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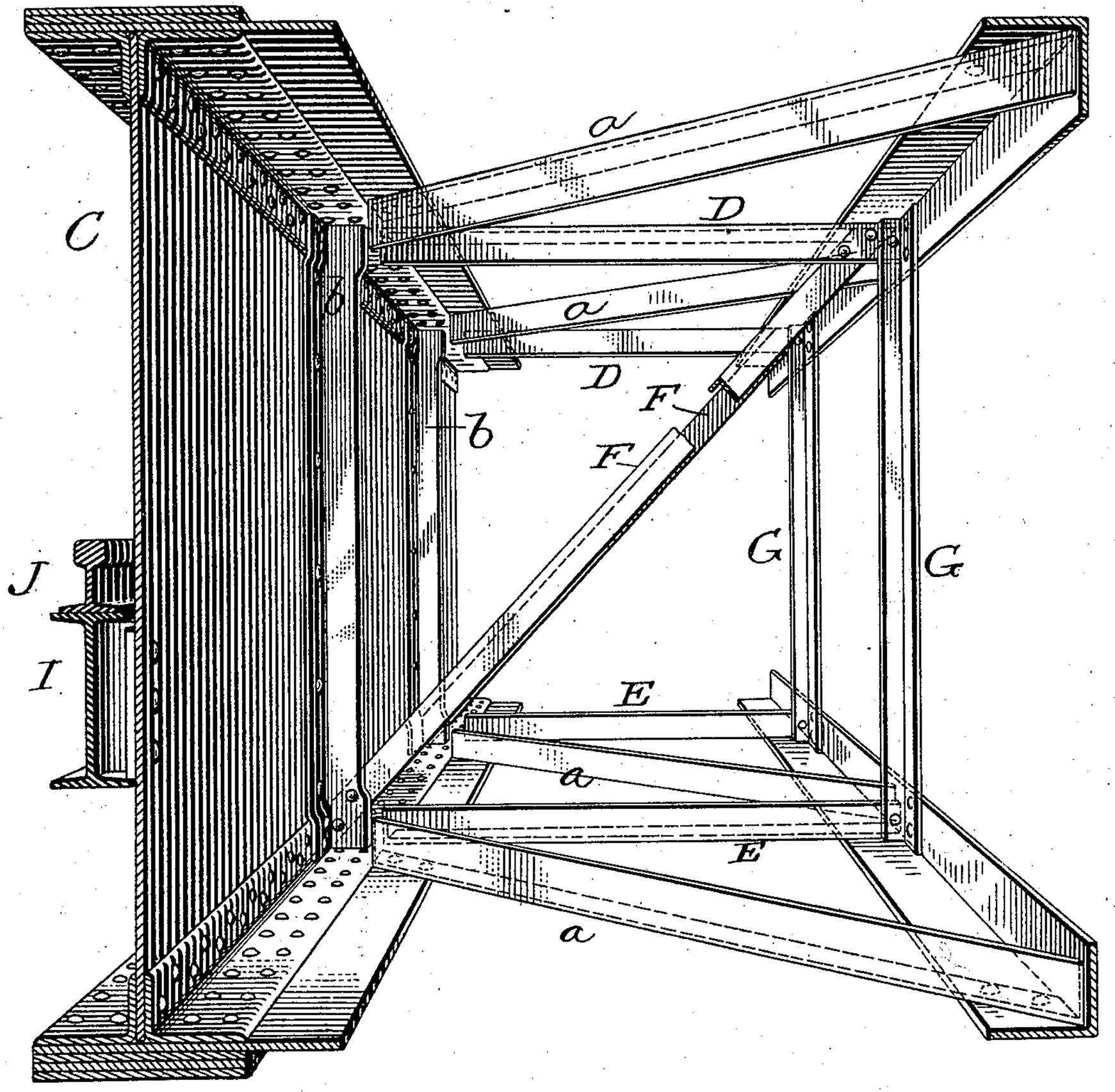
A. J. SHAW, Dec'd

M. H. SHAW, Administratrix.

CRANE.

No. 574,581. Patented Jan. 5, 1897,

Fig. 1.



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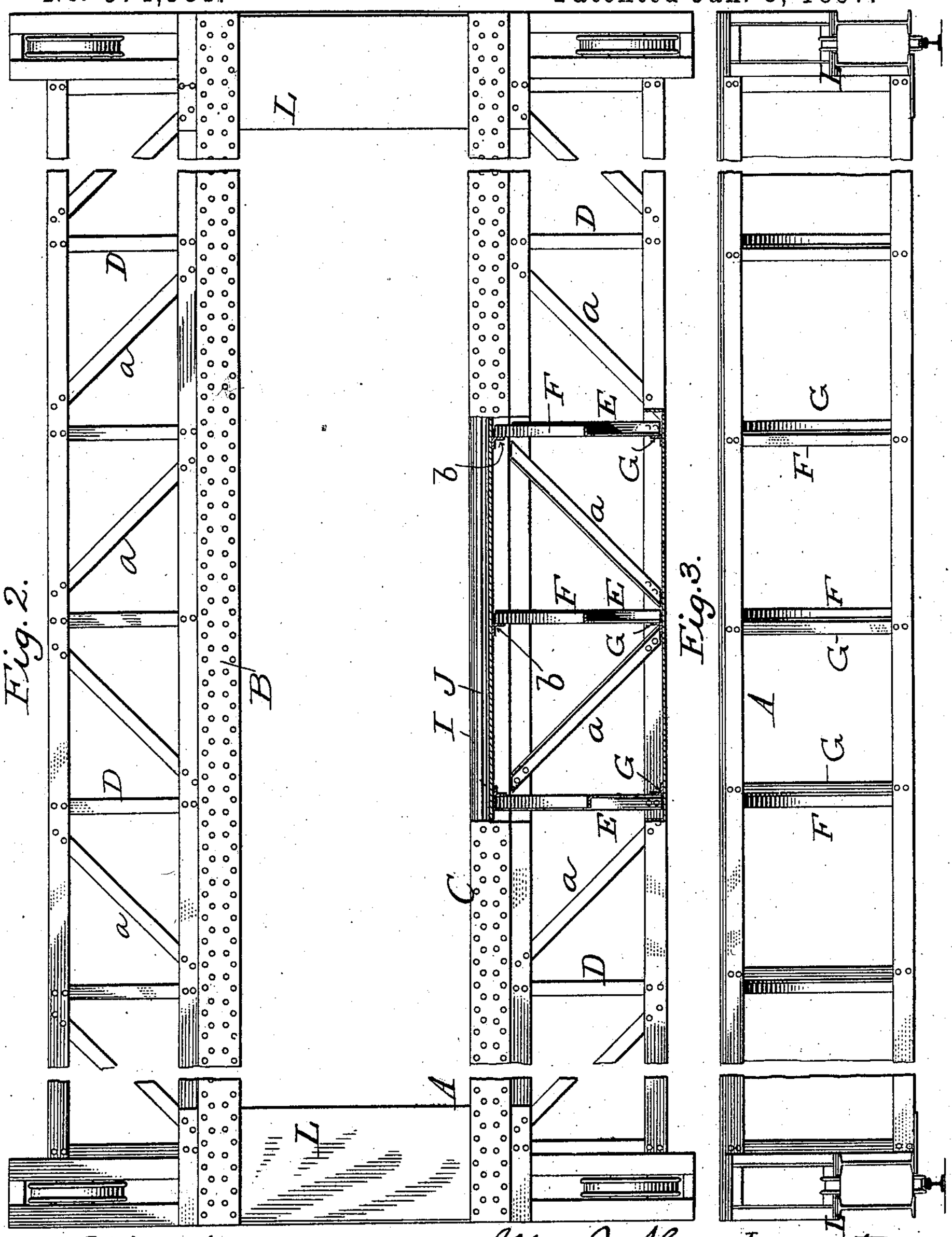
CRANE.

No. 574,581. Patented Jan. 5, 1897.



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No. 574,581. Patented Jan. 5, 1897.

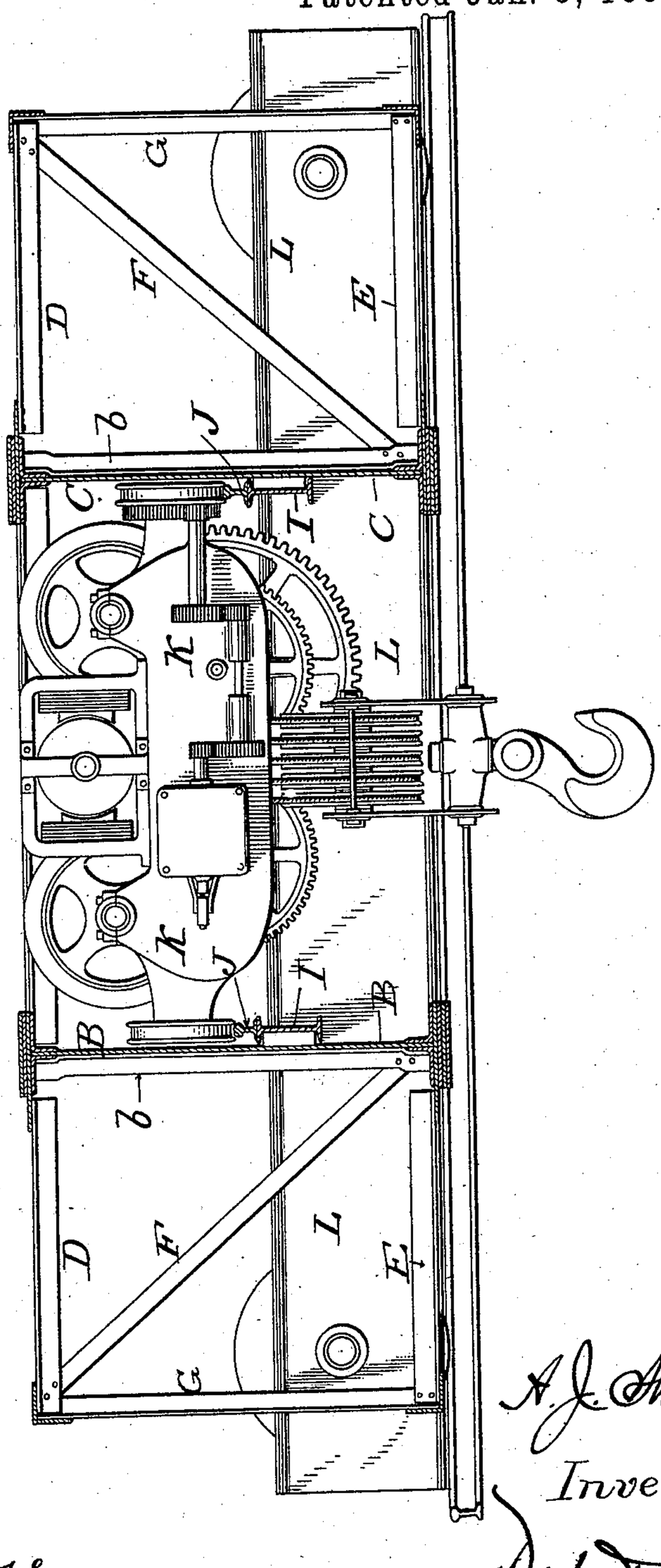

Fig. 4.

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CRANE.

No. 574,581. Patented Jan. 5, 1897.

Fig. 5.

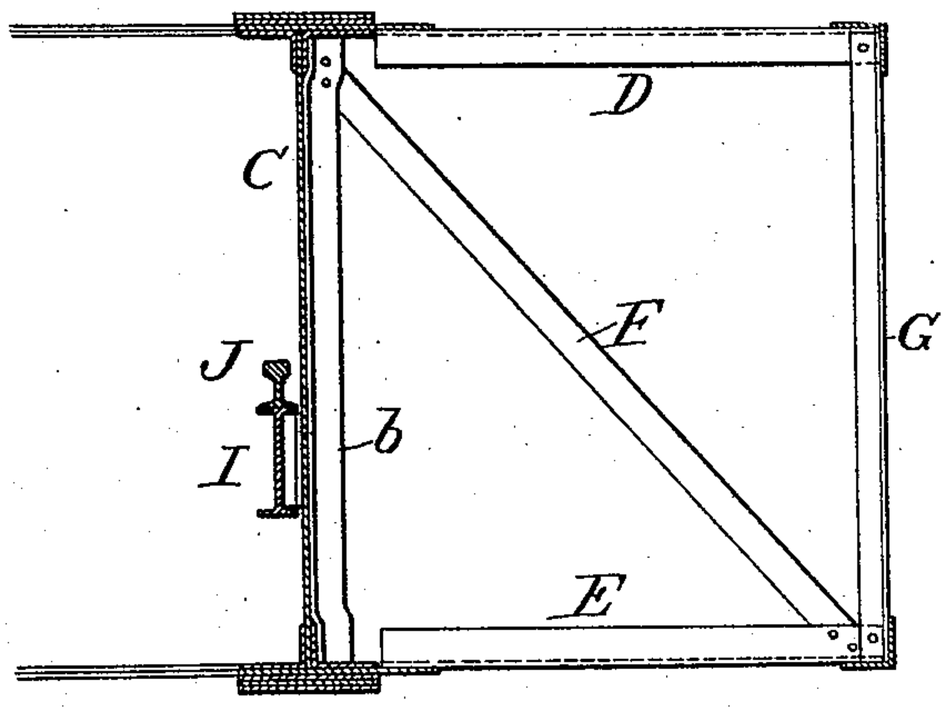


Fig. 6.

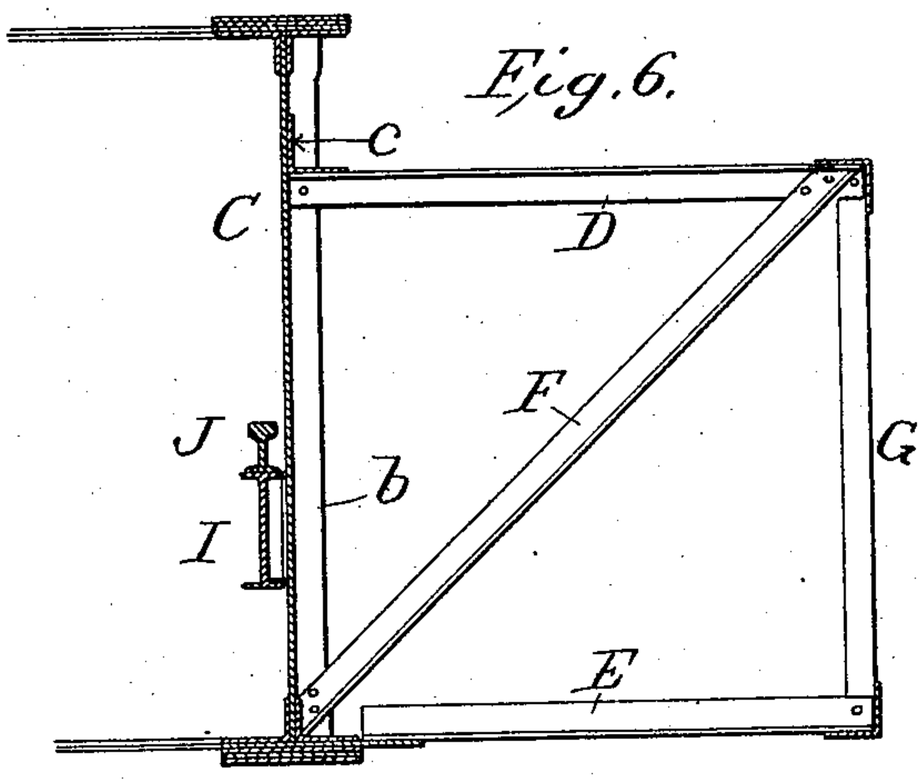
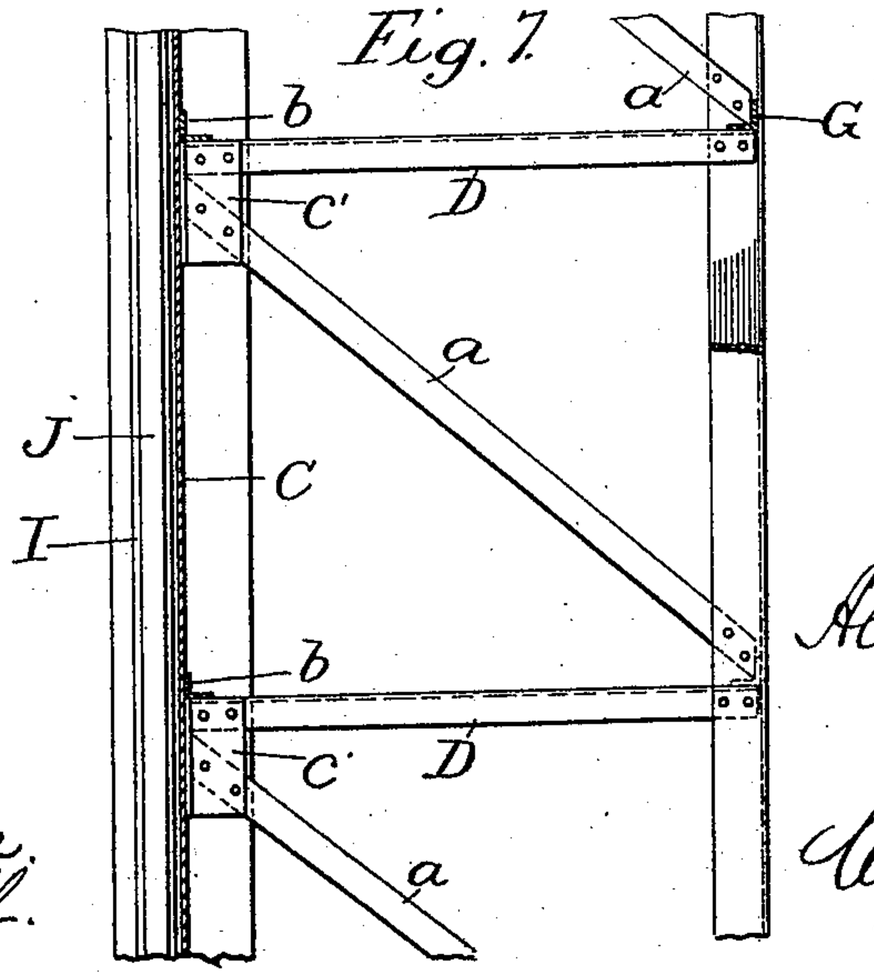


Fig. 7.



Witnesses
C. E. Burdine.
C. B. Bull.

Alton J. Shaw,
Inventor
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Attorneys.

UNITED STATES PATENT OFFICE.

ALTON J. SHAW, OF MUSKEGON, MICHIGAN; MARY H. SHAW, ADMINISTRATRIX OF SAID ALTON J. SHAW, DECEASED, ASSIGNOR TO THE SHAW ELECTRIC CRANE COMPANY, OF SAME PLACE.

CRANE.

SPECIFICATION forming part of Letters Patent No. 574,581, dated January 5, 1897.

Application filed December 13, 1894. Serial No. 531,711. (No model.)

To all whom it may concern:

Be it known that I, ALTON J. SHAW, a citizen of the United States, residing at Muskegon, in the county of Muskegon and State of Michigan, have invented certain new and useful Improvements in Cranes, of which the following is a specification.

My invention consists in a novel construction and arrangement of the girders or bridges of traveling bridge-cranes whereby the lateral vibration to which they have hitherto generally been subject is prevented and torsional strain is reduced.

The invention is illustrated in the accompanying drawings, in which—

Figure 1 is a perspective view of one side of a bridge constructed in accordance with my invention. Fig. 2 is a top plan view of a portion of my improved bridge or girder partially broken away to show parts otherwise hidden. Fig. 3 is a side elevation; Fig. 4, a vertical transverse section of the same; and Figs. 5, 6, and 7 illustrate certain modifications.

In traveling bridge-girders and like structures in which a bridge beam or girder is supported at its ends and is moved by power applied at or near its ends there is quite serious lateral strain and deflection in starting and a greater or less lateral vibration during travel due to the inertia of the bridge itself, augmented by that of the load carried between its ends. In other words, when power is applied to the truck-wheels they start forward promptly, while the intermediate bridge or girder does not start with equal promptness, but comes into motion gradually from the ends toward the middle. The difference in time, though slight, is proportionate to the length of span, weight and rigidity of structure, and weight and location of load, being of course greatest when the span is long, the structure deficient in rigidity, the load great, and its location near the mid-length of the bridge.

To overcome or prevent the lateral deflection of the bridge or girder, it has been proposed to truss the same laterally or horizontally, and in order to avoid transferring the strains of the horizontal truss or bracing to the vertical face of the bridge beam or girder and to preclude torsional strains it has been proposed to arrange the horizontal truss to bear only against the flange-plates or the upper and lower chords of the bridge and to employ a vertical truss to connect and carry the upper and lower horizontal trusses, said vertical truss to be carried at its ends by supplemental supports at or near the ends of the main bridge or girder. This produces in effect an open box-girder or two vertical girders connected at their upper and lower chords by horizontal trusses, but without any other cross connection.

Under my construction the secondary vertical truss is dispensed with and the lower horizontal truss is suspended from the outer chord of the upper horizontal truss, which latter is carried by struts extending upward and outward from the lower chord of the main bridge beam or girder, or the lower horizontal truss is suspended by diagonals extending downward and outward from the upper chord of the main bridge, and the upper horizontal truss is supported upon the lower one by suitable uprights. This construction prevents any material lateral deflection and vibration of the bridge, and the weight of the outer beams of the horizontal trusses is mainly sustained by being translated by said diagonals into horizontal stresses in the horizontal trusses themselves. In this way the main girder is relieved from torsional stresses almost if not quite as effectually as if an outer or auxiliary girder were used, and certain advantages are gained which will be hereinafter set forth.

As is well understood, when a girder or beam is loaded vertically and symmetrically or in a transverse plane through its center of gravity the effect of such loading is to compress or shorten the upper and elongate the lower flange or chord of the girder without torsional effect. If, therefore, there be rigid horizontal connections from such girder to another vertical girder which does not receive the load, and hence is not similarly deflected, such connections will tend to throw either the main or the secondary girder out of shape laterally or to produce a torsional strain upon

one or both. If, instead of employing a second vertical girder, the main girder be merely stiffened laterally by horizontal trusses carried by diagonal struts or braces extending upward from the lower chord of the main girder, there will be no lateral deflection of the main girder by a symmetrically-applied load and little or no torsional effect thereon, as the trusses will merely yield vertically and adapt themselves to the vertical deflection of the main girder.

In practice a crane-bridge commonly comprises two beams or girders, which support the trolley on rails situated on their top directly over their centers of gravity. In some cases the load is not supported directly over the center of gravity of the girders, and more or less torsional stress is set up thereby. In the form of girder herein described any torsional stress due to eccentric loading is resolved into three components. One, the vertical component, is sustained by the vertical or main girder precisely as if the load were applied symmetrically. The other two form a couple which tends to rotate the girder about the horizontal axis through its center of gravity and is resisted by the horizontal trusses.

In the present instance it is designed to locate the trolley which carries the hoisting mechanism between the two main beams or girders of the bridge and to keep its top near or below the level of the top of the bridge, in order to economize head-room as far as practicable. When the trolley is thus located, the rails upon which its wheels travel are secured to the inner faces of the two girders, and hence the load produces more or less torsional strain thereon. Such torsion, acting as described in the preceding paragraph, causes the upper flanges of the girders to move inward or toward each other and the lower flanges to move outward, both very slightly, but sufficiently to vary the gage of the rails. Obviously there is a neutral point or line between the upper and lower flanges, that is, a point where there is neither inward nor outward movement through torsion. By locating the rails in or beside this neutral axis I obviate any horizontal movement of the rails in relation to each other.

Referring now to the drawings, A indicates the main bridge, composed of two beams or girders B and C, of such construction as the purposes of the crane require and connected at their ends by truck-frames or "bridge-ends" L, only one of which is shown, in Fig. 4. Secured to and projecting from the upper flange or chord of each girder B and C is a horizontal truss D, and secured to and projecting from the lower flange or chord of each is a similar truss E. The outer chord of each upper truss D is supported by struts or braces F, which extend from the lower flange or chord of the main trusses B and C upward and outward, as shown. The outer chord of the lower truss E is suspended from the outer chord of the upper truss D by hangers or suspenders G, which are here represented as of angle-iron, but which may be simple rods or flat bars. Angle-iron is preferably employed for reasons of convenience and economy in construction.

The trusses D and E of course involve diagonal braces or struts *a* and perpendicular struts *b* between their inner and outer chords. No diagonals are, however, used between the outer chords of the upper and lower trusses, since it is neither intended nor desired to produce trusses at such points, but merely to maintain the lower trusses in parallelism with the lower chords of the main beams or girders.

To the inner faces of the main beams or girders B and C are bolted I-beams I, upon the upper flanges of which are secured rails J to receive the truck-wheels of a trolley K. The crowns or treads of these rails are located at such height, or at such point between the upper and lower flanges or chords of girders B and C, as will bring them approximately horizontally opposite the neutral axes of the main beams or girders B C, which will be at or near the mid-height thereof.

Wheels will of course be provided at the ends of the bridge.

While the construction of the bridge above set forth is more particularly designed for a crane in which the trolley is placed within the space between the main beams or girders, it is not restricted thereto, but may have the trolley mounted on its upper surface or carried in such other manner as may be determined by the exigencies of any particular case.

It is obvious that the construction may be varied without departing from the spirit of my invention, as, for instance, by making the diagonal braces F to extend from the upper chord of the main girder to the outer chord of the lower truss, as in Fig. 5, thus acting as suspension instead of compression braces, or the upper horizontal truss may be attached to the main girder below instead of directly to its upper flange, as in Fig. 6, in which case angle-plates *c* or equivalent means of attachment will be provided. Such differences do not materially alter the stresses set up by the various forces acting on the girder.

As above stated, I have represented the trussing as formed of angle-iron, though not intending to restrict myself thereto. When used, it may be bolted or riveted together in the manner illustrated in Figs. 5, 6, and 7, in which latter figure the vertical members G are shown of L form in cross-section, whereby strength and stiffness are secured, together with good bearing-surfaces and proper body through which to rivet.

Having thus described my invention, what I claim is—

1. A crane-bridge provided with a lateral support consisting of two horizontal trusses, one projecting from its upper and the other projecting from its lower chord or flange, di-

agonal struts or braces extending from the bridge proper to the outer chord of one of the trusses, and uprights connecting the outer chords of the two trusses.

2. In a crane-bridge, the combination with two separated beams or girders each provided with a horizontal truss, of trolley-supporting rails carried by the inner faces of said beams or girders, in line with the neutral axes thereof as regards the torsion of said beams or girders.

3. In a crane-bridge, the combination of two separated beams or girders each having parallel upper and lower chords; horizontal trusses applied to the outer faces of said beams; and rails carried by the inner faces of said beams, in a horizontal plane midway between their upper and lower chords.

4. In combination with bridge A comprising beams B, C, and ends L, horizontal trusses applied to the beams; rails J, carried by the inner faces of said beams in plane with the neutral axes of said beams from end to end, as regards torsion; and a trolley mounted upon said rails.

In witness whereof I hereunto set my hand in the presence of two witnesses.

ALTON J. SHAW.

Witnesses:

J. G. EMERY, JR.,

CHAS. L. GRIFFIN.