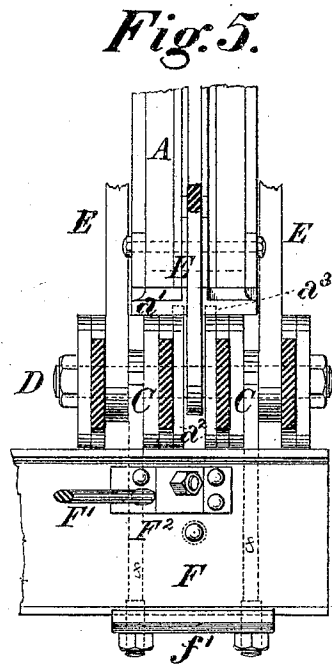
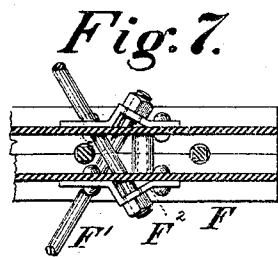
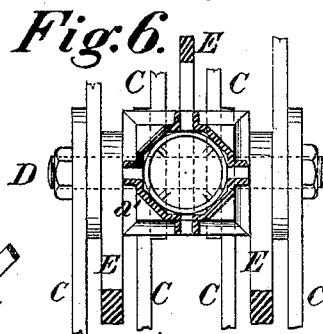
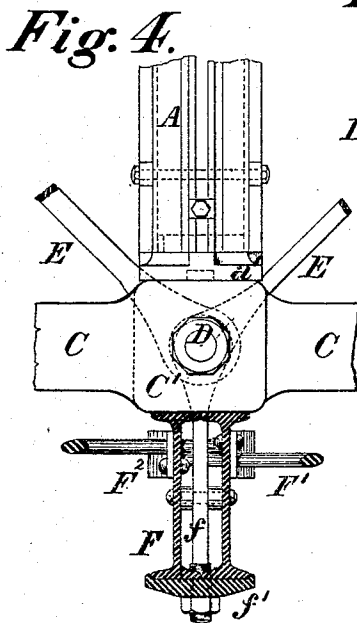
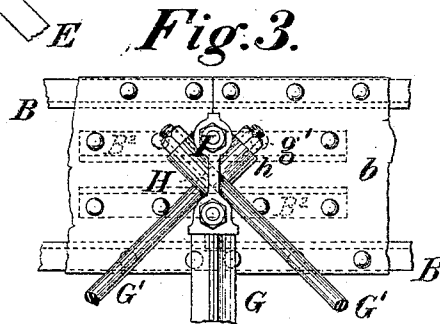
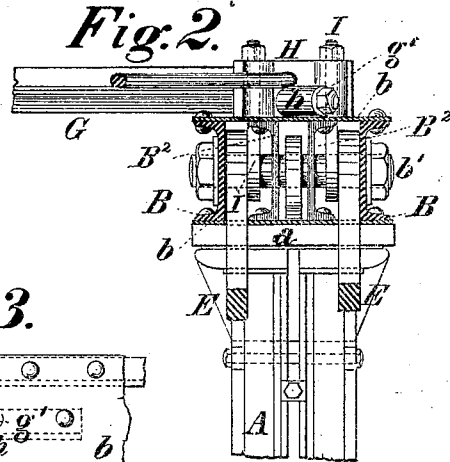
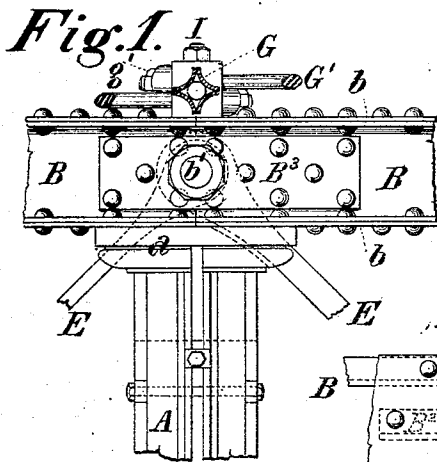


J. H. LINVILLE.

Truss-Frames for Bridges.

No. 145,114.

Patented Dec. 2, 1873.



Witnesses:

Philip Diesinger
Robert K. Lock

Inventor:

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UNITED STATES PATENT OFFICE.

JACOB H. LINVILLE, OF PHILADELPHIA, PENNSYLVANIA.

IMPROVEMENT IN TRUSS-FRAMES FOR BRIDGES.

Specification forming part of Letters Patent No. 145,114, dated December 2, 1873; application filed June 9, 1873.

To all whom it may concern:

Be it known that I, JACOB HAYS LINVILLE, of the city and county of Philadelphia, in the State of Pennsylvania, have invented certain new and useful Improvements in Truss-Frames for Bridges and other Structures, of which the following is a specification:

The object of my invention is to provide improved means for connecting the struts or posts of truss-frames with the chords and suspension-bars thereof, by the use of which increased strength shall be imparted to the structure, and convenience and economy of construction promoted; to which end my improvements consist in a novel combination of chord-bars, having substantially flat ends, with posts resting thereon, and connecting-pins, as well as in certain devices for connecting different members of the truss-frame, as hereinafter more fully set forth.

It is a fact well known to those familiar with bridge construction that columns or struts having round ends, or having their ends supported on pin-bearings, deflect under an end pressure of about one-third the weight which would be required to deflect similar columns with flat or firmly-fixed ends. It will, therefore, be obvious that greater strength can be secured, with less expenditure of material, by the employment of flat end bearings for the posts or struts; and, inasmuch as the plan of constructing lower chords of a series of deep and thin bars, united by pins passing through eyes on their ends, is highly approved and extensively employed, it is especially desirable to provide suitable means for using such posts in truss-frames embodying this plan. My invention accomplishes this object in a satisfactory manner; and I am further enabled, by its use, to conveniently and compactly arrange the chord-bars and suspension-bars with relation to the posts and to each other.

In the accompanying drawings, Figure 1 is a view in elevation of a portion of a post and upper chord of a truss-frame embodying my improvements; Fig. 2, a transverse section through the upper chord-beams; Fig. 3, a plan view of a portion thereof; Fig. 4, a side elevation, showing the lower portion of a post, and its connection with the lower chord-bar and floor-beams; Fig. 5, a transverse section through

the lower chord; Fig. 6, a horizontal section through the post, and Fig. 7 a similar section through the floor-beams.

To carry out the objects of my invention I employ, by preference, a tubular metallic post constructed in accordance with the specification of Letters Patent No. 132,475, granted and issued to me under date of October 22, 1872, it being well adapted for use in trusses embodying my present invention; but various other descriptions of posts may be used, if deemed more desirable. The post A is composed of four metallic segments united by a series of transverse tie-rods, and is provided with a cap, *a*, and base or shoe *a'*, each having plain bearing-surfaces abutting against the upper and lower chords, respectively. The upper chord of the truss is composed of a series of channel-beams, B, united at top and bottom by plates *b*, in which suitable openings are formed at intervals to admit of painting the inner surfaces of the beams and plates. The chord-beams of the several panels of the truss are connected by pins *b'*. The lower chord is composed of a series of bars, C, having eyes C' formed upon their ends, through which the connecting-pins D pass. As heretofore constructed, these bars have usually been provided with round eyes; and the connection of the post to the bars and pin has been generally made by ribs or stirrups, or their equivalents; or the pins have been passed directly through the posts.

In my improved truss-frame the eyes C' of the bars C are made with flat surfaces on their upper and lower sides, and the base *a'* of the post bears directly upon them without the intervention of any connecting-pieces whatever. By this arrangement I provide a firm bearing for the posts, and am enabled to arrange the chord-bars compactly and symmetrically on each side of the suspension-bars E, thus bringing the chord-bars nearer together, reducing the length of the connecting-pins, and equalizing, as far as practicable, the strain upon the different members.

In long-span bridges, where the reduction of weight in the bases of struts or posts is a matter of importance, my invention is particularly valuable, as it effects a material reduction in the dead weight to be carried, while

correspondingly increasing the efficiency of the struts by the firm and stable bearing which it affords them, the advantages of the pin-connection for the chords being made available without encountering the difficulties which have been met with hitherto in connecting the posts and chords. It is obvious that if the upper surfaces of the chord-bars were made either slightly concave or convex, the bases of the posts being correspondingly shaped, the bearing of the posts upon the chord-bars would be substantially the same as in the construction described and shown.

The floor-beams *F* are supported by eyebolts or stirrups *f*, which depend from the connecting-pins *D*, and carry wrought-iron washer-plates *f'*, provided with lips on each side to prevent the lateral displacement of the beams. The lower ends of the eyebolts *f* are threaded, and provided with proper nuts to secure the washer-plates in position. In manufacturing these washer-plates, I roll a bar of iron to the form of section shown in Fig. 4, and afterward cut it into lengths to form a number of plates, which are then drilled to admit the eyebolts. To guard against the displacement of the posts *A* from their position on the eyes of the chord-bars, plates *a*², provided with projections *a*³, are placed on the pins *D*, the projections *a*³ entering corresponding recesses in the shoes *a*¹ of the posts. The floor-beams are braced by diagonal tie-rods *F* passing through openings in the beams, and drawn up to a bearing by nuts, which bear against angle-washers *F*², riveted or bolted to the beams. These washers are, by preference, formed of strips of rolled plate-iron bent into the required form, as shown in Figs. 4, 5, and 7. I thus dispense with swivels, forged eyes, and the like, and effect the necessary adjustment by the tie-rods and plain nuts. The upper chord-beams *B* rest directly on the caps *a* of the posts, and are united by pins *b'*, which carry the upper ends of the suspension-bars *E*. In order to afford a firm and substantial bearing for the pins, as well as to diffuse the strain of the suspension-bars as equably as possible over their entire lengths, and to transmit the resulting strains from the suspension-bars directly to the axes of the posts, I provide channel or **I** bars *B*², which are suitably secured to the connect-

ing-plates *b* of the beams, and extend for a short distance on each side of the pins, which pass through suitable openings in the bars *B*². Exterior plates *B*³ are also provided, to further increase the amount of bearing-surface for the pins.

The upper chords are braced by the lateral struts *G* and diagonal tie-rods *G'*, which are connected to the chords in the following manner: The lateral struts *G* bear at each end against blocks *H*, which are secured upon the upper plate *b* of the chords by eyebolts or stirrups *I*, placed upon the pins *b'*, passing through square holes in the upper plate *b*, into which holes they are neatly fitted, and provided with threaded ends and nuts for securing the blocks to the plates. Knees or angle-pieces *h* are formed upon the blocks *H*, one on each side, and one above the other, through which angle-pieces the diagonal tie-rods *G'* pass, and are drawn up to a bearing by nuts *g'*. By this arrangement I am enabled to use plain rods, with nuts upon their ends for the purpose of adjustment, dispensing with sleeve-nuts, and thereby economizing cost of construction, and can connect all the members of the system to the pins in a substantial and economical manner.

I claim as my invention—

1. The combination, in truss-frames for bridges or other structures, of a series of struts having substantially flat lower end surfaces, a series of chord-bars having similarly-formed edges on their eyes, on which the struts are supported, and a series of connecting-pins passing through the eyes, and uniting the chord-bars at their ends, substantially as set forth.

2. The combination, with the upper chords and their connecting-pins, of the channel or **I** beams *B*², substantially as and for the purpose set forth.

3. The combination of the floor-beams, the inclined washers *F*², bolted or riveted thereto, and the diagonal tie-rods *F*¹, as and for the purpose set forth.

JACOB HAYS LINVILLE.

Witnesses:

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S. T. BENNER.