R. E. FRAME & F. H. GIBBS.

CAR UNDERFRAME.

APPLICATION FILED NOV. 15, 1910.

1,045,387. **Patented Nov. 26, 1912.**

4 SHEETS—SHEET 1.

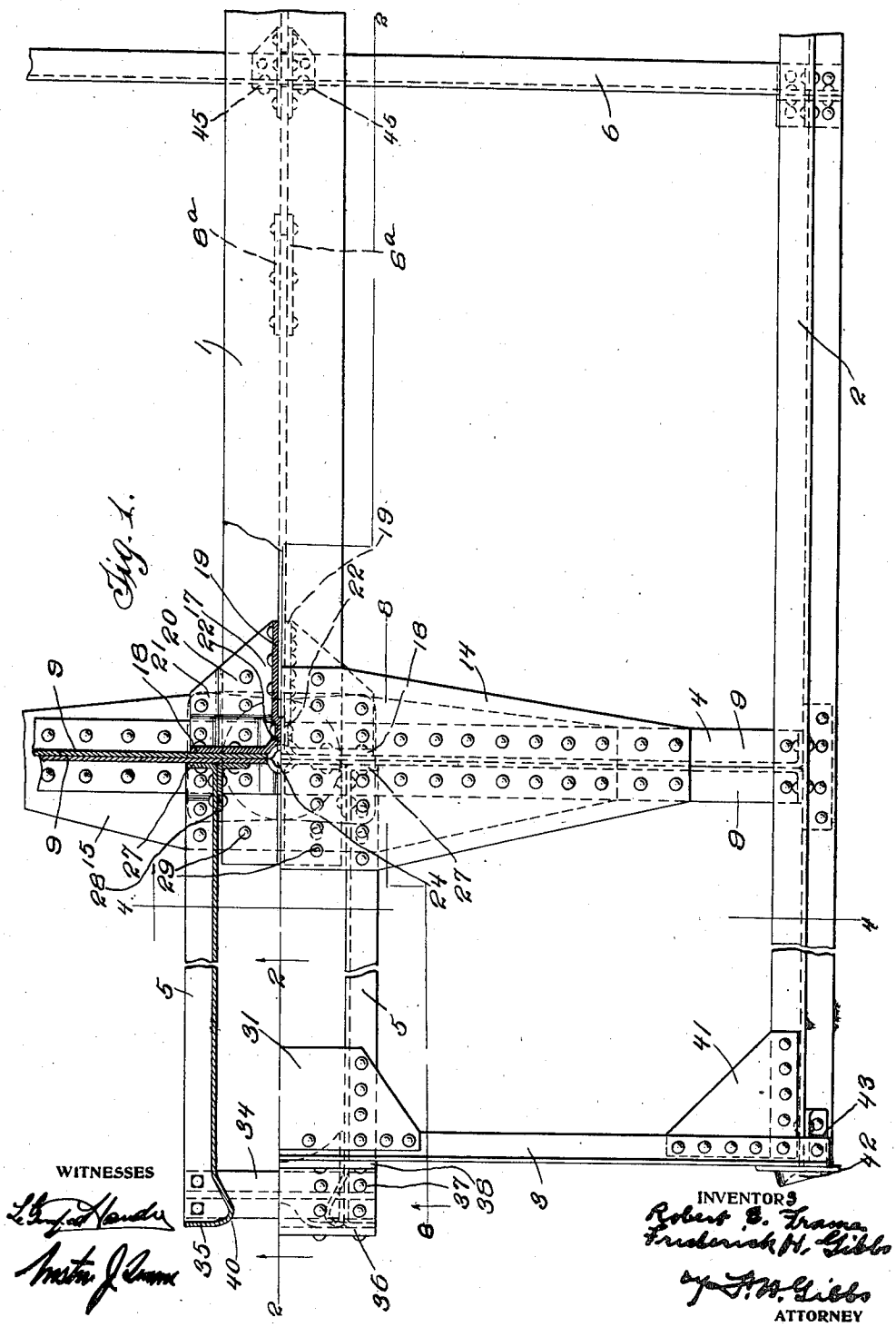

Fig. 1.

WITNESSES

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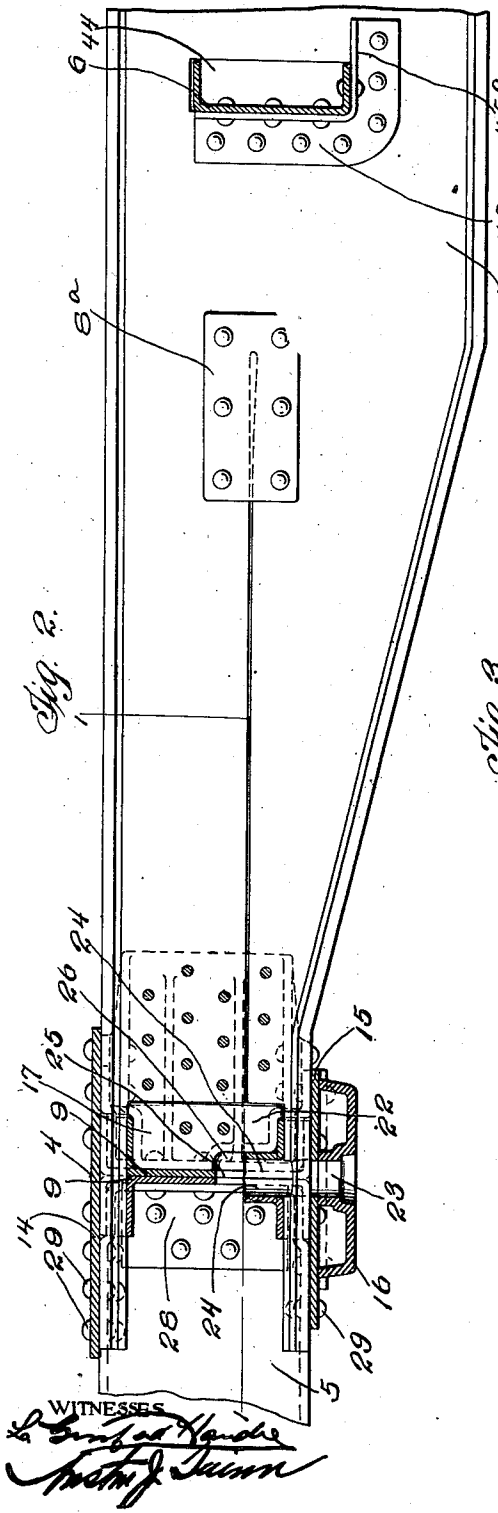

Fig. 2.

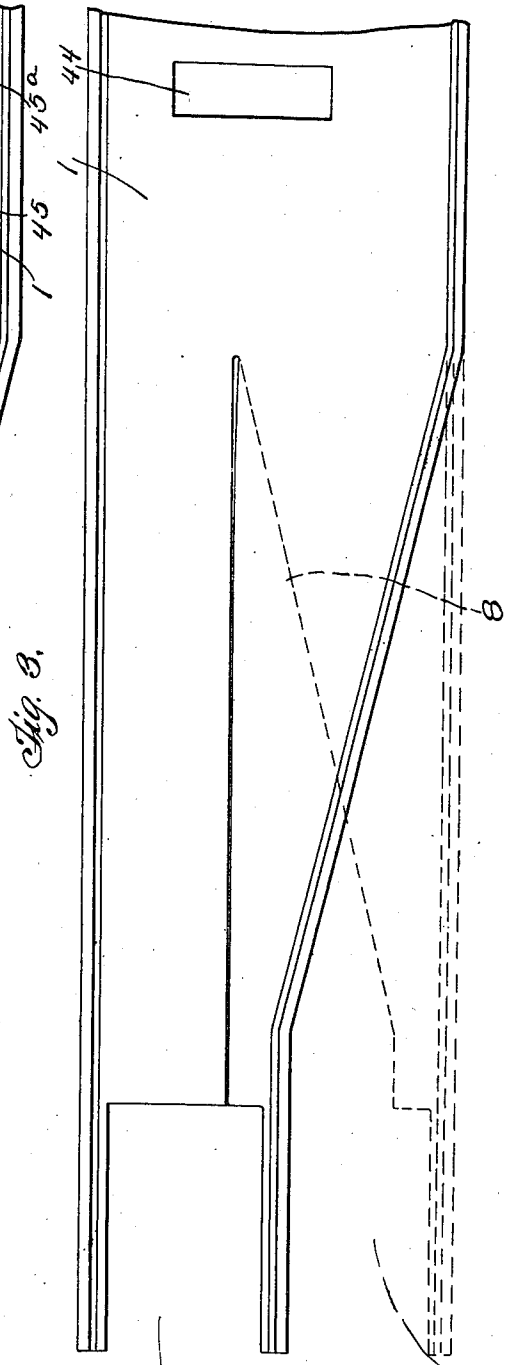

Fig. 3.

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4 SHEETS—SHEET 3.

Fig. 4.

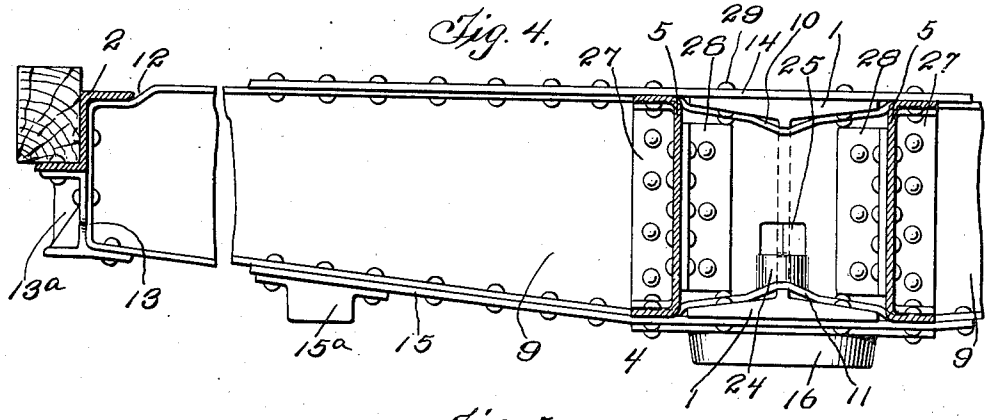


Fig. 5.

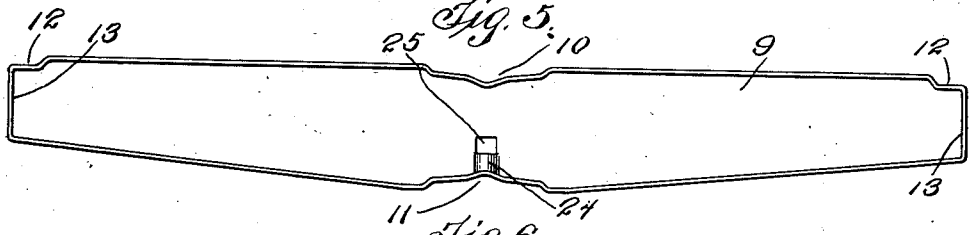


Fig. 6.

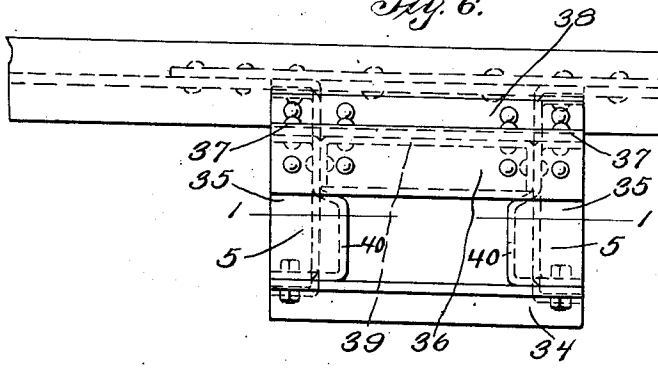


Fig. 11.

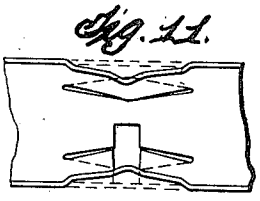
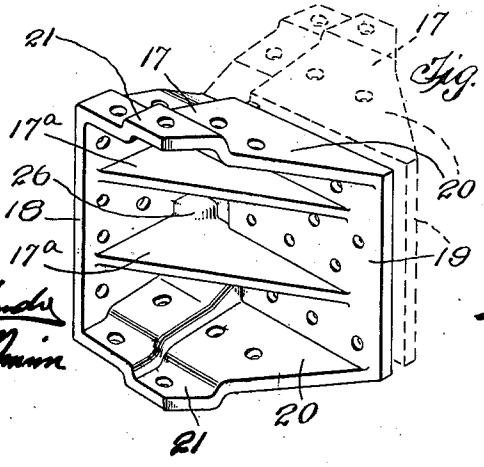


Fig. 7.



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4 SHEETS—SHEET 4.

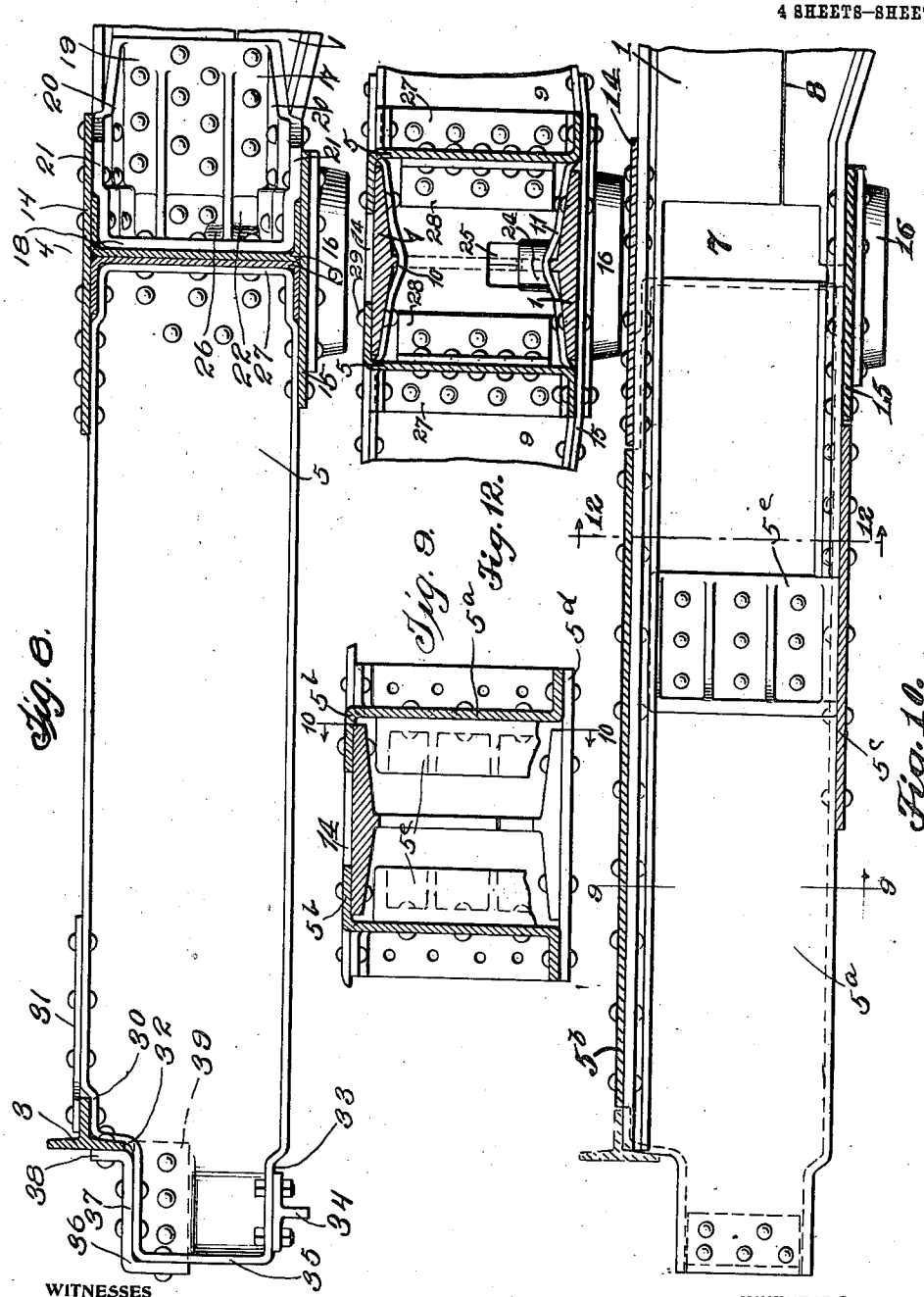

Fig. 8.

Fig. 9.

Fig. 12.

Fig. 10.

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UNITED STATES PATENT OFFICE.

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CAR-UNDERFRAME.

1,045,387. Specification of Letters Patent. Patented Nov. 26, 1912.

Application filed November 15, 1910. Serial No. 592,575.

To all whom it may concern:

Be it known that we, ROBERT E. FRAME and FREDERICK H. GIBBS, residing at Chicago, Illinois, and New York city, New York, respectively, and being citizens of the United States, have invented certain new and useful Improvements in Car-Underframes, of which the following is a full, clear, and exact description, such as will enable others skilled in the art to which it appertains to make and to use the same, reference being had to the accompanying drawings, which illustrate the preferred form of the invention, though it is to be understood that the invention is not limited to the exact details of construction shown and described, as it is obvious that various modifications thereof will occur to persons skilled in the art.

In said drawings: Figure 1 is a plan view of a portion of an underframe constructed in accordance with the invention, parts being shown in horizontal section, substantially on the plane of lines 1—1, Figs. 2 and 6. Fig. 2 is a vertical longitudinal sectional view taken on the plane of line 2—2, Fig. 1, parts being illustrated in elevation. Fig. 3 is an elevational detail view of one end of the center sill member, illustrating the manner of reducing the cross sectional area thereof. Fig. 4 is a transverse vertical sectional view taken substantially on the plane of line 4—4, Fig. 1. Fig. 5 is an elevational view of one of the bolster diaphragms. Fig. 6 is a fragmentary elevational view of the end sill and its connection with the draft sills. Fig. 7 is a detail perspective view of one of the angle connection castings hereinafter described. Fig. 8 is a vertical longitudinal sectional view taken on the plane of line 8—8 of Fig. 1. Figs. 9 and 10 illustrate a modification; Fig. 9 being a transverse vertical sectional view taken on the plane of line 9—9 of Fig. 10, and Fig. 10 being a vertical longitudinal sectional view taken substantially on the plane of line 10—10 of Fig. 9; parts being illustrated in elevation. Fig. 11 is a fragmentary view of the middle portion of a bolster diaphragm formed of rolled metal wherein portions of the web are cut out and the top and bottom flanges are pressed inwardly, and it is to be understood that the word pressed wherever used herein in describing the bolster diaphragms includes diaphragms formed as suggested in Fig. 11, as well as from flat sheets of metal. Fig. 12 represents a fragmental section of the modified construction on the line 12—12 of Fig. 10.

The object of this invention is to provide an underframe structure for railway cars, in which is utilized a single center sill member and in which the bolster portions are each composed principally of a pair of flanged diaphragms, either rolled or pressed, the flanges of which extend continuously from side sill to side sill and are received in suitably formed recesses of the center sill.

A further object is to provide draft sill members so connected with the bolsters and the center sill as to successfully withstand the severe shocks to which they may be subjected in use, and to transmit buffing stresses directly to the center sill as near as may be without unnecessary strain on the bolsters.

Since the structure is duplicated at each end of the car, it is necessary to illustrate and describe in detail only one end thereof.

Referring to the drawings; the numeral 1 indicates the center sill member; 2, the side connecting member; 3, the end sill; 4, the bolster; 5, the draft sills and 6 the cross bearers. The center sill 1 is formed of a commercially rolled I section and is placed in the structure with its web standing vertically. At the opposite ends the web is sheared out or recessed substantially from flange to flange as at 7, and extending inwardly from the recess is a shearing 8, indicated by dotted lines in Fig. 3. The shearing 8 is substantially V-shaped and opens into the recess 7. The portion of the web and flange, below the sheared portions, is bent upwardly and closes the V as is clearly illustrated in Fig. 3 in full lines. The depth of the center sill is thus reduced at the ends and the recess 7 is correspondingly reduced in height. The end portion of the lower flange is bent to a parallel with the corresponding portion of upper flange. A pair of reinforcing plates 8^a, 8^a, is secured to the opposite sides of the web to strengthen the end of the seam produced by the closing of the V.

The bolster 4 is composed of a pair of flanged diaphragms as 9—9. These diaphragms are placed back to back, as illustrated in the drawings, though it is obvious

that any suitable disposition of the bolster diaphragms known in the art is permissible, and the diaphragms may be spaced apart if desired, and extend from side sill to side sill, or from side to side of the car, and they are received in the recess 7 of the center sill. At their central portions the diaphragms are of slightly less depth than the reduced end portions of the central sill and suitable depressions as 10 and 11 are formed in the top and bottom flanges, respectively, of each of the diaphragms to receive the projecting web portions of said sill. The upper flanges of the diaphragms upon each side of the center sill are disposed with their upper surfaces in a horizontal plane, parallel with the upper surface of the top flange of the center sill. At their opposite ends the upper flanges are slightly depressed as at 12—12, to receive an inwardly projecting flange of the Z section side connecting member 2, or side sill. The lower flanges are inclined upwardly from the opposite sides of the lower flange of the center sill, so that the opposite ends of the diaphragms are reduced in depth to provide the usual side bearing clearance. The upper and lower flanges are connected by end flanges 13—13.

A top cover plate 14 bridges the top flange of the center sill and is fixed, by rivets, to said flange and to the upper flanges of the bolster diaphragms. Some of the rivets which fix said cover plate to the top flange of the center sill are extended through the depressed portions 10 of the flanges of the bolster diaphragms.

A bottom cover plate 15 extends beneath the flange of the center sill and is fixed, by rivets, to said flange and to the lower flanges of the bolster diaphragms. Some of the rivets which fix the bottom cover plate to the bottom flange of the center sill are extended through the indented portions 11 of the flanges of said diaphragms.

A flanged center bearing plate, as 16, is fixed to the under side of the bottom cover plate 15.

Angle connecting castings 17—17 (see Fig. 7) are fitted, one upon each side of the end portion of the web of the center sill, back of the bolster diaphragms and are fixed to said diaphragms and to the center sill for rigidly connecting said members. Each of the castings 17 is formed with a vertical front wall 18, a vertical side wall 19 and top and bottom walls 20—20. The front walls 18 are fixed by rivets to the adjacent vertical web portion of the bolster diaphragms; the side walls 19 rest against the opposite sides of the end portion of the web of the center sill, and are fixed thereto and to each other by rivets extending through said side walls and through the intervening portion of the center sill. The top and bottom walls 20 are fitted to the shape of the top and bottom flanges, respectively, of the center sill and to the portions 10 and 11 of the flanges of the rear bolster diaphragm, which lap the center sill flanges and are fixed to said members by rivets, some of which extend through the cover plates 14 and 15, respectively, and others through said plates and through the interposed portions of the flanges of the rear bolster diaphragm. A portion 21 of each of the walls 20 is projected so as to engage and be riveted directly to adjacent over-hanging portions of the cover plates 14 and 15. The rivets which connect the lower portions 21 to the lower cover plate 15 are extended through the flange of the center bearing plate 16.

The webs of the bolster diaphragms are spaced from the end of the center sill web and portions of the side walls of the castings 17 are offset, as at 22 and said offset portions are disposed so as to substantially complete the center sill web to the web of the rear bolster diaphragm. The portions 22 of each of the castings 17 are offset approximately one-half the thickness of the center sill web, and are securely riveted together. The rear vertical edges of the offset portions are arranged to rest solidly against the end of the center sill web, so as to effectually transmit the greater part of the shocks to which the end of the underframe may be subjected directly to the end of said center sill web. Suitable angle brackets as 17^a, 17^a, are formed in each of the castings 17 for reinforcing the connection between the front and side walls thereof.

The center bearing plate 16 is formed with the usual king-pin aperture as 23 and concentrically above said aperture the webs of the bolster diaphragms are pressed semicircularly away from each other so as to form a vertical tubular extension 24 in alinement with said aperture 23. The tubular portion 24 extends upwardly from the bottom flanges of the diaphragms to a point somewhat below the middle of the height of said diaphragms, and the material of said diaphragms, above the portions 24, is cut away at 25 upwardly to approximately said middle point, so as to afford a means of access for keying the usual king-pin in position. The lower flange of the center sill is obviously apertured concentrically with the aperture 23 for the passage of the king-pin.

The front and side walls of the castings 17 are indented as at 26, where they engage the portions 24 of the bolster diaphragms and said indented portions are extended upwardly above the top of the portions 24 at least to the top of opening 25, so as not to obstruct said opening, and may extend the full depth of the casting, in which case right and left castings will not be required.

The opposite ends of the bolster dia-

phragms are connected to the respective side connecting members 2 by rivets which extend through the vertical web of said connecting members and through the end flanges 13 of the diaphragms. Further connection is made by a combined jacking casting and angle bracket 13ª, which is disposed with one of its flanges lying flat against the under horizontal face of the lower flange of the side connecting member and extends below the bolster ends and is riveted thereto, and with its vertical portion lying flat against and being riveted to, the outer face of the flanges 13.

The usual side bearings as 15ª are fixed to the under face of the bottom cover plate 15 at points spaced from the median line of the structure.

The draft sills 5 are preferably pressed members of equal height with the reduced portions of the center sill. Their flanges are oppositely disposed in the structure of Figs. 1, 2, 4, 6, and their inner or rear ends are fitted between the upper and lower flanges of the forward bolster diaphragm. The rear vertical flanges 27 of the draft sills are disposed to lie flat against the forward face of said diaphragm. Angle brackets 28—28 are fixed, by one of their flanges, to the flat opposing faces of the webs of said draft sills at the rear ends thereof, and the other flanges of said angles are arranged to lie flat against the forward face of the forward bolster diaphragm. The last mentioned flanges of the angles 28 and the flanges 27 of the draft sills, are secured to the webs of the bolster diaphragms by the rivets which secure the front walls of the castings 17 to the rear face of the bolster diaphragms, which rivets are extended through the webs of said diaphragms and through said flanges.

The upper and lower flanges of the draft sills, where said flanges lap the flanges of the forward bolster diaphragm, are secured to said diaphragm flanges by rivets, which extend through said flanges and through the cover plates 14 and 15 of the bolster. The upper and lower flanges of the draft sills are fixed, by rivets, directly to the cover plates 14 and 15, respectively, at points in front of the forward edges of the flanges of the bolster diaphragm, the cover plates 14 and 15 being broadened at their central portions so as to overhang the flanges of the forward diaphragm and receive said rivets for further strengthening the structure against possible distortion. Some of the rivets which fix the lower flanges of the draft sills to the lower flange of the forward bolster diaphragm are extended through the flange of the center bearing plate 16. The portions of the center sill flanges which project in front of the bolster diaphragms are secured to the adjacent overhanging portions of said cover plates 14 and 15 by rivets as at 29.

The end sill 3 is formed of a rolled T section, arranged with its web portion disposed horizontally and with its flange portion arranged vertically along the forward edge of the web portion. The forward ends of the draft sills extend beneath the end sill 3, and are projected beyond the forward face thereof.

The top flanges of the draft sills are slightly depressed as at 30 to receive the web portion of the end sill, and a connecting cover plate 31 is riveted to the upper faces of said web and draft sill flanges. The upper flanges of the draft sills are further depressed at the rear face of flange portion of the T end sill, as at 32, so as to extend beneath the lower edge of said sill. The lower flanges of the draft sills are raised slightly at their forward ends as at 33 and a drawbar supporting plate 34 is fixed to the under faces of said raised portions. The forward ends of the top and bottom flanges of the draft sills are connected by end flanges 35.

A relatively heavy striking plate 36 extends from one of the draft sills to the other, and is fixed to the forward faces of the flanges 35. The lower edge of the plate 36 is spaced above the upper face of the supporting plate 34, and the upper portion thereof is bent horizontally backwardly and riveted to the adjacent depressed portions of the top flanges of the draft sills as at 37. The rear edge is bent again to a vertical position and is riveted to the forward face of the flange portion of the end sill as at 38. A suitable reinforcing filler 39 is fixed between the inner faces of the draft sills, beneath the horizontal portion of the plate 36, and is riveted to the webs of the draft sills and to the horizontal portion of the plate 36, and to the front vertical portion of the said plate for reinforcing the connection between the ends of the draft sills and for strengthening their connection with the striking plate.

Beneath the lower edge of the striking plate the webs of the draft sills are pressed toward each other, so as to form restricting lugs 40, which serve to reduce the width of the drawbar opening without the necessity of attaching separate members for the purpose.

The opposite ends of the end sill 3 extend beyond the vertical web of the side connecting members 2, and are disposed with the web portion thereof lying above the upper flange of said connecting members. A gusset plate 41 is interposed and is riveted to each of said members. A push-pocket 42 is fixed to the overhanging portion of the end sill and to the web and lower flange of the side connecting member,

as at 43, and serves to further strengthen the connection between said members.

Any desired number of cross bearers 6 may obviously be employed throughout the length of the structure, but, for convenience, only one has been illustrated. Each of the cross bearers is of channel cross-section and is continuous from side to side of the structure. Apertures as 44 are formed in the web of the center sill for the free passage of the cross bearers. Angle brackets 45—45 are fixed by through rivets to the opposite sides of the web of the center sill, adjacent the openings 44, and each of said brackets is disposed vertically and has its outstanding flange fixed to the vertical flat face of the adjacent cross bearer. The lower end of each of the brackets is bent to a horizontal, as at 45^a, so that the outstanding flange thereof underlaps the lower flange of the cross bearer, and the lapping flanges are secured by rivets. This arrangement provides a simple but wide and thoroughly substantial support for the central portion of the cross bearer.

Since the center line of the draft rigging employed in car construction is usually placed below the horizontal median line of the underframe structure, there is a consequent tendency to force the end sill downward, or inversely, to force the bolster upward. This tendency has resulted in a frequency of rupture of the underframe at the bolster, or at a point immediately in front of the bolster, due to ineffectual connection between the draft sills and the center sill or sills. In Figs. 9 and 10 we have illustrated a structure designed to materially and effectually overcome this difficulty.

It will be seen from Fig. 10 that the top flange of the center sill is extended to a point beyond that previously described and to the rear face of the end sill. The bottom flange is extended to a point determined by the form of draft rigging in connection with which it is to be employed, and, as illustrated, may serve as a reinforcement for the rear follower stop 5^e of the draft rigging.

The draft sills 5^a are substantially Z-shaped in cross section throughout the greater part of their length and the upper flanges thereof are turned toward each other and are riveted to the upper surface of the extended portion of the top flange of the center sill, as at 5^b. The bottom flange projects outwardly and is disposed with its underface parallel with the underface of the extended portion of the lower flange of the center sill.

A bottom cover-plate 5^c is riveted to the underface of the bottom flange of the center sill, and extends so as to underlap, and be riveted to, the bottom flanges of the draft sills, as at 5^d. The plate 5^c extends from the forward edge of the bottom cover-plate of the bolster forward sufficiently to be employed for supporting the rear end of the draft rigging, but not so far as to prevent thorough inspection of the draft rigging.

The forward and rear end portion of the draft sills 5^a are formed to a substantial equivalent of the corresponding parts of the draft sills 5 previously described.

Owing to the angularity of the castings 17, shown in detail in Fig. 7, and the position of the center sill, bolster and draft sills with relation thereto, it is evident that buffing stresses transmitted to the draft sills will be received by the transversely outstanding end walls 18 of said castings and transmitted to the center sill web and flanges direct, with the bolster diaphragm serving, incidentally, in this connection as a "filler" rather than as a means for receiving the buffing stresses. The top and bottom flanges of said casting being riveted directly to the top and bottom bolster cover plates, and the draft sills likewise being riveted to the said plates, it is evident that buffing stresses are transmitted through the draft sills, top and bottom bolster plates, the castings 17 and to the center sill, and so long as these rivet connections are intact the bolster will not receive these stresses.

Having fully described the invention, what we desire to claim is:—

1. In a car underframe, a longitudinal sill, a bolster comprising a pressed member of variant cross section extending continuously from one side of said sill beyond the other side, and parts of said sill extending above and parts below said bolster, the web of the sill terminating short of said bolster.

2. In a car underframe, a longitudinal sill, a bolster comprising a pressed member of variant cross section and of general channel shape in cross section, extending continuously from one side of said sill to the other and parts of said sill extending above and parts below said member, the web of the sill terminating short of said bolster.

3. In a car underframe, a longitudinal sill, a bolster comprising a pressed channel member of variant cross section, extending continuously from one side of said sill beyond the other side and between the flanges of said sill, the web of the sill terminating short of said bolster.

4. In a car underframe, a longitudinal sill, a bolster comprising a plurality of pressed channel members of variant cross section extending continuously from one side of said sill beyond the other side and parts of said sill extending above and parts below said members, the web of the sill terminating short of said bolster.

5. In a car underframe, intersecting members, one of said members comprising a pressed shape, with oppositely disposed de-

pressions formed in the upper and lower faces of said pressed member to receive parts of the other member.

6. In a car underframe, intersecting members, one of said members comprising a bolster consisting of a pressed member of variant cross section with top and bottom flanges and with a depression formed in each of said flanges for receiving parts of the other member.

7. In a car underframe, intersecting members, one of said members being of variant cross section and having oppositely disposed depressions formed therein for receiving parts of the other member.

8. In a car underframe, continuous intersecting members, upper and lower flanges formed upon each of said members, the flanges of one of said members being depressed to receive the flanges of the other.

9. In a car underframe, a combination comprising a flanged center sill with a center pin aperture therein and a bolster extending between the flanges of said center sill, and a socket for said pin formed in said bolster.

10. In a car underframe, a combination comprising a center sill with a web, top and bottom flanges extending beyond said web and a bolster in juxtaposition to said web between the flanges of said sill.

11. In a car underframe, a flanged center sill, a bolster member extending continuously from one side of said sill to the other and between the flanges thereof, parts of the center sill lapping the bolster and one of said lapping portions being formed with a king-pin aperture, the web of the sill terminating short of said bolster.

12. In a car underframe, a bolster comprising a pair of marginally flanged pressed members extending continuously from side to side of the car, the webs of the respective members contacting and the flanges being disposed to project away from each other, a center sill extending above and below said flanges and castings at each side of said center sills connected with said bolster, the web of the sill terminating short of said bolster.

13. In a car underframe, intersecting members, one comprising a pressed shape of variant cross section and the other a commercial shape; a depression formed in said first member and a part of said other member extending into said depression, upper surfaces of said members extending to substantially a uniform plane.

14. In a car underframe, intersecting members, one of said members comprising a pressed shape of variant cross section and having a depression formed in said member for receiving a part of the other member, upper surfaces of said members extending to substantially a uniform plane.

15. In a car underframe a pair of bolster members comprising pressed shapes of variant cross section providing a plurality of marginal depressions in the middle portion thereof for receiving parts of other members and a center sill having a web terminating short of said bolster members and having flanges resting in said depressions.

16. In a car underframe, intersecting flanged members, one comprising a pressed shape, and the other comprising a commercial shape, the first of said members having upper and lower marginal depressions therein for receiving respectively the upper and lower flanges of the second member.

17. In a car underframe, intersecting members, parts of one of said members being depressed and parts of the other being cut away to receive the depressed portions of the first.

18. In a car underframe, a bolster comprising pressed members of variant cross section extending continuously from one side of the underframe to the other, parts of said members being pressed to form a king-pin socket, and a center sill lapping said bolster with a pin aperture therein registering with said socket.

19. In a car underframe, a bolster, a center sill, the web of the center sill being spaced longitudinally away from the bolster and the flanges of said sill lapping the bolster and means interposed between said sill and bolster and within the cross-sectional area of said sill for connecting the webs of said sill to the bolster.

20. In a car underframe, a bolster, a flanged center sill, the web of said sill terminating at a point spaced from said bolster and angular castings interposed between said web and bolster and lapping said bolster within the cross-sectional area of said sill for completing said web to the bolster.

21. In a car underframe, the combination comprising a single center sill with webs terminating between bolsters, with top and bottom flanges extending beyond the bolsters, bolster diaphragms between said flanges, draft sills connected with the flanges of said center sills and a top bolster cover plate connecting a center sill flange and said draft sills.

22. In a car underframe, a longitudinal sill, a transverse bolster member extending continuously from side to side of the car and having vertically alined depressions formed in the top and bottom faces of said bolster member for receiving parts of the sill, and a top cover plate secured directly to said sill and bolster member.

23. In a car underframe, a longitudinal sill comprising an I section and a bolster comprising a pressed member, with irregular flange portions extending continuously from side to side of the underframe between the top and bottom flanges of the center sill,

and top and bottom bolster cover plates riveted directly to said sill and to said pressed member.

24. In a car underframe, a single center sill, the web of which terminates between bolsters, a bolster comprising a pressed member of variant cross section extending continuously between the flanges of said sill, and draft sills directly engaging the flanges of said center sill.

25. In a car underframe, a center sill comprising a rolled flanged section, bolsters comprising pairs of members extending continuously transversely of said sill beyond the web of the sill at each end, and draft sills connected to flanges of said center sill.

26. In a car underframe, a single center sill comprising an I section, a bolster comprising a member of variant cross section extending continuously transversely of and beyond the web of said sill, and flanged draft sills connected to the upper flange of said center sill.

27. In a car underframe, a single center sill comprising an I section extending in part from end sill to end sill, bolster diaphragms comprising pressed members extending continuously from side to side, top and bottom cover plates for said bolsters and draft sills connected with the flanges of said center sill, and with said cover plates.

28. In a car underframe, the combination comprising a center sill, a bolster comprising members of variant cross section extending from side to side of the underframe beyond the web and between the flanges of said sill and a pair of oppositely disposed castings fixed to the web and flanges of said bolster member and to said sill.

29. In a car underframe, a center sill, a bolster comprising a pressed member of variant cross section extending through a part of said sill and between the flanges thereof, the center sill and said pressed member rising to substantially a uniform plane, a pair of oppositely disposed castings fixed one to each side of the web of said center sill and each fixed to said pressed member and a cover plate connecting said sill, pressed member and said castings.

30. In a car underframe, a center sill, a bolster comprising a pressed member extending through part of said sill and between the flanges thereof, a pair of oppositely disposed castings fixed one to each side of the web of said center sill and abutting the end surface of said web and each casting fixed to said pressed member.

31. In a car underframe, a center sill comprising a single rolled member, a bolster comprising a pair of pressed members which extend from one side of the underframe to the other and between the flanges of said sill, draft sills fixed to said members and a pair of castings fixed to some of said members in alinement with the web of said center sill for transmitting shocks from said draft sills to the center sill.

32. In a car underframe, a flanged center sill, a bolster comprising a flanged pressed member extending from one side of said underframe to the other, depressions formed in the flanges of said pressed member for receiving the flanges of the center sill, and a casting fixed to the depressed portions of the flanges of the pressed member and to the flanges and web of said center sill.

33. In a car underframe, a flanged center sill, a bolster comprising a pressed member extending transversely of said center sill and having continuous top and bottom flanges parts of which are substantially in the respective planes of the top and bottom flanges of the adjacent portions of the center sill and depressions formed in the flanges of said pressed member for receiving the flanges of the center sill.

34. In a car underframe, a flanged center sill, a bolster comprising a pressed member extending from side to side of said underframe, with continuous top and bottom flanges of the adjacent portions of the center sill lapping said pressed member and bolster, cover plates connected to the respective top and bottom flanges of the pressed member, and to the top and bottom flanges of the center sill, the web of the sill terminating short of said bolster.

35. In a car underframe, a center sill, a flanged cross bearer extending continuously from one side of said sill to the other between the flanges thereof and a bracket fixed to the sill and to the web portion of the cross bearer and being bent to overlap the bottom flange of said cross bearer, the web of the sill terminating short of said bolster.

36. In a car underframe, a bolster comprising a pair of flanged members of variant cross section extending continuously from side to side of the underframe and being recessed to form a king-pin socket between said members, and a center sill with continuous bottom flange underlapping said bolster and being provided with pin opening registering with said socket, the web of the sill terminating short of said bolster.

37. In a car underframe, a bolster comprising a pair of pressed members of variant cross section extending continuously from side to side of the car, bottom flanges formed upon said members and a king-pin socket formed in the webs of said members relatively between said flanges, and a center sill with continuous bottom flange underlapping said bolster and being provided with pin opening registering with said socket, the web of the sill terminating short of said bolster.

38. In a car underframe, a flanged center

sill, a bolster, a portion of said bolster lapping a portion of said sill and a king-pin aperture formed in said lapping portions.

39. In a car underframe, a center sill formed with a bottom flange, a bolster comprising a pair of members formed each with a bottom flange, said last mentioned flange being disposed to lap a portion of the flange of said center sill and a king-pin socket formed in said lapping portions.

40. In a car underframe, the combination comprising a single center sill, a continuous flanged member extending transversely of and through said sill, and provided with flanges spaced apart, the distance between said flanges being less within the zone of said sill than at other points in the length of said transversely flanged member.

41. In a single center sill underframe for railway cars, the combination comprising a center sill with notched end portions, bolster diaphragms within said notches and below and in the plane of the top of said center sill, a top cover plate extending over said center sill and connected directly thereto and with said diaphragms and castings connected to said sill, diaphragms and cover plate.

42. In a single center sill underframe, a combination comprising a center sill extending in part beyond the bolsters, bolster diaphragms projecting through said sill, bolster cover plate extending over and connected to said sill and said diaphragms, separately formed draft sills abutting said diaphragms and connected with said cover plate and buffing castings in alinement with said draft sills, connected with said center sill.

43. In a single center sill car underframe, the combination comprising a center sill, bolster diaphragms between the top and bottom flanges of said sill, said diaphragms being of substantially the depth of said sill in parts thereof outside of the sill, draft sills connected with said bolster diaphragms, and buffing castings in alinement with said draft sills between the bolster and cover plates connecting said center sill and bolster diaphragms, draft sills and castings.

44. In a car underframe, a single center sill with top flange and vertical web, a bolster and Z-shaped draft sills with their upper flanges lapping and being riveted directly to the top flange of said center sill.

45. In a car underframe, a single center sill with top flange and vertical web, a bolster and Z-shaped draft sills having inwardly disposed upper flanges and outwardly disposed lower flanges, with their upper flanges lapping and being riveted directly to the top flanges of said center sill, and bottom tie members for said draft sills.

46. In a car underframe, a single center sill with top flange and vertical web, a bolster and Z-shaped draft sills lapping said center sill flanges and a bolster plate connecting said bolster, center sill and Z-shaped draft sill.

47. In a car underframe, a single center sill formed of a rolled section with continuous top flange, a flanged bolster, Z-shaped draft sills connected with the top flange of said center sill, means for connecting the bottom flanges of said draft sills and a bolster plate connected directly to the center sill, bolster flanges and top flanges of the draft sills.

In witness whereof we have hereunto set our hands in the presence of two witnesses.

ROBERT E. FRAME.
FREDERICK H. GIBBS.

Witnesses:
HILLEL TIFF,
F. O. REEMER.