G. P. Herthel Jr.,

Truss Bridge.

No. 98,866. Patented Jan. 18. 1870.

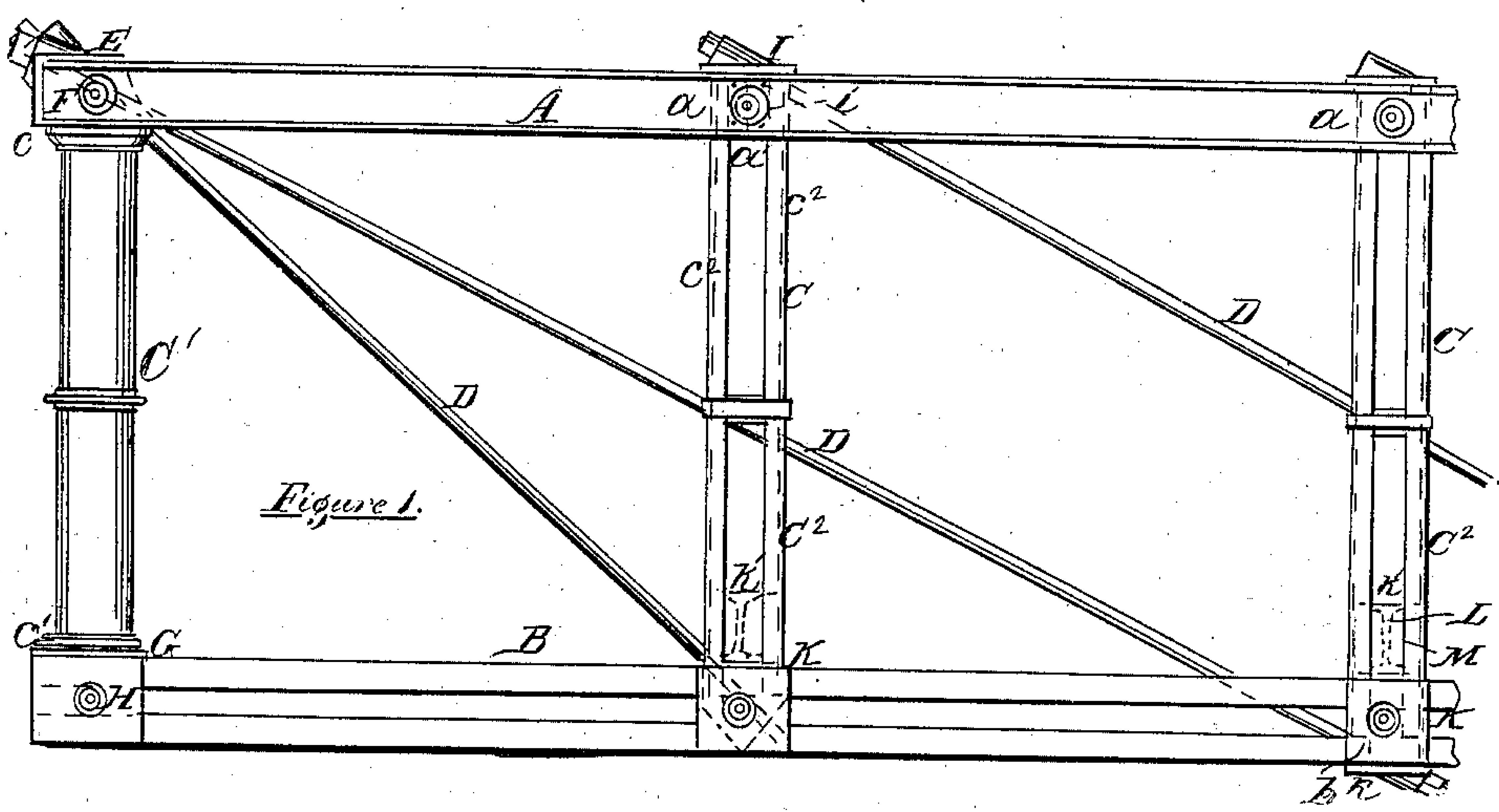

Figure 1.

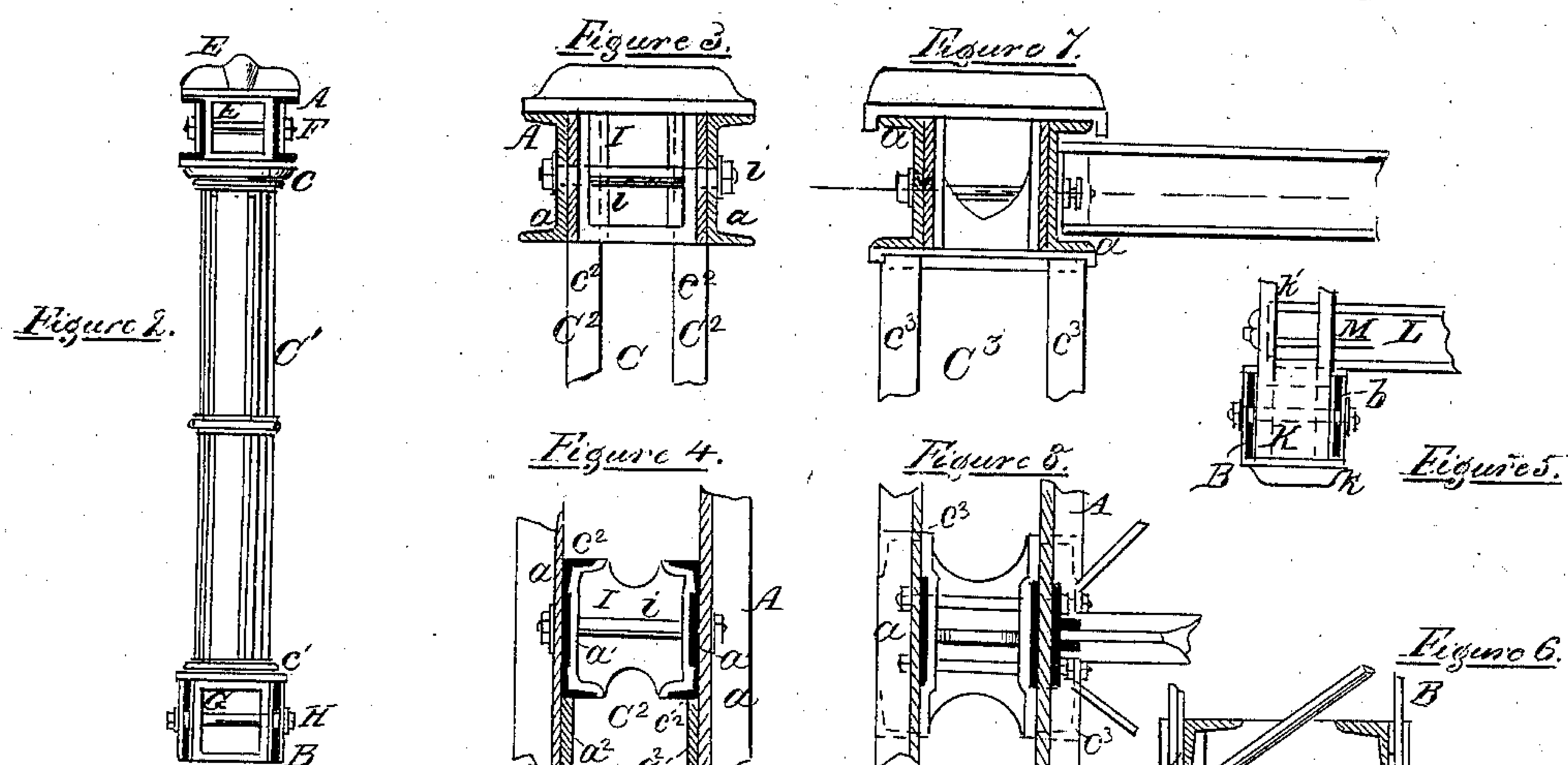

Figure 2. Figure 3. Figure 7. Figure 5. Figure 4. Figure 8.

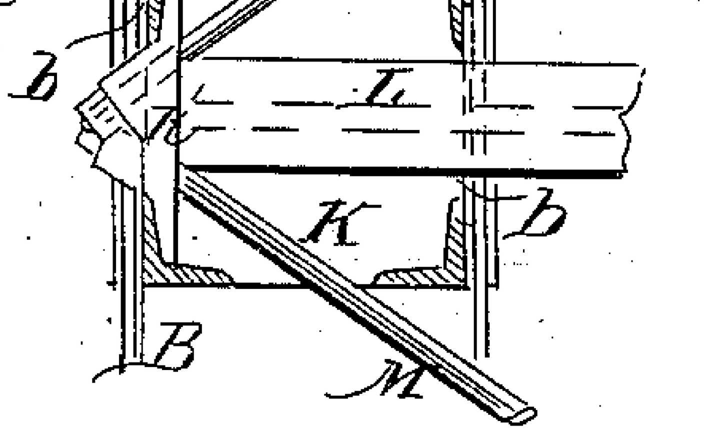

Figure 6.

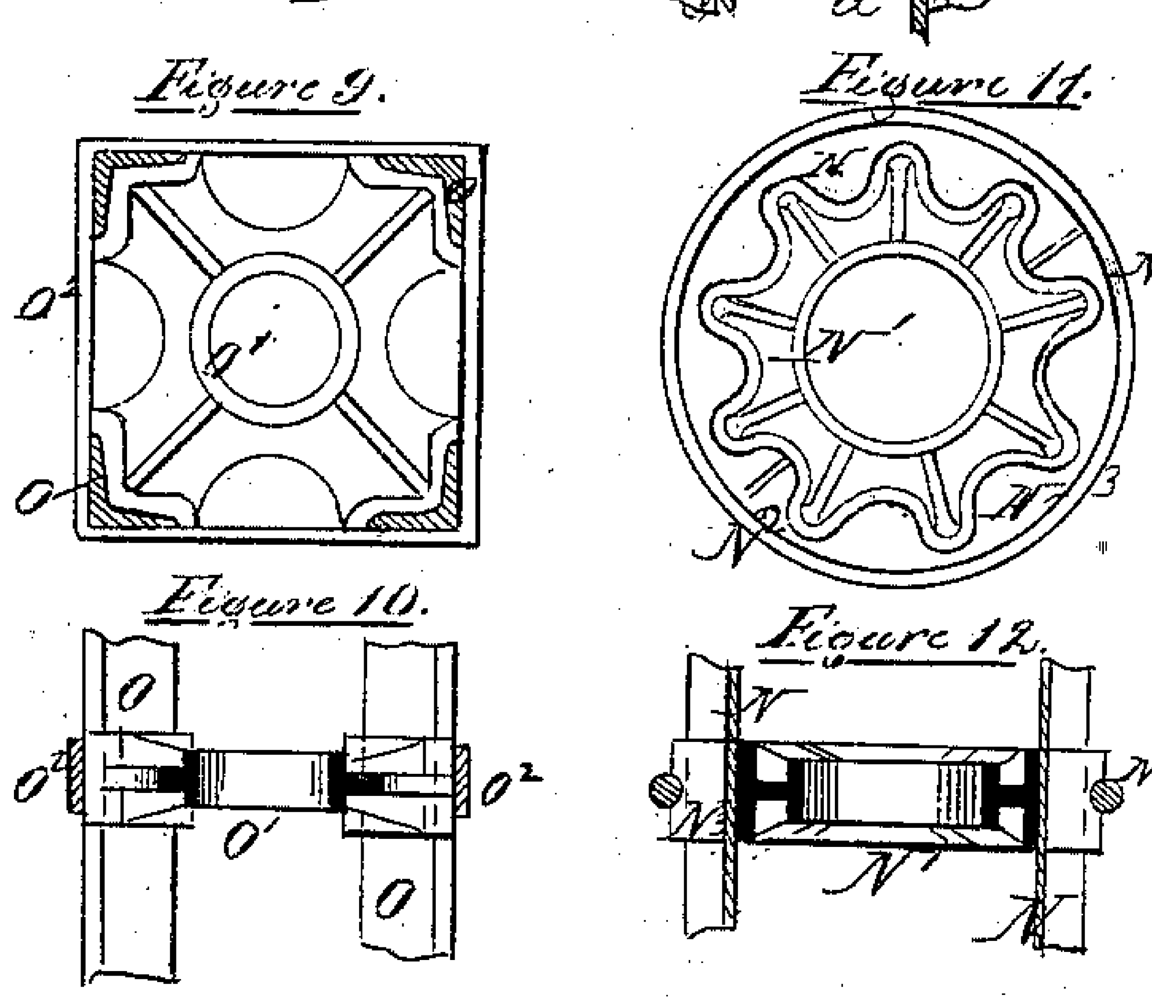

Figure 9. Figure 11. Figure 10. Figure 12.

Witnesses

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GEORGE P. HERTHEL, JR., OF ST. LOUIS, MISSOURI.

Letters Patent No. 98,866, *dated January* 18, 1870.

IMPROVEMENT IN BRIDGES.

The Schedule referred to in these Letters Patent and making part of the same

To all whom it may concern:

Be it known that I, GEORGE P. HERTHEL, Jr., of the city of St. Louis, in the county of St. Louis, and State of Missouri, have made certain new and useful Improvements in Bridges; and I do hereby declare that the following is a full and true description thereof, reference being had to the accompanying drawings, and to the letters of reference marked thereon.

This invention relates more especially to bridge and similar structures, constructed principally of wrought-iron or steel.

This invention relates, in its nature, first, to the manner of constructing the compression-posts or struts of a bridge, and connecting the same with the upper and lower chords.

Said nature is, secondly, in the manner of connecting the posts or struts of a bridge-truss with the upper or lower members and the diagonal rods or braces, and herein this invention more particularly relates to the manner of placing the parts comprising the upper or compression-member of a bridge-truss in such position, relative to vertical planes to the parts comprising the posts or struts, that the braces shall pass between said parts without cutting away material therefrom, to weaken the same, and at the same time reducing the width of the truss to a minimum.

Lastly, this invention relates to certain features of detail construction, as will hereinafter more fully appear.

To enable those herein skilled to make and use my said improvements, I will now more fully describe the same, referring to the accompanying

Figure 1 as a general elevation of a bridge-truss in its usual form, showing such parts as are deemed essential to this description.

Figure 2 is an end view.

Figure 3 is a sectional elevation, and

Figure 4 is a horizontal section, both of said figures showing the joint of the strut or post, with the upper member or cord.

Figure 5 is an elevation, showing the joint at the lower chord, and the support of the floor-beam or cross-bearer;

Figure 6 is a plan of the same, enlarged;

Figure 7 is a vertical sectional elevation, showing the joint of the post, with the compression-chord, as used in large bridges; and

Figure 8 is an axial horizontal section of the same.

Figures 9 and 10 show an angle-iron post or strut, in sectional plan and elevation, and

Figures 11 and 12 show a corrugated-iron post or strut, in sectional plan and elevation.

The bridge-truss is constructed in any of the forms adapted to properly receive the strains and carry the load placed thereon.

As shown in the figures—

A is the compression-member, or top chord.

B, the tension-member, or lower chord.

C are the posts or struts, acting under compression principally, but formed to sustain tension also.

D are the braces, acting solely under tension when arranged in the form shown.

The upper chord will generally be made of rolled channel-bars, I or T-beams, so as to properly resist the strains thereon. These rest upon the end-post C', which I have shown formed of corrugated iron.

Said post has a cap, *c*, upon which the parts of the upper chord rest, being held laterally by a casting, E, arranged between the chord-bars and above the cap *c*.

A bolt, F, passes through the chord A and the casting E, securing said parts.

The cap *c* (and similarly the cap c^1, hereafter referred to,) is fitted within and above the corrugated-iron post-body, so that said iron rests fairly under a projecting flange of the cap, and fits about a vertical part or tenon of the cap. Around the corrugated-iron, an annular fillet is then arranged, held on by a band, which will be shrunk or forged on, generally in the manner indicated in figs. 1, 2, 11, and 12.

The casting E rests, by its upper flange, on the chord-bars, and has proper bearings for the braces D. The casting passing over the vertical end edge of the chords, is drawn down on, and also horizontally against the upper chord, retaining it on the post, and causing the compression-strain in the post and chord.

Similarly a casting, G, is placed between the parts of the lower chord, and connects with said parts by a bolt, H. The casting G is firmly secured to the base *c'* of the post C^1, thus making a firm connection between the post and lower chord.

As none of the braces D pass through the body of the end-post C^1, it was formed, as before stated, of corrugated iron in an endless cylinder.

The other posts, C^2 and C^3, will usually be arranged to pass the braces between their sustaining members, and are formed, in accordance with the nature of this invention, of angle-iron, channel-bars, I or T-beams, or similar parts, which are set apart, as indicated in the drawings.

In small bridges, where the truss-height is insufficient to allow for top lateral bracing, it is important to support the upper member A against lateral vibration. I therefore employ a joist of post and top chord, as indicated in figs. 1, 3, and 4; the post C^2, passing up between the parts *a* of the upper member, and a casting, I, being used to space the said parts, as well as form the proper bearing for the braces D.

To bind the parts, a joint-bolt, *i*, passes through the chord and casting I.

I prefer arranging a joint of the chord-pieces *a* in the vertical axis of the post, as at a^1, the joint being made good by the usual lap-plate, and this being placed between the parts c^2 of the post, thus acting to prevent the post from longitudinal movement under strain of the braces.

The cap of the casting I may fit around or about the outer edges of the parts c^2, in this wise, holding the post in all directions.

A casting, K, receives the lower end of the post C^2, the post being either set upon the casting itself, or it may pass to the lower edge of the lower chord, and the cap k may retain the post. A proper bolt here again passes through the lower chord and the casting K, and the lap-plates b act to prevent longitudinal movement.

In case an increase of metal section is needed in the upper or lower chord, this is usually accomplished by adding a plate to the original chord. Said added plate is placed vertically against the part of the chord, as shown at a^2, in fig. 4, so that the additional plate abuts fairly against the post C^2 C^3, and receives therefrom the compression-strain, (through the action of the brace,) as well as prevents the longitudinal displacement of the post.

To support the floor-beam or cross-bearer, and to permit the same to act as a lower lateral strut, I arrange the casting K with a vertical rib, K′, extending above the lower chord B, and fitting against the inner surfaces of the post angle-irons.

The cross-bearer L then secures to the casting K, (this acting as a saddle,) and said cross-bearer transmitting its pressures as a wind-strut to the rib K′ and the post C^2.

Said rib is then also arranged with proper bearing-surfaces to receive the wind-braces M, as more clearly shown in fig. 6.

If the cross-bearer extends laterally beyond the lower chord, then the rib K′ will be arranged parallel with the cross-bearer, and bolts will be used to connect the latter with the rib and its saddle-casting K.

In large bridges, the height of truss is sufficient to permit lateral bracing between upper chords; and as here it becomes more particularly necessary to economize in width of truss, I arrange the parts c^3 of the post C^3 under the parts a of the chord A, as indicated in figs. 7 and 8.

Here, again, the connection of post and chords is made by proper castings and through-bolts. If, by necessity of increases of strain, a greater number of chord-parts is needed, then the additional parts will be arranged in the same horizontal plane with the parts before in use, and under each new chord-part, a post-part (similar to c^3) may be placed, in accordance with the nature of this invention.

In very long panels, where the points of support to the upper chord are far apart, this chord will be formed in members arranged above each, and spaced and connected, as hereafter described, for the construction of compression-members.

To confine the ends of the post, bands will be used, and the chords of opposite trusses will be connected by lateral bracing generally, as indicated in figs. 7 and 8, or in any other proper manner.

For the purpose of forming a strong and economical post, where braces do not require passage-way, (as at ends of trusses,) and especially for forming columns in buildings, telegraph-posts, and similar structures, I use corrugated or similar iron (or steel) plate N. This is formed to a cylinder, either circular or polygonal in general outline, as shown in figs. 11 and 12.

Within such cylinder, especially at top and bottom, I arrange castings, N^1, fitting to the plate N, and without I arrange a wrought-iron or steel band, N^2, which will be forged or shrunk on, and which has a proper bearing-ring, N^3, fitting to the outer plate-surface of the post. The ring N^3 should be split, to allow the band N^2 to draw up in shrinking.

Similarly for posts, especially on bridge-trusses where braces pass through the posts, I arrange the angle-iron or steel (or other shape) bars O, and within these the spacing-castings O^1, and secure the parts by bands O^2, passing around the bars and castings. By nicking the plate N or the bars O, the inner castings and the bands will be prevented from slipping down under violent jar or vibration.

In the use of shape iron posts may be formed of a rectangular, hexagonal, or other polygonal outline, and as a form well adapted for bridge-work, I mention the one produced from ∩-bars.

It is apparent that a compression-member, (such as a post or strut,) when formed of several parts to act as a whole, must be firmly secured, so that its several parts shall act conjointly. This, it is plain, is achieved by the castings O^1 and band O^2, the latter, by great power, binding the several parts, to prevent buckling or even displacement axially.

Again, the joint of the several parts thus made does not cut away the available metal section of any of the sustaining members, and the several sustaining members may be placed at such distances apart as to give the post, strut, or compression-chord the required diameter or areal dimensions to prevent buckling or transverse strains.

By placing angle or channel-iron with the flanges of the several members of the post at the farthest possible remove from the vertical axis of the post, a form similar to that of fig. 9 is achieved. This form is of rectangular outline, and two of its surfaces being placed parallel to the vertical planes of the longitudinal upper or lower chord-strips or members, the joint of the post and said chord-strips may be achieved by a metal contact of the several members, which are contiguous, thus avoiding dangerous joint-castings and other than rectangular or so-called "square" fittings.

Lastly, in using endless sections, as when applying corrugated iron, inner castings are not absolutely required, and, by riveting cylinder to cylinder, great lengths of posts may be achieved.

To attain great lengths without riveting, the cylinders (or the bars O) may rest, one above the other, and then castings N^1 or O^1 may be employed within and bands without to secure the joint.

Having thus fully described my invention,

What I claim, is—

1. A post, strut, or other compression-member, formed of corrugated metal with or without inner castings, and arranged with caps fitted at ends, and secured by bands shrunk or forged on, substantially as set forth.

2. Passing the posts or struts between the parts of the upper chord, and securing the parts by a joint casting and bolts or bands, substantially as set forth.

3. The arrangement of the lap-plate in joints of the upper or lower chords, to hold the post against longitudinal movement, substantially as set forth.

4. The plate I, receiving the braces D, and arranged between the parts of the upper chords, and also resting thereon and between the post parts, substantially as set forth.

5. The casting K, arranged between the parts of the post and the lower chords, and receiving the thrust of the wind-strut and strain of the lateral braces, substantially as set forth.

6. Arranging the parts of the post or strut vertically under parts of the compression-chord, substantially as set forth.

In testimony whereof, I have hereunto signed my name, in the presence of—

GEO. P. HERTHEL, JR.

Witnesses:

WILLIAM W. HERTHEL,

ROBERT BURNS.