(No Model.) 3 Sheets—Sheet 1.

D. F. LANE.

TRUSS BRIDGE.

No. 531,048. Patented Dec. 18, 1894.

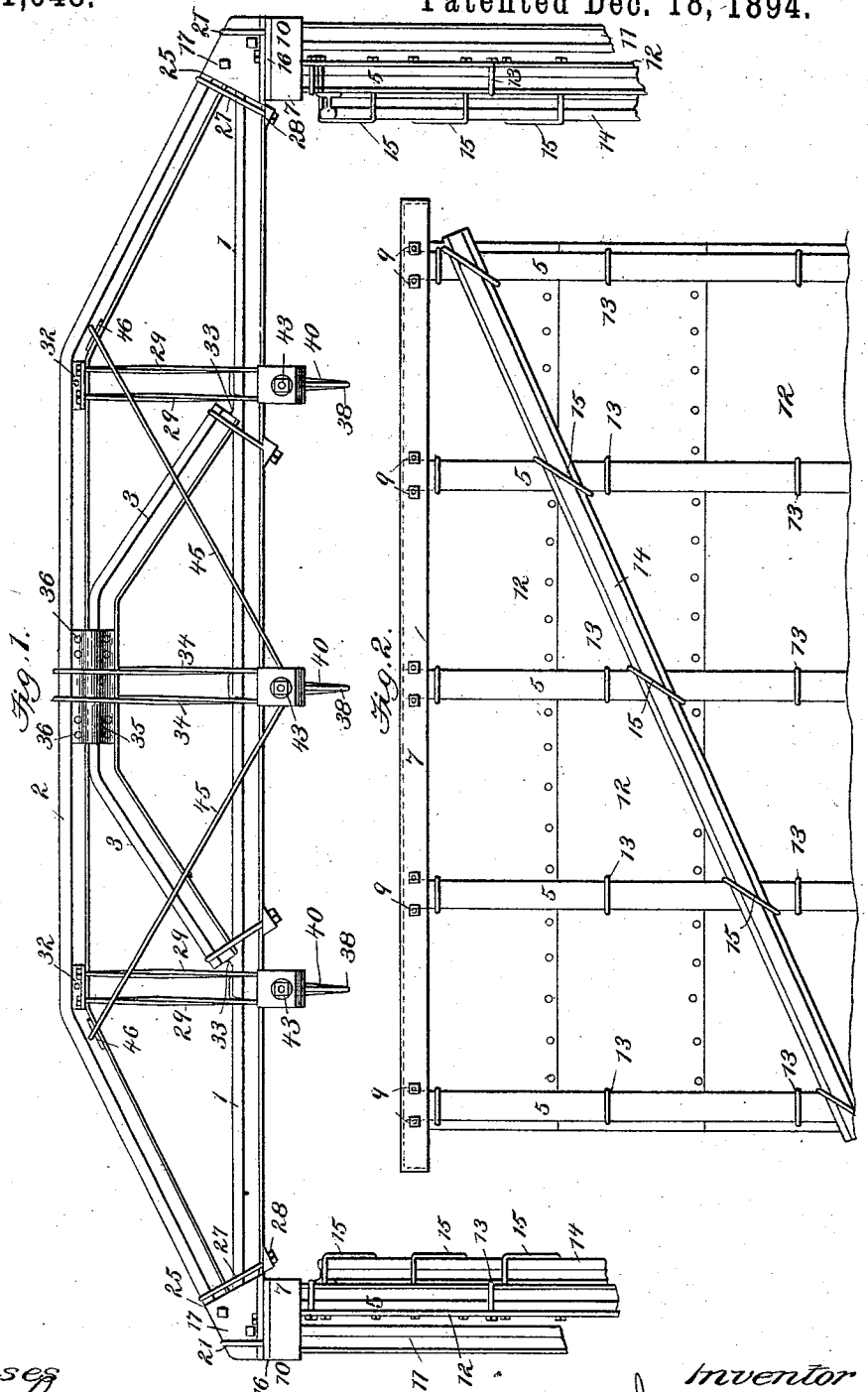


Fig. 1.

Fig. 2.

Witnesses
Guy A. Johnson
Lowell Battle

Inventor
Daniel F. Lane
By Johnson and Johnson
his Attorneys

(No Model.) 3 Sheets—Sheet 2.

D. F. LANE.

TRUSS BRIDGE.

No. 531,048. Patented Dec. 18, 1894.

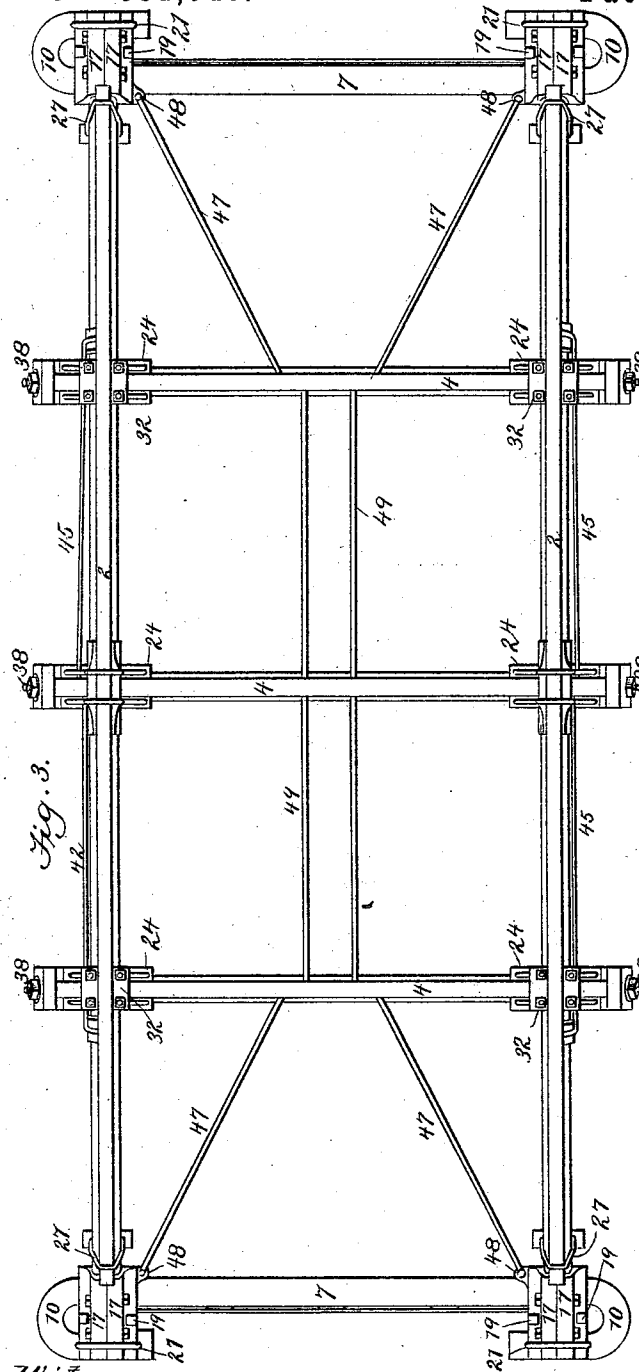


Fig. 3.

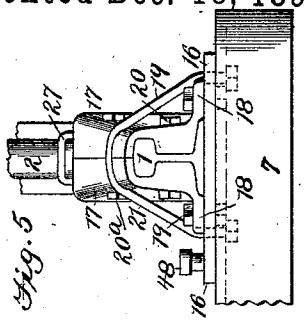


Fig. 5

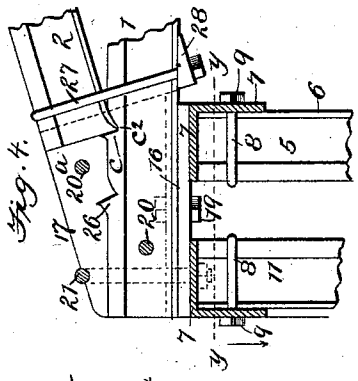


Fig. 4.

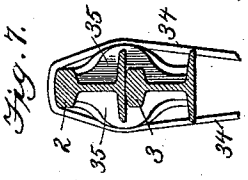


Fig. 7.

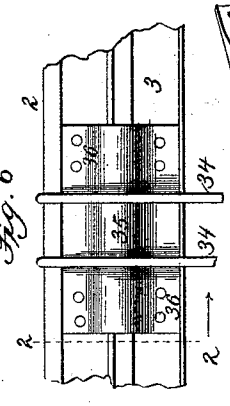


Fig. 6

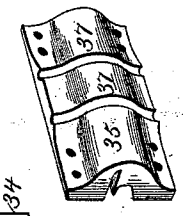


Fig. 8.

Witnesses

Geo. H. Johnson.

Howell Battle

Inventor

Daniel H. Lane

By Johnson & Johnson

His Attorneys

(No Model.) 3 Sheets—Sheet 3.

D. F. LANE.

TRUSS BRIDGE.

No. 531,048. Patented Dec. 18, 1894.

Fig. 9.

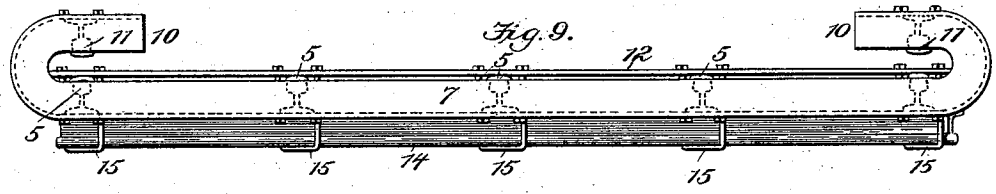


Fig. 10.

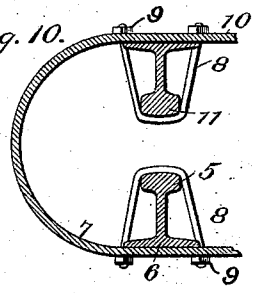


Fig. 11.

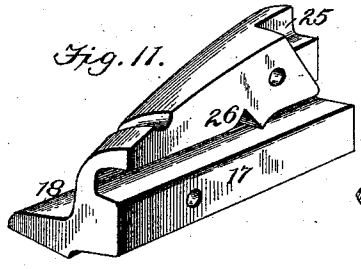


Fig. 15

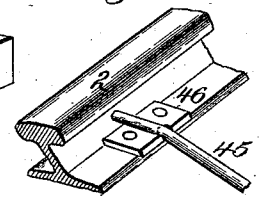


Fig. 12.

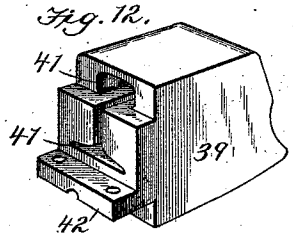


Fig. 13.

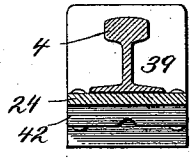
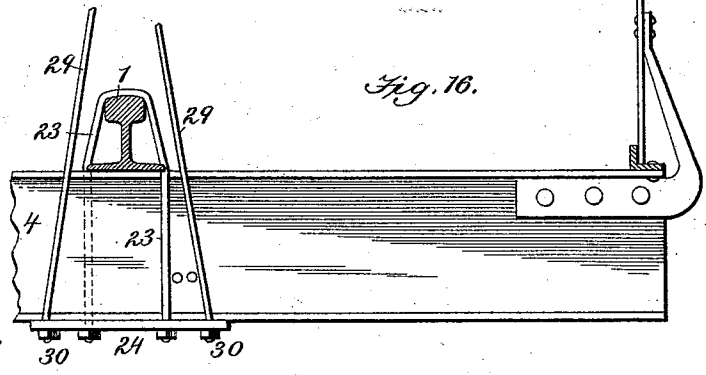


Fig. 14.

Fig. 16.



Witnesses

Geo. H. Johnson.

Howell Gatlin

Inventor

Daniel F. Lane

By Johnson & Johnson

his Attorneys

UNITED STATES PATENT OFFICE.

DANIEL F. LANE, OF CORNING, NEW YORK.

TRUSS-BRIDGE.

SPECIFICATION forming part of Letters Patent No. 531,048, dated December 18, 1894.

Application filed April 8, 1892. Renewed April 7, 1894. Serial No. 506,775. (No model.)

To all whom it may concern:

Be it known that I, DANIEL F. LANE, a citizen of the United States, residing at Corning, in the county of Steuben and State of New York, have invented certain new and useful Improvements in Truss-Bridges, of which the following is a specification.

I have improved the construction of the truss-bridge for which Letters Patent No. 424,318 were granted to me March 25, 1890, and my present improvements are directed to provisions whereby the connections of the floor-beams and the top truss-beams are rendered stronger and more durable; the floor truss-rods rendered more effective; the abutments for the ends of the bridge rendered durable and firm; and the bridge rendered stiff and firm. In these particulars my invention consists of certain parts and combinations of parts, the several features of which will be separately pointed out in the claims concluding this specification. Before specifying such claims I will describe the bridge which is illustrated in the annexed drawings, showing a structure embodying the several features of my present invention in combination.

Referring to the drawings: Figure 1 is a side view of an iron bridge constructed according to my invention. Fig. 2 shows a side view of the iron abutment for the bridge. Fig. 3 is a top view of the bridge shown in Fig. 1. Fig. 4 shows in vertical sectional elevation the lapped end of the abutment cap-beam and the ends of the truss beams secured thereon and together, one-half of the clamping chair being removed, and Fig. 5 is an end view of the same. Fig. 6 shows in side view a coupling binder for connecting the upper truss beam with its central arched brace. Fig. 7 is a vertical cross section on the line x of Fig. 6, and Fig. 8 shows one of the coupling binder parts. Fig. 9 is a top view of the iron abutment. Fig. 10 is a horizontal section of one end of the abutment on the line y of Fig. 4, showing the manner of securing the cap beam to the abutment piles. Fig. 11 shows one of the divided chair parts for the chord beams. Fig. 12 is a shoe block for connecting the girder beam and its truss rod. Fig. 13 is a vertical cross section on the line x of Fig. 14, which is a vertical sectional elevation showing the lower truss beam, the girder beam, its shoe block truss-rod connection, and the top truss-beam clip connections with the girder-beam. Fig. 15 shows the brace rod connection with the top truss-beam, and Fig. 16 shows a construction in which the floor girders are extended beyond the truss beams to form side walks at each side of the bridge.

The two horizontal truss-beams 1, the top truss-beams 2 and 3, and the cross or girder-beams 4, I prefer to make of railroad iron. The lower truss-beams are the length of the bridge and rest at their ends upon pile abutments which are also preferably of railroad iron, and the truss-beams are secured together, and to these pile abutments at the ends of the bridge, as I shall presently state. In forming the abutments I drive a row of iron piles 5 along or near each bank so that their flanges 6 stand toward the water, as seen in Figs. 9 and 10, and they are sufficiently close together to form a firm support on which the bridge rests with its flooring on a level with the roadway. A cap-beam 7 preferably of angle or L-shaped iron is placed upon the tops of the piles so that its vertical side abuts against the flange 6 of the piles, and is secured and bound thereto by clips 8, see Fig. 4, passed around the piles and through holes in the vertical side of the cap-beam 7 and fastened by nuts 9. The ends of this cap beam are bent and turned inward toward the bank so as to form a lap 10, which I secure to one or two piles 11 in the same manner as with the row of piles. On the land side I cover the row of piles with iron plates 12 so as to form a wall, and I fasten these wall plates to the rows of piles by nutted clips 13. On the water side I secure to the row of piles one or more beams 14, preferably of railroad iron, extending obliquely from the lower end of one pile at one end of the row to the upper end of the pile at the other end of the row, and inclining down the river and I fasten this inclined beam to the piles by nutted clips 15. This construction provides a pile abutment of iron so as to form a structure walled and braced and a solid sill or foundation for the ends of the chord-beams at each end of the bridge.

A base plate 16 is (seen in Figs. 4 and 5) placed across the lapped ends of the cap beam 7 and forms the seat for the end of the

truss-beam 1 and to which it is secured by a chair of peculiar construction which I will now describe. An iron chair the counterpart of the truss-beam, is provided so as to form a clamp, preferably of two parts 17, adapted to fit over and upon the end of the truss-beam, each part having a base flange 18 by which it is secured to the base plate 16 by the nutted bolts 19. A nutted bolt 20 passing through the chair parts and the web of the truss beam, and a nutted bolt 20^a passing through the chair parts above the latter bind the chair parts and said beam together. A nutted clip 21 passing in a groove over and upon the chair parts and through holes in the cap-beam of the abutment, serves to secure and bind the chair parts to the said abutment. Each end of each truss beam is supported and secured in an identical way. Centrally at the middle of the length of the bridge and at equal distances therefrom I secure cross beams or girders 4 beneath the truss-beams by means of nutted clips 23, see Fig. 14, passed over the said beams and through holes in a base-plate 24 on the under side of the girder, the clips obliquely straddling the girder.

The truss beams 2 are inclined downward at their ends and are fitted into sockets 25, see Fig. 11, formed at the inner ends of the divided chair parts 17, which chair parts thereby serve as abutments for the truss-beams. This socket is the counterpart of the truss-beam 2 and the latter when bound therein rests in a shouldered notch *c* upon the head or ball of the lower truss-beam. The head or ball of the lower truss-beam is notched and upset at 26, see Fig. 4, and the chair parts have corresponding notches and projections 26, see Fig. 11, which interlock and supplement the fastenings of the chair parts for resisting the thrusting action of the truss-beams 2 upon the divided chair. At these abutting ends I fasten the truss-beams together by nutted clips 27 straddling the beams and passing through the projecting ends of a tie-rod 28 beneath the lower truss beam, as in Fig. 4. The chair socket and the clip serve to hold the end of the upper truss-beam firmly and solidly upon the lower truss-beam and prevent it from side movement as the chair embraces the truss-beams like a clamp.

Referring to Fig. 4 it will be seen that the lower truss-beam is notched and upset at *c* to receive the end of the upper truss-beam and form a shouldered abutment therefor and that the corners c^2 of the base of the latter beam are turned down at the ends so as to lap on each side of the ball or head of the lower truss-beam, and thus give a firm support for each end of the upper truss-beam in connection with the abutting chair of the lower truss-beam, and the clips 27 which straddle both beams.

The upper truss-beams and the girder-beams are connected by rods 29 secured by nuts 30 to the base-plate 24, and by nuts 31 to the angle plates 32 which are bolted to the opposite sides of the upper truss-beam; said rods being preferably crossed as shown in Figs. 1 and 14. At the middle of the span an arched truss brace 3 supports the main upper truss-beam and is clipped at its ends to the lower truss-beam, which latter is upset to form abutments 33 for the brace. At the junction of the arch and upper truss-beam, clip-rods 34 straddle these beams and are nutted to the girder base plate 24. I find it important however to connect the arch and upper truss-beam to give the latter a better support, and for this purpose I provide a binder of two clamping parts 35 having their clamping faces the counterparts of the rail-road iron form of these joining parts, as seen in Figs. 7 and 8, so that the binders will lie upon the webs of these parts and be bound firmly thereon by clinch bolts 36. The clip-rods 34 pass over these binder parts 35 in face grooves 37 which serve to hold the rods in place.

A truss-rod 38 is placed beneath each girder and is secured to each of its ends by a shoe or socket block 39 as seen in Figs. 1, 12 and 14, and is trussed over a downward standing post or prop 40 at the middle of the girder. The shoe is a solid iron block cast with sockets 41 the counterpart of the cross section of the beam and it has a bottom projection 42 by which it is bolted to the base flanges of said beam. The truss-rod passes through holes in the shoe blocks and is secured by nuts 43 with which I use washers 44 seated in a concave bearing in the outer end of the shoe so that the latter form solid abutments for the rod and with the latter and the middle prop, form a durable and effective support for the girder-beam. One or more brace rods 45 connect and are nutted to each end of the girder-beam and to the inclined ends of the upper truss beam, through the web of which it passes and rests upon a wear plate 46 as seen in Fig. 15. Brace rods 47 connect the girder-beams with the abutments through the truss beam plates 16, to which said rods are secured by the studs 48, as seen in Figs. 3 and 5; while one or more tie rods 49 connect the girders to each other.

Where the clip fastenings pass over the edges of the flanges of the beams, the latter are notched to give a positive locking connection therewith.

In Fig. 16 I have shown a construction of the girder-beams for side walks in which the said girder-beams are extended to give the desired width of walk, and in this connection I do not use the bottom truss-rods.

The construction which I have set out gives a strong, safe and durable iron bridge for comparatively short spans. The floor-girders and the truss-beams are bound together by rod-clips; the flooring structure is firmly braced; and the truss-beams, and the abutments are bound together by bolts and clip-rods. At this abutment connection the construction of the abutments gives a broad and solid support for the truss-beams; and the

doubled or lapped ends of the abutments, give the advantage of firmness which would be given by a double abutment.

The provision of the abutment chairs gives great strength and firmness at the connection of the truss-beams, and a strength capable of resisting great weight at the center of the bridge; and the construction is in every way rendered stiff and firm against longitudinal or lateral vibration; or sinking at the crown. It is obvious that the abutments can be placed to form a wall at the bank or a short distance away from the bank; and that the piles when firmly driven, walled and braced, form a structure more durable as a support for the end of the bridge, than would be afforded by stone work or piles alone. It is evident that immaterial departures may be permitted from the general construction and arrangement of parts contributing toward my invention, and for this reason I do not wish to be understood as limiting myself thereto in precise detail, and construction.

Referring to Fig. 14 it will be seen that the girder-beams 4 and the truss-beams 2 are connected by rods 29 nutted to plates 24 under the girder-beam and to angle-plates 32 bolted to the opposite sides of the truss-beams, and it will be understood that these angle-plates are fitted upon the web and base of said truss-beam and are bolted to said web through their vertical sides, while the said rods are nutted to the horizontal sides of said angle-plates, which, for this purpose, overhang the edges of the beam, and thereby give a strong and durable fastening for these rods to separate plates at both ends. It will also be understood that the plates 24 project on each side of the girder-beams and that these rods are arranged in pairs on each side of said beam, as seen in Fig. 3.

Having thus described an iron bridge embodying, in preferred form, the several features of my present invention in combination, what I claim, and desire to secure by Letters Patent, is—

1. In an iron bridge, the combination, of an abutment and the truss beams, the upper beam resting upon and engaging the lower beam, with a chair formed of two matching parts engaging the lower beam, the bolts 20, 20ª securing the chair parts together and to the lower beam, the nutted clip 27 engaging said beams, and the nutted clip 21 engaging the chair and the abutment, substantially as described.

2. The combination, in an iron bridge, of the truss-beams, with chairs formed of two counterparts providing sockets or seats adapted to receive and support the ends of said beams in abutting relation, and nutted bolts 20 and 20ª passing through the beam and the chair parts, substantially as described.

3. The combination, in an iron bridge, of the truss-beams, with chairs formed of two counterparts providing sockets or seats adapted to receive and support the ends of said beams in abutting relation, a base plate 16, a transverse abutment beam, and means for binding and securing said parts together, substantially as described.

4. The combination, in an iron bridge, of the truss-beams, with chairs formed of two counterparts provided with sockets or seats adapted to receive and support the ends of said beams in abutting relation, a base-plate 16, a transverse abutment beam, bolts for securing the chair, plate and said beams together, a clip for securing the chair, plate and abutment beam together, and a clip for securing the chord and truss-beams together, substantially as described.

5. The combination, in an iron bridge, of the truss-beams, with a binder chair support for their ends, an abutment formed of a beam bent and lapped at its ends, and means for binding and securing the said several beams and chair parts together, substantially as described.

6. The combination, with the truss-beams and a chair provided with seats or sockets adapted to receive and support the ends of said beams, of a base-plate for said chair, and a transverse cap-beam bent and lapped at its ends, means for securing said chair to said base-plate, and means for securing said chair, base-plate and lower beams to the lapping end of said cap-beam, substantially as described.

7. The combination, in an iron bridge, of the truss-beams, with a chair formed of two counterparts having sockets or seats adapted to receive and support the ends of said beams in abutting relation, the ball or head of the truss-beam and the wall of the chair-socket having engaging upset parts, and means for binding the said beams together and to the chair parts, substantially as described.

8. In an iron bridge, an abutment chair of two half parts, each part having a base side flange 18, an end socket 25 and notches and projections 26 on its inner wall, in combination with the lower flanged truss beam having notches and projections corresponding with those of the chair-walls, and means for binding the parts together and to the said lower beam, substantially as described.

9. The combination, in an iron bridge, of the floor or girder-beams, with the truss rod and the shoe or socket-blocks for connecting the ends of said truss rod and the girder-beam, substantially as described.

10. The combination, in an iron bridge, of the floor or girder-beams, and the truss-beams, with the shoe or socket-blocks, the truss-rod, the base plates 24, and the clips 23 and 29, substantially as described.

11. The combination, in an iron bridge, of the main and the arch truss-beams, and the floor or girder-beams, with the clamps or binders 35, the base-plates 24, and the clips 23 and 34, substantially as described.

12. The combination, in an iron bridge, of the floor or girder-beams, the truss-beams, and the base-plates 24, with the clamps or bind-

ers 35, the clips 29 and 34, and the brace-rods 45, substantially as described.

13. The combination, in an iron bridge, of the truss-beams, and the floor or girder-beams, with the base-plates 16 for said truss-beams, chairs or binders provided with sockets or seats adapted to receive and support the ends of the truss-beams, the brace rods 47 connecting the said base-plates and girder-beams, and means for binding and securing the said truss-beams, chairs and base-plates together, substantially as described.

14. In combination, in an iron bridge, the truss-beams, the socket chairs and the arch clamps or binders therefor, the floor or girder-beams, their truss rods and shoe or socket-blocks, the clips and brace rods, and iron abutments having cap-beams bent and lapped at their ends and bound and secured to the said socket chairs, substantially as described.

15. The combination, in a bridge, of the truss-beams and the arch-beams, with clamps or binders having their clamping sides formed with grooves interlocking with the flanges of the truss-beam and the sides of the head of the arch-beam, and riveted to the webs of both said beams, substantially as described.

16. The combination, in an iron bridge, of the truss-beams and the girder-beams, the rods 29 connecting the truss and girder-beams by the base plates 24 and by the angle plates 32 bolted to each side of the web of said truss beam, substantially as described.

17. The combination, in an iron bridge, of the truss-beams and the base-plates 16, with a sectional flanged chair 17 constructed to form the socket for the end of the truss-beam, a nutted clip 21 and the bolts 19, 20 and 20^a for securing the parts together, substantially as described.

18. The combination, in an iron bridge, of the lower chord having the notched abutments 26 and *c* in its head, with a sectional chair-socket constructed to engage the beam abutment 26, the truss-beam engaging the beam abutment *c* and means for securing said parts together, substantially as described.

19. The combination, in an iron bridge, of the truss-beams, and the girder-beams, with sectional chair sockets constructed to engage said truss-beams, the base plates 16, means for securing the latter to the sectional chair, means for securing the latter to the truss-beams, and the brace rods 47 connecting the said base-plates and girder-beams, substantially as described.

20. As a tie and support for the lower chord-beams of an iron bridge, the horizontal cap-beams of angle iron bent and lapped at each end, in combination, with the truss-beams, and suitable means for securing the ends of said beams to said cap-beams, substantially as described.

21. The combination, in an iron bridge-truss, of a tie-beam and a brace-beam of railway T rail, with chairs formed of two parts with confronting faces, each face conforming in contour to the said beams and having a shoulder to receive the abutting end of the brace-beam and bolts for securing said parts of the chair to each other, and to the tie-beam, substantially as described.

In testimony whereof I have hereunto signed this specification in the presence of witnesses.

DANIEL F. LANE.

Witnesses:
A. E. H. JOHNSON,
GUY H. JOHNSON.

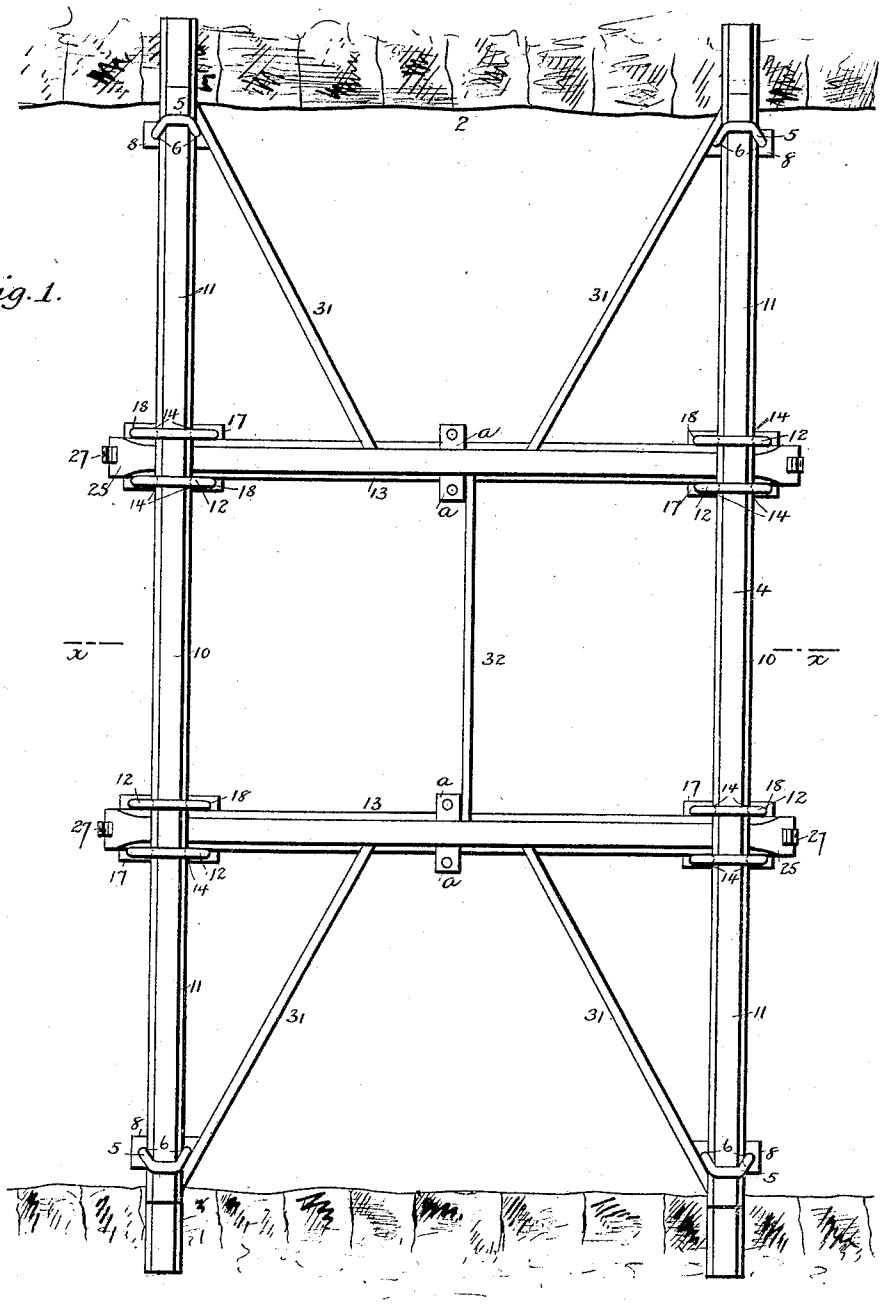
(No Model.) 3 Sheets—Sheet 1.

D. F. LANE.

TRUSS BRIDGE.

No. 424,318. Patented Mar. 25, 1890.

Fig. 1.



WITNESSES:

Wm. A. Norton

Howell Battle

INVENTOR

Daniel F. Lane

BY

Johnson & Johnson

his ATTORNEYS.

(No Model.)

3 Sheets—Sheet 2.

D. F. LANE.

TRUSS BRIDGE.

No. 424,318. Patented Mar. 25, 1890.

Fig. 2.

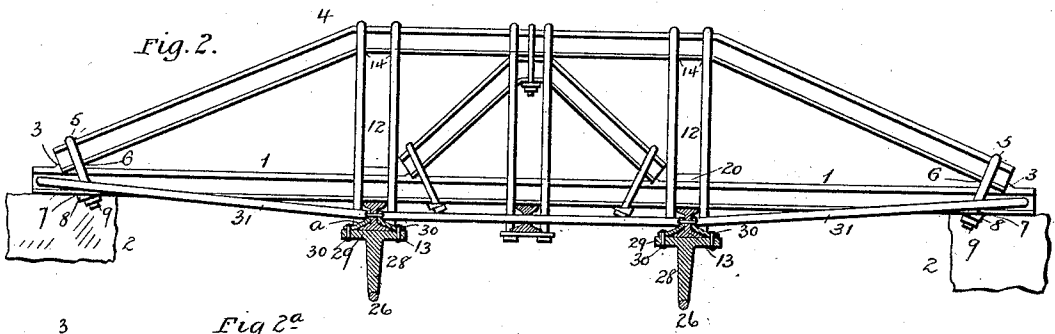


Fig 2a

Fig. 2b

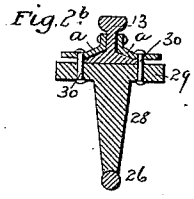


Fig. 2c

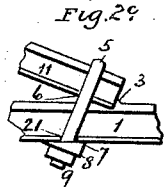


Fig. 3.

Fig. 3a

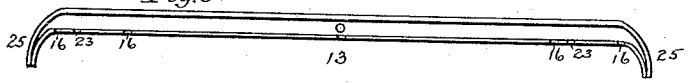


Fig. 4.

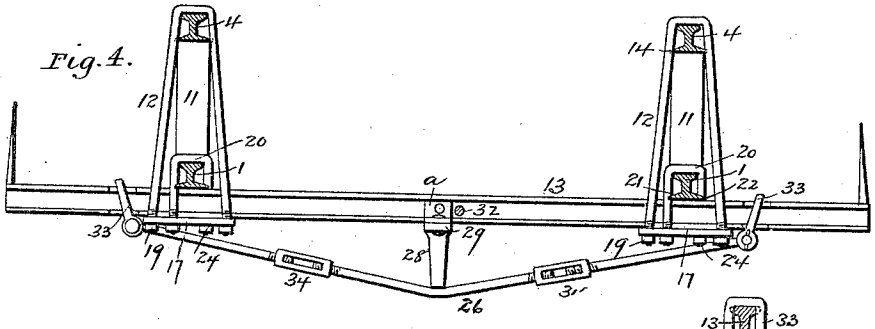


Fig. 4a

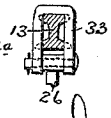
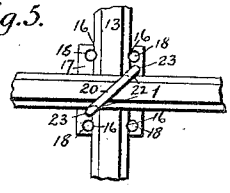


Fig. 5.



WITNESSES:

Wm. A. Norton

Howell Battle

INVENTOR

Daniel F. Lane

BY

Johnson & Johnson

his ATTORNEYS.

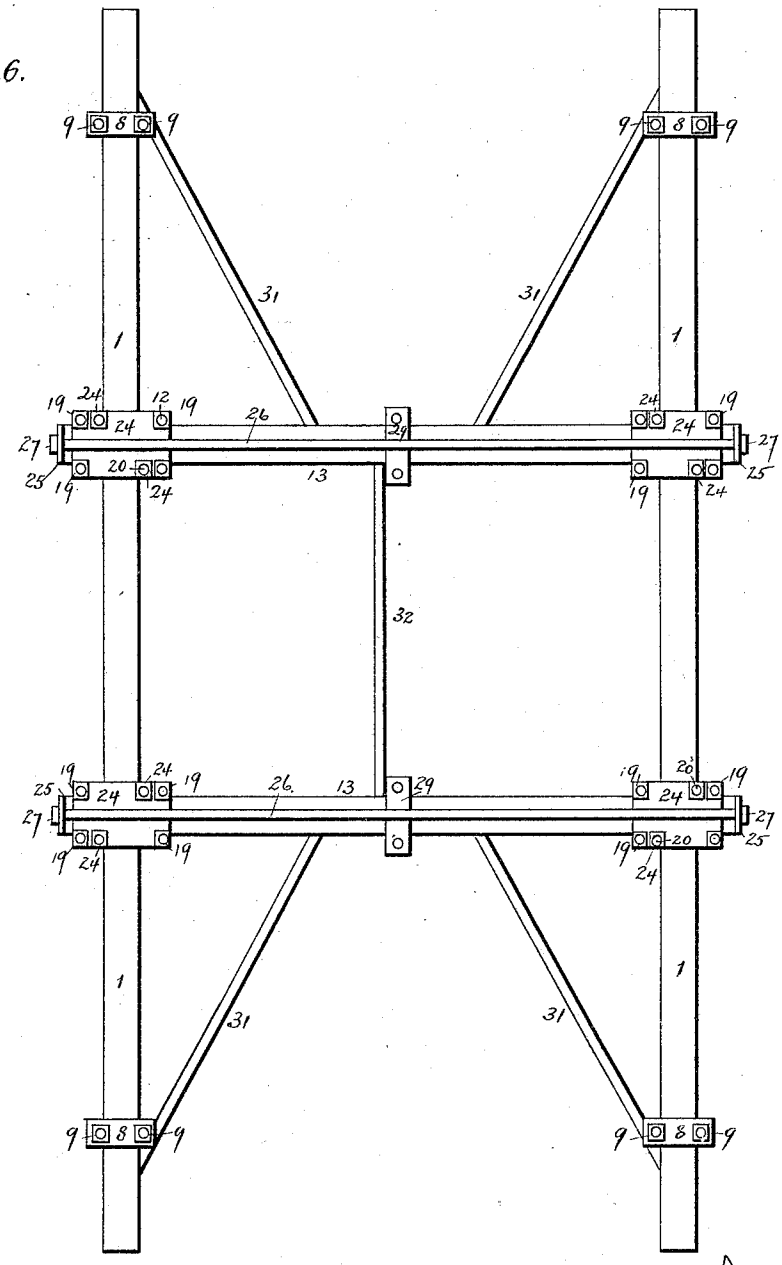
(No Model.) 3 Sheets—Sheet 3.

D. F. LANE.

TRUSS BRIDGE.

No. 424,318. Patented Mar. 25, 1890.

Fig. 6.



WITNESSES:

Wm. E. Norton

Howell Battle

INVENTOR

Daniel F. Lane

BY

Johnson & Johnson

HIS ATTORNEYS.

UNITED STATES PATENT OFFICE.

DANIEL F. LANE, OF HORNBY, NEW YORK.

TRUSS BRIDGE.

SPECIFICATION forming part of Letters Patent No. 424,318, dated March 25, 1890.

Application filed January 13, 1890. Serial No. 336,815. (No model.)

To all whom it may concern:

Be it known that I, DANIEL F. LANE, a citizen of the United States, residing at Hornby, in the county of Steuben and State of New York, have invented new and useful Improvements in Truss Bridges, of which the following is a specification.

My invention is directed to the improvement of bridges constructed of railway-rails; and the object of my improvement is to provide a strong and durable bridge in which the floor or chord beams, the top or truss beams, and the cross-beams or girders for the chords are constructed of railway-rails and supported and bound together by clips and shackle-plates, and truss-rods bound to the ends of the girders, and the particular novel matters of construction and combination will be specifically pointed out in the claims concluding this specification.

Referring to the drawings which illustrate my improvements, Figure 1 represents a plan or top view of my improved bridge. Fig. 2 is a central longitudinal vertical section of the same. Fig. 2^a is a side view of one of the chord rails or beams. Fig. 2^b shows in detail section the connection of the queen-post with the truss-rod and the cross-girder. Fig. 2^c shows in detail the clip-connection of the chord and the truss-beam. Fig. 3 is a cross-section of the bridge on the line $x\ x$ of Fig. 1. Fig. 3^a is a side view of one of the cross-girders. Fig. 4 is a cross-section showing a modification of some parts of the bridge. Fig. 4^a shows in detail the eyed-stirrup connection for the truss-rod with the cross-girder shown in Fig. 4. Fig. 5 shows in detail top view the clip-connection of the chord-rail and cross-girder, and Fig. 6 shows the bridge in bottom view.

The chord-beams 1 rest upon the abutments 2 2 for the bridge. These chord-beams are preferably of the form of railroad-iron, and the cap is formed with notches 3 near each end of the rail and with notches 7 in the base-flange near the top notches 3, as seen in Fig. 2^a. The cap of this chord-beam is about one and a quarter inch thick and the notches 3 extend about half-way through it, and they are so cut as to form a raised shoulder at that side of said notch next the end of the chord to form good bearing projections for the inclined ends of the top truss-beams. The chord-beams rest about fifteen inches upon the abutments to bring the notched parts of the chords over the abutments with a firm support. The top truss-beams 4 are also of the I form of railroad-iron, and their ends are inclined downward and rest in the notches 3 upon the ends of the chords and against the shoulders of said notches. At these abutting ends I fasten the top truss-beams to the chord-beams by means of clips 5, which straddle both beams, fitting in notches 6 and 7 in the base-flanges of both beams, and passing through the projecting ends of a shackle-bar 8, are secured by nuts 9, so as to bind the shackle-bars against the under side of the chord-beam. To render this fastening effective, the clips stand in oblique positions toward the middle of the bridge and the shackle-bars are made wedge shape in cross-section, as shown in Fig. 2^c, so that when the beams and shackle-bars are thus bound together the clips are locked at each side in the notches of the beams.

At points vertically below the junction of the inclined and horizontal portions of the top truss-beams I secure a cross-girder 13 beneath the chord-beams by means of clips 12, which straddle the horizontal portions of the top truss-beams and the chord-beams in pairs and are secured to the girders as follows: To the ends of these clips 12, I secure shackle-plates 17 by nuts 19, which bind the plates against the under side of the said girder, and thereby bind the latter to the under side of the chord-beam, as seen in Fig. 3. For this purpose this shackle-plate is provided with holes 18, (seen in Fig. 5,) and the base-flange of this girder has notches 16, (seen in Figs. 3^a and 5,) which are coincident with the clip-holes 18, whereby the said clips 12, fitting into the said notches, are locked to the girder, while the base-flanges of the top truss-beams have notches 14, into which the clips are also locked. The clips in pairs, therefore, bind and lock the truss-beams, the chord-beams, and the girders firmly and securely together. Supplementing these clip-fastenings I provide an independent clip-fastening 20 for the chord-beam and the girder-beam,

so that it straddles the junction of these beams obliquely, as seen in Fig. 5, and is secured by nuts 24 to the shackle-plates 17, which for the purpose is provided with holes 23, the said clips being also locked to the girder by notches 21 and 22 in the base-flange of the girder-rail, as seen in Fig. 3. The ends of the girders are bent downward to form perforated arms 25, to which are secured truss-rods 26 by nuts 27. These truss-rods cross beneath the girders and serve to support the middle of the latter by means of props or queen-posts 28, the upper ends of which are formed with flat heads 29, which are secured to the under sides of the girders by bolts 30, which pass through angle-pieces *a*, which are bolted to the girder, as seen in Fig. 2[b]. The lower end of the queen-post is securely fitted upon the truss-rod and the latter is deflected from said post upward to the girder-arms. Brace-rods 31 are secured to the ends of the chord-beams, preferably, by being bent and passed through holes in and riveted to said beam ends, and extend inward obliquely and are secured to the cross-girders at or near the middle of their length, preferably, in the same way, while one or more rods 32 connect the girders to each other, being secured to them in the same way as the brace-rods, whereby the chords and the cross-girders are braced against lateral or longitudinal strain and the structure rendered stiff and firm. The flooring of the bridge, which is not shown in the drawings, is supported upon the girders in any suitable way.

In bridges constructed with sidewalks at the outer sides of the truss-beams, as seen in Fig. 4, the cross-girders are extended beyond the chord-beams to the desired width of the sidewalk. When these girders are so extended, I provide for connecting the truss-rods to them by means of eyed stirrups or clevis 33, (shown in detail in Fig. 4[a],) which straddle the girder just outside of the truss-beams, and projecting below the latter are secured at their eyed ends to the truss-rods 26 by bolts which pass through said eyes and through a perforated head on the said truss-rod, the said stirrup being keyed and locked to the cross-girders by being fitted into notches in the base-flange of the girder-rail. In this modification of the truss-rod connection I provide for taking up any slack in such connection by means of turn-buckles 34, which connect the truss-rod sections.

All the parts of the bridge are firmly united, and yet are sufficiently free to expand and contract, by reason of the capacity of the clip-fastenings to compensate for such expansion and contraction within the notches by which they are locked to the beams. It is obvious that the number of cross-girders can be increased to suit the length of the bridge and fastened by long and short clips in the way described. The shackle-bars 8 prevent the clips 5 from spreading and form clamping-bars for these clips. The cross-girders may be used in pairs side by side and the long clips and shackle-plates arranged to suit the double girders, and in such construction the truss-rod may be dispensed with. Referring to the long clips 12, it will be noticed that they spread or flare from the top truss-beam to the shackle-plate in the line of the girder to support and brace the truss-beams against side strain, and for this purpose the lower ends of these clips are about eighteen inches apart, while the shackle-plates are about two feet and a half long and are placed lengthwise of the girder. The flooring runs crosswise of the bridge, and it may be supported on railway-rails running the same way as the chord-beams.

To support the top truss-beams against the strain of the long clips, I secure a railway-beam of arch form with its ends resting upon the chord-beams and its crown against the under side of the said top beams, as seen in Fig. 2.

The bridge may be made of single or double track. Wherever a clip binds the beams it also locks them together by means of notches in the flanges of the beams, into which the clips fit. The girders may be of **I** form.

I claim as my improvement—

1. The combination, in an iron bridge, of the flanged chord-beams having the top notches 3 and the side flange notches 7, the truss-beams 4, the short end clips 5, locked in said chord-flange notches 7, the binder-plates 8, and the nuts 9, with the cross-girders 13, the middle clips 12, arranged in pairs straddling the said top and bottom beams, the short clips 20, obliquely straddling the chords and girders, the shackle-plate 17, and the nuts 19 and 24, the said clips 12 and 20 being locked in notches 16 and 22 in the flanges of the beams and of the girders for securing and binding the parts together in the way described.

2. The combination, in an iron bridge, of the chord-beams, the truss-beams, and the girder-beams, constructed and arranged as described, with the long clips 12, arranged in pairs, the shackle-plates 17 for said clips, and the short clips 5 and their shackle-plates, the said clips being locked in notches in the said beams and secured to their shackle-plates by the nuts 9, substantially as described, for the purpose specified.

3. The combination, in an iron bridge, of the chord-beams, the truss-beams, and the girder-beams, constructed and arranged as described, with the long clips 12, arranged in pairs, their binding shackle-plates, the short clips 20, secured to said shackle-plates, and the short clips 5 and their binder-plates 8, and the nuts 9, 19, and 24 for the said clips, substantially as described, for the purpose stated.

4. In an iron bridge, the combination of the chord-beams, the truss-beams, and the cross-girder beams 13, constructed and arranged as described, with the truss-rod 26, secured to said cross-girder, the prop or queen-post 28, secured to said truss-rod and cross-

girder, and the clips 12, 20, and 5, and the nuts 9, 19, and 24, for binding the several beam parts in the way described.

5. In an iron bridge, the combination of the chord-beams and the truss-beams with the cross-girder beams having downwardly-bent perforated ends 25, the truss-rod 26, its securing-nuts 27, the queen-post 28, having a flat head 29, and the clips 12, 20, and 5, substantially as described.

6. The combination, in an iron bridge, of the chord-beams, the truss-beams, and the girder-beams, constructed and arranged and bound together with clips as described, with the oblique rods 31, connecting the chord-beams with the cross-girders, and the rod 32, connecting the girders, and the truss-rods supporting the girders, substantially as described.

7. The bridge-frame consisting of the beams 1, 4, and 13 of the form of flanged rails, in combination with the long clips 12, the short clips 20, the shackle-plates 17, the nuts 19 and 24 for said clips, the short clips 5, their binder-plates 8 and nuts 9, and the truss-rod 26, the said long and short clips 12 and 20 being secured to the said shackle-plates 17 in the way and for the purpose described.

8. The combination, in an iron bridge, of the chord-beams, the truss-beams, and the cross-girders, with the long clips straddling the truss-beams and flaring at their lower ends and the shackle-plates secured as described, the short clips 5, their binders 8, and nuts 9, whereby to support the truss-beams against side strain.

In testimony whereof I have hereunto set my hand in the presence of three subscribing witnesses.

DANIEL F. LANE.

Witnesses:
C. G. WHEAT,
FARREN SANDS,
F. A. WILLIAMS.