicle underframe, bolsters, and a web of arcuate cross section extending for a substantial portion of the distance between said bolsters with corrugations therein extending transversely of the direction of curvature of the web.
26. In a railway vehicle underframe, bolsters, and a web of arcuate cross section extending for a substantial portion of the distance between said bolsters with corrugations therein extending parallel with the direction of curvature of the web.
27. In a railway vehicle underframe, bolsters, and a web of arcuate cross section extending for a substantial portion of the distance between said bolsters with a series of concentric corrugations formed therein.
- In testimony whereof I hereunto affix my signature this 7th day of October, 1930.
- EINAR G. HALLQUIST.