O. H. BOGARDUS.
Iron-Bridges.

No. 150,515. Patented May 5, 1874.

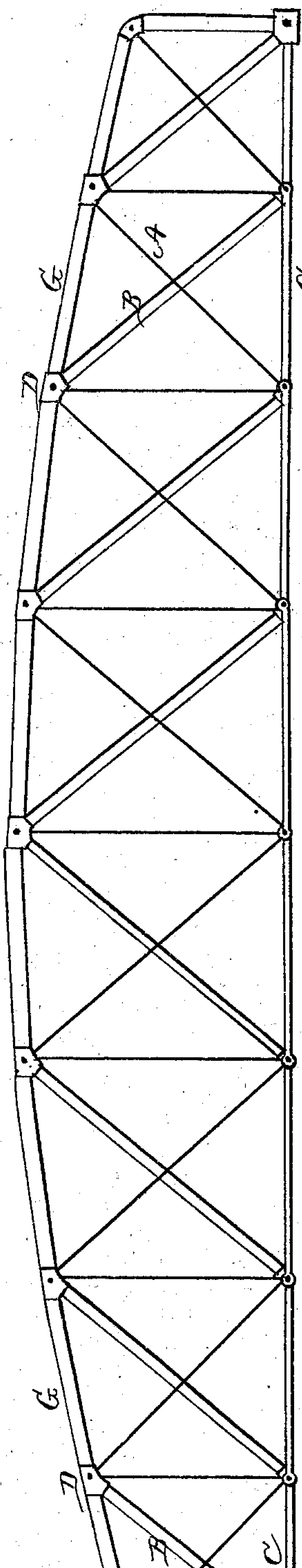

Fig. 1.

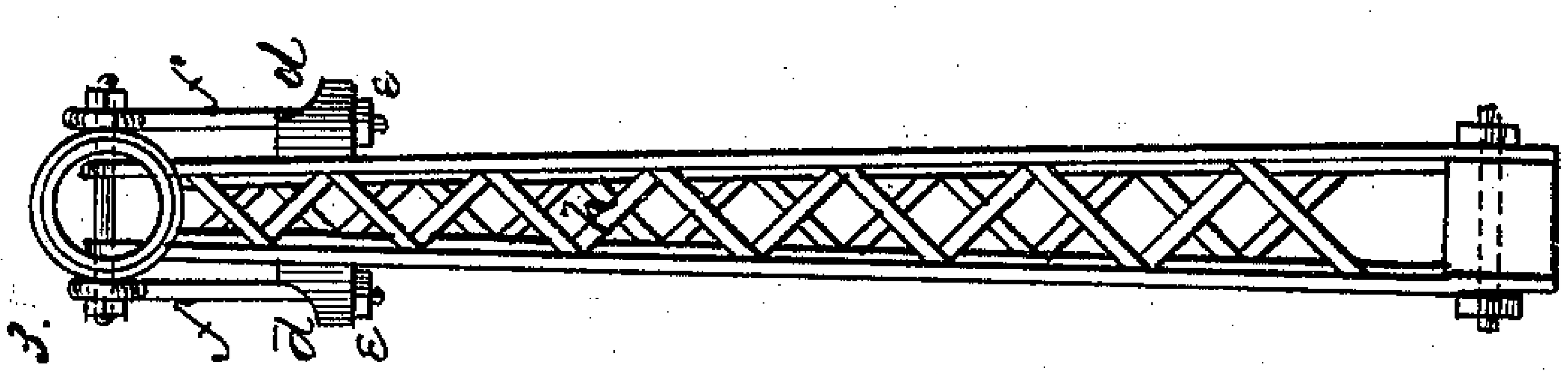

Fig. 3.

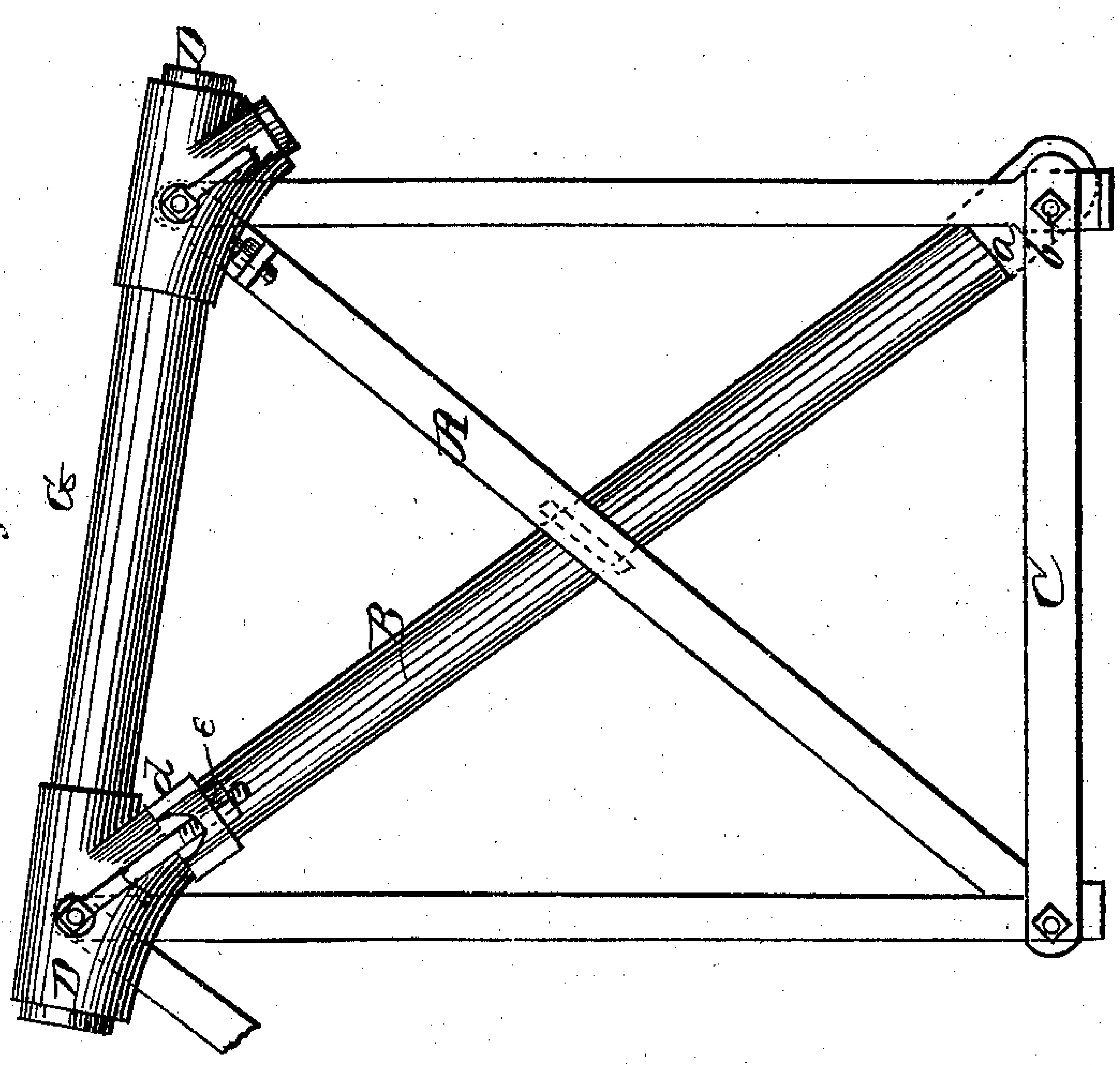

Fig. 2.

WITNESSES:
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AM. PHOTO-LITHOGRAPHIC Co. N. Y. (OSBORNE'S PROCESS.)

UNITED STATES PATENT OFFICE.

OVA H. BOGARDUS, OF DURHAMVILLE, NEW YORK.

IMPROVEMENT IN IRON BRIDGES.

Specification forming part of Letters Patent No. **150,515**, dated May 5, 1874; application filed March 31, 1874.

To all whom it may concern:

Be it known that OVA H. BOGARDUS, of Durhamville, in the county of Oneida and State of New York, have invented certain new and useful Improvement in Bridges; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings and to the letters of reference marked thereon, which form a part of this specification.

In the accompanying drawing, Figure 1 is a side elevation of a bridge embodying my invention. Fig. 2 is an enlarged side view of one of the panels, and Fig. 3 is an end view of the same.

In nearly all metallic bridges there is an excess of metal, or rather weight of metal is placed where less can advantageously sustain the strain.

In the longer-span bridges recently constructed, the load to be carried is small compared with the weight of the structure itself, and it should be noted that the length of span said to be required by the wants of inland commerce is ever increasing. I have adopted for the outline form of my truss practically a circumscribed parabola, thereby reducing the area of web to be filled by that part of the parallelogram omitted at the top, which is regarded as superfluous.

For the filling of the outline or the web various designs have been adopted. I consider that to be best which is simplest and most directly carries the load from the center, or the point of application, to the abutments. A beam supported at the ends is inclined to sag in the middle. Take any section and there is developed extension strain from the upper chord inward and downward to the bottom chord, and compression from the upper chord outward and downward to the bottom, thus showing not only the kind but position of member required to prevent the sag. I therefore adopt the rectangular panel system, and introduce both a tension member, A, and a compression member, B, which cross each other in the center of the panel and are joined at their intersection. To adapt the diagonals to the curved upper chord and preserve their parallelism I diminish their intervals from the center toward the abutments.

It will be observed that both tension and compression are used to constantly carry the main strain to the abutments, both diagonals acting as principals, the verticals joining what would otherwise be two independent systems of triangles, and are thus useful in distributing and equalizing the load.

As a result of curving the upper chord the end posts and all panel members are shortened, and, as the compression members are not only shortened, but since their strength is in an inverse ration to their length, they may be also reduced in sectional area; also, the greatest reduction of length occurs where the vertical strains are greatest; hence I actually provide for increasing strains by reducing material.

Thus far I have assumed the bridge as uniformly loaded, and have considered and provided only for the direct strains generating from the center; but when the bridge is unequally loaded, as in the case of a moving train, we have a new set of forces, generating from a movable center, called counter-strains, because acting counter to or in an opposite direction from the direct strain. In any truss braced symmetrically from the center a load applied at the center is carried directly to the abutments; but let a load be applied at a point either side of the center, and that portion of the weight going to the far abutment has no support between the point where the load is and the center of the bridge. To provide for these counter-strains and carry the proportional load to the center, I utilize the members already in position by making them counteracting—that is, capable of sustaining strains either of tension or compression. The posts B, to resist the direct strain (which is compression) coming from the center, are shod with a suitable shoe, *a*, and rest upon the connecting-pin *b* of the lower chord C, and abut against the joint-block D of the upper chord G. That they may resist the counter-strain (which is tension) coming from the opposite direction, they have fitted upon their upper ends a collar, *d*, with a shoulder projecting out sufficiently to pass tie-bolts *f* through it. The tie-bolts fit upon the connecting-pins with an eye, and, passing through the collar, are drawn up with nuts *e*. The ties A, to resist the direct strain, (which is tension,) are joined to the connecting-pins of the upper and lower chords by an eye, and to resist the counter-strain (which is compression) they are stiffened by a system of cross-bracing, *h*, between the bars, and an attachment, *d e f*, similar to that on the posts B.

Another advantage of this attachment is, that as the strains are reversed by the passing load there is no play in the joint on the connecting-pin. As the different strains pass through different joint surfaces the change of strain is in solid metal and not in a joint.

Among the advantages derived from the use of double diagonals crossing each other and joined at their intersection is, that any tendency to deflection in the post is resisted and counteracted by the tension in the tie. This practically reduces the posts to half-lengths, supports, and gives rigidity to the whole.

The lower chord C is made up of flat bar-iron, in length corresponding to panels, drilled, and joined by pin-connection. The end posts, upper chords, and braces are made of wrought or drawn iron, or steel tubes, used singly, in pairs, or in groups, as the size of the bridge and resulting strains may require. The upper chord is also in lengths corresponding to the panel lengths, and joined by a cast-iron or steel joint-block, D.

It will be seen that by the combination I have adopted the strains of braces and ties act over an entire panel, and the end brace is, therefore, carried to the abutment instead of stopping at a half-panel.

Having thus fully described my invention, what I claim as new, and desire to secure by Letters Patent is—

1. The upper curved chord G, in combination with hollow metal posts B and braced ties A, adapted to strains both of tension and compression, the diagonal parts A and B crossing each other and joined at their intersections, and the intervals between diagonals diminishing from the center toward the abutments, as and for the purpose specified.

2. The hollow metal posts A, provided with collar *d*, with perforated shoulder to receive the bolts *f*, in combination with the joint-block D, constructed and arranged substantially as and for the purpose set forth.

In testimony that I claim the foregoing as my own I affix my signature in presence of two witnesses.

OVA H. BOGARDUS.

Witnesses:
B. E. CARPENTER,
E. W. HALL.