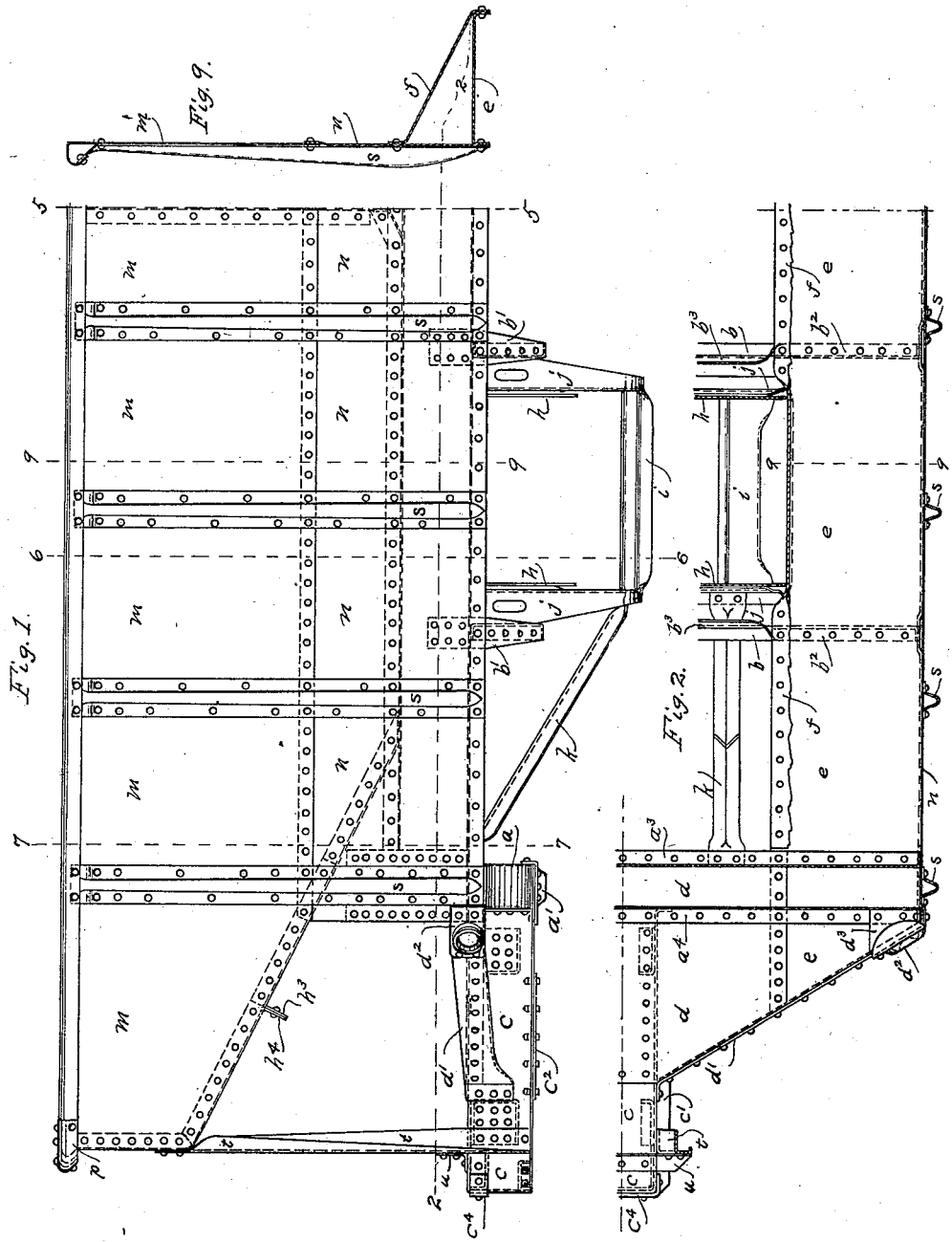
No. 646,196. Patented Mar. 27, 1900.

E. W. SUMMERS.

METALLIC CAR.

(Application filed Oct. 24, 1899.)

(No Model.) 4 Sheets—Sheet 1.



WITNESSES:

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(No Model.) 4 Sheets—Sheet 2.

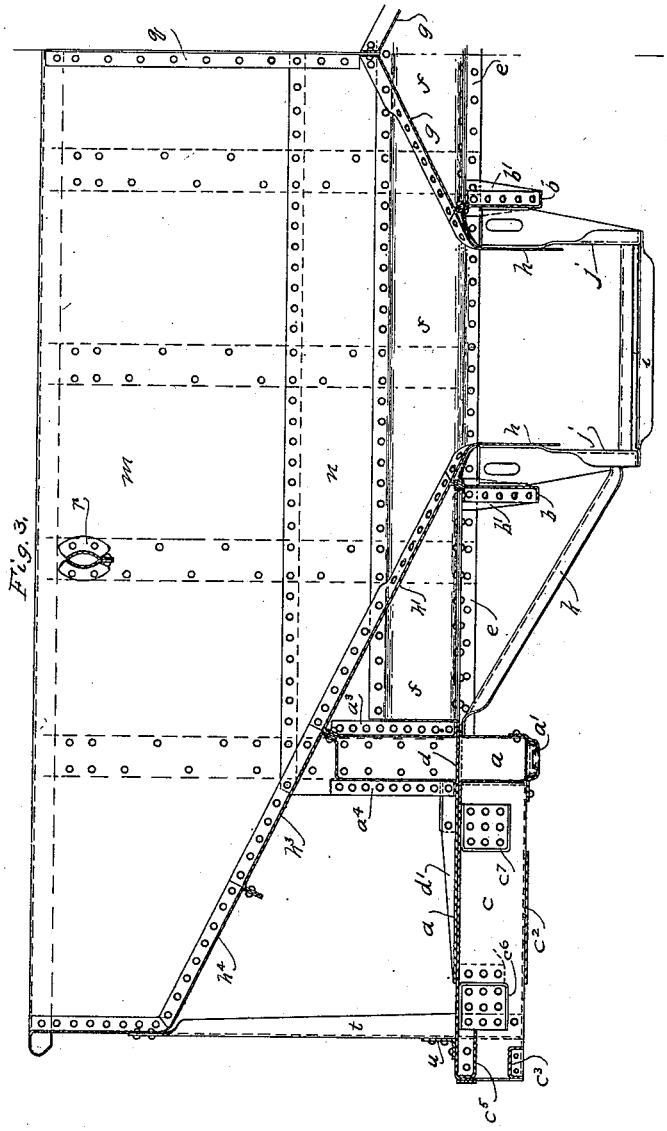

Fig. 3.

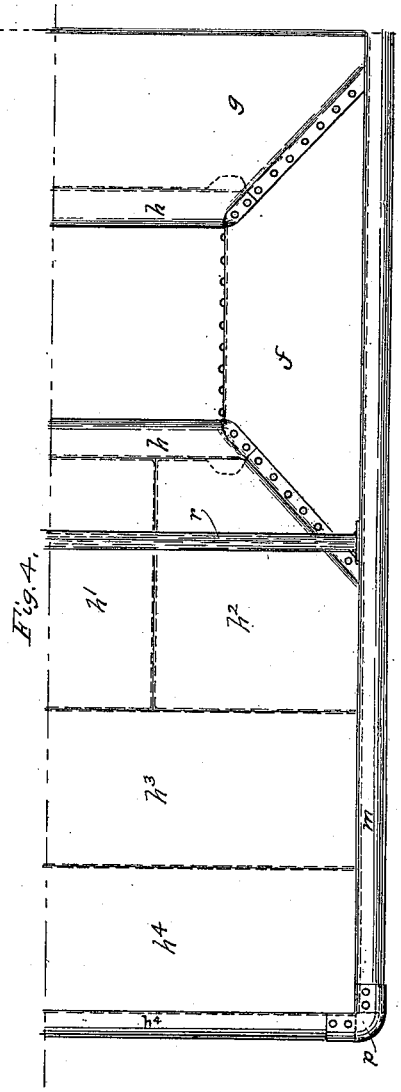

Fig. 4.

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(No Model.) 4 Sheets—Sheet 3

Fig. 7.

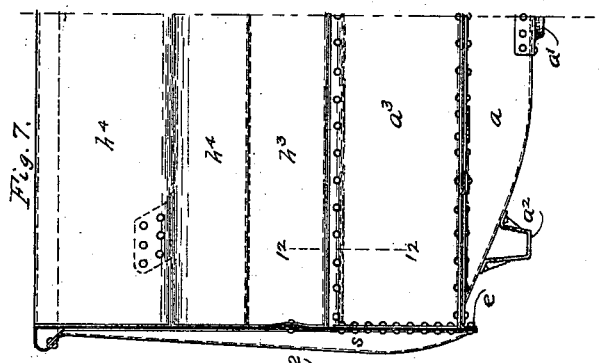


Fig. 12.

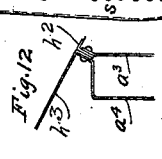


Fig. 13.

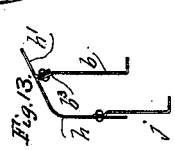


Fig. 11.

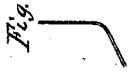


Fig. 6.

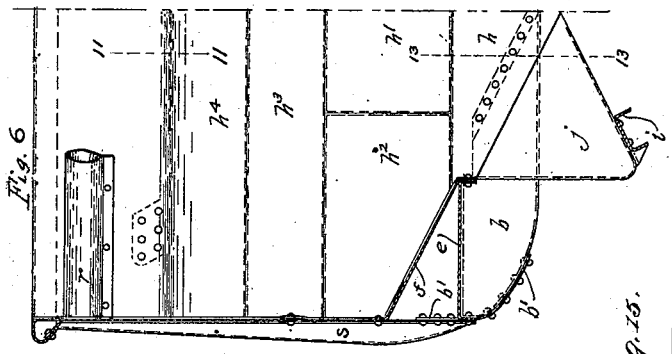


Fig. 15.

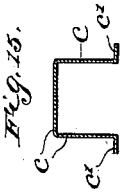


Fig. 5.

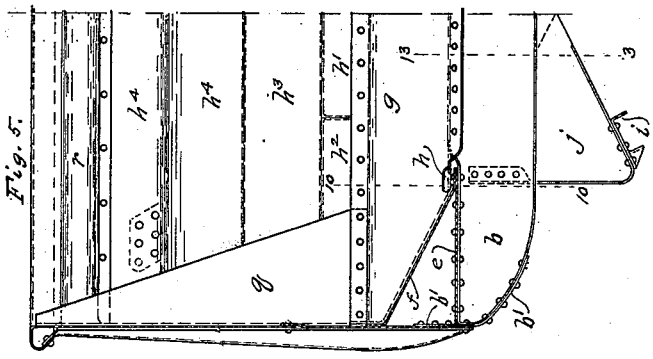
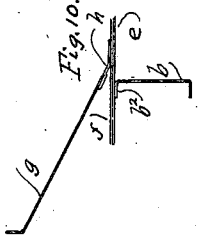


Fig. 10.



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(No Model.) 4 Sheets—Sheet 4

Fig. 8.

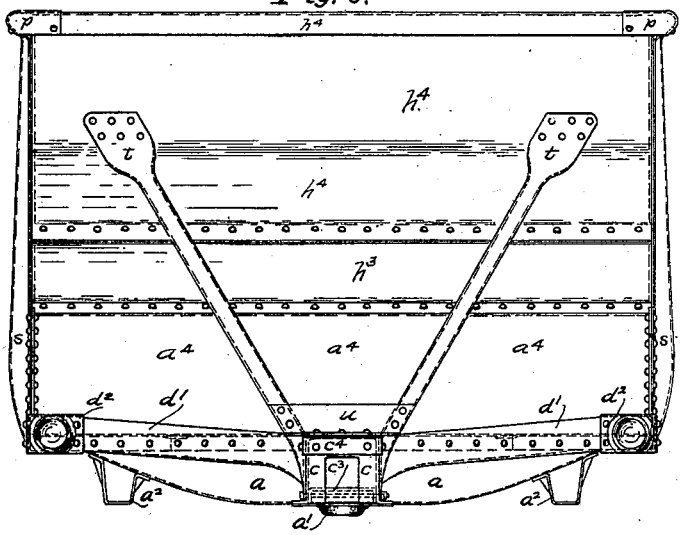
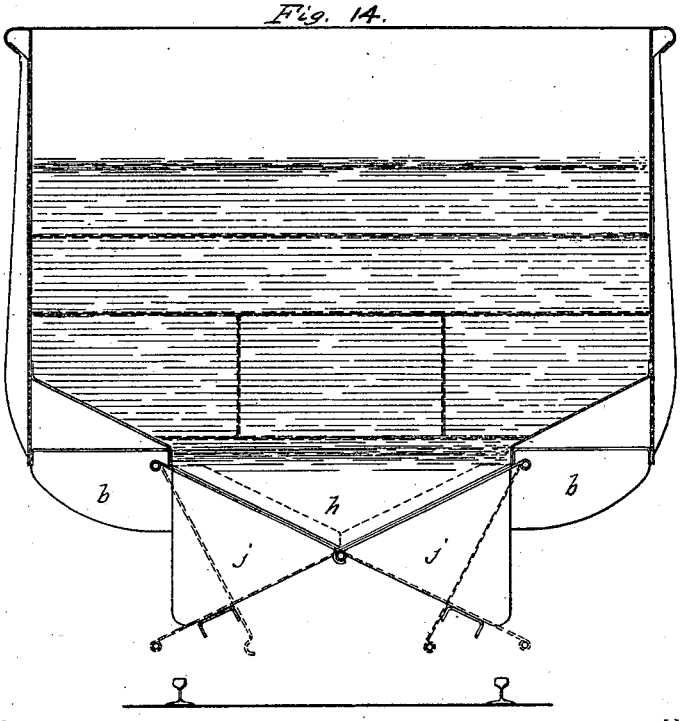


Fig. 14.



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UNITED STATES PATENT OFFICE.

EDGAR W. SUMMERS, OF AKRON, OHIO.

METALLIC CAR.

SPECIFICATION forming part of Letters Patent No. 646,196, dated March 27, 1900.

Application filed October 24, 1899. Serial No. 734,653. (No model.)

To all whom it may concern.

Be it known that I, EDGAR W. SUMMERS, a citizen of the United States, residing at Akron, in the county of Summit, and in the State of Ohio, have invented certain new and useful Improvements in Metallic Cars, of which the following is a full, clear, and exact description.

This invention relates, stated generally, to the construction of a railway-car, and, stated specifically, to the construction of steel hopper-bottom cars, and is designed with the express view of using it in connection with the doors and chute mechanism, as described and claimed in my application for car-bottoms filed June 28, 1899, Serial No. 722,177; but it is clearly within my invention to use it with any other form of door or chute that is applicable.

In order to avoid repetition of the fact, it may be stated once for all that the preferred construction of the parts of my invention may be constructed of mild steel plate and that the majority of the parts may be formed into shape at the temperature of the surrounding atmosphere. I desire it to be noted that I make a departure from the form and method of framing used in wooden-car construction. I do not use the longitudinal sills under the car or at the sides. The sides of my car are used as plate-girders, as well as for retaining-walls, and are constructed to resist the stresses due to both. Neither do I use the end sills.

In the accompanying illustrations of my invention I have endeavored to illustrate the parts in the proportions and arrangements as nearly as practicable and consistent with clearness, all drawings being made to the same scale; but it is clearly within my invention to make alterations in the several particulars so long as the principle of my invention is retained.

In the accompanying drawings, illustrating my invention, in the several views of which like parts are similarly designated, Figure 1 is a side elevation of the left-hand half of the car. Fig. 2 is a horizontal section taken in the line 2 2, Fig. 1, showing the part below the line and to the longitudinal and transverse center lines only, the car being symmetrical about these lines, except as hereinafter described. Fig. 3 is a vertical longitudinal section of the left-hand half of the car, the section being taken through the center line of the car. Fig. 4 is a top plan view of the nearer half of the left-hand half of the car. Fig. 5 is a vertical cross-section showing half of the car from one side and taken in the plane of line 5 5, Fig. 1. Fig. 6 is a cross-section similar to Fig. 5, but taken in the plane of line 6 6, Fig. 1. Fig. 7 is a cross-section similar to Fig. 5, but taken in the plane of line 7 7, Fig. 1. Fig. 8 is an end view of the car, showing nothing beyond the bolster. Fig. 9 is a section through one side of the car, taken in the plane 9 9, Figs. 1 and 2, showing only a stiffener and rivet-heads beyond the section. Fig. 10 is a vertical longitudinal section taken in the plane of line 10 10, Fig. 5. Fig. 11 is a section taken in the plane of line 11 11, Fig. 6. Fig. 12 is a section taken in the plane of line 12 12, Fig. 7. Fig. 13 is a section taken in the plane of line 13 13, Figs. 5 and 6. Fig. 14 is a vertical cross-section through the car in the plane of line 6 6, Fig. 1, showing the combination of this construction with the door and chute mechanism in my application, Serial No. 722,177, as referred to above. The light-shaded portion of the figure is intended to represent the floor of the car sloping from the end toward the center, and the heavy-shaded portion representing where the plates curve from the slope to the vertical. Fig. 15 is a vertical cross-section through draw-beam c and its integral flanges c'. This is shown apart from other plates attached to it in order that the shape of the body of the draw-beam may be made clear.

The floor-plates in the car, as shown, comprise four plates h, two plates g, two plates h', four plates h^2, two plates h^3, two plates h^4, and two plates f. h^4 also forms the vertical portion of the end of the car-body. (Shown in section in Fig. 3, inside elevation in Fig. 7, and outside elevation in Fig. 8.) The top edge of the plate is flanged out and curved downward conforming with the top of the side plates. The lower edge is flanged down and riveted to a similar flange on the upper edge of h^3, thus forming a reinforcing-beam to carry the floor-load out to the side plates. The ends of the end portion are flanged in and of the floor portion flanged up and riveted to the side plates. The lower edge of h^3 and the

upper edge of h' and h^2 are flanged down, and such flanges are riveted between the top edges of bolster-plates a^3 and a^4, (see Fig. 3,) thus making a very rigid lateral connection through the floor-plates to the bolster, which is continuous down to the truck. h^3 is riveted through its upturned flanges to the side plates n for a part of its length, the other part being flanged to conform with the sloping surface of plate f. (See Figs. 3 and 4.) h' is joined to h^2 by riveting their downturned flanges together the same as h^3 and h^4 are joined. This downturned flange between h' and h^2 is not shown in Fig. 3 in order that the other parts may be more clearly shown. On one side of the chute-opening floor-plate h is joined at its upper edge to the lower edge of h' and h^2 by riveting their downturned flanges together, and by the same rivets their connection is made to the upper edge b^3 of floor-beam b, (see Fig. 13,) thus forming a support for the floor-plates and a rigid lateral connection to the horizontal girders e. On the other side of the chute-opening floor-plate h is similarly connected to floor-plate g and floor-beam b. The lower ends of plates h hang vertical, having their lower edges shaped to conform with or to the plane of the doors when in their closed position and behind which the upturned edges of the doors may project. (See Figs. 1, 6, and 14.)

i and j are parts described in my application, Serial No. 722,177, and do not need other description here.

Where plates h are joined to h^2 and to g over the connected edges of e and f, (see Figs. 4, 5, and 10,) the flanged portion on the lower edge of h^2 and of g is omitted and the upper edge of h is turned up under the lower edge. Floor-plate g extends from side to side of the car, and the lower edge is flanged down and riveted to h and b, as described. The plate rests mainly on f and is flanged to conform with the sloping surface of f and riveted thereto the same as plate h^2. The holes for these rivets are countersunk in the top plate and the rivets driven flush. These two joints are the only places where rivets occur in the sloping surface.

By the above-described construction I obtain a floor-surface which is practically free from all projections and am enabled thereby to make the floor with less than the usual inclination and still have the material in the car to flow freely. The portion of the plate g which extends to the side of the car is flanged up and riveted thereto.

The upper edges of plates g meet each other on the center line of the car, where they have their edges turned up and are riveted through such flanged edges to each other as well as to plates q, hereinafter described.

The floor-beams b are channel-shaped near the ends, as shown in section, Fig. 10, the upper flange for the central portion being turned up normal to the floor-surface, as shown in section, Fig. 13. The beam is rounded off narrow to the end (see Figs. 5 and 6) and has its vertical support in the hanger-plates b', which are riveted to the end of the beam and to plates n of the car side. (See Figs. 1, 5, and 6.)

Fig. 2 shows the outer edge of horizontal girder e depressed where hangers b' occur. By this construction I carry the floor-load direct to the side girders, and thence to the bolsters, avoiding the necessity of under longitudinal sills for carrying vertical load. I thereby obtain a large opening in the floor, through which the load is discharged.

The side of the car comprises the lower plate n and the upper plate m, which are reinforced against buckling with stiffeners s. n is riveted at each end to the end flanges of bolster-plates a^3 and a^4. (Shown in Figs. 1 and 3.) The upper edge of n is offset to overlap the lower edge of m where the two are riveted together, preferably leaving an even outside surface, to which the stiffeners are riveted, and the offset part of n is made gradual, so as to form but slight obstruction should the unloading at any time be accomplished by turning the car over sidewise, as is now done in car-unloading machines, in which case the material to be unloaded may find lodgment against abrupt projections. The lower edge of n is riveted to the downturned flange of e. (See Figs. 1, 2, and 9.) This provides a reinforcement for the lower edge of the car side, increasing its moment of resistance as a girder. In order to have the top of the car side resist compression and to keep the ratio of the length to the least radius of gyration within a safe limit, the top of plate m is flanged out and curved downward, the edge of the plate pointing in toward itself, preferably at an angle of about forty-five degrees with the vertical, the top part of stiffeners s being turned out and riveted to the edge of m. (See Figs. 1, 5, 6, 7, and 9.) I may also increase the section at the upper edge of m by leaving the plate with increased thickness at this part in the process of rolling. Corner splice-plates p are pressed to conform with the rolled top of side and end plates and are riveted thereto. The side plates are also protected against buckling by means of cross-struts r and brace-plates q. (See Figs. 3, 5, 6, and 7.) Cross-struts r are preferably formed of one piece of metal, bent into an oval or elliptic shape in its cross-section, the plate edges riveted together on the lower side. The strut is flanged out at the ends for riveting to the side plate, as shown in Figs. 3, 4, 5, and 6. Brace-plates q are provided for the purpose of staying the tops of the side girders against lateral deflection. q has its lower edge riveted to g, as hereinbefore described, and is riveted to the side plates through its flanged edge, as shown in Figs. 1, 3, and 5. This connection is the only unsymmetrical part about the longitudinal and transverse center lines of the car.

For clearness I have shown both plates q flanged toward the same end of the car, as I

have only shown this end of the car. (See Figs. 1 and 3.) In practice I would preferably flange both plates alike. Then when riveted in position the flanges will point toward opposite ends of the car and the side plates will fit on either side of the car. Floor-plates *f* extend from bolster to bolster on each side of the car, and besides forming a part of the inclined floor serve as one side of a column having a triangular cross-section, (see Fig. 9,) making a very rigid construction for resisting compression due to jamming cars together. It also serves as a brace for the side plates against the overturning tendency from its action as a retaining-wall. Draw-beam *c*, Figs. 1, 2, 3, 8, and 15, is of an inverted-trough-shaped section and is flanged outwardly at the bottom.

c^2 is a carrier-plate bolted to the outturned flange c' and is removable for the purpose of withdrawing the draw-bar when necessary.

c^3 is a carrying-plate of channel-shape with its ends boxed in, having bolts through the end flanges and through the vertical webs of *c*. The outer end of *c* is partly boxed in, leaving an opening for the passage of the draw-bar, and is reinforced above the opening inside and outside with bar c^4 and plate c^5 to resist the impact from the abutting of the draw-head.

c^4 is a bar bent around the end of *c* and riveted as shown.

c^5 is a plate flanged upon two sides and one end, the end flanges abutting against the boxed end of *c*, the side flanges being riveted to the sides of *c* and abutting at the inner end against c^6.

c^6 and c^7 are flanged plates which will be made of the usual or approved form for the draw-bar connection.

The office of draw-beam *c* is to transmit the forces due to moving the car along the track and is not a support for any part of the car-body. Its outer end is carried and held against any up-and-down movement relative to the car-body by braces *t*, hereinafter described. The forces due to moving the car along the track are transmitted to the car through plate *d*, which is riveted to the top of *c*, near the center of *d*, and to the inner edges of plates *e e*, being offset down, leaving an even top surface.

d extends back through between the upper and lower parts *a* and a^3 a^4 of the bolster and is riveted to their horizontal flanges. I may also extend *d* in beyond the bolster in order to get a riveted connection between *d*, *e*, and *f*. (See Figs. 1 and 2.) The edges of *e* and *d* toward the end of the car are flanged down and are reinforced with d', which is made of a plate having its under edge flanged in, its inner end bent to conform with the side of *c*, and its outer end bent around the side of the car and all riveted, as shown.

e is a substantially-horizontal plate extending from end to end of the lower outside edge of the car-body and is adapted to transmit the forces (caused by the draw-bar action) to the car sides and floor.

d^2 is a poling-pocket to be made of approved or usual form.

d^3 is a reinforcing-plate flanged up adjacent to the poling-pocket. The inner end of *c* has its side plates flanged outward and is riveted to the vertical web of *a*.

a' is a cupped center bearing-plate of usual or approved form, through which the truck connection is made, the whole making a most rigid and economical construction.

The bolster comprises the lower part *a* and the upper parts a^3 and a^4. *a* may be made of one piece of plate having a trough-shaped cross-section, deepest in the center, the lower edge tapering up to the ends, the depth at the ends being the thickness of the plate only, the sides being flanged outward at the top, forming a substantially-horizontal top, the flanges being depressed from the even top at the joint between *e* and *d*. (See Figs. 2 and 7.) The side bearings a^2 may be of usual or approved form. These bearings are not shown in Fig. 1. a^3 and a^4 have their ends flanged out for connection to the side girders, and their bottom edges flanged out for connection as hereinbefore described. The top of a^4 is bent over and riveted, as hereinbefore described, and is clearly shown in Figs. 12, 7, 2, and 8. The bolster may be provided with a vertical diaphragm at the center bearing-plate. Braces *t* may be of a channel-shape, the channel-flanges pointing in toward the car. The flange adjacent to the draw-beam *c* may be set to conform with and is riveted to the side of *c*. *t* is also connected by means of angle-lug *u* to the top of *c*. The upper end of *t* is flat and is riveted to the end of the car-body, all as shown in Figs. 1, 2, 3, 5, 6, 7, and 8.

k is an angle-shaped brace with its ends flattened, its upper end riveted to the bolster, and its lower end riveted to the lower flange of the chute side *j*. Stiffeners *s* are triangular in their cross-section, are flanged out at the base of the triangle, and at the apex are curved to a small radius. This section is used to prevent crushing from a heavy pressure on the side of the car, which may be caused by turning the car over on its side with a load in it, should it be unloaded in a car-unloading machine. The stiffener has its greatest depth at the point where *f* is attached to *n* and tapers thence toward the ends. The upper end is flanged outward and riveted, as hereinbefore described, being a means of transmitting a part of the girder-flange stress to the web and tending to equalize the unsymmetrical form of the top flange of the girder. For the general shape of *s* and other riveting see Figs. 1, 2, 3, and 9.

The structure is designed throughout with the view of eliminating ambiguity from or of the stresses, and the stresses may be calculated with reasonable accuracy for all the parts. I have purposely omitted from the drawings such details as are not directly in-

volved in my invention, and as to these details I propose to supply them at discretion.

What I claim is—

1. A car-body having its sides composed of plates of metal, the lower part of the side plate forming one side of a triangular member, the other sides being formed with plate *e* and plate *f*, substantially as and for the purpose set forth.

2. A car-body, having its sides composed of plates of metal, the plate at the upper edge of the car side being flanged outward and downward, the downturned edge being riveted to the outturned end of the stiffener, substantially as and for the purpose set forth.

3. In a car the floor-plates of metal being flanged downward at their intersection, riveted together through such flanges, the flanged joints extending crosswise of the car, the plates being flanged at their intersection with the car side and riveted through such flanges to the car side, the flanges being integral parts of the plate.

4. In a hopper-bottom car, the end floor-plate having its lower edge flanged downward, its upper edge turned up forming the end of the car, its sides flanged and riveted to the car sides, substantially as described.

5. In a car, metallic floor-plates flanged downward and such flanges riveted to the bolster for the purpose set forth.

6. In a car, metallic floor-plates flanged downward and such flanges riveted to transverse floor-beams.

7. A hopper-bottom car, having its floor composed of plates of metal, flanged downward at the intersection of the plates, such flanges extending crosswise of the car and riveted together through the flanges, the plates being flanged at their intersection with the car side and riveted through such flanges to the car side, the flanges being integral parts of the plate.

8. The floor-plate *h*, with its upper portion at an inclination and in the plane of the floor, its lower portion substantially vertical and extending down to the closed position of the doors, the vertical portion being riveted to the side plate of the chute the said side plate being flared out or offset away from plate *h* far enough to admit the upturned flanges of the door between the two plates, substantially as and for the purpose set forth.

9. In a hopper-bottom car, the floor-plate *f*, forming the side sloping portion of the floor and extending under the end sloping portions of the floor, its upper edge flanged and riveted through such flange to the car side, its lower edge being riveted to plate *e*, substantially as and for the purpose described.

10. In a hopper-bottom car, a substantially-horizontal plate at each side of the lower edge of the car-body, extending longitudinally (with regard to the length of the car,) from bolster to bolster and connected thereto, its outer edge being flanged and riveted through such flange to the car side, its inner edge being riveted to plate *f*, substantially as and for the purpose set forth.

11. In a hopper-bottom car, a transverse horizontal girder, having its web-plate attached to the draw-beam and to the upper and lower parts of the bolster, being adapted to transmit the forces (caused by the draw-beam action) to the sides of the car, substantially as and for the purpose described.

12. In a hopper-bottom car, a transverse horizontal girder attached to the draw-beam, having its greatest depth near the longitudinal center line of the car, and tapering from the side toward the end of the car, to its shallowest depth near the side of the car, leaving a large open space between the ends of adjacent cars, substantially as set forth.

13. In a hopper-bottom car, a draw-beam extending from the bolster to the end of the car, the outer end of the draw-beam depending on the overhanging part of the car-body for its vertical support, substantially as described.

14. In a hopper-bottom car, a draw-beam, having its body of an inverted-trough-shaped section with its lower edges flanged outward, its inner end attached to the bolster, substantially as and for the purpose set forth.

15. In a hopper-bottom car, a body-bolster composed of an upper and a lower part, the upper and lower parts being flanged at their intersection and riveted through said flanges to each other and to the horizontal transverse girder, substantially as described.

16. In a hopper-bottom car, a body-bolster, composed of an upper and a lower part, its upper part being riveted through its upper edge to the downturned flange of a floor-plate, its ends being flanged and such flanges being riveted to the car side, substantially as and for the purpose described.

17. In a hopper-bottom car, a body-bolster composed of an upper and a lower part, the upper part being riveted to the floor-plate, substantially as described.

18. In a hopper-bottom car, a body-bolster composed of an upper and a lower part, the lower part being bellied down, supporting the center bearing-plate on its under side, also being riveted to the end flanges of the draw-beam, substantially as described.

19. In a car, a transverse floor-beam, having its upper edge riveted to the downturned flange of a floor-plate, and its ends attached to the side plates for support.

20. In a hopper-bottom car, a transverse floor-beam, having its upper edge riveted to the downturned part of a floor-plate for the middle portion of the beam, and for the end portions to the horizontal plates *e*, substantially as and for the purpose set forth.

21. In a hopper-bottom car, the cross-strut *r*, being in cross-section of an oval shape with the plate of which it is made riveted together on one side of the strut, its ends flanged out for connection to the car sides substantially as shown.

22. In a metallic car the stiffeners for side plates of a substantially-triangular cross-section, flanged out at the base of the triangle for riveting to the side plates and curved to a small radius at the apex of the triangular cross-section for the purpose described.

In testimony whereof I have hereunto set my hand this 20th day of October, A. D. 1899.

EDGAR W. SUMMERS.

Witnesses:
R. HERBERT WILKINSON,
L. V. CUSHING.