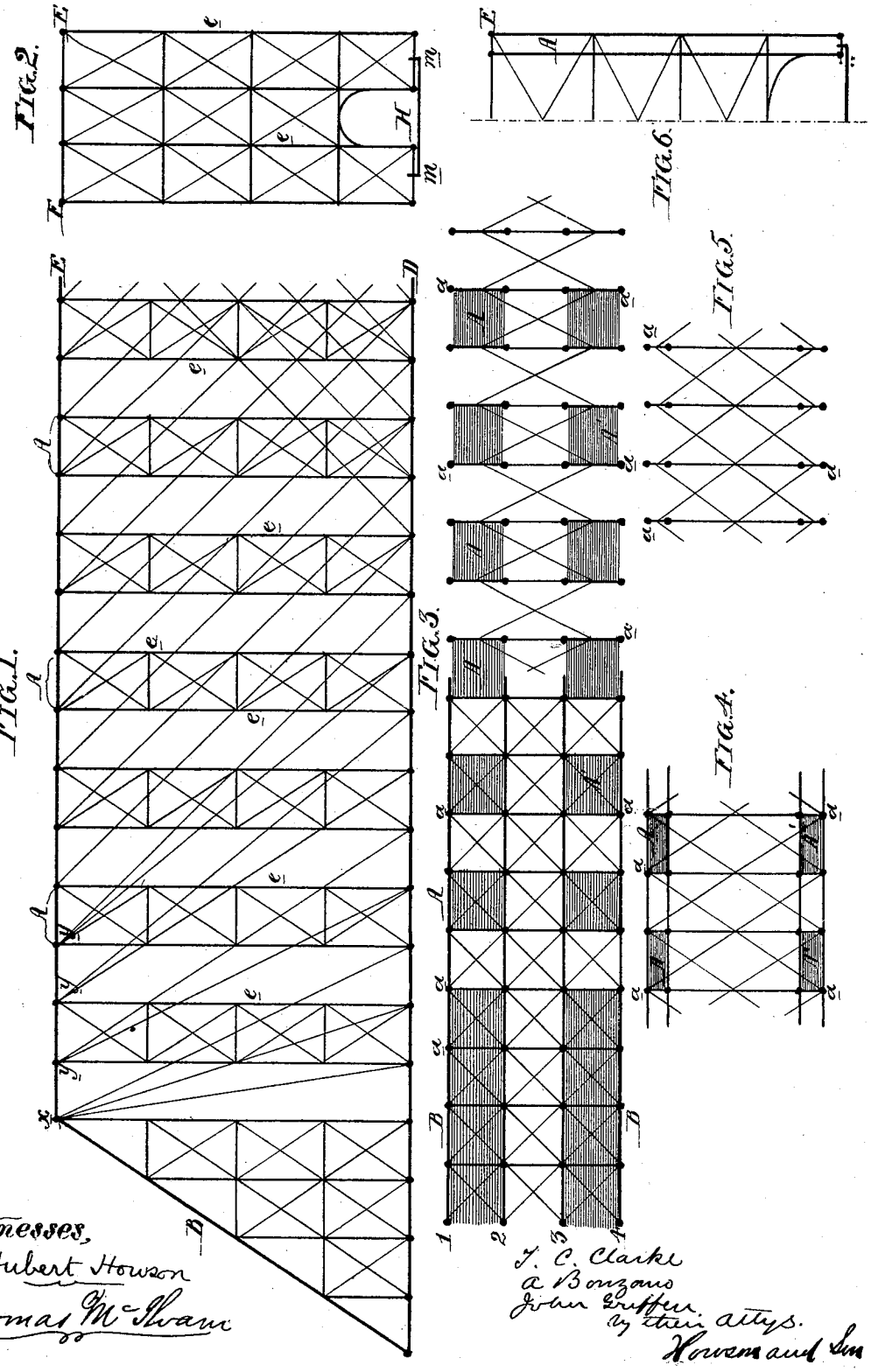
T. C. CLARKE, A. BONZANO & J. GRIFFEN.

Truss-Bridges.

No. 140,471. Patented July 1, 1873.



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UNITED STATES PATENT OFFICE.

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IMPROVEMENT IN TRUSS-BRIDGES.

Specification forming part of Letters Patent No. **140,471**, dated July 1, 1873; application filed June 16, 1873.

To a l whom it may concern:

Be it known that we, THOMAS C. CLARKE, of Philadelphia, and ADOLPHUS BONZANO and JOHN GRIFFEN, both of Phoenixville, Chester county, State of Pennsylvania, have invented certain Improvements in Truss-Frame Bridges, of which the following is a specification:

The object of our invention is to so construct truss-frame bridges that they can be economically made and erected with a length of span heretofore considered impracticable; and this object we attain by grouping the posts together in such a manner that they will form a system of towers, as illustrated in the side view, Figure 1, the transverse section, Fig. 2, and sectional plan, Fig. 3, of the accompanying drawing.

Heretofore the application of truss-frames to bridges has been restricted to such as are of comparatively short span, for the reason that the longer the span the greater will be the depth of truss demanded, and, consequently, the longer must be the posts, and, as the strength of the posts depends upon the ratio of diameter to the length, they must, in ordinary truss-frames of long span, be of large diameter and great length, and of a weight which prohibits the practice of economy in the erection of such structures in the usual manner of a longer span than about four hundred and twenty feet. For instance, a truss-frame bridge with a span of one thousand feet would demand a height of about one hundred and twenty feet, and, if the trusses be constructed in the usual manner, the posts would require a diameter of at least two and one-half feet, and these posts would present such a dead weight and such an extended area to receive the action of the wind that the structure would be impracticable, even if the enormous expense of erecting it did not forbid the entertainment of such a bridge by practical engineers.

The drawing, however, represents a portion of a truss-frame bridge having a span of one thousand feet and a height of one hundred and twenty feet, and so constructed as to obviate the above difficulties.

We discard the usual system of posts and substitute therefor a series of towers, A, which are illustrated in the side view, Fig. 1. The method of forming these towers will be best understood, however, by referring to the plan view, Fig. 3, in which the bridge is represented as consisting of four truss-frames, 1, 2, 3, and 4. Two posts of the frame 1 are combined with two opposite posts of the frame 2 to form the tower A. In like manner two posts of the frame 3 are combined with two posts of the frame 4 to form the opposite tower A′. We have in Fig. 3 shaded with lines each quadrangular space which is within the limits of one tower, and from this it will be rendered apparent that in the bridge represented there is one row of towers, A, composed of posts of the frames 1 and 2, and another row of towers, A′, composed of posts appertaining to the frames 3 and 4, the roadway being between the two rows of towers. The four posts of each tower extend from the lower chord D to the upper chord E, and are connected together at intervals between the chords, both longitudinally and transversely, by horizontal cross-ties *e* and by diagonals on all four sides of the tower, the opposite rows of towers being connected together by cross-ties and diagonals, as shown in Fig. 2. Each end of each of the four truss-frames consists of a triangular structure, B, which forms the end post, and the construction of which is rendered too evident by the drawing to need description.

It has been usual in truss-frame bridges to extend the main diagonals from the lower chord to the upper end *x* of the end post, but the diagonals in the present instance are so numerous that it would be difficult to make an appropriate attachment at this one point, hence some of the main diagonals are connected in pairs to the upper chord at points *y y y*, Fig. 1. It should be understood that there are two sets of the usual diagonals, one set on each side of each frame, these diagonals being so clearly shown in Fig. 1 that a description will be unnecessary.

To illustrate the advantages of our invention, we may here remark that a tower composed of posts of from eight to twelve inches

in diameter will be much stronger than the single column of two and one-half feet in diameter above referred to, and that the tower, including its cross-ties and diagonals, will weigh less than the single column, while the tower presents the smallest possible surface to the action of the wind.

An important feature of our invention is the mode of connecting the transverse beams which support the floor to the truss-frame. This is illustrated in Fig. 2, where H represents one of the transverse beams suspended at its opposite ends *m m* only to the opposite towers, the points of suspension being the centers of the tower. By this arrangement the weight of the passing load will be distributed equally among the several truss-frames.

It will be evident that a bridge with but two truss-frames may be constructed in accordance with our above-described invention, but we prefer to use four truss-frames, in the manner described.

The bridge shown in Fig. 2 has a narrow roadway for a single track. Should a wider roadway with a double track be required, we propose to make the bridge in the manner shown in the plan views Figs. 4 and 5 and the cross-section Fig. 6, representing one-half of the bridge. In this case the truss-frames, instead of being arranged at equal distances apart, as in the bridge above described, occupy the relative position shown in Fig. 4, so that there may be a wider roadway between them; in other words, the towers are transversely further apart from each other than in Fig. 3, the space within the limit of the posts of each tower in Fig. 4 being of oblong shape instead of square. With this exception, and with the exception of a slight variation in the disposition of the diagonals connecting the opposite towers together, the bridge is similar to and possesses the same characteristics as that described on reference to Figs. 1, 2, and 3.

One of the important objects attained by our invention is facility of erecting the bridge without the aid of cumbrous and costly scaffolding, all the scaffolding required being such as will extend to the lower chord, above which the bridge may be erected story after story, the lower stories serving as scaffolding for the upper stories.

We claim as our invention—

1. A truss-frame bridge in which the posts are combined to form towers, as set forth.

2. A truss-frame bridge in which the transverse beams for supporting the roadway are suspended to the frames in the manner described.

In testimony whereof we have signed our names to this specification in the presence of two subscribing witnesses.

THOMAS C. CLARKE.
ADOLPHUS BONZANO.
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Witnesses:
P. G. CAREY,
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