

No. 864,377.

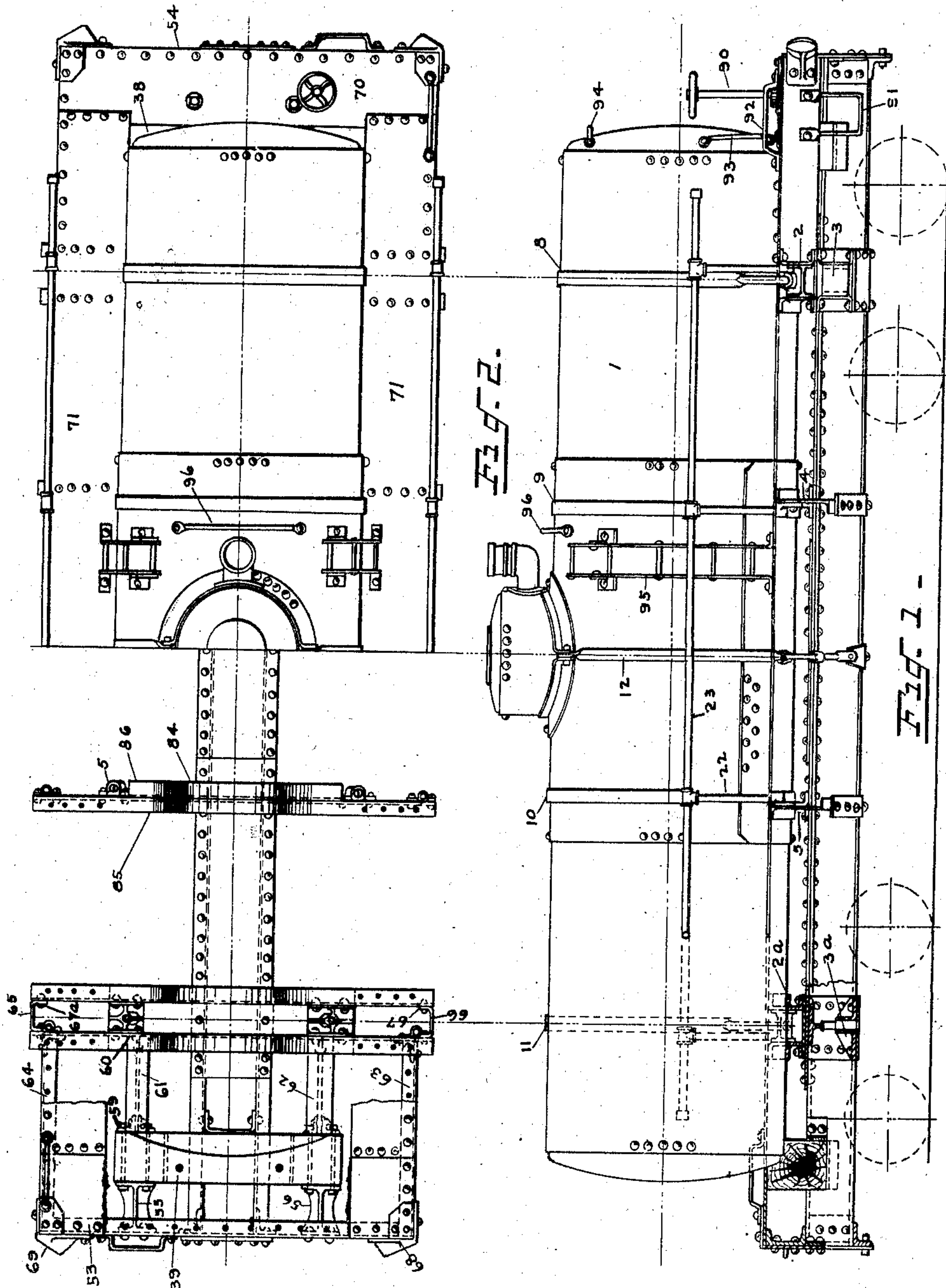
PATENTED AUG. 27, 1907.

F. L. IRWIN.

TANK CAR.

APPLICATION FILED FEB. 4, 1907.

4 SHEETS—SHEET 1.



WITNESSES:

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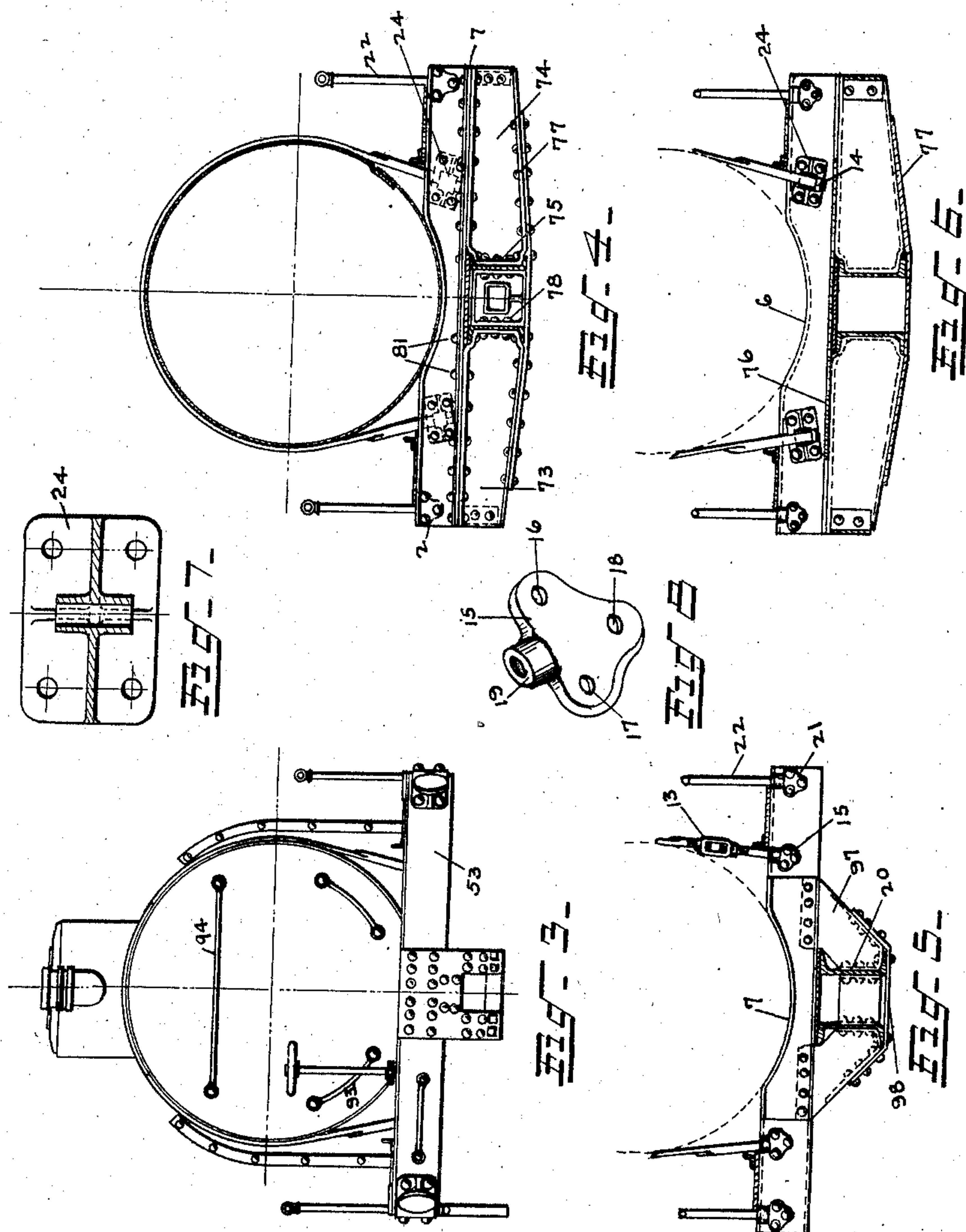
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4 SHEETS—SHEET 3.

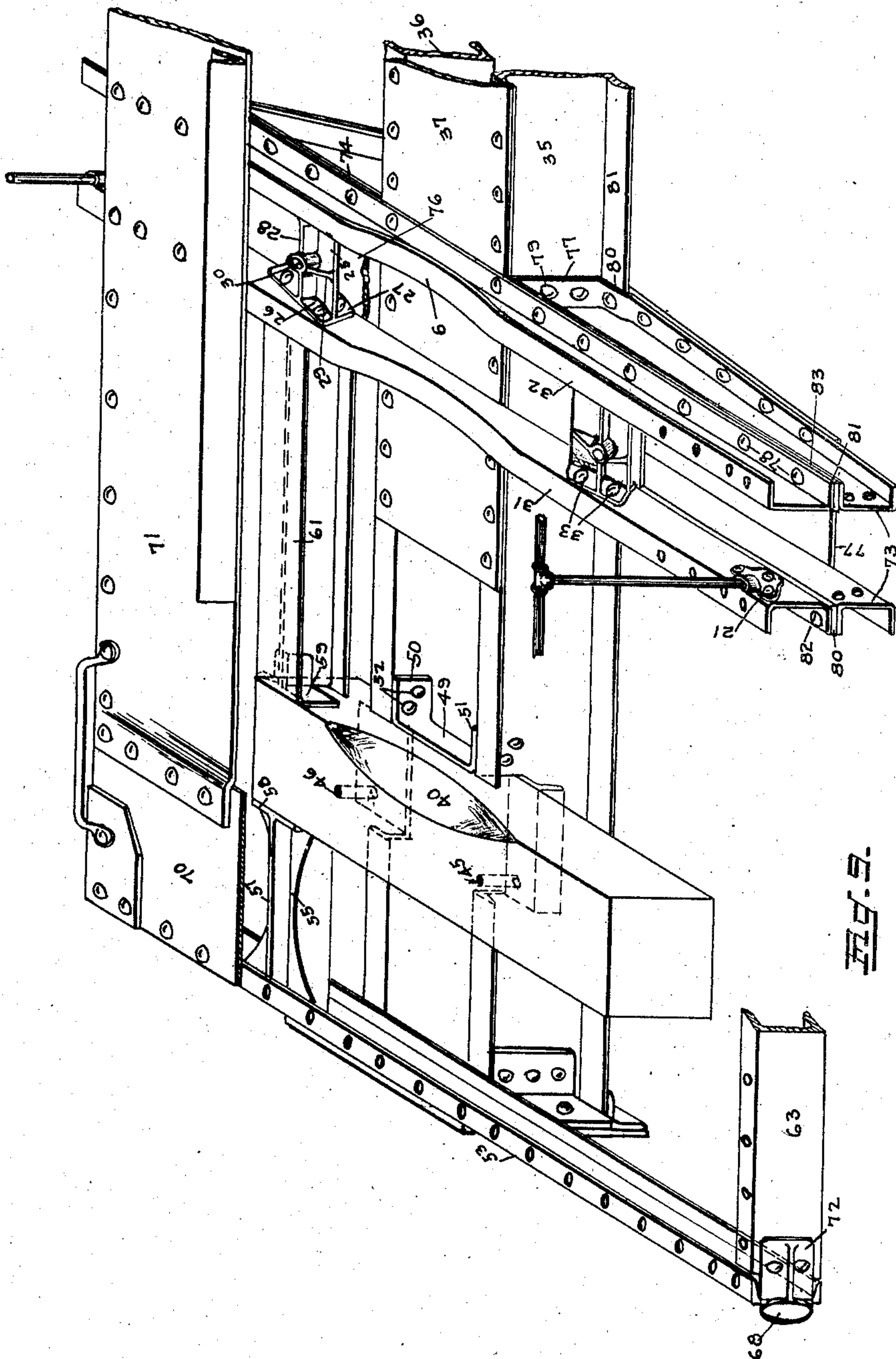


Fig. 3.

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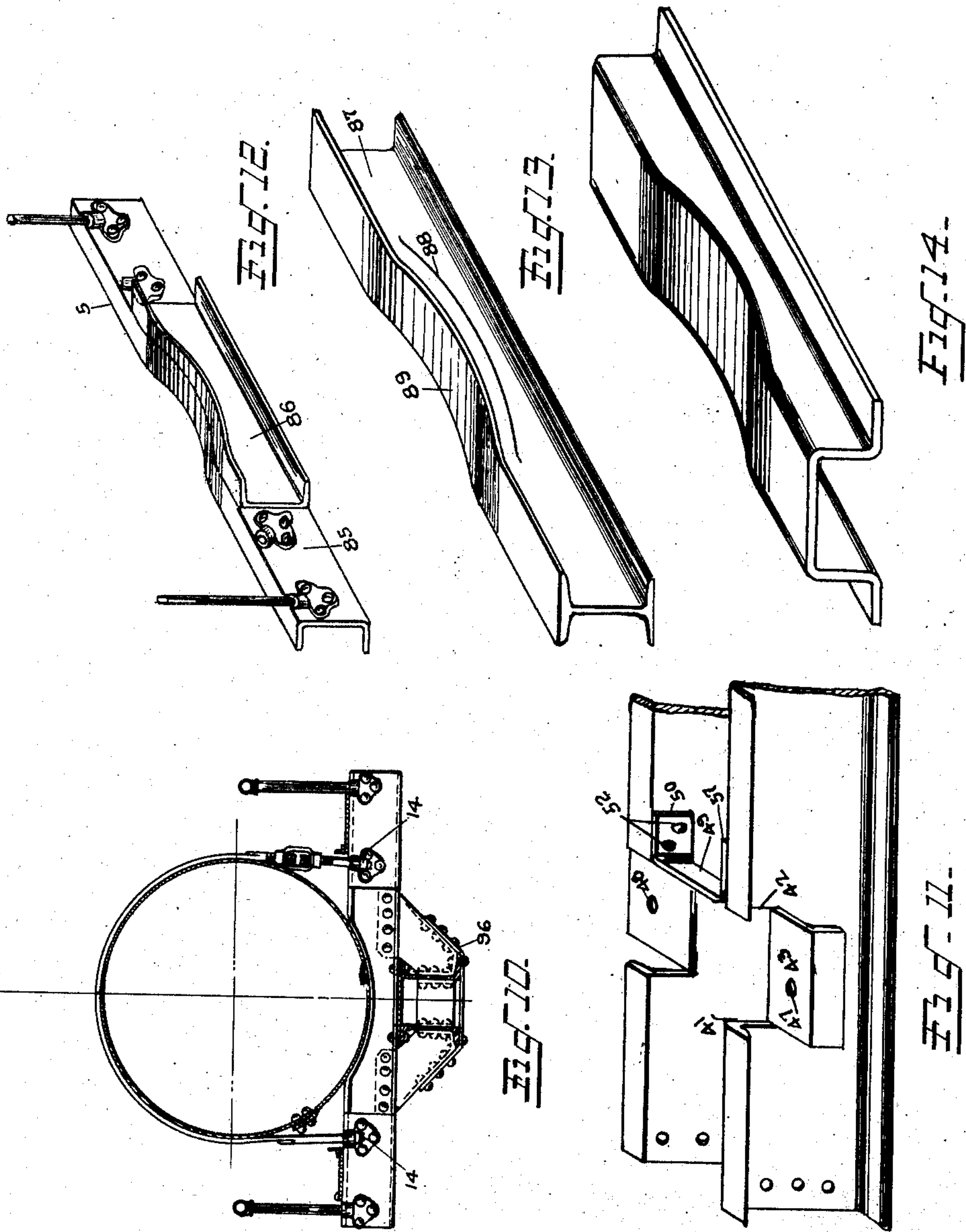
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TANK CAR.

APPLICATION FILED FEB. 4, 1907.

4 SHEETS—SHEET 4.



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# UNITED STATES PATENT OFFICE.

FRANK L. IRWIN, OF COLUMBUS, OHIO, ASSIGNOR TO THE RALSTON STEEL CAR COMPANY,  
OF COLUMBUS, OHIO, A CORPORATION.

## TANK-CAR.

No. 864,377.

Specification of Letters Patent.

Patented Aug. 27, 1907.

Application filed February 4, 1907. Serial No. 355,733.

*To all whom it may concern:*

Be it known that FRANK L. IRWIN, a citizen of the United States, residing at Columbus, in the county of Franklin, State of Ohio, has invented certain new and  
5 useful improvements in Tank-Cars, of which the following is a specification.

My invention relates especially to tank cars and comprises improvements in the underframe construction adjacent the ends thereof, means for the seating and  
10 bracing of the tank block, means for securing the ends of the straps and improvements in cross-bearers and tank-supports at the bolsters.

It further comprises the parts and combinations of parts hereinafter fully described and set forth in the  
15 claims.

In the drawings which are hereto attached and made a part of this application, Figure 1 is a side view of a tank car embodying my improvements, with one end thereof in vertical section; Fig. 2 is a plan view showing at one end thereof the construction with the tank  
20 in place; Fig. 3 is an end view of the tank car with the trucks omitted; Fig. 4 is a vertical transverse section through the car on a plane passing through the tank at one side of the bolster, showing a strap in place; Fig. 5  
25 is a vertical transverse section through the tank at a cross bearer, showing the moorings for the strap, and the diaphragm tie plate, the tank being shown in the broken dotted line; Fig. 6 is a vertical transverse section through the bolster with the tank indicated by the  
30 broken dotted line, showing the moorings for the tank strap; Fig. 7 is a longitudinal section through the member for securing the tank strap to the tank supports, said section passing centrally through the opening in said casting; Fig. 8 is a view of the member for securing  
35 the tank strap to the cross-bearers and also for securing the hand rail supports in place; Fig. 9 is a perspective with parts broken away of the underframe construction at the end of the car, including the bolster; Fig. 10 is a vertical transverse section through the tank at one of the  
40 cross-bearers showing the manner of securing the ends of a tank strap thereto; Fig. 11 is a view of the center sill near one end thereof showing the flange and part of the web cut away and bent outwardly to form a shelf for the tank block, and an abutment therefor both in the  
45 front and rear thereof and a spreader in connection therewith; Fig. 12 is a perspective of the cross-bearer made up of pressed shapes; Fig. 13 is a modified form of cross-bearer cut away at center and pressed into shape; Fig. 14 is a modified form of the bolster tank supports.

Referring to the drawings in which the same numerals indicate identical parts throughout, 1 is a tank arranged longitudinally upon the underframe construction of the car, and in the embodiment here shown rests upon the tank supports 2 and 2<sup>a</sup> mounted upon and rigidly secured  
55 respectively to the bolsters 3 and 3<sup>a</sup>; the tank

also rests upon the cross-bearers 4 and 5; additional cross-bearers may be used if desired. The cross-bearers and supports are made concave for a short distance on their upper faces as shown at 6 and 7 so that the tank may fit into the depressions snugly, and thereby prevent the tendency of the tank to roll. Further to maintain the tank in its position against rolling, I provide the straps shown at 8, 9, 10, 11 and 12 which pass over the top of the tank and downwardly on each side thereof and are secured preferably upon the supports and the  
65 cross-bearers as clearly shown in Figs. 5 and 6; to tighten the strap I provide a turn buckle 13 arranged near the lower end thereof. Each end of the strap is provided with a head 14 formed thereon to prevent the strap from being withdrawn from the mooring member  
70 15 shown in Fig. 8. The member 15 is preferably formed with triangular body and provided with rivet holes 16, 17, and 18, the upper end thereof being formed into a short tube 19 through which the end of the strap is inserted and the head formed thereon, thereby preventing the same from being drawn outwardly. As is  
75 apparent in Fig. 5 the member 15 is secured against the cross-bearer at an angle thereto instead of being perpendicular; therefore when, through its tendency to roll, the tank exerts a stress upon the strap the pull  
80 upon the cross-bearer will not be directly vertical, but on account of the angular position of the mooring member the stress will be directed towards the center of the cross-bearer where the bracing construction shown at  
85 20 is located, thereby throwing the stress where it can best be borne. The member 15 is easily made and very easily replaced, and its use for the purpose indicated is highly satisfactory. I employ the same type of member indicated at 21 for securing the lower end of the support 22 for the hand rail 23, which latter is provided along the side of the car as is clearly shown in Fig. 1.

At the bolster I provide a different mooring member for securing the ends of the tank strap shown in half section at 24 in Fig. 7; this member is made up  
95 of a body plate 25 (see Fig. 9) having the edge flanges 26 and 27 extending at right angles thereto in both directions, and the webs 28 and 29 thereon crossing each other substantially at right angles, their intersection being enlarged to form the opening 30 through  
100 which one end of the strap is inserted. This strap mooring 24 is positioned between the tank supports 31 and 32 mounted upon the bolster, and is secured thereto through its side flanges by rivets shown at 33. It is set at an angle below the horizontal plane of the tank  
105 supports and when a pull is exerted upon the tank strap, the stress is thereby thrown inwardly towards the central construction of the car, which is strongest and therefore best able to sustain the strain. It will be understood that in rounding curves the centrifugal  
110



force set up by a heavily loaded tank is very great and not only must the strap be strong and tightly adjusted but the mooring therefor must be so positioned as to resolve the forces along the median line of the underframe, and at the same time locate the points of application of the force at as wide an interval as possible, so as to check in the beginning, the tendency of the tank to roll. It is apparent that if the tank strap mooring members were secured directly to the central portion of the underframe construction, all the stress set up by the roll of the tank would be sustained by the strongest portion of the car, but on account of the narrow base or distance between said members the initial movement could not be readily overcome, and I provide for this by spacing the said mooring members at a comparatively great distance apart and at the same time I direct the stresses inwardly towards the central portion of the car by positioning the mooring members at an angle as described above.

Extending centrally through the underframe and longitudinally thereof from end to end of the car is the center sill, formed, as shown, of the channels 35 and 36, and the cover plate 37 riveted to the top flanges of the channels and extending therewith to a point adjacent the end of the car, as appears in Fig. 9. This form of construction renders the center sill massive and of great strength, and affords a firm foundation upon which to position the tank supporting constructions 2 and 2<sup>a</sup>, the bolsters 3 and 3<sup>a</sup>, and the cross-bearers shown at 4 and 5. I do not wish to confine myself to the specific construction for a center sill shown in the drawings, as my improvements may be readily adapted to other known forms of construction.

At the ends of the tank are provided the tank blocks shown at 38 and 39, which may be of wood or metal, as preferred, against which the lower portions of the ends of the tank abut. The block contains the depression 40 to adapt it to the contour of the tank. It will be noted that the block is set into the channels of the center sill, and by referring to Fig. 11, it is seen that each of the channels is slit downwardly at two points 41 and 42, at an interval determined by the thickness of the block, and the slit portion is then bent outwardly, thereby forming a shelf 43 upon which the tank block is positioned and secured in place by bolts 45 and 46, passing upwardly through the holes 47 and 48. The block, when positioned in the transverse openings, on its forward side abuts against the upper portion of the web and flange on each of the channels, and on its rear side also abuts against the upper portion of the web and flange on each of the channels, so that the block is buttressed by the channels both at the front and rear, and any strain due to the tendency of the tank to move forward or backward is borne directly by the rear walls of the transverse openings. At this point I provide the spreader or buttress piece 49, bent outwardly at its ends 50 and 51, mounted between the channels and secured thereto by rivets 52 passing through the bent ends. The spreader is so positioned as to engage the forward side of the tank block, and thereby create a greater bearing surface for said block against buffing stresses thereon exerted from the end of the car.

At the ends of the center sill and somewhat removed

from the tank block are positioned the end sills 53 and 54. Between the block and the end sill and at opposite sides of the center sill are the short braces 55 and 56 having extending upwardly and longitudinally thereon the web 57, provided at one end with the head 58, the latter bearing against the rear side of the tank block adjacent its end, the other head (not shown) bearing against the end sill. In this way I provide for the support of the tank block on its rear side at a plurality of points distributed so as to take up any stress due to the longitudinal movement of the tank.

On the front side of the tank block and abutting against the same at one end 59 and abutting against the tank supports mounted upon the bolster at its other end 60, I provide the I-beams 61 and 62, to buttress the tank block directly in line with the braces 55 and 56. Therefore the block is supported on its forward side at a plurality of points, and it is effectually braced against the movements of the tank. Additional braces and beams may be provided, if the circumstances require.

In addition to the rectangular bracing construction just described, I provide at the outer sides of the underframe and adjacent the ends thereof the channel irons 63 and 64, extending from the outer ends of the end sill to the outer ends of the rear tank support mounted upon the bolster, said channel irons being secured at their ends to said sill and support.

In Fig. 2, the end construction of the underframe just described is most clearly shown, and it is apparent that outward stresses thereon would be received chiefly by the tank block, and would be distributed over the rectangular bracing construction shown; inward stresses thereon, due to the bumping of cars or to pushing the tank car by means of a push pole applied to either of the pockets 68 and 69, would be at once distributed throughout the bracing construction and finally concentrated upon the center sill. This end construction also takes up and distributes stresses exerted upon the underframe by an angular pull upon the car, such as is experienced when the car is being drawn upon a curve. The end construction is still further united and braced by the provision of the transverse cover plate 70 secured upon the end sill, the channel irons at the sides, the short braces and the center sill, and occupying preferably the entire space between the tank block and the end of the car; further, the runway or cover plate 71 extends along the side of the car and is secured to the cover plate 70, the channel iron 64, and the tank supports mounted upon the bolsters, and on account of the width of the plates 70 and 71 a very great addition to the bracing construction is made. Further to strengthen the end construction the push pole pockets shown at 68 and 69 are secured to deep angle irons, one arm 72 of which embraces the channel iron 63 and is secured thereto, and the other arm embraces the end sill and is secured thereto.

The bolster, in the form shown herein, is composed of web plates 73 and 74 on opposite sides of the center sill and secured thereto at their inner ends as shown at 75; passing transversely across the center sill, and secured at its ends to the upper flanges of said web plates is the plate 76, while said web plates are connected on their under sides by the plate 77, which is secured to the lower flanges of said plates as clearly appears in



Fig. 4. Reference to the same figure discloses the body bolster center brace 78, secured to the center sill channels 35 and 36, by rivets passing through said channels and the inner flanges of the web plates 73 and 74; there-  
 5 by forming a continuously united structure from one outer end of said bolster to the other, and being secured to said center sill at both sides, and at the top and bottom thereof. Adjacent the outer ends of said web plates and between the same and secured thereto are  
 10 the spreaders 65 and 66 having their ends bent inwardly and secured to the inner faces of said webs at 67 and 67<sup>a</sup>.

The tank is mounted at the bolster upon the transverse tank supports 31 and 32, which are mounted upon  
 15 the plate 76 and secured thereto by rivets 79, which also pass through the upper flanges of the web plates 73 and 74. It will be noted that the plate 76 does not extend completely across the upper face of the bolster, as appears in Fig. 6; filler plates 80 and 81 are provided,  
 20 which are interposed between the lower flanges on the tank supports and the upper flanges on the bolster web plates, and are secured thereto by rivets, as shown at 82 and 83. Said tank supports, at the middle of their upper faces are concave, as shown at 6, to adapt them  
 25 to the contour of the tank. As described hereinbefore the tank strap mooring members 24 are located between the tank supports 31 and 32 and are secured thereto by the rivets 33; these moorings serve also as spreaders, and render the tank support construction  
 30 more firm. The members 21 for securing the lower end of the support for the hand rail are secured to the inner face of the tank support, as appears in Figs. 4 and 5.

In Fig. 14 is shown a modified construction of the  
 35 tank supports, which is integral, and pressed into the form shown, by well known processes.

The cross-bearer 5 (see Figs. 2 and 12) is positioned upon the center sill at 84, and is formed of the channel iron 85 pressed into a concave form near the middle  
 40 point of its upper face, and is reinforced by the channel iron 86, which is similarly concaved, to accommodate the curved surface of the tank. In Fig. 13 is shown a modified form of cross-bearer, made of the I beam 87; the middle portion of the web is cut out lon-  
 45 gitudinally thereof and pressure is applied to the upper face to force the metal into the opening, the line of union being shown at 88, whereby the upper face is made concave as shown at 89, to conform to the curvature of the tank. In Fig. 2 I have shown a cross-bearer  
 50 formed of pressed shapes, as in Fig. 12, but the form shown in Fig. 13 may be used if desired.

The brake shaft is shown at 90, at 91 is the stirrup and at 92, 93 and 94 the handholds used in mounting, and retaining position upon, the car; at 95 is shown the  
 55 ladder for mounting the tank, and at 96 the handhold at the top of the tank.

It is seen from the foregoing description that I provide a central longitudinal sill of box form, mounted pivotally upon the trucks of the car; bolsters mounted  
 60 transversely thereon adjacent the trucks; tank supporting members mounted upon the bolsters; cross-bearers mounted upon said center sill between the bolsters; transverse blocks let into the center sill intermediate the bolsters and the ends of said sill, and arranged  
 65 to be supported both forwardly and rearwardly by said

center sill; a buttress piece or spreader secured to the center sill channels and between the same, and arranged to give a bearing surface to said block and to support the same; a rectangular bracing construction for the end of the car, with the tank block arranged near  
 70 the middle thereof, whereby stresses outwardly or inwardly either in the longitudinal line of said car or at an angle thereto are taken up and distributed, and all parts are braced against the sudden shocks incident to railroad transportation. The bolsters and tank sup-  
 75 ports thereon and cross-bearers have preferably the forms and constructions described, and I attach the ends of the tank straps thereto, securing the same in mooring members of the novel forms noted; the cast-  
 80 ings or mooring members being positioned at an angle for the purpose of directing the stresses inwardly to the center sill; and I also provide brace plates and tie plates in the bracing construction 20 as shown at 97 and 98, for said cross-bearer. I have therefore braced the  
 85 underframe construction of my improved tank car in every direction and have so arranged the parts that the forces operating thereon are resolved along the longitudinal median line of the center sill.

Although the forms and constructions described are believed to show the preferable embodiment of my im-  
 90 proved tank car, yet I do not desire to limit myself to the specific forms described, but I wish to claim any modifications thereof accomplishing the same ends in the same general manner. Nor do I desire to limit my-  
 95 self by any commercial or trade terms employed in the description, but I intend such terms to comprehend any construction of the same general form for accomplish-  
 ing the purposes indicated.

Having described my invention, what I claim as new and desire to secure by Letters Patent is:

1. A tank car comprising a longitudinal center sill, transverse bolsters and cross-bearers arranged thereon, a tank arranged longitudinally upon said transverse bolsters and cross-bearers, transverse members forming end abut-  
 105 ments for said tank and let into said center sill so as to be supported thereby against stresses on said member directed rearwardly or forwardly.

2. A tank car comprising a longitudinal center sill formed of channels spaced apart and having a cover plate thereon, cross-bearers and bolsters arranged thereon, a  
 110 tank arranged longitudinally upon said cross-bearers and bolsters, shelves formed on the sides of said channels by slitting the same from above and flanging the slit portion laterally, thereby providing slit openings in said channels having front and rear walls, transverse members forming  
 115 end abutments for said tank arranged in said slit openings in engagement with said walls and buttress pieces arranged between said channels and secured thereto and adapted to be positioned against said transverse members to support the same.

3. A tank car underframe construction comprising a longitudinal center sill formed of channels spaced apart and having a cover plate thereon, a deep flange on each of said channels formed by slitting down the latter and bend-  
 120 ing the slitted portion laterally, whereby a transverse opening through said channel is made, a member adapted to be positioned transversely in said openings upon said flanges and supported forwardly and rearwardly by the walls of said openings, a buttress piece positioned between  
 125 said channels and secured thereto adjacent its ends, and operating to support said member and also to tie said channels together at the points where the said flanges are formed thereon.

4. A tank car underframe construction comprising a longitudinal center sill formed of channels spaced apart, a  
 135 deep flange on each of said channels formed by slitting



down the latter and bending the slitted portion laterally whereby a transverse opening through said channel is made, and a member adapted to be positioned transversely in said openings upon said flanges to rest thereon and supported forwardly and rearwardly by the walls of said openings.

5. A tank car underframe construction comprising a longitudinal center sill formed of channels spaced apart, a deep flange on each of said channels formed by slitting down the latter and bending the slitted portion laterally whereby a transverse opening through said channel is made, a member adapted to be positioned transversely in said openings upon said flanges to rest thereon and supported forwardly and rearwardly by the walls of said openings, and a member positioned between said channels adjacent said transverse openings and adapted to tie said channels together and to support said member positioned therein.

6. A tank car underframe construction comprising a longitudinal center sill formed of channels spaced apart, a deep flange on each of said channels formed by slitting down the latter and bending the slitted portion laterally whereby a transverse opening through said channel is made, a member adapted to be positioned transversely in said openings upon said flanges to rest thereon and supported forwardly and rearwardly by the walls of said openings, and a member positioned between said channels adjacent said transverse openings and adapted to tie said channels together and to support said member positioned therein, and thereby provide a bracing construction for said center sill at the points where the said flanges are formed thereon.

7. A tank car underframe construction comprising a longitudinal center sill, a cross-bearer mounted on said sill and having its upper face depressed adjacent the middle thereof, said depression being formed by removing a portion of said cross-bearer adjacent its center, and compressing the upper portion thereof into said opening, whereby the upper face of said cross-bearer is conformed to the curvature of the tank.

8. A tank car underframe construction comprising a longitudinal center sill, a cross-bearer mounted on said sill and having its upper face depressed adjacent the middle thereof, said depression being formed by removing a portion of said cross-bearer adjacent its center, and compressing the upper portion thereof into said opening, whereby the upper face of said cross-bearer is conformed to the curvature of the tank, and means carried by said cross-bearer for securing a tank in place thereon against lateral movement.

9. A cross-bearer supporting a tank thereon comprising a channel member having a portion of its upper face pressed into a concave form, and a reinforcing channel member having a portion of its upper face pressed into a concave form and secured to said first member.

10. A tank car underframe construction comprising a central longitudinal sill formed of channels spaced apart and having a cover plate thereon, a cross-bearer on said sill having an upper concave face formed by removing a central longitudinal portion thereof and compressing the upper part into the resulting opening, whereby the supporting face of the cross-bearer is adapted to the curvature of the tank, and means carried by said cross-bearer adjacent the end thereof adapted to receive and secure the end of a tank strap.

11. An end bracing construction for the underframe construction of a tank car comprising a longitudinal center sill, a transverse bolster mounted thereon, a transverse sill mounted at the end of said center sill, a transverse tank block let into said center sill intermediate said bolster and end sill, brace plates interposed between said end sill and tank block and secured thereto, and bracing

members interposed between said bolster and tank block and secured thereto.

12. An end bracing construction for the underframe construction of a tank car comprising a longitudinal center sill, a transverse bolster mounted thereon, a transverse sill mounted at the end of said center sill, a transverse tank block let into said center sill intermediate said bolster and end sill, brace plates interposed between said end sill and tank block and secured thereto, bracing members interposed directly between said bolster and tank block and secured thereto, and side bracing members interposed between said end sill and bolster secured thereto.

13. An end bracing construction for the underframe construction of a tank car comprising a longitudinal center sill, a transverse bolster mounted thereon, a transverse sill mounted at the end of said center sill, a transverse tank block let into said center sill intermediate said bolster and end sill, brace plates interposed between said end sill and tank block and secured thereto, bracing members interposed directly between said bolster and tank block and secured thereto, side bracing members interposed between said end sills and bolster and secured thereto, a transverse end cover plate secured to said end sill and side bracing members and abutting against said tank block, and a side runway secured to said cover plate, said side bracing members, and said bolster.

14. In a tank car, a longitudinal center sill, a bolster mounted upon said sill and secured thereto, a tank support arranged upon said bolster and having a portion of its upper face pressed into a concave form for receiving a tank, said tank support being secured to said bolster.

15. In a tank car, a longitudinal center sill, web plates secured against said center sill at each side thereof, a cover plate arranged transversely upon said center sill and being secured to the upper flanges of said web plates, a continuous tank support arranged transversely of said car upon said cover plate and having a depression formed by pressing the metal into a concave shape adjacent the middle of its upper face for receiving a tank.

16. In a tank car, a longitudinal center sill, web plates secured thereto upon each side thereof, a cover plate arranged transversely upon said center sill and secured to said upper faces of said web plates, and a tank support arranged transversely of said car upon said cover plate and secured through said cover plate to said web plates, said tank support being pressed into shape and being formed with a depression in its upper face adjacent the middle thereof.

17. In a tank car, a longitudinal center sill, a bolster formed of two pairs of web plates mounted against said center sill at each side thereof, a cover plate arranged transversely of said center sill and positioned thereon and upon said web plates and secured to the latter, continuous tank supports arranged transversely upon said center sill and positioned also upon said web plates and secured thereto, and being formed with a depression adjacent the middle of their upper faces to adapt them to the curvature of a tank.

18. In a tank car, a longitudinal center sill, cross bearers arranged thereon at intervals, bolsters arranged thereon, continuous tank supports arranged upon said bolsters, a foot board positioned upon said bolsters and cross bearers adjacent their outer ends, whereby a side channel is dispensed with, and a hand rail supported directly upon said bolsters and cross bearers.

In witness whereof I affix my signature in the presence of two witnesses.

FRANK L. IRWIN.

Witnesses:

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A. RAGER.