(No Model.) 2 Sheets—Sheet 1.

T. C. CLARKE.

CANTILEVER BRIDGE.

No. 504,559. Patented Sept. 5, 1893.

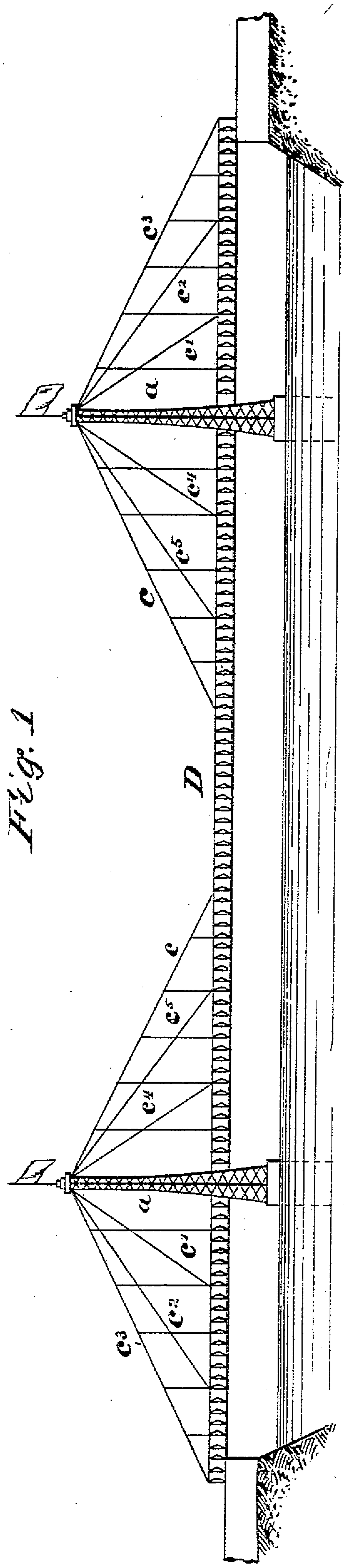

Fig. 1

WITNESSES:

J. A. Bergstrom

C. Sedgwick

INVENTOR

T. C. Clarke

BY Munn & Co

ATTORNEYS.

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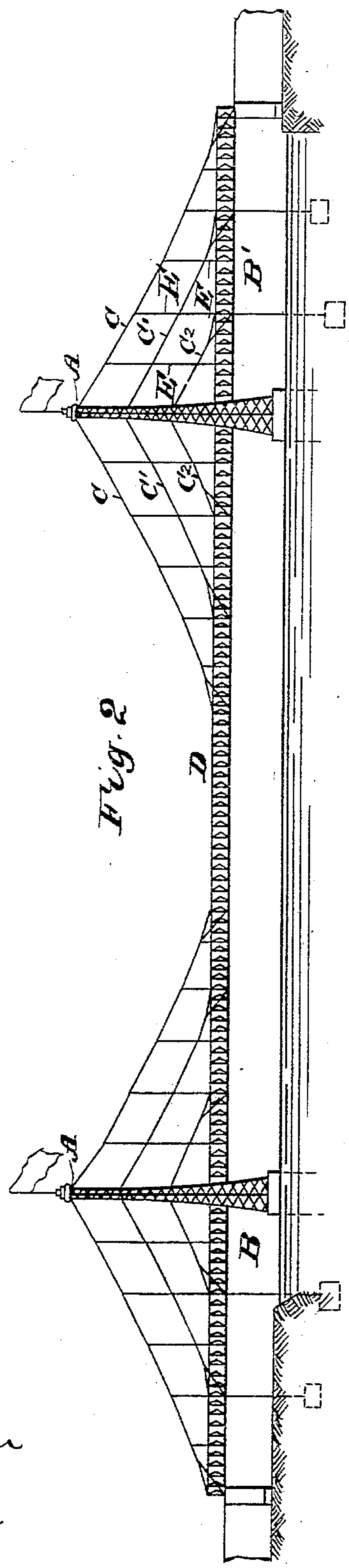

Fig. 2

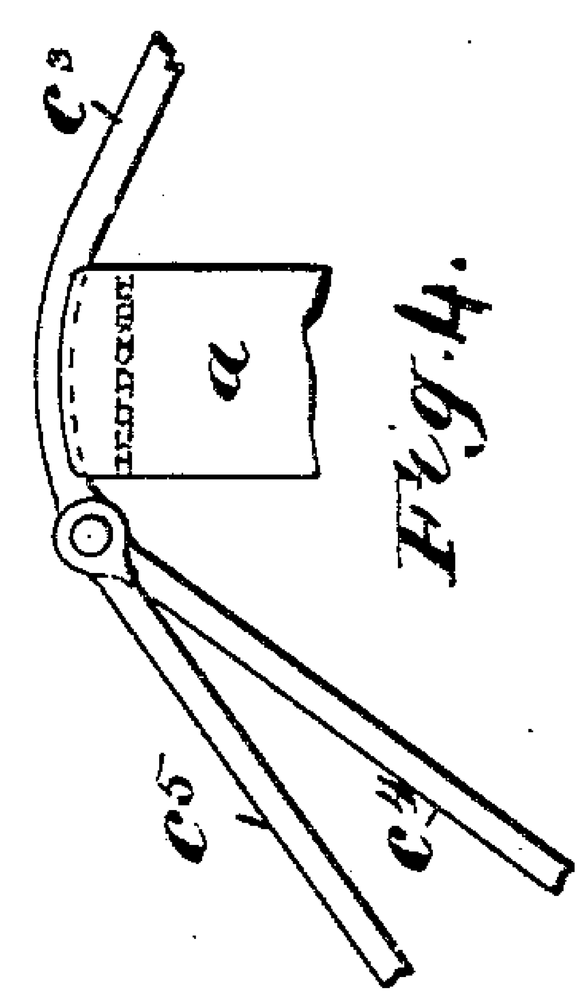

Fig. 4.

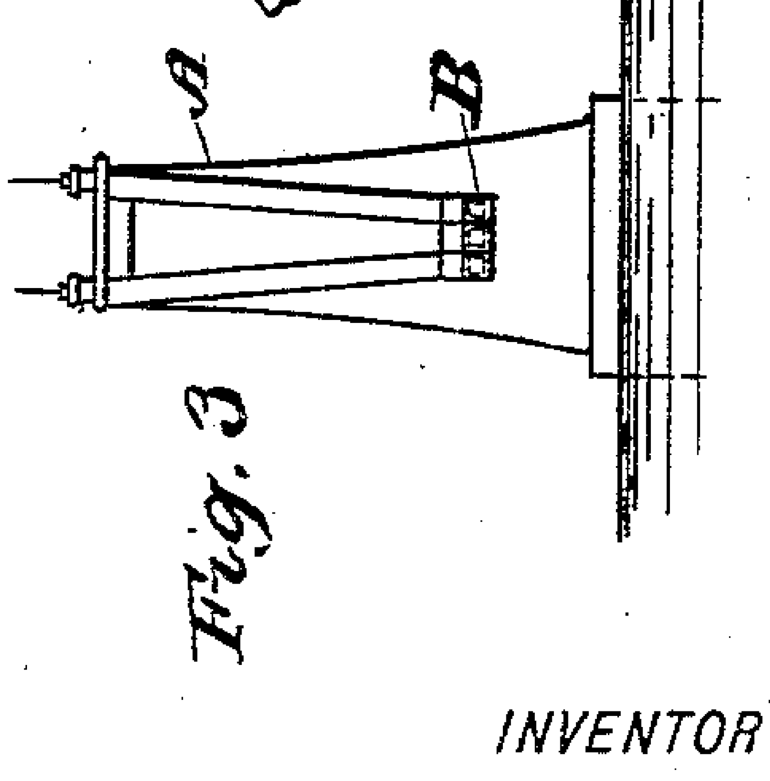

Fig. 3

WITNESSES:
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United States Patent Office.

THOMAS C. CLARKE, OF NEW YORK, N. Y.

CANTALEVER-BRIDGE.

SPECIFICATION forming part of Letters Patent No. 504,559, dated September 5, 1893.

Application filed August 2, 1892. Serial No. 441,906. (No model.)

To all whom it may concern:

Be it known that I, THOMAS C. CLARKE, of New York city, in the county and State of New York, have invented a new and useful Improvement in Cantalever-Bridges, of which the following is a specification, reference being had to the annexed drawings, forming a part thereof, in which—

Figure 1 is a side elevation of a bridge without anchorage ties below the land span, constructed according to my improvement. Fig. 2 is a side elevation of a modified form of the bridge, the said bridge being provided with anchorage ties below the land span. Fig. 3 is a transverse section taken through the center of the bridge; and Fig. 4 is a side elevation of a part of one of the overfloor stays.

Similar letters of reference indicate corresponding parts in all the views.

The object of my invention is to construct a cantalever bridge in such a manner as to secure great economy of material and cost.

In carrying out my invention, I make use of the form of cantalever bridge in which suspended girders are used, the members of which take up the compression which comes from the ties supported by the towers; I also arrange the stays on converging lines to enable them to resist wind pressure, and furthermore, I provide an expansion joint by means of which the members of the bridge are allowed to expand or contract without in any way interfering with their proper action. I also resist the bodily movement of the girders from unbalanced loads by a peculiar arrangement of the stays.

In the form shown in Fig. 1, the towers *a* support the girders b', b^2, by means of the stays c, c', c^2, c^3, c^4, c^5. The stay c is connected with the stays c' c^2 on the opposite side of the tower, and in like manner the stay c^3 is connected with the stays c^4 c^5. The stays c c^3 extend over saddles at the top of the tower and are connected with the stays c' c^2 and c^4 c^5 respectively, in the manner shown in Fig. 4, that is to say, the stay upon one side of the tower is connected with two stays on the opposite side of the tower by means of eyes and pins; but I do not limit or confine myself to this particular construction. The lower ends of the stays c^3 are connected with the ends of the girders b', b^2. The stays c', c^2, are connected with the girders b', b^2, at points between the towers and shore ends of the girders, and the stays c^4 c^5 are connected with the girders at points located between the tower and the center of the bridge.

In the form shown in Fig. 2, the girders B, B′, are suspended from the towers A, by means of the stays or ties C, C′, C², extending over the floor of the bridge, and connected at different heights with the tower, the stays C being preferably connected with the top, and the stays C′, C², being connected with the tower at points between the top and the bridge floor. These stays are made of steel wire cables. The panels forming the girders B, B′, may be constructed on any approved plan. The central loose span D of the bridge is connected with the girders B, B′, by means of expansion joints. The stays C, C′, C², are secured to posts E, attached to the main girder or trestle of the bridge, the said posts serving to prevent the stays from deflection. The steel wire stays which support the girders of the bridge are farther apart at the tops of the towers than at the places of attachment to the girder. The effect of this construction is to do away with much of the metal ordinarily used in cantalever bridges for wind bracing.

Two cases occur in construction; one where tail or land span, Fig. 2, can be supported from below, and here I make the supports, also anchorages from the stays C′ and C². This supports the unbalanced loads between the tower and the ends of the cantalever. The other case is where no supports can be placed under the tail spans. Here, Fig. 1, I divide the main anchor stay c^3 after it passes over the tower into the two smaller intermediate stays c^4, c^5, and in like manner divide the main stay c, which supports the center of the girder after it passes over the tower, into two smaller stays c' and c^2. In this way I avoid an upward bending movement on the girders and consequent deflection on the other side of the tower.

By the improvement in cantalever bridges, which I have invented, I am enabled to construct a bridge of longer span than has heretofore been attempted. This form of cantalever was first suggested by the French engineer Navier, in 1825, and has since been reinvented by the late Professor Trowbridge, and others, since then under the name of "derrick cantalevers." This form of bridge has never been brought into practical use for two reasons; one is, because in cantalever spans of moderate length, say below one thousand feet, the present system of diagonally braced girders is preferable, while for very long spans, the "derrick" is impracticable. If the inclined ties were made of pins and eye-bars, their width in long spans, owing to the number of members required, would be so great as to cover the whole width of the bridge, rendering it impossible to attach them to the lower compression members. Their weight would be prohibitory, and the surface exposed to wind pressure very great. They would be very difficult to support and impossible to erect without staging. I avoid all these difficulties by making the inclined ties of small cables made of steel wires laid up parallel and unite them after erection. This material has a tensile strength of one hundred and eighty-five thousand pounds per square inch, or three times as much as the eye-bar and pin system. This allows of a great reduction of the area and weight. It can be easily put in place; it requires fewer supports; it exposes less surface to the wind, and it can be easily and strongly attached to the compression members without taking up too much space laterally. This application of steel wire to form the inclined ties of derrick cantalever bridges presents advantages over every other known system of construction.

The second objection to the derrick cantalever is that under a moving load it is nearly as flexible as a suspension bridge. The tie on one side of the tower goes down with the load because it pulls up on the other side, being resisted only by the stiffness of the girders. The only remedy heretofore proposed has been to anchor the land spans at every point of attachment of the ties.

In many cases anchors cannot be used.

My device has the advantage of being capable of gathering all the intermediate ties supporting one side of the bridge into one at the top of the tower. This single tie on the land side is attached to the anchorage at the end of the girder, and on the river side to the other end girder which supports the central loose span.

In my improved bridge the pull is always against the weight which is sufficient to resist an upward movement.

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

1. A cantalever bridge in which the main land anchor stays pass over the towers and are thence divided into the intermediate stays on the water or central side, and in which the main stay on the central or water side, after passing over the tower is divided into the intermediate stays on the land side.

2. A cantalever bridge, provided with intermediate stays on the land side, said stays being anchored from below, substantially as specified.

THOMAS C. CLARKE.

Witnesses:
C. SEDGWICK,
E. M. CLARK.