No. 704,965. Patented July 15, 1902.

H. C. HODGES & G. A. BLUME.

CAR CONSTRUCTION.

(Application filed May 4, 1901.)

(No Model.) 4 Sheets—Sheet 1.

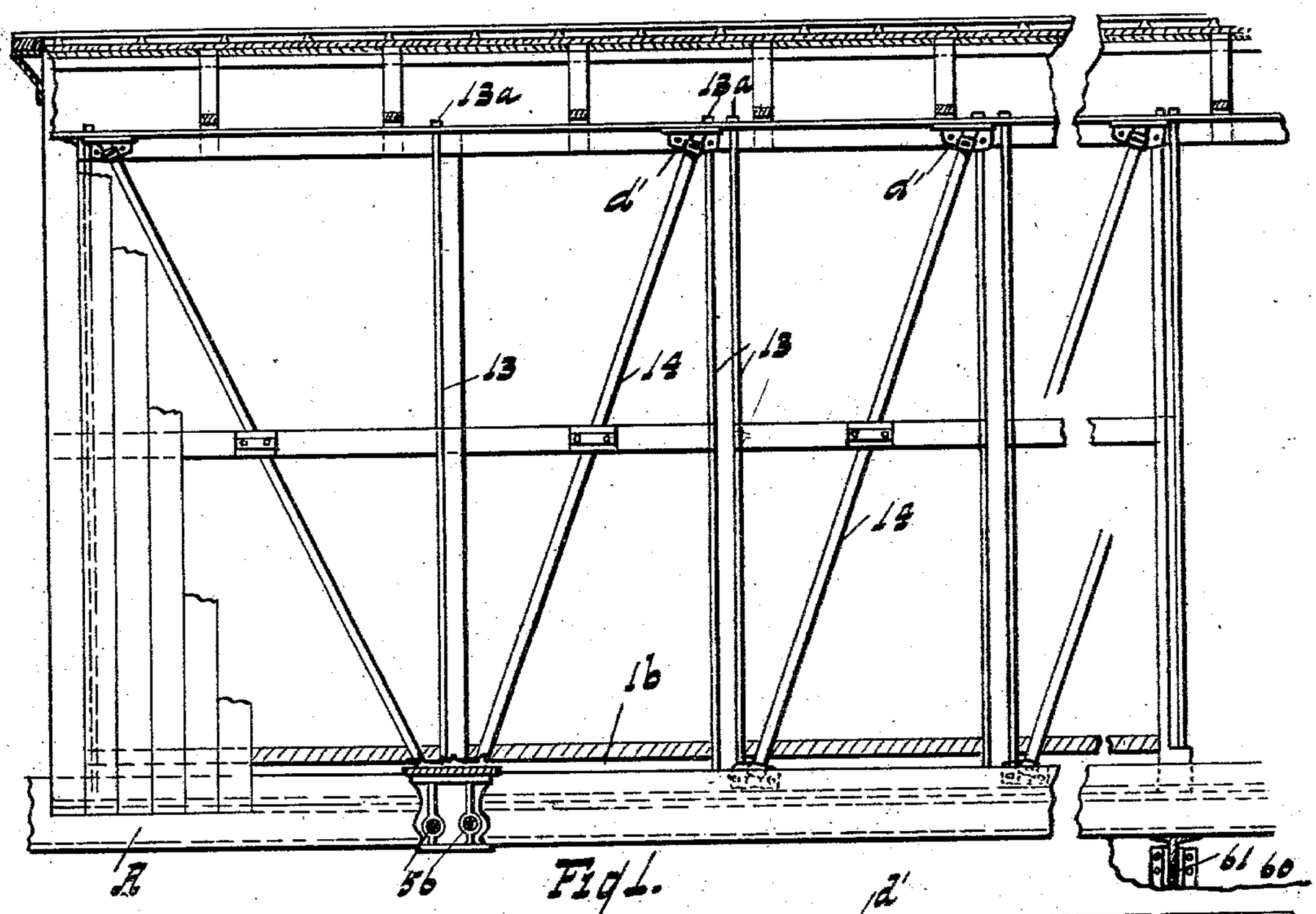


Fig 1.

Fig 2.

WITNESSES
T. Y. Massey
May E. Kott.

By

INVENTORS
Henry C. Hodges
Gustave A. Blume,
Parker & Burton,
Attorneys.

No. 704,965. Patented July 15, 1902.

H. C. HODGES & G. A. BLUME.

CAR CONSTRUCTION.

(Application filed May 4, 1901.)

(No Model.) 4 Sheets—Sheet 2.

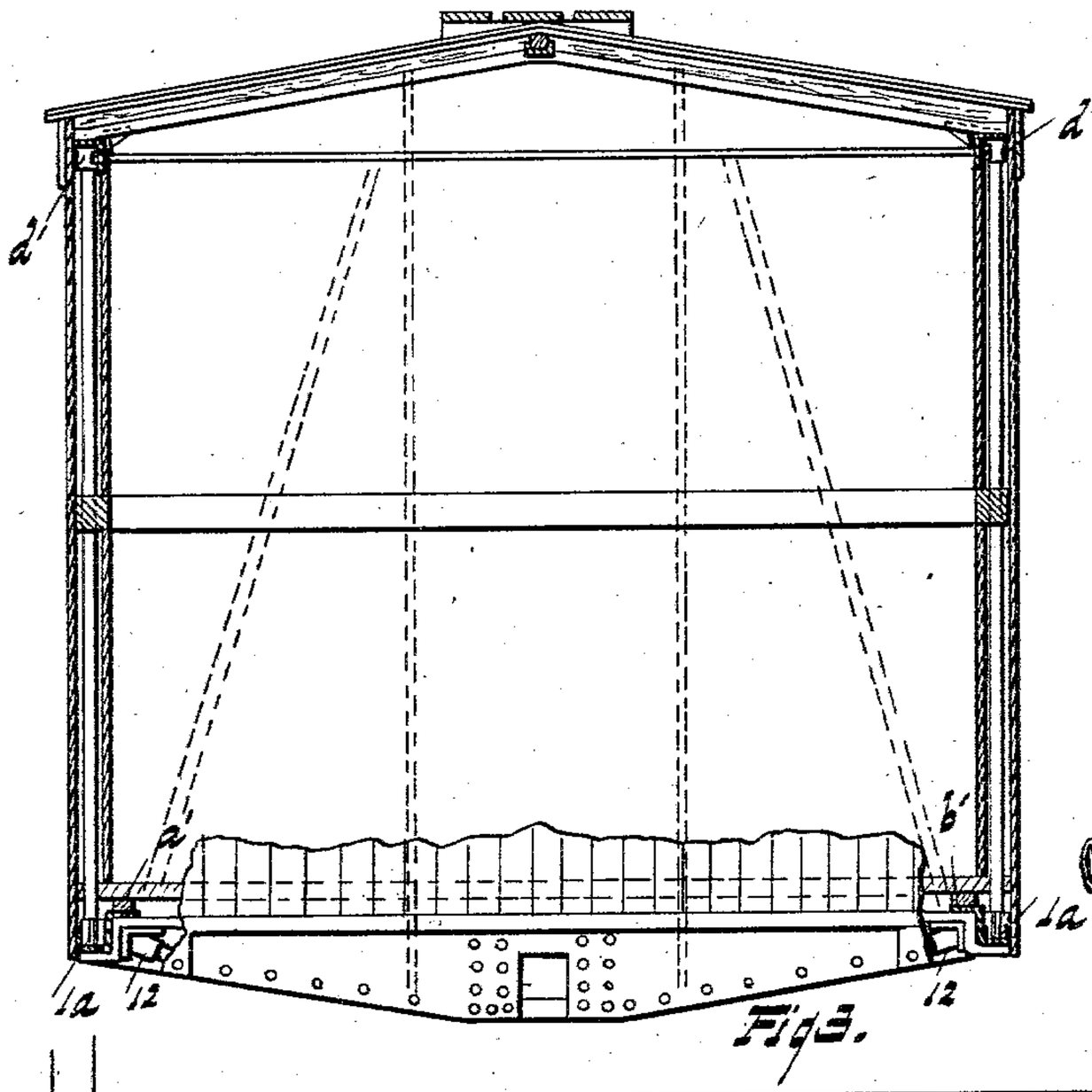


Fig 3.

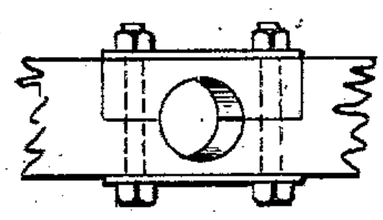


Fig 4.

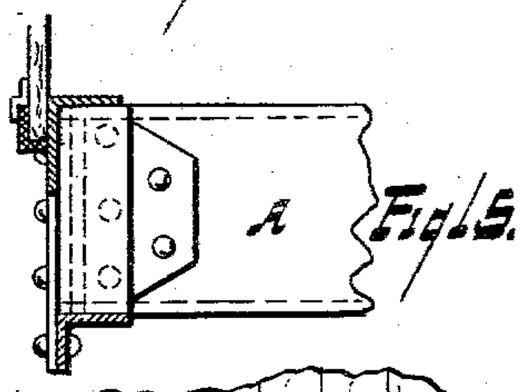


Fig 5.

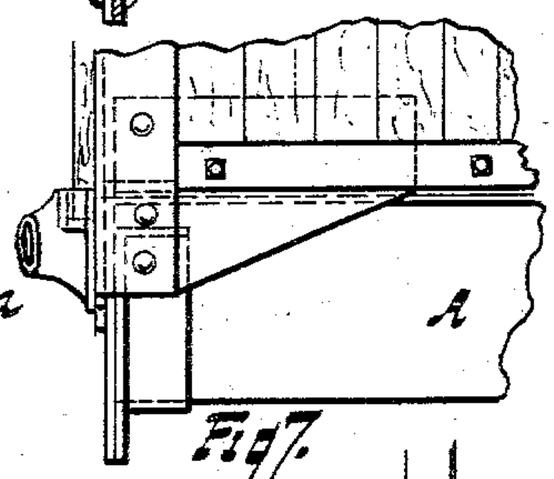


Fig 7.

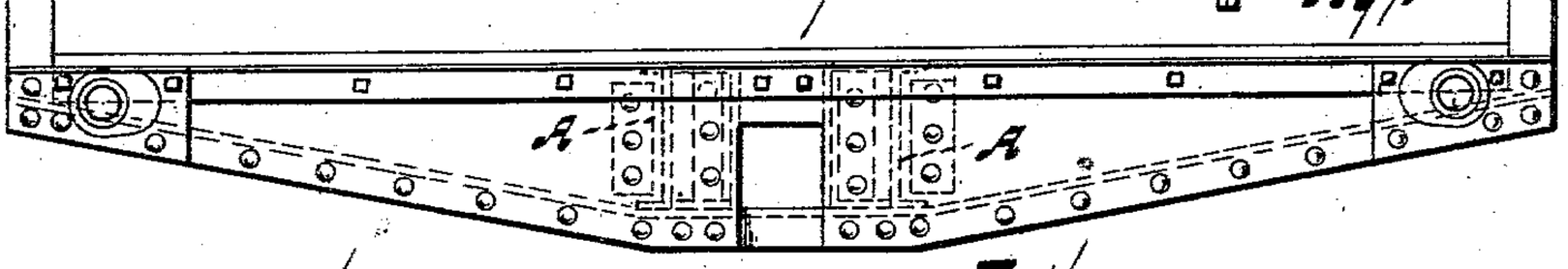


Fig 6.

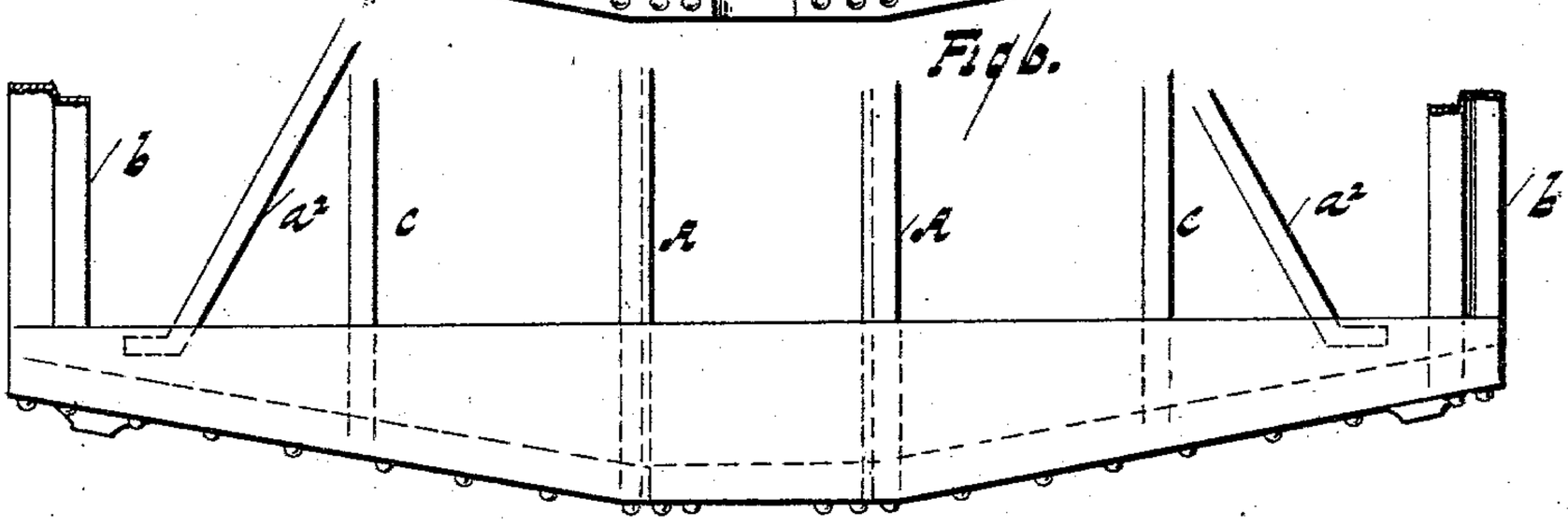


Fig 5.

WITNESSES

T. J. Massey

May E. Nott.

By

INVENTORS

Henry C. Hodges

Gustave A. Blume

Parker & Burton

Attorneys.

No. 704,965. Patented July 15, 1902.

H. C. HODGES & G. A. BLUME.

CAR CONSTRUCTION.

(Application filed May 4, 1901.)

(No Model.) 4 Sheets—Sheet 3.

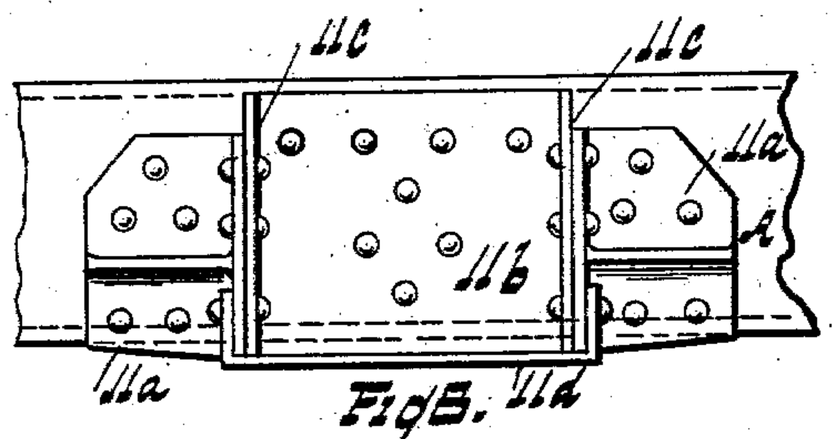


Fig 8.

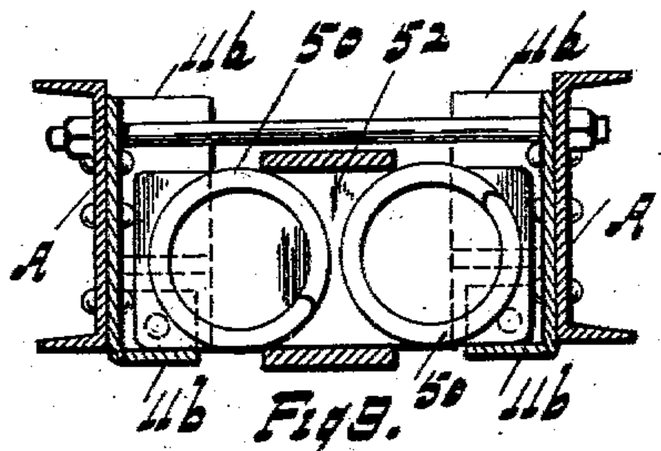


Fig 9.

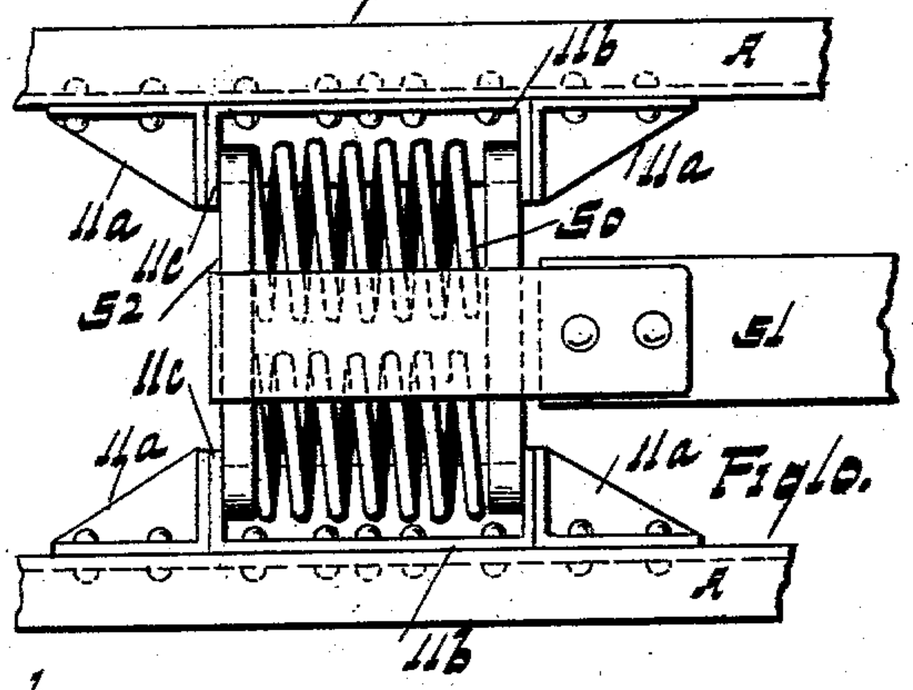


Fig 10.

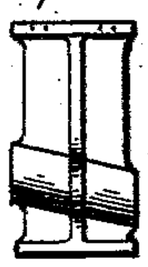


Fig 14.

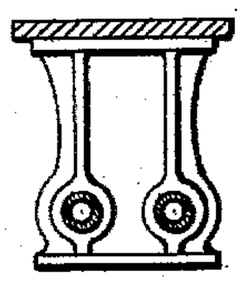


Fig 13.

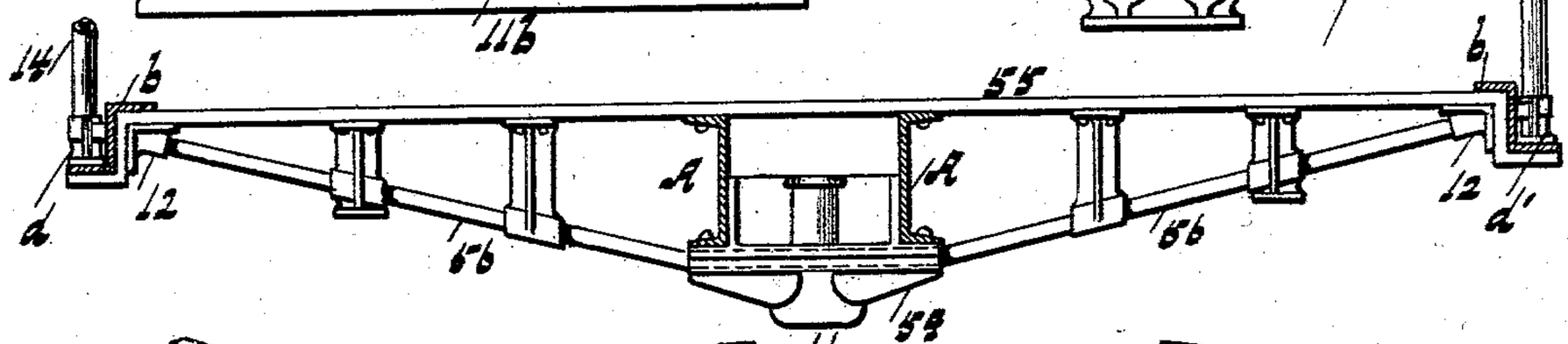


Fig 11.

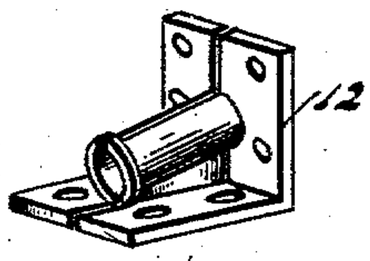


Fig 12.

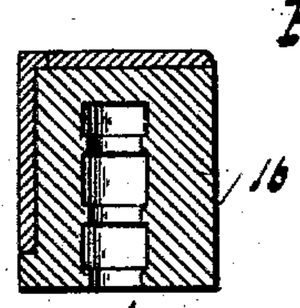


Fig 16.

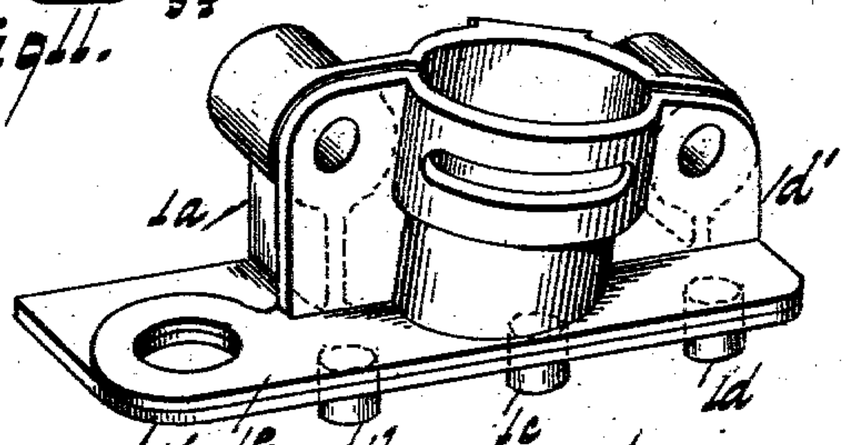


Fig 18.

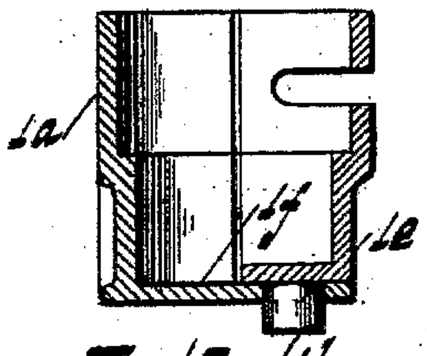


Fig 19.

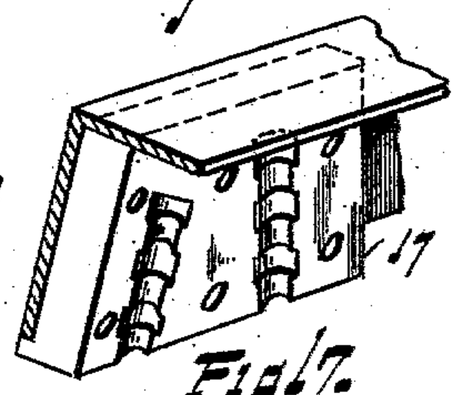


Fig 17.

WITNESSES

T. J. Massey

May E. Mott.

INVENTORS

Henry C. Hodges

Gustave A. Blume

By Parker & Burton

Attorneys.

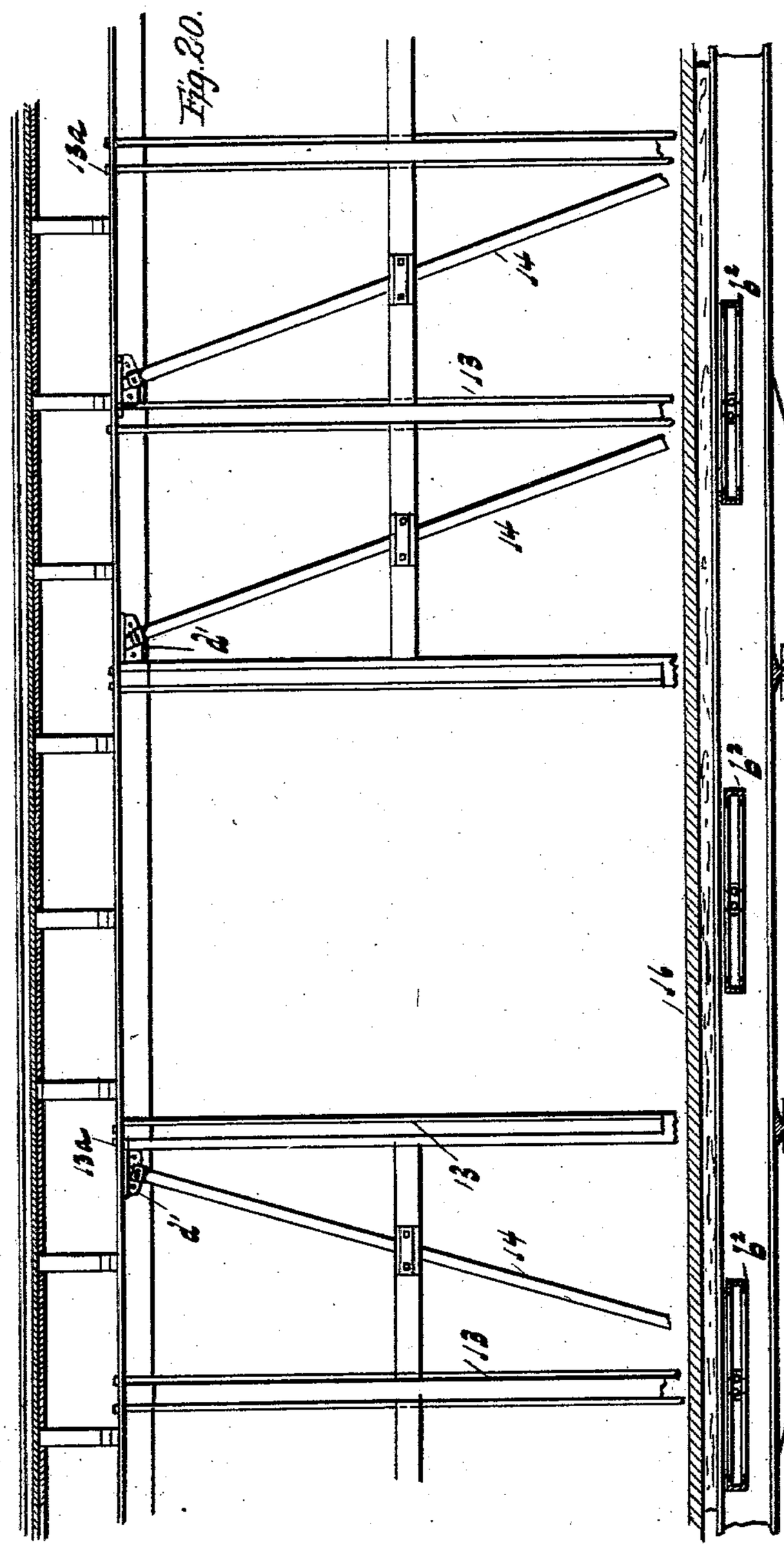
No. 704,965. Patented July 15, 1902.

H. C. HODGES & G. A. BLUME.

CAR CONSTRUCTION.

(Application filed May 4, 1901.)

(No Model.) 4 Sheets—Sheet 4.



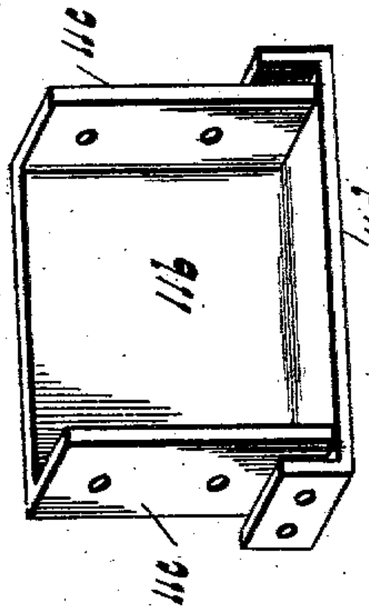


Fig. 22.

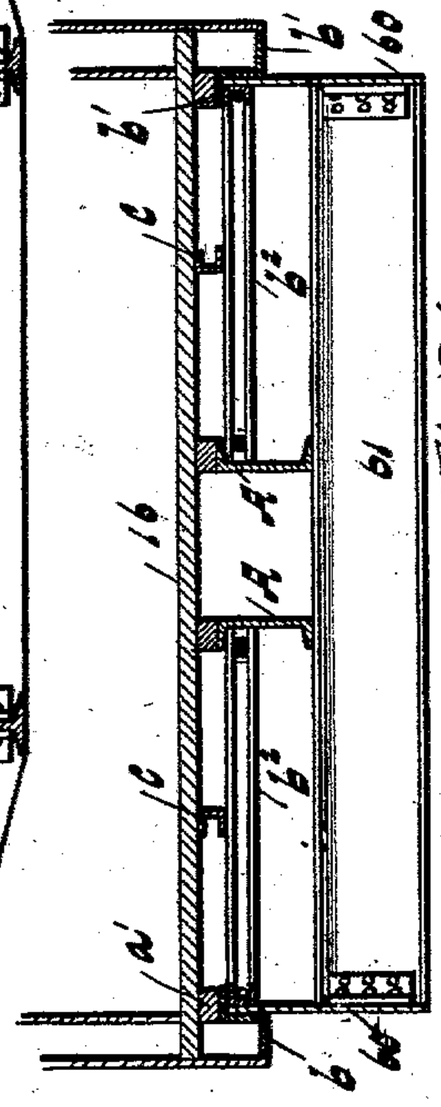


Fig. 21.

WITNESSES

J. J. Massey

May E. Nott.

INVENTORS

Henry C. Hodges

Geo. A. Blume

By Parker & Burton

Attorneys.

UNITED STATES PATENT OFFICE.

HENRY C. HODGES AND GUSTAVE A. BLUME, OF DETROIT, MICHIGAN;
SAID BLUME ASSIGNOR TO SAID HODGES.

CAR CONSTRUCTION.

SPECIFICATION forming part of Letters Patent No. 704,965, dated July 15, 1902.

Application filed May 4, 1901. Serial No. 58,701. (No model.)

To all whom it may concern:

Be it known that we, HENRY C. HODGES, a citizen of the United States, and GUSTAVE A. BLUME, a subject of the King of Sweden and Norway, both residing at Detroit, in the county of Wayne, State of Michigan, have invented a certain new and useful Improvement in Car Construction; and we declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it pertains to make and use the same, reference being had to the accompanying drawings, which form a part of this specification.

This invention relates to car construction, and has for its object improvements in the construction of composite railway-cars by which the car is built stronger without increasing the weight of the material employed.

In the evolution of the modern car many attempts have been made to build cars of metal or partly of metal and partly of wood, and for general purposes the composite car built partly of metal and partly of wood seems to meet the requirements of commerce in the most desirable way.

In the early history of the art a car-body built substantially entirely of wood met all the requirements; but at the present time greater strength is required, greater capacity to carry loads, and greater ability to withstand the more rapid transit that is now a necessity have shown that the early wooden structures no longer meet the requirements.

A car built entirely of iron or steel is useful for some purposes; but it has for certain types of cars disadvantages which need not be pointed out.

Our object is to construct a railway-car to secure the strength of metal and the advantages of wood and to so arrange the structure that all the material entering into it shall contribute its due share to the strength of the construction.

In the composite-car construction heretofore made the substructure has been designed with purpose of resisting the larger proportion of strain inflicted upon the car, and outside of their purpose to form a housing for the load, as well as to protect the same, the sides have (a few constructions only excepted) contributed little to the carrying strength of the construction.

The car which embodies the invention is composed of beams, tubes, tension-rods, channels, with engagement members, as hereinafter described.

A railway-car differs from any other structure, and the problem of producing such a car which shall utilize to the fullest extent the material of which it is composed, so that there shall be no useless dead-weight carried and yet so that the car shall be strong to resist the strains of haulage, quick stoppage, the twisting of uneven tracks, and the added stress produced by winds while the car is in motion and is subject to all normal strains, is one that is difficult of solution. The rules which are applicable to bridge building or to the building of stationary structures are not fully applicable in car construction; but naturally that construction fulfils best all requirements in which every part of said construction is placed in such a position that it contributes in equal proportion to its own strength to the strength of the car. The inventors, therefore, propose the application in the sides of a composite car such material which enables said sides to contribute to the carrying of the load in a greater proportion than heretofore possible and this without adding materially to the dead-weight of this part of the car construction. A successful solution of this will bring about the reduction of material in the car substructure and will give a lighter car better proportioned than in previous composite-car constructions.

According to our invention the sides form a truss supported near each end of the car by the body-bolsters. At the center of the car, underneath the door-opening, the bottom chord is fortified by a tie-plate. The bottom chord of said truss may be made in special form to engage the uprights, both compression and tension members, and to support the same against both straight thrust along the member and against the shearing strain incident to the movement of the car.

In embodying our invention we employ in the center part of the underframe of the car two beams parallel with each other and extending from end to end of the car. These

beams are preferably channel-beams and are spaced enough to allow the introduction of the draw-bar and its accessories between them. The side sills of the underframe, which are also the bottom chords of the side trusses, may be made a Z-shaped angle-iron. (Z-beams are double angle-bars, with the flanges turned out in opposite directions from the web which unites them.) These beams, the channel-beams along the middle line, and the two beams at the sides constitute the main longitudinal beams of the floor. They are tied by diagonal floor-braces, and a light floor-supporting beam runs longitudinally of the car between each side beam and its adjacent middle beam. This floor-supporting beam rests on the floor-beams and is elevated thereon, so that the flooring when nailed to the flooring-strips on the center and side beams rests directly on said beam. For the purpose of reducing the section of the center sills these sills are near the middle line of the car and on each side thereof supported by two cross-beams, which transfer part of the load from the middle part of the car to the side trusses, thus enabling the utilization to a larger extent of the strength of the material employed in construction of the sides.

The top chord of each side of the car may be an angle-iron with one flange extending downward and one flange extending horizontally outward and under the horizontal flange, and outside the vertical flange are secured pocket-abutments for the reception of the ends of the compression members of the side truss. The trusswork proper has its main bearing-point directly over the bolster, and from this point one compression member extends diagonally upward toward the end of the car and terminates at the corner. A similar compression member extends diagonally upward toward the middle of the car to an abutment on the upper chord. From this abutment a tension member or members extend down to the lower chord and pass through an abutment which is vertically beneath it, the tension member being extended through both the upper and the lower chord and being provided with means for securing it, so that it will constitute a tension member between the two parts. A second diagonal compression member extends from the lower end of the tension member, where it is secured in the abutment, to a similar securing-abutment underneath the horizontal outward-extending flange of the upper chord, and this form of bracing by compression members and tying by tension members is continued to the door-opening at the middle of the car, where the last tie-rods are close to the side frame of the door-opening. The other end of the car has its side frame constructed in an exactly similar way, and the two trusses thus formed are connected by a tie-plate secured to the lower chord and crossing between the two trusses underneath the door-sill. There are two tie-plates, one at each side of the car, and these support the two cross-beams which lie across the car, one at each side of the door-opening. The compression members are tubular shapes, the ends of which engage against and into the abutment-pockets, which are bolted to the chords; but the compression members are not themselves bolted to the chords either at the top or bottom, and thus there is no tendency to shear the boltwork. The tie members are long rods, which, as before described, tie the top and bottom chords together at each engagement of the compression members. Between the top and the bottom chords of the side framework is a longitudinal girth of wood, which girth is provided along its length, at the places where the upright members cross it, with gains, into which the uprights are fitted, and over each upright a short piece of wood is fitted into the gain and bolted to the girth, so that each upright piece is completely surrounded, and embedded in this wooden girth, extending lengthwise of the car at a proper distance between the top and the bottom chords, this wooden strip serves as a clamp and lathing to which to secure the siding of the cars, and it also serves as a damper to prevent vibration of the upright members.

In the drawings, Figure 1 shows a portion of a car-frame in side elevation. Fig. 2 shows a portion of the floor detail in plan view. Fig. 3 shows an end elevation of car-frame. Fig. 4 shows the detail of a piece of the damper-bar and clamp. Fig. 5 shows a plan of the abutment. Fig. 6 shows a front elevation of the abutment. Fig. 7 shows an elevation of the abutment. Fig. 8 shows the draw-bar connection. Fig. 9 is an end view of the draw-bar connection. Fig. 10 is a plan of the draw-bar connection. Fig. 11 shows the bolster. Fig. 12 shows the abutment for the bolster-rod. Fig. 13 shows the middle brace for the bolster. Fig. 14 shows a brace intermediate the middle and end of the bolster. Fig. 15 is a section longitudinal of the car at the middle of the parts shown in Fig. 6. Fig. 16 is a cross-section of an abutment-step. Fig. 17 is a perspective showing an abutment-step. Fig. 18 is a perspective of the casting of an abutment of same somewhat different to that shown in Figs. 16 and 17. Fig. 19 is a cross-section of Fig 18. Fig. 20 shows a longitudinal section of the middle part of the car-frame. Fig. 21 is a central cross-section of the floor and under-floor framing. Fig. 22 is a perspective of the draw-bar holder.

Similar characters refer to similar parts.

A A indicate the middle angle-beams, which constitute one of the main beams of the floor construction, and *b* indicates the side Z-beam. To the top flange of the middle bar and to the top horizontally inward extending flange of the side Z-beams are secured nailing-strips *a' b'*, on which the floor-boards rest and to which the floor-boards are secured. The vertical webs of the Z-beams are braced by diagonal struts a^2 and b^2. A metallic floor-stringer C is supported on these struts. At

intervals along the lower chords are abutment-pockets *d'*. Each abutment may be fortified by a sheet or angle of steel. The pockets are made of metal, of which the details are shown in Figs. 17, 18, and 19. They are made in two parts, one of which, 1^a, is to engage snugly in the angle between the flanges of the beam. It may be provided with dowels 1^b 1^c 1^d, that project from the body and are arranged to engage through holes in the horizontal flange of the beam. The second part lies alongside the first and at the end overlaps it. Through the overlap 1^e of the second part and the underlap 1^f of the first part are holes that register, and through these holes and through the flange of the truss-chord passes the tie-chord. Where the two parts 1^a 1^b lie side by side there is in each a reëntering curve, and in the two parts when assembled there is a circular cavity having an abutment at the bottom arranged on a line oblique to the vertical section, so that the tubular member when in place on a car rests against this oblique abutment. A similar pocket is arranged to engage under the horizontal flange of the upper chord, and pockets that are in the main similar, but differ slightly in shape, are arranged at ends of the upper chord to take the thrust of the strut member that rises obliquely over the transom to the rear corner. Other forms of pockets for the same purpose are shown at 16 17.

A furring-piece is secured to the upper chord underneath its horizontal flange, and a suitable furring-piece is secured to the lower chord.

Between the beams A A is a draw-bar lug or pocket to receive the spring of the draw-bar, the details of which are shown in Figs. 8, 9, and 10. Brackets 11^a are secured to the channel-beams by rivets or bolts, and these brackets hold a box-like structure 11^b, of a bent steel plate, which is made by turning from a sheet of suitable thickness flanges 11^c and bending the ends of the flange 11^d parallel to the upturned flanges 11^c. The two brackets 11^a are arranged with parallel faces, and the box structure is arranged to engage closely between the two parallel faces, with one flange 11^c in close engagement with the face of one of the brackets and the other flange 11^c in close engagement with the face of the other bracket. The inturned ends of the flange 11^d are bent over outside the web of the face of the brackets. The brackets are riveted to the beam. The box-like structure is riveted to the beam and also to the brackets. There is one such structure on each beam at each end of the car located underneath the car at the proper distance from the end thereof to allow for the draw-bar 51. The draw-bar springs 50 are held to the cross-heads 52, which rest in the pockets thus formed, and the draw-bar itself, held in the ordinary way to the springs, is secured mediately to the car by the box construction just described.

The tie-rods 13, used in the construction of the trusses at the sides of the car, pass through both the upper and the lower chords. The compression members 14 are tubular, held securely in sockets in the abutments described, and are not themselves bolted to either the upper or the lower support. The proper compression on the compression members can always be brought about by adjusting the tie members by screw-nuts 13^a on the ends thereof, and this adjustment can be readjusted after use if such readjustment should be necessary.

The middle of the car, under the door-opening, is supported by a plate 60 on each side, and these are by beams 61.

In the construction of the bolster 54 a simple, light, and strong form is employed. This bolster consists of a top bar 55, nearly horizontal, passing over and resting upon the center sills. The bar extends across the car, and its ends engage under the side sills *b*, which rest upon and are supported by said bolster. The top bar 55 is a tension member and is made to resist the tension caused by the load, which is in effect transferred by the truss structure until it rests on the bolster. Underneath this tension-bar and supporting the ends of same are tubular-shaped members 56, which also extend from side to side of the car. These tubular-shaped members engage at each end in abutment-pockets 12 and resist the downward thrust caused by the load concentrated at the bolster, as before said. The ends of the members 56 are fitted into pocket-abutments 12 of similar type as those employed in the construction of the sides.

To close the ends of the underframe and to form a carrier for the draw-bar and to protect the framing against shocks, we provide a steel plate or end cross-sill with its center part extending forward of its ends. To this end cross-sill the center as well as the side sills are connected. The end cross sill or plate has its upper edge flanged to support the end posts. An angle-iron is riveted to its lower edge for the purpose of adding to the strength of said plate.

We do not wish to confine ourselves in using the invention herein described to car constructions merely, as many of the features are applicable to the building of analogous structures.

What we claim is—

1. In a frame for a car, in combination with a side floor-sill provided with a vertical web and a horizontal flange extending from the bottom of the web, pockets resting on the flange and secured to the sill, tubular compression members forming part of a trusswork, a top chord to said trusswork and tie-rods uniting the chord and the sill, substantially as described.

2. A car-framing having in combination center sills, metallic side sills provided with horizontal projecting flanges and vertical webs, pockets resting on the flange of said side sills adapted to receive the lower ends of

tubular compression members, tubular compression members engaging in said pockets, and tie-rods engaging the sills and top chords and forming a completed metallic trusswork, substantially as described.

3. In car construction, in combination with center sills, and side sills provided with vertical webs and horizontally-projecting flanges, pocket-abutments secured above the flange and at the sides of the vertical web adapted to receive the ends of the tubular metallic compression members, tubular compression members forming part of a trusswork and tie-rods uniting the sills and top chords of said trusswork, substantially as described.

4. In car construction, the combination of a side sill provided with a vertical web, and a horizontal projecting flange, abutment-pockets secured with a side bearing on the web and under bearing on the flange and adapted to receive tubular compression members, tubular compression members of a trusswork engaging in said abutment-pockets, a top chord to said trusswork and tie-rods uniting the side sill and the chord, substantially as described.

5. In a composite car, in combination with a metallic side sill provided with a vertical web and a horizontal flange, a metallic trusswork composed of tubular compression members and tie-rods, and having an under bearing on the flange and a side bearing against the web of said sill, and a damper-timber extending in contact with the truss members and between the top and the bottom ends thereof and arranged to receive the truss members and having gains in said damper-timber, substantially as described.

6. In a composite car, in combination with a Z-shaped side bar arranged with its web vertical its upper flange directed toward the middle line of the car its lower flange directed outward, a trusswork bearing on the lower flange, a nailing-strip secured to the upper flange of the Z-bar inside the trusswork, substantially as described.

7. In a composite car, an abutment-pocket having in combination a part arranged to engage in the angle of a flanged sill, and a part arranged to engage at the side of and to partly overlap the first part, the two parts being concaved to form a pocket for a compression member and bored with registering holes to allow a tension member to engage through both parts, substantially as described.

8. In composite-car construction, an abutment-pocket arranged to receive the end of a compression member, against a shoulder therein and to receive the end of a tension member which traverses both pieces thereof, substantially as described.

9. In car construction, the combination of side beams of a Z form having one flange of the beam turned inward to support the floor and one flange of the beam turned outward to support abutment-pieces for a truss superstructure, a trusswork of tie-rods and tubular compression members, and abutment-pieces arranged to engage the compression members and support the end thrust thereof and to engage the tie-rods through perforations therein, substantially as described.

10. In car construction, the combination of a side sill of metal, a truss superstructure extending from each end of the car inward, the sill and top chord of said truss crossing the opening between the ends of the trusswork and a tie-plate located under said opening and fortifying the sill at said location, substantially as described.

11. In car construction, the combination of a side beam of metal, a metallic truss superstructure and abutments engaged against the vertical web of the beam, and bearing against a horizontal flange of the beam arranged to be tied by tension members, and provided with abutments to receive the ends of compression members, substantially as described.

12. In a composite car, the combination with side sills with projecting horizontal flanges in the substructure, angle-beams forming the top chord of the superstructure, a truss uniting the sill and the top chord and supported on the flange, an intermediate longitudinal beam of wood provided with gains in which the upright members engage and with binding-blocks set in the gains over the vertical members, substantially as described.

13. In a composite car, the combination with a metallic truss superstructure, a longitudinal beam of wood between the top and the bottom ends of the truss forming a damper, and having gains in which to engage and clamp the vertical members, substantially as described.

14. In car construction, in combination with top and bottom chords each of which has a vertical web and a horizontally-extending flange, compression members of tubular shape and means for securing the compression members to both the web and flange, substantially as described.

15. In car construction, in combination with side sills and top chord, a trusswork having tubular compression members and metallic tension members, substantially as described.

In testimony whereof we sign this specification in the presence of two witnesses.

HENRY C. HODGES.
GUSTAVE A. BLUME.

Witnesses:
CHARLES F. BURTON,
MAY E. KOTT.